Section 1: Melbourne's orbital mobility challenge

Chapters 1 to 4

February 2018

Contents

Section 1: Summary

The first section of this business case sets out the role of transport in a connected Melbourne, the problems facing the city's transport network and the benefits of addressing these problems. It examines and tests a range of potential strategic options to confirm that North East Link is the most effective strategic response to these problems.

Melbourne's population boom has underpinned consumer demand, housing construction and, ultimately, economic growth; however, it has also created significant demands on housing, infrastructure, services and the environment. As the city continues to grow, Melbourne must be able to offer access to jobs and education, and meet basic housing, energy and transport needs in ways that are efficient and sustainable. A large city that grows without these opportunities, services and structures in place is at high risk of experiencing adverse economic, environmental and social consequences. With the benefits of a productive, competitive and liveable Melbourne extending well beyond the city's boundaries, maintaining these features is also critical to strengthening the wider Victorian and Australian economies.

Supporting a growing city requires strong transport connectivity for radial (to and from the CBD), cross-city and orbital travel. While Melbourne has strong radial connectivity that enables good central city access, other trips are not as well served by the transport network. These journeys are becoming increasingly important to moving people and goods around and through Melbourne, and to extracting maximum value and opportunity from the city's productive and competitive potential.

Alongside improved cross-city connectivity, it is important to maintain the qualities that make the city an attractive destination for residents and businesses, and to reinforce Melbourne's reputation for liveability. This includes making sure that additional pressures are not placed on the Urban Growth Boundary, which is designed to contain Melbourne's outward growth, create a more consolidated and sustainable city, and protect productive agricultural land and significant natural landscapes.

The Victorian Government has taken steps to improve Melbourne's connectivity by alleviating road congestion, increasing accessibility and adopting a strong focus on integrated transport and land use planning. Much-needed capacity has been added to the transport network, including investment in major new rail and road infrastructure and upgrades to existing assets and services. While these actions have resulted in significant improvements to parts of the transport network, the city's unconnected freeway network continues to constrain the performance of the wider network and reduce connectivity and accessibility for households and businesses across Melbourne.

Cross-city movements between Melbourne's west and north are facilitated via the M80 Ring Road, extending from the Princes Freeway in Altona to the Greensborough Bypass. Movements between the east and south east are enabled by EastLink, which traverses the outer eastern suburbs between Donvale and Seaford. However, there is no freeway-standard connection for cross-city orbital movements between the eastern terminal of the M80 Ring Road and the Eastern Freeway and northern end of EastLink. Instead, these movements are facilitated via arterial roads that are struggling to cope with increasing traffic volumes and competing travel demands that include commuter trips, business trips and intra-city, regional and interstate freight movements.

The context for the preparation of the business case is outlined in Chapter 1.

Chapter 2 explores the impacts of poor cross-city orbital connectivity by analysing how:

- Melbourne's unconnected freeway network constrains the economic potential of Victoria.
- Inefficient freight movement between the north and south east of Melbourne limits supply chain competitiveness and hinders the growth of high value industries.
- Congestion and heavy vehicles on neighbourhood roads in the north east harm liveability and community wellbeing.

Addressing these problems is expected to deliver:

- Economic, employment and business growth – Providing a fast, reliable and direct orbital connection to key employment areas in the north, east and south east will attract more investment in these areas and improve the ability of businesses to access skilled workers, participate in supply chains and share inputs, ideas and innovation.
- Improved competitiveness and productivity – Greater cross-city connectivity will allow improvements and efficiencies in freight movements and supply chains, which will flow through to reduced business costs and lower consumer prices and deliver productivity benefits across the Melbourne and Victorian economies.
- Increased opportunities for households in the north, east and south east – Improved accessibility will give residents more job choices and more options for working closer to home, boost household incomes and support the development of 'employment rich' suburban hubs that can generate new economic opportunities from Melbourne's expanding services sectors.
- Improved liveability and thriving communities in the north east – Decreased reliance on local and arterial roads as key cross-city routes through Melbourne's north east will boost amenity in these areas through reduced noise pollution, improved air quality, safer local roads, less time lost sitting in traffic and better connections to local destinations.

'Cross-city' versus 'orbital' movements

Generally, 'cross-city movements' refers to **travel across Melbourne from one part of the city to another**, such as using arterial roads to travel from Bundoora in the north to Box Hill in the east..

'Orbital movements' refers to **travel around Melbourne via the outer suburbs**, such as using the M80, arterial roads and the Monash Freeway to travel from Broadmeadows in the north to Dandenong in the south east.

Only a small number of trips are truly 'orbital' in that they travel along the full extent of the city's orbital network. Most journeys use part of the orbital network to move across the city in a variety of directions: from the west to the north east, from the north west to the east, from the south east to the north and so on. This business case refers to these trips along sections of the orbital network as **cross-city orbital movements** and notes the importance of improving cross-city orbital connectivity as Melbourne continues to grow.

The achievement of these benefits will be measured against a set of key performance indicators, as outlined in Chapter 3.

Chapter 4 examines a range of strategic options and tests how effective they would be in addressing the problems identified in Chapter 2. Options are tested against five criteria: benefits, cost, time, risk and impacts. This analysis confirms that a solution with a connected freeway (North East Link) as its core element is the most comprehensive and viable solution to orbital connectivity and capacity problems in Melbourne's north east. This solution also delivers the highest amount of benefits in the medium term for relatively fewer dis-benefits (adverse impacts).

North East Link also provides connectivity to activity centres and employment hubs, facilitating economic growth and access to jobs and education opportunities. It will move trucks off local roads in the north east, improving liveability and wellbeing for communities. These benefits are supported by modelling and economic analysis undertaken by Infrastructure Victoria, which show the North East Link as being a relatively high-performing project that offers substantial benefits in linking people to employment across Melbourne.

This strategic response also supports national, state and local government strategies and policies that have identified the need for a freeway-standard link between the M80 Ring Road and the Eastern Freeway/EastLink.

1 Context

The Victorian Government has announced it will build North East Link – the 'missing link' in Melbourne's cross-city orbital road network between the M80 Ring Road (M80) and the Eastern Freeway/EastLink.

The Government's announcement followed Infrastructure Victoria's identification of North East Link as a high priority infrastructure project for the state in its *30-Year Infrastructure Strategy*, released in 2016. Infrastructure Victoria noted that the link will enhance access to major suburban business and employment centres, improve orbital road connectivity across Melbourne and boost the capacity of the city's freight network.

In October 2017, the Victorian Government's *Victorian Infrastructure Plan* confirmed North East Link as one of several 'catalyst', state-shaping infrastructure projects designed to stimulate economic growth, create jobs and deliver positive, long-term benefits for Victorians. The State Budget 2017-18 allocated funding for business case development, consultation and route selection for the project.

This business case tests the merits of the investment based on a comprehensive assessment of Melbourne's transport needs. It identifies the potential transport outcomes, benefit and impacts of the North East Link Project and examines scope options, delivery strategies and funding approaches. Following its consideration of the business case, Victorian Government approval will be required for further funding to deliver the project.

This chapter describes the context in which North East Link is being developed.

1.1 Melbourne's advantages and attributes

As with any major new investment in infrastructure, planning for North East Link needs to consider the project's potential contribution to and impacts on the advantages, attributes and values that have made Melbourne a highly liveable and successful city.

Melbourne's diverse and globally-connected urban economy, its role as Australia's premier transport hub, its internationally renowned cultural contributions and its success in managing strong population growth are of national importance. The city is home to more than 70 percent of Victorians and has the second largest population of any state in Australia[1]. It is a commercial and administrative centre, international gateway, higher education and research hub, and the country's sporting and cultural heartland. Melbourne residents enjoy a high quality of life in a city that is consistently rated as one of the most liveable in the world.

Melbourne is a key contributor to Australia's status as the twelfth largest economy in the world. In 2015-2016, the city's Gross Domestic Product (GDP) of $304 billion accounted for almost 20 percent of national GDP[2]. Growing by 4.4 percent over the year, Melbourne underwrote almost one third of national GDP growth. With strengths in finance, manufacturing, research, IT, education, logistics, transportation and tourism, the diversity and flexibility of the city's economy has been central to the growth and continued resilience of the Australian economy.

[1] Facts About Victoria, Live In Melbourne. Accessed from http://www.liveinvictoria.vic.gov.au/?a=17079
[2] Australian Bureau of Statistics, 5220.0 – Australian National Accounts: State Accounts 2015-16

Melbourne ranks among the top 30 cities in the world in the Global Financial Centres Index and is a leading financial centre in the Asia-Pacific region[3]. Two of Australia's big four banks, NAB and ANZ, are headquartered in Melbourne and the city is the country's superannuation hub, managing 40 percent of Australia's total super funds and 65 percent of industry super funds.

Melbourne is Australia's second-largest industrial centre and the Australian base for a number of major manufacturing firms. It is home to one third of Australia's information and communications technology professionals[4], half of the top 20 ASX biotech companies and major Australian and international companies including BHP, Telstra, Medibank, BP, ExxonMobil, Energy Australia and BUPA.

The city is a highly attractive destination for international students. In 2017, it was ranked the world's fifth top University City, and seven Melbourne universities featured in the 2016-17 QS World University Top 100 Rankings[5]. It has more research centres than any other city[6] in the country and boasts internationally recognised innovation clusters, such as the Melbourne Biomedical Precinct in Parkville and the Monash Science Technology Research and Innovation Precinct in Clayton. La Trobe University, located in the middle suburb of Bundoora also has an expanding education and research role, including a growing student and research population and the recently completed AgriBio Centre.

As major gateways for domestic and international trade and visitors, the Port of Melbourne and Melbourne Airport are key economic assets for Victoria and Australia. Underpinning Melbourne's role as a national logistics centre, the Port of Melbourne handles more than $102 billion in trade every year and is Australasia's largest maritime hub for containerised, automotive and general cargo. Total trade through the Port has increased by 2.6 percent (89.3 million revenue tonnes) from the 2014-15 financial year[7]. The 2015-16 financial year saw record high levels of trade through the Port, with throughput exceeding 2.6 million containers (a growth rate of 2.3 percent since 2011-12) for the first time.

Melbourne Airport is Australia's second busiest airport, accommodating 34.6 million domestic and international passenger movements in 2016 (up 4.6 percent since 2015)[8]. The airport accounts for just under one third of freight facilitated by all Australian airports combined[9]. The airport's operations support 14,300 jobs and indirectly support another 43,000 jobs to move large numbers of passengers and freight 24 hours a day[10]. The site and surrounding areas are an important employment cluster for the State, one of the largest outside Melbourne's CBD[11]. Economic activity undertaken across the airport precinct contributes about $1.47 billion a year to Victoria's Gross State Product (GSP) [12].

[3] The Global Financial Centres Index 21, Long Finance, March 2017
[4] Melbourne's strengths in technology, Invest Victoria. Accessed from http://www.invest.vic.gov.au/opportunities/technology/melbourne-s-strengths-in-technology
[5] QS World University Rankings: www.topuniversities.com
[6] Medical technologies, biotechnology and pharmaceuticals, Invest Victoria. Accessed from http://www.invest.vic.gov.au/opportunities/medical-technologies-biotechnology-and-pharmaceuticals/victorias-strengths
[7] Port of Melbourne Corporation, Annual Report 2015-16
[8] 'Melbourne Airport passenger records smashed in 2016', Melbourne Airport. Accessed from http://melbourneairport.com.au/news-events/listing/overview/melbourne-airport-passenger-records-smashed-in-2016-2136.html
[9] Australia Pacific Airports (Melbourne) P/L, Melbourne Airport Master Plan 2013
[10] Australia Pacific Airports (Melbourne) P/L, Melbourne Airport Master Plan 2013
[11] Australia Pacific Airports (Melbourne) P/L, Melbourne Airport Master Plan 2013
[12] Australia Pacific Airports (Melbourne) P/L, Melbourne Airport Master Plan 2013

Referred to as Australia's 'cultural capital', Melbourne is the birthplace of Australian impressionism (with deep connections around Heidelberg), Australian Rules football and the Australian film and television industries. It is one of seven UNESCO Cities of Literature and is a major centre for street art, music and theatre. Melbourne has one of the most highly regarded live music scenes in the world and more theatres and performance venues than any other city in Australia. Melbourne also has growing global reputation as a food destination, known for the quality and diversity of its cafes, restaurants and produce.

Melbourne is also a city of great diversity and a model for other cities across Australia and around the world. Victorians come from more than 200 countries, speak 260 languages and dialects and follow 135 religious faiths[13]. The city attracts a large proportion of international overseas immigrants entering Australia, absorbing 36 percent of net overseas migration in 2015-16[14]. Migrants have been – and continue to be – amongst Melbourne's greatest economic assets, contributing economically, politically, socially and culturally to Victoria's liveability and prosperity.

As with the rest of the country, the city must focus on its comparative advantages by sustaining its successful industries, growing new capabilities and further investing in its liveability. However, what makes Melbourne different to many other parts of the country is the scale of its contribution to Australia's wellbeing: decisions taken about how to plan the city's future – and how to enhance its advantages and attributes – can have far reaching consequences for Victoria and the nation.

1.2 Key challenges for the city

Over the last 50 years, Melbourne has experienced major changes and shifts in its population, economic structure and spatial organisation. These changes have been central to the city's success, but have created many challenges. Developing effective policies and smart investments to address these challenges requires a clear understanding of their causes, effects and interconnectedness.

1.2.1 A growing population

Although Melbourne's population has been booming for more than a decade, the recent scale of growth is unprecedented for an Australian city. In the year to June 2016, the Australian Bureau of Statistics (ABS) estimates that almost 30 percent of Australia's population growth occurred in Melbourne. During that time, the city swelled by an additional 108,000 people (or 2.3 percent), nearly twice the rate of growth of the rest of the country[15]. If current trends persist, Melbourne is expected to become a city of eight million people by 2051[16], surpassing Sydney as Australia's largest city by population and reaching a population comparable to London and New York City today[17].

[13] Victorian Multicultural Commission, Population & Migration. Accessed at https://www.multicultural.vic.gov.au/population-and-migration/victorias-diversity/2016-census-a-snapshot-of-our-diversity

[14] Australian Bureau of Statistics (ABS), Migration, Australia, 2015-16. Accessed from http://www.abs.gov.au/ausstats/abs@.nsf/mf/3412.0

[15] Australian Bureau of Statistics (ABS), 3218.0 Regional Population Growth, Australia, 2016

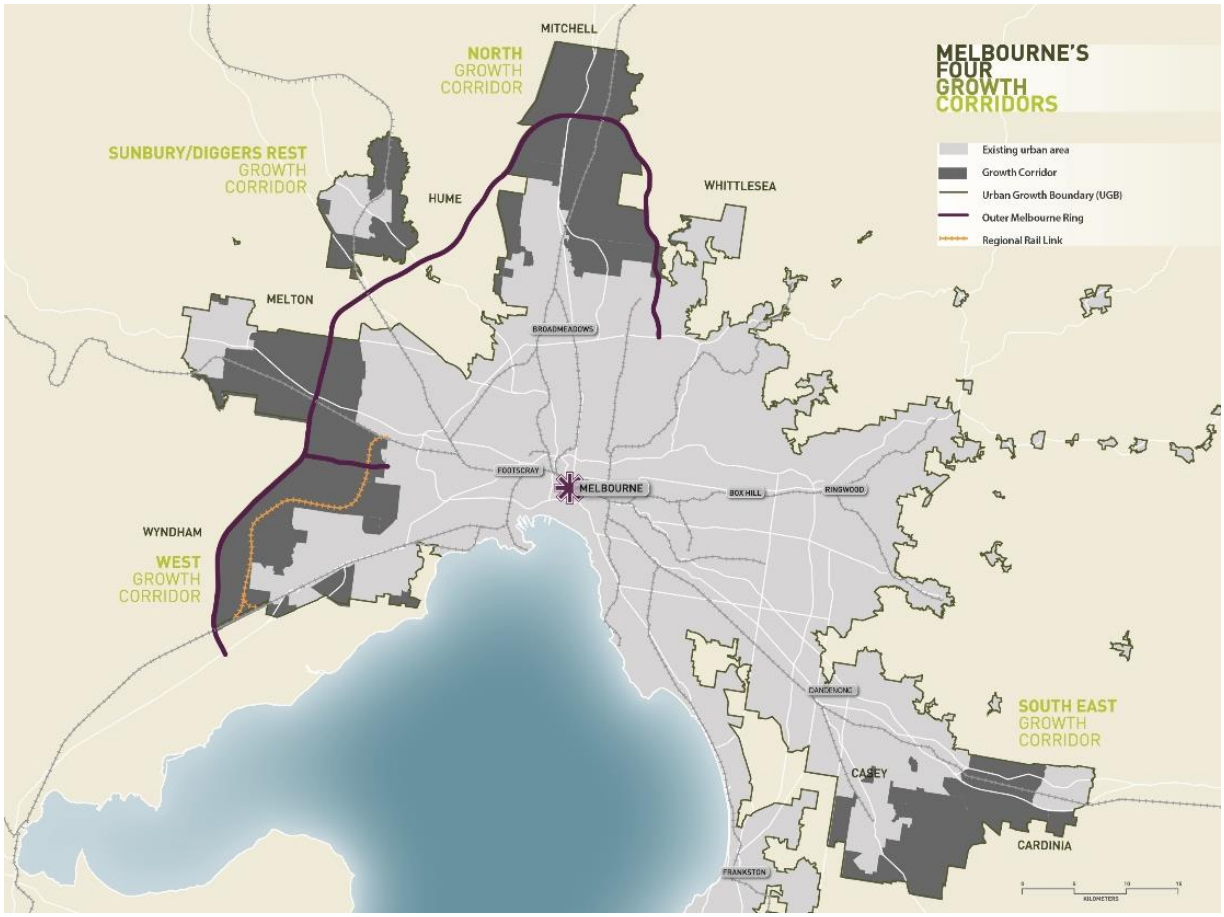
[16] DELWP, Victoria in Future 2016

[17] Largest cities in the world and their mayors 2017. Accessed at http://www.citymayors.com/statistics/largest-cities-mayors-1.html

Much of Melbourne's growth over the last decade occurred in 'greenfield' areas on the city fringe and through urban densification in established inner and middle suburbs. During this time, Melbourne's outer suburbs absorbed nearly 470,000 people (or 55 percent) of total population growth. The inner suburbs grew by almost 94,000 people (or 39 percent), while the middle suburbs grew by roughly 295,000 people (or 15 percent)[18].

While some of Melbourne's future growth is expected to be absorbed by inner city suburbs, most of the growth will occur in the outer suburbs[19]. As shown in Figure 1-1, Melbourne is growing along four main corridors: north, north west, west and south east. Roughly half of all growth over the last decade has occurred along these corridors and nine of the city's top ten fastest growing suburbs are in the outer north, west and south east.

Figure 1-1 Melbourne's four growth corridors

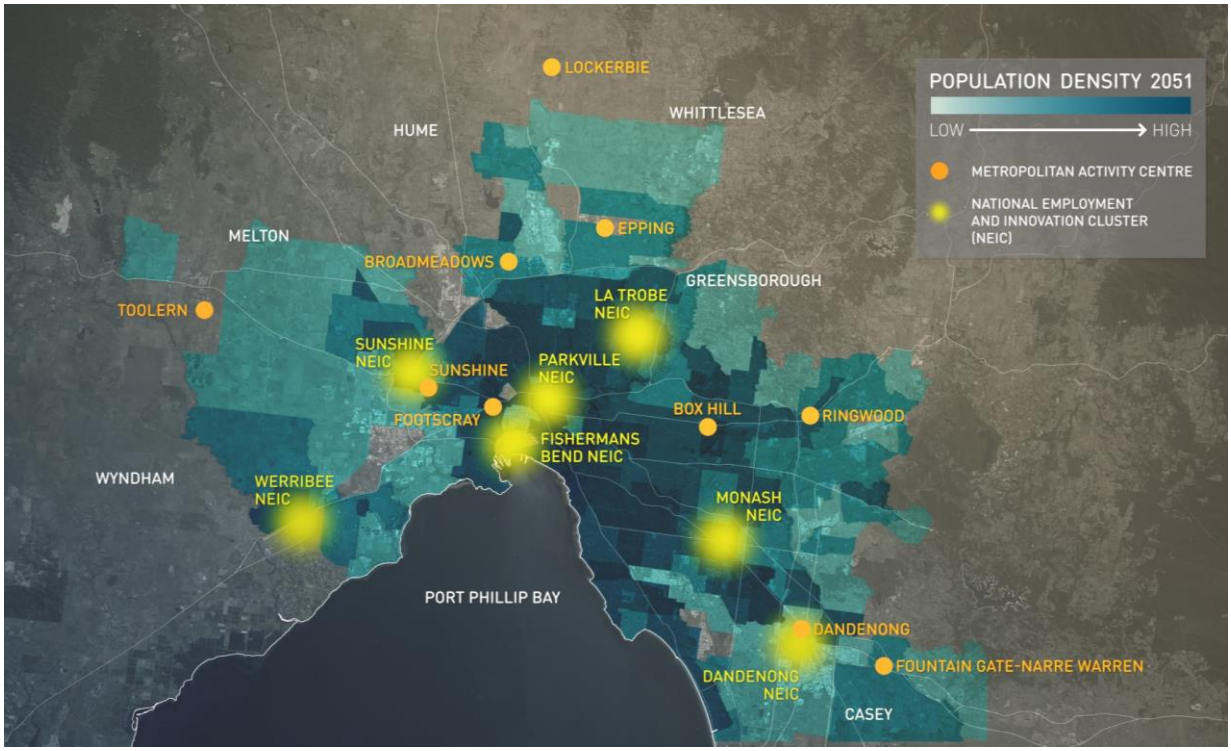


Source: Victorian Planning Authority, Growth Corridor Plans – Managing Melbourne's Growth, 2012

[18] DELWP, Victoria in Future 2016
[19] DELWP, Victoria in Future 2016

As Melbourne continues to grow, some parts of the city will become more densely developed than others. Figure 1-2 illustrates forecast population density across Melbourne to 2051, showing the increasing density expected to occur in the city's growth corridors and around Metropolitan Activity Centres (MACs) and National Employment and Innovation Clusters (NEICs)[20].

Figure 1-2 Population density to 2051



Source: DELWP, Victoria in Future 2016

Melbourne's population boom has underpinned consumer demand, housing construction and economic growth; however, it has also created significant demands on housing, infrastructure, services and the environment. In the future, it will become increasingly important for Melbourne to offer access to jobs and education, and meet basic needs such as housing, energy and transport, in ways that are efficient and sustainable. A large city that grows without these opportunities, services and structures in place is at high risk of experiencing adverse economic, environmental and social consequences.

[20] Metropolitan Activity Centres (MACs) and National Employment and Innovation Clusters (NEICs) have been identified by the Victorian Government as 'places of state significance' that will be the focus for investment and growth. MACs are major centres that are well served by public transport and that will provide jobs, activities, housing, services and retail opportunities for large regional catchments. NEICs are clusters of business activity of national significance, particularly in knowledge-based industries.

Melbourne's north east

Melbourne's north east comprises the municipalities of Banyule, Darebin, Nillumbik, Whittlesea, Manningham, Boroondara, Maroondah and Yarra Ranges. It is home to approximately 947,000 residents, around 20 percent of the city's population[21]. Housing is typically in the form of low density detached dwellings, with higher density development clustered around the employment and retail precincts of Greensborough, Ringwood, Heidelberg, La Trobe University, Box Hill and Doncaster.

As indicated in Figure 1-1 and Figure 1-2, while the north, south east, north west and west corridors are recording strong population growth, the north east is experiencing relatively low growth. This pattern of growth is expected to continue.

By 2036, the population in the north east is forecast to increase by around 212,340 (up by 22 percent)[22], with growth expected to be accommodated through infilling and urban renewal in already developed areas. Over this period, neighbouring regions are likely to experience much higher levels of growth. For example: to the north, the municipality of Whittlesea is expected to grow by 103,460 (up 49 percent)[23]; to the south east, Clyde and Cranbourne East are expected to be among the fastest growing suburbs in Australia. New suburbs are also being planned in the outer north.

The relatively low population growth in the north east is due largely to geographical constraints and the development limits imposed by the city's Urban Growth Boundary (see box below).

The transport network in the north east is different to other regions in Melbourne; compared to the south east, there is limited access to trams and rail services, a lower reliance on freeways for longer trips and a more disjointed arterial road network.

The north east's location between two urban growth corridors – and between the major freeway connections of the M80 and the Eastern Freeway – means that the region's arterial road network is used for freight and commuter traffic between the north and south east urban growth corridors. Population growth in these corridors – along with the future expansion of major industrial precincts in the north and south east – will generate increasing traffic volumes across the arterial road network in the north east. If not addressed, this will affect amenity and safety in communities adjacent to the network and bring some of the north east's valued attributes and community assets under pressure.

[21] DELWP, Victoria in Future 2016
[22] DELWP, Victoria in Future 2016
[23] DELWP, Victoria in Future 2016

The importance of the Urban Growth Boundary

The Urban Growth Boundary (UGB) is a critical feature in planning for Melbourne's future as a liveable, sustainable and accessible city. The UGB applies around the urban areas of metropolitan Melbourne and is designed to direct urban growth to areas with appropriate infrastructure and services and to protect valuable agricultural land, rural landscapes, important habitats and environmental features.

Melbourne's urban footprint extends across approximately 10,000 square kilometres. Some outer suburbs are 100 kilometres apart and it can take hours to travel from one end of the city to the other.

The UGB was legislated in 2002 to contain the city's sprawl and encourage more sustainable, higher density development within existing centres. In subsequent years, the high demand for housing from a rapidly growing population has led to the boundary being expanded several times. The current UGB (shown in Figure 1-1) was reaffirmed as the outer limit for Melbourne's growth in Plan Melbourne 2017-2050. Plan Melbourne confirmed the UGB's importance in:

- Reducing urban sprawl and creating a more consolidated city
- Increasing metropolitan housing densities in the right places
- Protecting the values of non-urban land, opportunities for productive agricultural land and significant natural landscapes.

While the UGB can only be changed by majority vote in both houses of the Victorian Parliament, planning for new infrastructure should not strain the boundary or encourage its expansion. In Melbourne's north east, placing the UGB under pressure has the potential not only to push the city's growth out into rural areas and natural landscapes, but also to jeopardise the attributes valued by residents and communities.

1.2.2 An economy in transition

Over the last 30 years, Victoria has moved from a largely manufacturing-based economy to a post-industrial, globally connected information and services economy. This shift has been driven by the rising demand for services, the industrialisation of East Asia, economic reform and technological change. Since the 1950s, the share of manufacturing in the state's economy has declined from around 40 percent to less than seven percent today, while service industries have grown strongly – rising from 60 percent to nearly 90 percent.

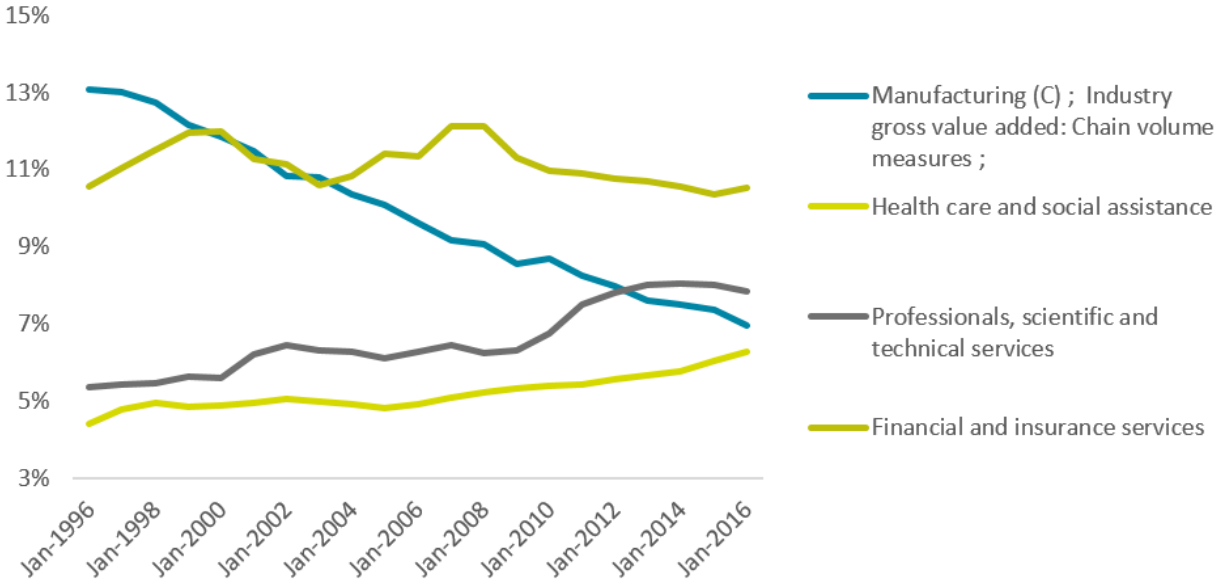
The nature of services has also changed. Previously, services were linked to manufacturing, with wholesale trade and transport supporting the production and distribution of manufactured goods. These types of services have fallen, consistent with manufacturing's declining share of the economy.

In 2016, professional and financial services and health care represented nearly 30 percent of Melbourne's economy, growing from around 20 percent in 1996, while manufacturing's share of the economy declined from more than 13 percent in 1996 to just under seven percent in 2016[24]. Figure 1-3charts these changes in Melbourne's industry structure over the 20 years from 1996 to 2016, as measured by industry gross value added share of GDP.

These changes have created new economic, social and spatial structures and transformed the way economic value is created.

[24] Australian Bureau of Statistics (ABS), 5204.0 Australian System of National Accounts, 2015-16

Figure 1-3 Industries in Victoria as a percentage of total GDP, 1996-2016



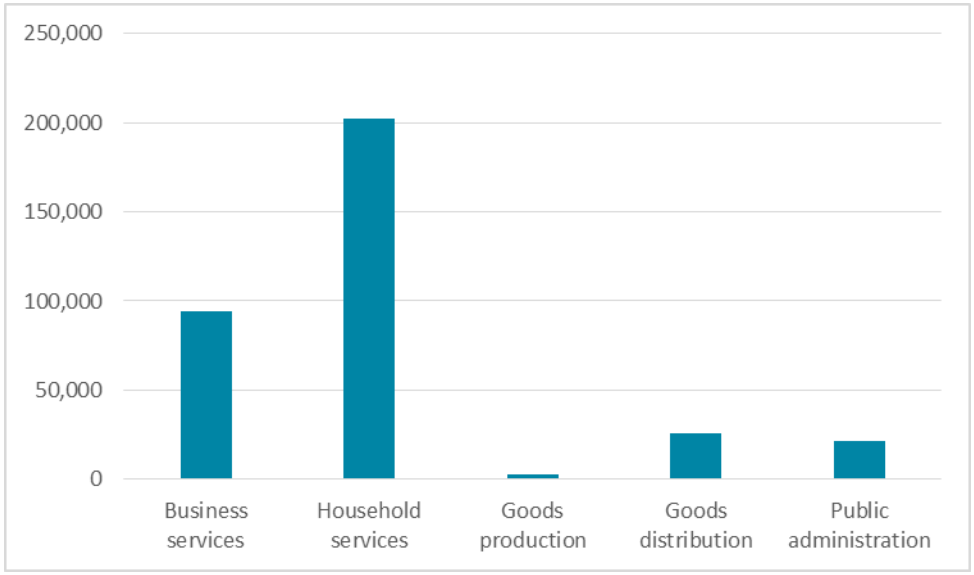
Source: ABS, Australian National Accounts, 2015-16

The decade between 2006 and 2016 saw Melbourne gain around 404,134 jobs to a total of 2.1 million[25]. Figure 1-4 shows that employment growth has been overwhelmingly in household services, mostly in health and education. Business services jobs have grown strongly over the decade, predominantly in professional and financial services. Employment in goods production and goods distribution has also increased, with large losses in manufacturing offsetting significant job gains in construction[26].

[25] Australian Bureau of Statistics (ABS), 2011 Census of Population and Housing, Greater Melbourne

[26] Categories as defined by the Reserve Bank of Australia:
Household services: health care and social assistance; Arts and recreation services; Education and training; Accommodation and food services; Other services
Business services: Professional, scientific and technical services; Financial and insurance services; Administrative and support services; Rental, hiring and real estate services; Information media and telecommunications
Goods production: Agriculture, forestry and fishing; Mining; Manufacturing; Construction; Electricity, gas, water and waste services
Goods distribution: Retail trade; Wholesale trade; Transport, postal and warehousing

Figure 1-4 Employment growth in Melbourne between 2006 and 2016



Source: ABS, 2006 and 2016 Census

In recent years, knowledge-intensive activities have grown in importance across all sectors of the economy. These activities require a skilled and educated workforce, and tend to be associated with high value industries such as professional services, finance, health and education. The growth of knowledge-intensive activity, coupled with the decline of the manufacturing sector, has had spatial repercussions across Melbourne. Many households have been affected by the loss of industrial jobs in the city's outer western, northern and eastern suburbs, while highly skilled workers are benefiting from a growing concentration of knowledge-intensive industries in the central city and inner suburbs.

While the Victorian economy has been performing strongly (with average annual growth in GSP of 2.6 percent over the last 15 years), labour productivity has stagnated and growth in real income per person has been relatively flat in recent years compared to NSW[27]. In 2016, GSP per person for Melbourne was $65,400: $4,000 below the national average and around $15,000 less than Sydney[28]. A priority for Melbourne is to raise productivity and workforce participation levels by growing high value industries, creating more employment opportunities and getting the city to operate in smarter, more efficient ways. A high quality, well-connected transport system is critical to achieving these outcomes.

1.2.3 An evolving urban spatial structure

Melbourne's liveability and the performance of the urban economy does not depend solely upon economic factors. The availability and condition of infrastructure affects the costs of production and the profitability of many sectors of the economy. Different urban spatial structures – encompassing the distribution, density and composition of jobs and population and the links between these – generate different economic and social outcomes. Productivity growth depends upon the city being able to efficiently connect workers with firms and the providers of goods and services with customers and suppliers. As Melbourne has grown, the city's ability to facilitate these connections has declined.

[27] Premier's Jobs and Investment Panel, Enhancing Victoria's economic performance and productivity, Discussion paper, June 2017
[28] SGS Economics & Planning, Australian Cities Accounts 2015-16

Melbourne's CBD persisted as the city's primary economic centre (supported by the radial rail network) until the 1950s when the mass uptake of private motor vehicles allowed access to large parcels of land not serviced by rail, leading to large scale suburban expansion.

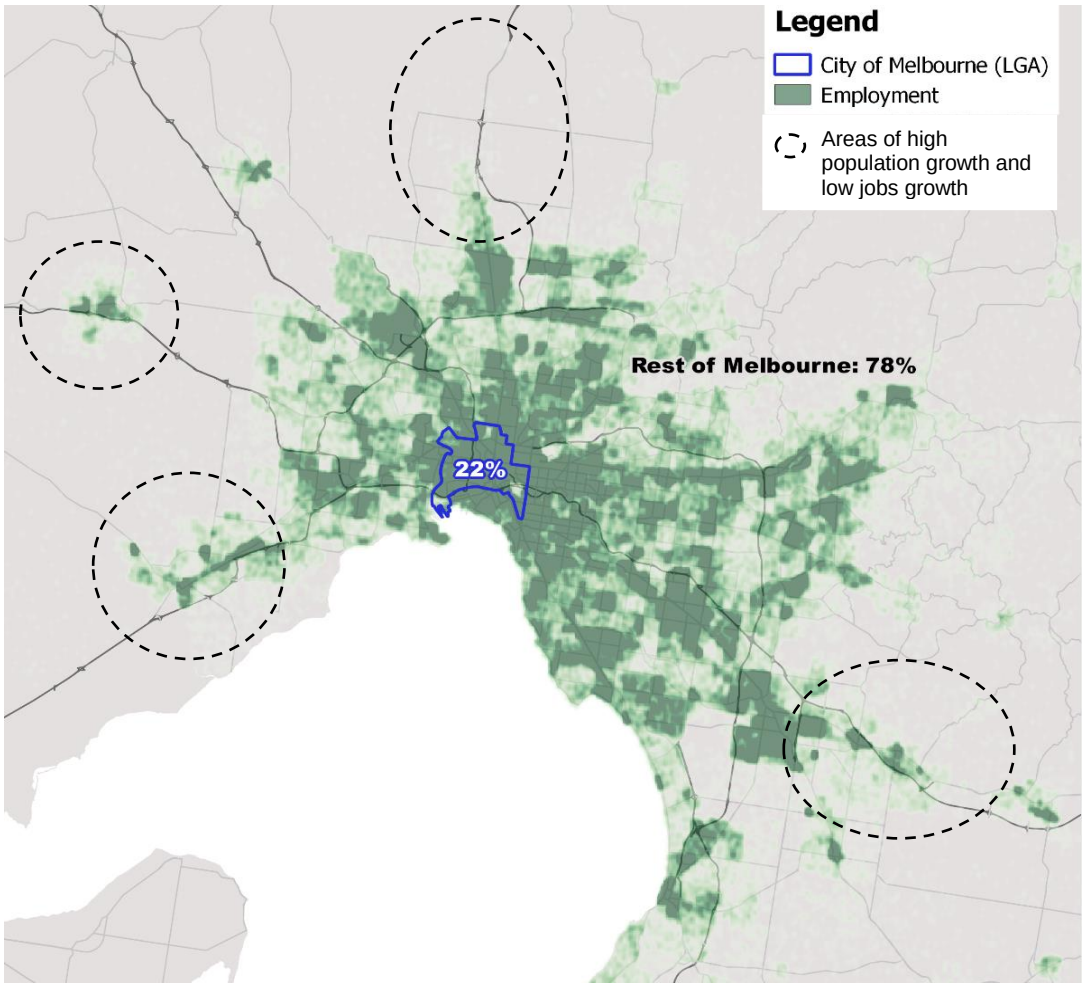
By the late 1960s and early 1970s, industry had also made the move to the suburbs to avoid growing road congestion, take advantage of cheaper land and be closer to suburban labour markets. Car-based retail developments in places such as Chadstone, Knox, Doncaster, Northland and Highpoint brought services and large scale retail activities to middle and outer suburban centres for the first time.

Between the 1950s and today, an increasing proportion of Melbourne's jobs has spread to secondary centres in the city's middle and outer suburbs, largely in the north and east (as shown in Figure 1-5). This has led to the emergence of large secondary business centres and new relationships between jobs and population across the city.

However, as Figure 1-5 also indicates, the distribution of jobs has not kept pace with increasing population in in the city's growth corridors. Over the next two decades, most employment growth is projected to occur in the central and inner city, and – to a lesser extent – the middle suburbs[29]. A very low percentage of new jobs are expected to be created in Melbourne's outer suburbs.

[29] The Current and Future State of Victoria: A macro perspective, Advice to Infrastructure Victoria by Deloitte Access Economics, February 2016

Figure 1-5 Job density (employment proportions) in Melbourne, 2016



Source: DELWP, Victoria in Future 2016

Melbourne's evolving spatial structure has created new patterns of opportunities and costs. The central city remains competitive for most economic functions and provides high levels of accessibility to customer and labour markets, but it is unattractive to many firms due to high costs. Firms in secondary centres have a cost advantage over those in the central city, but this gain is offset by poor accessibility as roads and freeways in the middle and outer suburbs become increasingly congested. Declining housing affordability in inner urban areas means that while many Melburnians benefit from living close to jobs and transport links, others are forced by necessity to live in parts of the city where access to jobs, services and transport is limited.

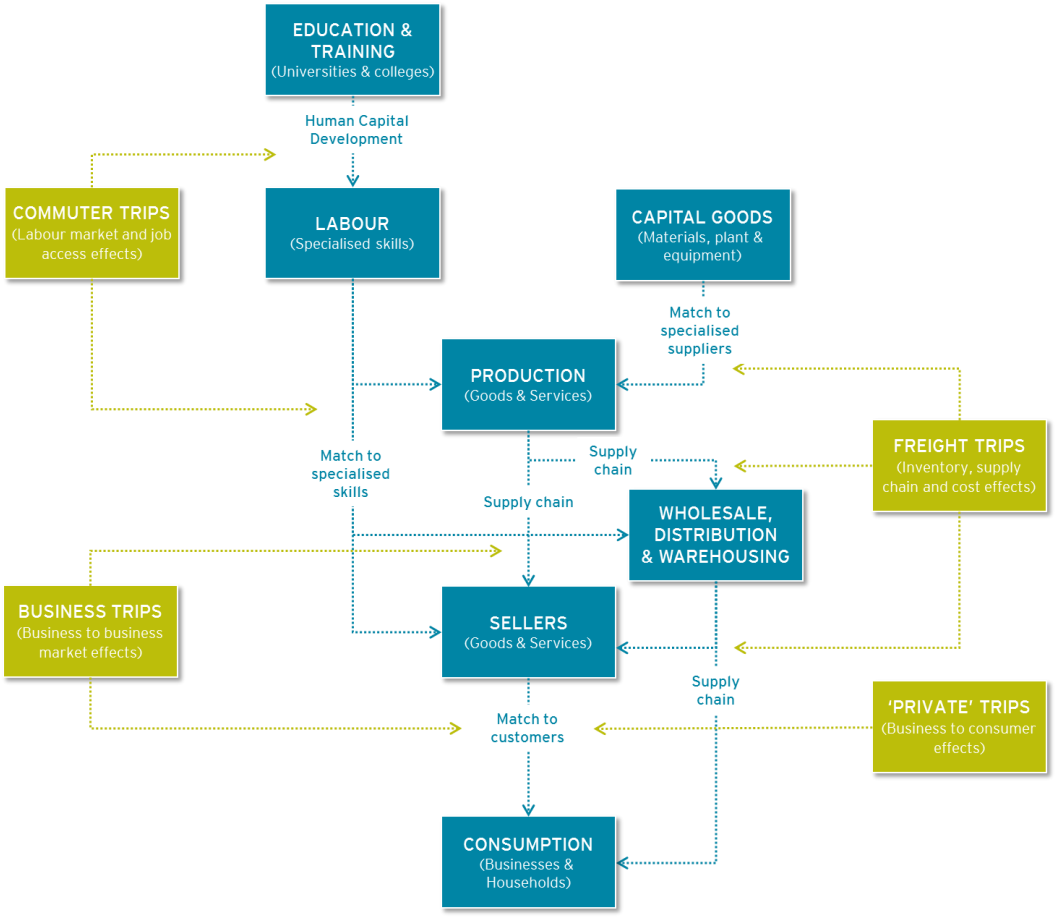
A productive and equitable city maximises a firm's access to suppliers, workers and customers, and a household's access to the opportunities needed to generate income and meet basic requirements. The long evolution of Melbourne's urban spatial structure translates into increasingly constrained access for firms to markets and increasingly constrained access for households to jobs and services. A key challenge for Melbourne is adjusting to a changing economic geography while still operating with a largely radial transport network that reinforces the primacy of the central city, constrains productivity growth and diminishes equity.

1.3 Transport for a changing city

To maintain an economy that keeps pace with global, technological and other developments, creates opportunities and delivers high employment, transportation networks must evolve to meet the needs of a changing city. Eliminating spatial barriers to the movement of people, goods and information is central to expanding markets and increasing Melbourne's productivity.

Figure 1-6 is a simplified representation of key elements of the urban economy and transport's role in relation to these elements. The blue boxes show economic activities, while the green boxes show how transport affects the flows between them. It highlights the fact that all economic activity depends upon access to workers, input materials, suppliers and customers, and that improvements to the transport system directly affect productivity and economic outcomes for all.

Figure 1-6 Location and transportation: effects on Melbourne's productivity and competitiveness



1.3.1 Connecting people to employment and services

The ability for Victorians to access jobs and the broad range of services offered by the city is essential for improving equity and wellbeing. Melbourne's expanding urban footprint and evolving spatial structure has led to accessibility imbalances and bottlenecks for many people living in the middle and outer suburbs, as well as in peri-urban areas. Households located close to the central city or along radial transport networks have significantly better access to jobs than those residing at the city's edge where jobs are dispersed across multiple suburban locations.

While Melbourne's western suburbs are expected to absorb the largest share of Victoria's growth over the coming decades, nearly two thirds of the city's population reside in the north, east and south east[30]. Most established employment clusters and activity centres are in these regions, hosting around 1.15 million jobs in diverse industries[31]. Despite their relative proximity, many households are unable to easily access the jobs and services available in established employment clusters and activity centres, particularly on either side of the Yarra River. This is because efficient cross-city and orbital movements are not fully supported by the existing road network and public transport services.

The mismatch between the distribution of population and jobs also generates additional travel from the outer suburbs to and through the middle suburbs. This 'through' traffic competes with local traffic, further eroding accessibility to jobs and services. The lack of a freeway connection between the fast-growing north and south east means that the north east arterial road network is under high and increasing pressure from this through traffic.

As Melbourne's population grows, the transport network in the west will need to evolve to support a burgeoning population, facilitate growth in existing firms and attract new industry investment so that jobs are available in the longer term. Investments such as Metro Tunnel and West Gate Tunnel are designed to meet these needs. However, the most pressing issue for the broader, city-wide transport network is the need for better connectivity across Melbourne's north, east and south east, where the majority of people and jobs are located and where considerable growth from urban consolidation and suburban development is expected.

1.3.2 Connecting businesses to consumers, workers and suppliers

The location of workers, consumers and businesses relative to each other and the speed of transport connections determine the effective size of urban markets and, therefore, the additional productivity that could be gained from the scale and agglomeration economies[32] of cities. Fast and reliable transport connections give firms access to a larger pool of workers and a higher number of skilled workers. They keep transport costs down and enable firms to extend their reach to more customers and a bigger range of suppliers. They also enable the exchange of ideas and promote collaboration and innovation to improve productivity.

When economic activities were clustered largely in central Melbourne, access to most firms and jobs was enabled by a radial transport network that moved large volumes of people and goods to and from the city centre. High numbers of these trips had many origins, but one concentrated destination.

As economic activities have become more dispersed, trip patterns have become more complex and less predictable. Without the support of an efficient, cross-city orbital network, Melbourne's existing radial transport network is increasingly unable to support changes in travel demand. While continuing to meet the demand for travel into an expanded city centre (including through the new Metro Tunnel), the radial transport network is reaching the geographic limits of its utility.

[30] DELWP, Victoria in Future 2016

[31] DELWP, Victoria in Future 2016

[32] 'Agglomeration economies' refers to the economic benefits associated with certain types of economic activity being concentrated in a general location and the links between those activities. Agglomeration benefits include reducing the costs of production and attracting customers, and boosting collaboration and innovation.

The long-term effect of dispersed economic activity and population across the metropolitan area has been an increase in journey times and lower levels of accessibility across the city. This has led to the fragmentation of large consumer, labour and supplier markets into smaller ones, constraining the productivity potential of the city. It has also led to a situation where residents living in the outer suburbs have relatively narrow employment choices compared to inner city residents.

In a city heading to a population of eight million, efficient radial, cross-city and orbital networks are essential features of a large city. As the demand patterns of the former dormitory suburbs change, connections with surrounding activity centres have become more important. Increasing connectivity between population, employment and activity centres across the metropolitan area would improve access to markets and boost the 'agglomerative power' of Melbourne. It would also reduce the need for long trips and use existing infrastructure more efficiently by encouraging outbound (against peak) commuting to employment and activity centres, improving access to jobs and services for people living beyond inner Melbourne.

1.3.3 Optimising the movement of goods

In addition to trips made by commuters, consumers and businesses, economic activities generate freight trips between ports, logistics centres and businesses. As the population and economy continue to grow, so too does Melbourne's freight task.

While a larger share of the metropolitan freight task is likely to be moved on the rail network, trucks and light commercial vehicles (LCVs) will continue to be the most efficient option for urban goods movements as they are better suited to shorter trips, diverse pick-up and drop-off points, and door-to-door deliveries. The growth of eCommerce means that more goods are being delivered directly from businesses to consumers in residential locations. Businesses in large cities like Melbourne also need to be supplied constantly with merchandise for sale in shops and materials and parts for use in manufacturing. These freight trips, which made up 7.7 percent of the total vehicle kilometres travelled (VKT) in Melbourne in 2015[33], do not follow the same patterns as commuting trips.

The expansion of the metropolitan area, the emergence of road freight transport, the relocation of manufacturing and warehousing activity to outer Melbourne and the expansion of eCommerce have made freight journeys less predictable and more complex. Notwithstanding the considerable freight task attributable to the movement of commodities to and from the Port of Melbourne, cross-city and orbital movements now comprise a significant proportion of all freight movements. The city's highly centralised freight transport network – which remains focused on the Port of Melbourne and pre-Federation handling facilities in the central city – is struggling to accommodate these changing freight patterns.

One of the biggest challenges for freight operators is moving goods through and around Melbourne efficiently and reliably. Currently, traffic congestion is one of the greatest impediments to improved freight productivity. Road freight operators in Victoria specialise in delivering time-sensitive and perishable commodities, consumer goods and construction materials. Congestion reduces the amount of deliveries these operators can make within a given time, makes it difficult to accurately predict trip or delivery times, and increases labour and fuel costs. These costs are passed on to producers and suppliers, which reduces their ability to compete across larger distances and increases the 'landed' cost of goods for consumers.

Moving higher volumes of goods efficiently by road and managing evolving patterns of freight travel without degrading local amenity is essential to improving the productivity of individual firms and the city.

[33] VicRoads, Traffic Monitor (Vehicle Kilometres Travelled), 2017

1.3.4 Enhancing liveability

Melbourne's status as the world's most liveable city is a strong competitive advantage – one that underpins efforts to attract businesses, investors, skilled workers and talented people to Victoria. Liveable cities offer a high quality of life and support the health and wellbeing of people who live and work in them. Liveable cities are equitable, socially inclusive, affordable, accessible, healthy, safe and resilient. They provide a diversity of choices and opportunities for residents, supporting them to realise their full potential. Liveable cities are also welcoming and safe destinations for visitors.

As Melbourne grows and changes, maintaining the city's liveability is increasingly challenging. There are concerns about growing disparities within Melbourne. Some communities are experiencing problems with regards to liveability, such as a shortage of affordable housing, marginalisation of lower income populations and relatively poor access to employment, education, social and health services, shops and recreational facilities. Growth areas are a key concern, particularly new low density outer suburban growth areas, some of which are experiencing such rapid growth in their populations that it is difficult for essential services and infrastructure provision, let alone employment, to keep up.

Transport networks and services are critical to accessibility, which is a core feature of liveable cities. Cities with good transport connectivity give a large proportion of residents, access to social and economic opportunities within a reasonable travel time and at a reasonable cost. As housing affordability in central and inner Melbourne has declined, residents who can afford to live closer to the city centre enjoy greater access to skilled and better paid jobs. Conversely, the opportunity to access these jobs becomes scarcer the further away from the city centre a resident lives[34], increasing the travel distance and time taken to get to work. Time spent commuting can have an impact on quality of life, taking away from time spent with family and friends or participating in community, cultural and recreational activities.

While a well-connected road network is important to a city's liveability (by providing access to jobs and services), it can contribute to diminished local amenity. Some communities become dependent on cars to meet daily mobility needs, with low rates of walking, cycling and public transport use. Urban environments that are dominated by cars are not conducive to incidental exercise (such as walking for local errands or to public transport) or recreational exercise. Around 45 percent of Melburnians commute less than 10 km to work or study, but less than six percent cycle or walk to work.

Maintaining and extending Melbourne's reputation as one of the world's most liveable cities will require all parts of the city to be well-connected (not just the city centre and inner urban areas), with city-wide transport networks that enhance access to jobs and services for a substantial proportion of the population – without detracting from neighbourhood amenity.

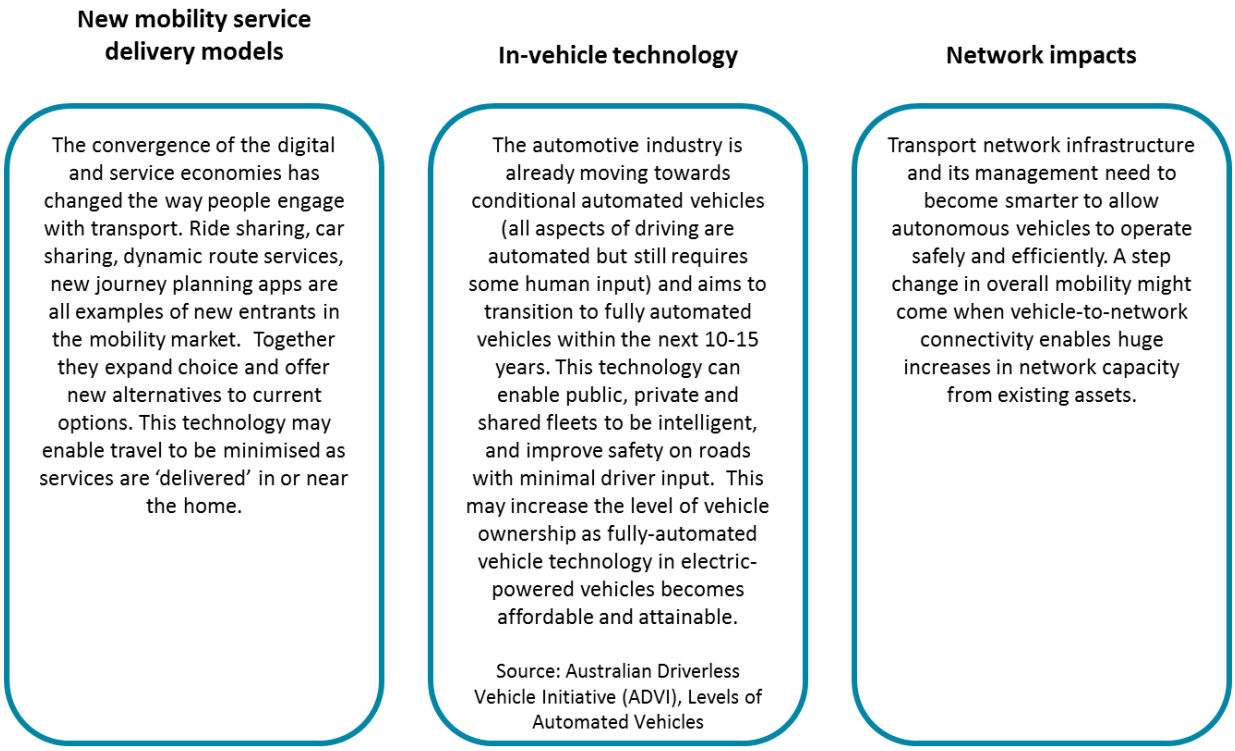
1.3.5 Planning for the future

Planning for Melbourne's future transport system must consider the changing role it will play in meeting the city's evolving personal, business and freight travel needs. This includes addressing the challenges associated with ongoing strong population growth and the demographic shifts that will occur over the coming decades due to increased life expectancy and an ageing population. These factors will drive changes in the patterns of demand for mobility. The broader environment in which transport operates, technological developments and the expectations of users are also changing at a rapid pace.

The figure below shows the three broad areas where mobility is changing.

[34] Bureau of Infrastructure, Transport and. Regional Economics (BITRE), Australia's commuting distance: cities and regions, Department of Infrastructure and Regional Development, 2015

Figure 1-7 Areas where mobility is changing



While there will be a continuing need for investment in transport infrastructure, a flexible approach will be needed in planning and delivering infrastructure and services to accommodate future demographic shifts and potential technology scenarios. Melbourne's transport requirements cannot be met with one or two simple solutions: a range of investments and initiatives will be needed across all transport modes. Multi-modal initiatives, better integration of transport and land use planning, new funding and pricing options, and using technology to deliver services differently are all likely to be part of the future mix of transport solutions for Melbourne.

Motorways of the future

Managed Motorways using Intelligent Transportation Systems (ITS) are a proven approach with demonstrated benefits in Victoria and internationally. In Victoria, detailed analysis of the M1 Upgrade project showed that ITS delivered a 16 to 19 percent improvement in average route throughput per lane. Road safety data has also shown a steadily declining crash rate since completion of the project: from 9.15 crashes per 100 million vehicle kilometres travelled (VKT) between 2001 and 2005 to 6.31 crashes per 100 million VKT between 2010 and 2014 (Source: VicRoads, Managed Motorways Framework, 2017).

Ample further opportunities exist to apply ITS to unlock greater value in current and future investments in transport networks. The potential range of applications for technology-enabled solutions is broad and includes improving customer experiences, making more efficient use of available capacity, facilitating better network flows and resilience, and improving the safety, reliability and efficiency of networks, assets and services.

Issues that need to be considered in planning Melbourne's future motorways include:

- *Smart vehicles need smart roads* – Investment in smart networks will be needed to fully realise the possibilities arising from advances in in-vehicle technologies. To deliver on the promise of these technologies, motorways of the future may need to embrace 'hyper-connectivity' by using in-built sensors, ITS infrastructure, smart signage, in-vehicle communications, dynamic lane management, dynamic speed management and other forms of intelligent infrastructure. Advanced analytics and real-time decision support tools may be needed to translate insights from smart network infrastructure into improved customer experiences. Open data and intellectual property developments are expected to facilitate private sector collaboration and innovative solutions to transport network challenges.
- *Vehicle autonomy* – While it is unclear how the transition from driver-controlled to driverless or autonomous vehicles will be managed, one scenario is a step-by-step transition that involves designated lanes for autonomous vehicles. The Victorian Government has indicated its desire for Victoria to lead the way in autonomous vehicles and it is likely that Melbourne's freeway network will play an important part in any transition plan.
- *Safety and incident management* – An intelligent network communicating with intelligent vehicles should deliver enormous safety and incident management dividends. Incidents will be predicted and prevented through ITS and direct communication to vehicles, and speeds may also be dictated external to the vehicle. In the event of an incident, the automated control of surrounding traffic should clear a quick, safe path for emergency response services. However, this level of connectivity also introduces new threats: cyber security will become more important and new levels of security and redundancy will be required across the connected network to avoid hacking or system failure.
- *Road space prioritisation* – Alongside conventional public transport services, future mobility services may comprise ride sharing, car sharing, dynamic bus routes and other forms of demand-responsive transport – all forms of collective transport that arguably 'deserve' priority in a congested situation. Motorways will need to be sufficiently intelligent to identify and clear a pathway for these services or do the same in response to a premium pricing regime.
- *Transport pricing* – The increasing pressures on governments to meet many competing demands – along with the forecast decline in fuel excise, changes in vehicle ownership and licensing, and new ways of providing mobility – mean that models of funding and pricing may change in the future to increase investment in transport infrastructure. Current planning for new motorways needs to consider these models and ensure that potential transport pricing options are not closed-off by incompatible or outmoded infrastructure, technologies, systems and commercial arrangements.

1.4 The Victorian Government's response

Melbourne would not be the successful, liveable city it is today without past investments in connectivity that have driven a more efficient urban spatial structure. As Melbourne has grown and transformed, the Victorian Government has invested in infrastructure and services to ensure that the sustainable, productive and liveable growth of the city is supported by its transport networks. The Government has also developed policies and strategies that provide direction with respect to integrated transport and land use planning in Melbourne.

With population and freight forecast to grow substantially over the next few decades, further investment and initiatives are required to continue to achieve strong outcomes for Melbourne.

1.4.1 Plan Melbourne 2017-2050

Plan Melbourne 2017-2050 updates the city's long-term planning strategy to achieve the Victorian Governments vision for Melbourne to become a 'global city of opportunity and choice'. Three underlying principles of this Plan are to create a more globally connected and competitive Melbourne by increasing the number and diversity of jobs closer to where people live; to facilitate social and economic participation; and to establish liveable communities and create 20-minute neighbourhoods so that people can access a range of local services and facilities, ideally within 20 minutes of home.

Plan Melbourne sets seven overarching objectives for Melbourne's development. To varying degrees, improved transport connectivity will contribute to achieving each of these objectives.

Table 1-1 Objectives of Plan Melbourne 2017-2050

Objectives	Description
Delivering jobs and investment	Create a city structure that drives productivity, supports investment through certainty and creates more jobs
Housing choice and affordability	Provide a diversity of housing in defined locations that cater for different households and are close to jobs and services
A more connected Melbourne	Provide an integrated transport system connecting people to jobs and services, and goods to market
Liveable communities and neighbourhoods	Create healthy and active neighbourhoods and maintain Melbourne's identity as one of the world's most liveable cities
Environmental and water	Protect our natural assets and better plan our water, energy and waste management systems to create a sustainable city
A state of cities	Maximise the growth potential of Victoria by developing a state of cities which delivers choice, opportunity and global competitiveness
Implementation: delivering better governance	Achieve clear results and deliver outcomes through better governance, planning, regulation and funding mechanisms.

Source: Plan Melbourne 2017-2051

1.4.2 Network investments

To accommodate population growth, support industry investment and the creation of new jobs, and attract a skilled workforce, successive Victorian Governments have taken steps to improve transport network connectivity and service levels across Melbourne.

Major transport investments from previous decades, such as the M80, CityLink, Eastern Freeway, Tullamarine Freeway, EastLink and Melbourne City Loop, led to substantial boosts to the Melbourne and Victorian economies. The progressive introduction of the SmartBus orbital network since 2005 has provided orbital public transport connections to employment and education locations, and better access for outer suburban residents.

In the past decade, the Victorian Government has embarked on an ambitious program to inject much-needed capacity into the transport system. The Regional Rail Link has been completed, improving access to Melbourne's west and service levels to Geelong, Bendigo and Ballarat. Major projects have commenced, including the city-wide Level Crossing Removal Program, Metro Tunnel, Monash Freeway upgrade, M80 upgrade, widening of CityLink and the Tullamarine Freeway, and the West Gate Tunnel project. Additional train fleet capacity is being delivered, including new high-capacity metro trains, six-car X'Trapolis trains and VLocity regional carriages. Planning work has commenced on the Regional Rail Revival program to upgrade Victoria's regional rail network and the Outer Suburban Arterial Roads Program, which will upgrade major arterial connections in the city's growing outer regions.

Even with these investments, an analysis of the performance of the transport network in 2036 shows that parts of the network will struggle to cope with the increased demand flowing from population and employment growth, particularly between the city's larger population and economic centres. Further enhancements of the network are critical to ensure Victoria can respond to ongoing population growth and demographic shifts, economic changes and increased mobility demand.

1.4.3 Infrastructure Victoria

The Government established Infrastructure Victoria in 2015 as an independent statutory authority to provide expert advice and guidance on the state's infrastructure needs and priorities. Infrastructure Victoria has three main roles: prepare a long-term infrastructure strategy for Victoria, provide advice to the State Government on infrastructure matters and publish research on infrastructure matters. Transport is one of nine matters covered by Infrastructure Victoria.

Infrastructure Victoria has undertaken research into several areas with implications for the future of transport in Melbourne, including how to value more economic, social and environmental impacts of infrastructure projects, implementing value capture mechanisms and different types of funding and financing mechanisms that could be used to deliver infrastructure priorities.

In 2016, Infrastructure Victoria released its 30-Year Infrastructure Strategy, identifying North East Link as a high priority infrastructure project for the State.

1.4.4 Victorian Infrastructure Plan

In 2017, the Government responded to Infrastructure Victoria's 30-year Infrastructure Strategy through the Victorian Infrastructure Plan. The Government has accepted 134 of the strategy's 137 recommendations in full, in part or in principle. North East Link is confirmed in the Plan as one of several 'catalyst', state-shaping infrastructure projects designed to stimulate economic growth, create jobs and deliver positive, long-term benefits for Victorians. The Government has committed funding to develop the project to the procurement stage, noting in the Plan that construction will require future funding via a mix of government contributions and tolls, with final funding arrangements determined as part of the detailed planning process.

1.5 Melbourne's cross-city connectivity

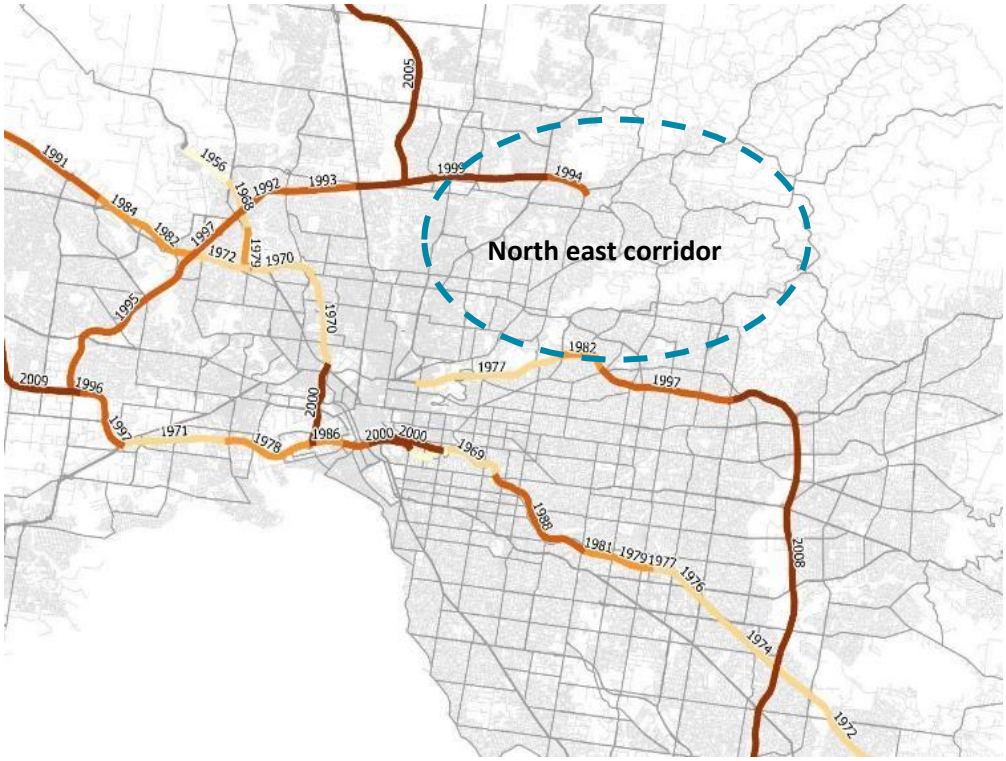
Supporting a growing city requires strong transport connectivity for radial, cross-city and orbital travel. While Melbourne has strong radial connectivity that enables good access to the central city, other trips are not as well served by the transport network.

Even as Melbourne began to slowly decentralise in the 1970s and 1980s, urban transport infrastructure remained focused on accommodating the demand for radial trips, with major investments including the construction of the Tullamarine Freeway, South Eastern Freeway, Mulgrave Freeway (now the Monash Freeway), West Gate Freeway (including the West Gate Bridge) and the Eastern Freeway. The Melbourne Underground Rail Loop was completed, which improved connectivity to the inner city and provided a substantial boost to the economy.

Decentralisation started to accelerate significantly following the opening of Melbourne's first orbital freeway, the M80, in the late 1990s, which allowed traffic to move around the city and bypass the congested centre. Further investments such as the completion of CityLink and EastLink in the 2000s continued the shift away from a largely radial network towards cross-city connective infrastructure.

The development of Melbourne's freeway network from 1970 is illustrated in Figure 1-8.

Figure 1-8 Development of Melbourne's freeway network from 1970 to present day



New cross-city and orbital routes were the catalyst for significant land use change and intensification, with high levels of employment and commercial development occurring along these corridors. Outer suburban activity centres and employment hubs such as Dandenong, Ringwood, Greensborough and Tullamarine experienced rapid growth due to the increased accessibility provided by the orbital roads.

Melbourne's present day orbital movement corridor connects households and businesses to economic and employment clusters in the city's middle and outer suburbs, and provides a route through the city for moving goods to customers, suppliers, industrial precincts and freight gateways. These strategic circumferential movements around the city are provided primarily by a series of freeways and partly by the arterial road network where the freeway network is disconnected.

Cross-city orbital movements between Melbourne's west and north are facilitated via the M80, which runs from the Princes Freeway in Altona to the Greensborough Bypass in Greensborough. Movements between the east and south east are enabled by EastLink, which traverses the outer eastern suburbs between Donvale and Seaford. However, there is no freeway-standard connection for movements between the eastern end of the M80 and the Eastern Freeway (M3) and northern terminal of EastLink.

In this part of Melbourne, around 250,000 radial trips are made between the north east and inner and central Melbourne each day. However, demand for cross-city orbital movements in the north east is larger than this radial demand. As shown in Figure 1-9, daily trips between the north east and the north (100,000), the inner east (160,000), the outer east (20,000) and east (60,000) currently total approximately 340,000 – and are forecast to increase to approximately 440,000 by 2036.

In addition to these trips to and from the north-east, there is demand for cross-city orbital travel that involves travelling through the north east without stopping. Across a day, approximately 40,000 trips are made between the eastern suburbs and the northern suburbs, as shown in the inset in Figure 1-9. These are trips that travel through the north-east without stopping.

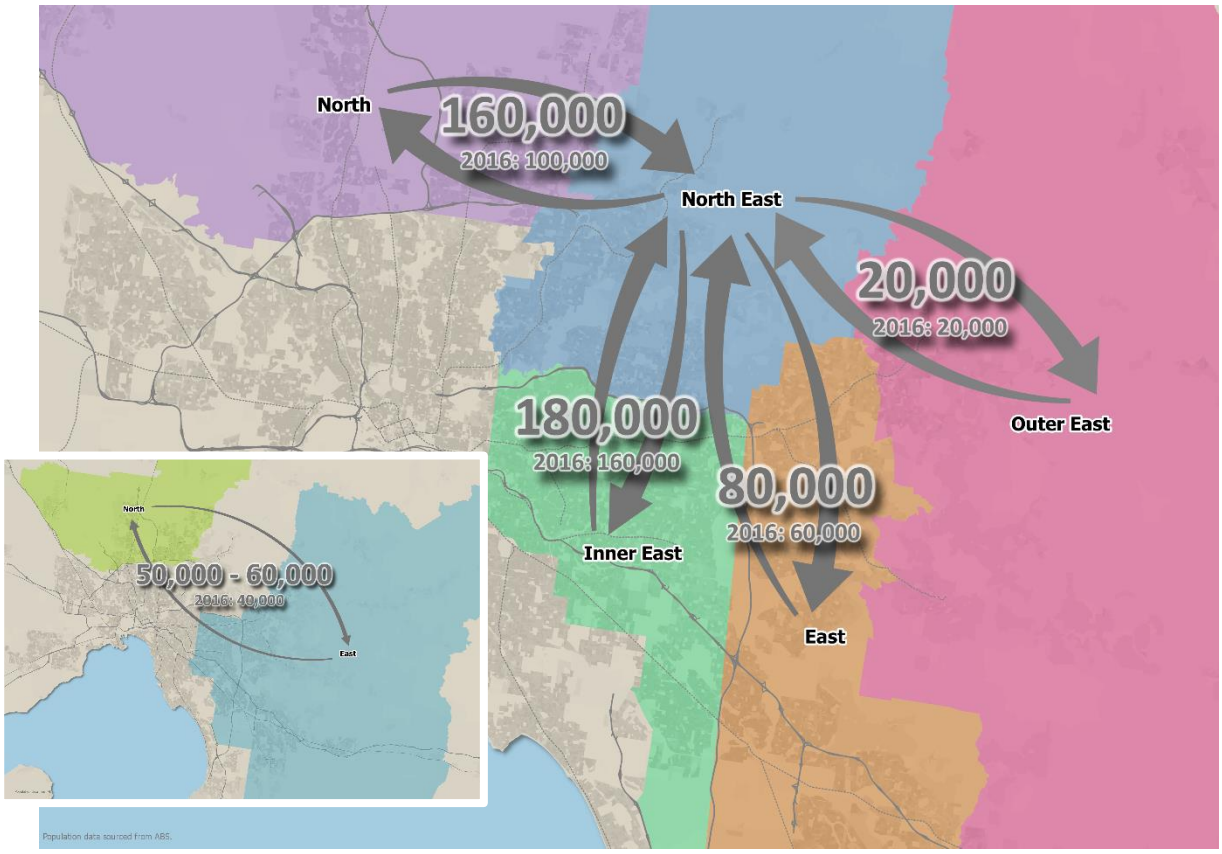
All these movements are facilitated via a handful of key arterial roads that accommodate diverse and important economic journeys, including:

- Commuter trips within and through the north east corridor to employment centres such as La Trobe University, Heidelberg/Austin Medical Precinct, Northland and Ringwood
- Business trips between industrial and commercial precincts and employment and activity centres in the north, east and south east, and to and from Melbourne Airport
- Freight movements, including regional movements to and from Gippsland, interstate movements via the Hume Freeway, and cross-city movements to freight hubs in the north (Somerton) and south east (Dandenong). An estimated 46 million tonnes of freight travels along the north east corridor each year: approximately 10 percent of the total Victorian freight task[35]. At present, there are between 8,100 and 9,000 trucks daily at the M80/Greensborough Road interchange making their way through the north east road network.

The north east corridor faces the challenges of managing high and increasing local traffic volumes while also accommodating multiple – and often conflicting – movement types and journeys.

[35] XAct Solutions, North East Link Needs Assessment, 2017

Figure 1-9 Daily trip movements across Melbourne to and from the north-east, 2016 and 2036



Source: Veitch Lister Consulting (VLC), Zenith Model 2017

While Melbourne continues to evolve into a city with a number of important suburban centres outside the central city, this transition is checked by a transport network that remains focused largely on radial movements. In particular, an unconnected cross-city freeway network – exemplified by the 'gap' in the orbital movement corridor in the north east – creates constraints to important journeys, which flows through to adverse impacts on the Melbourne and Victorian economies.

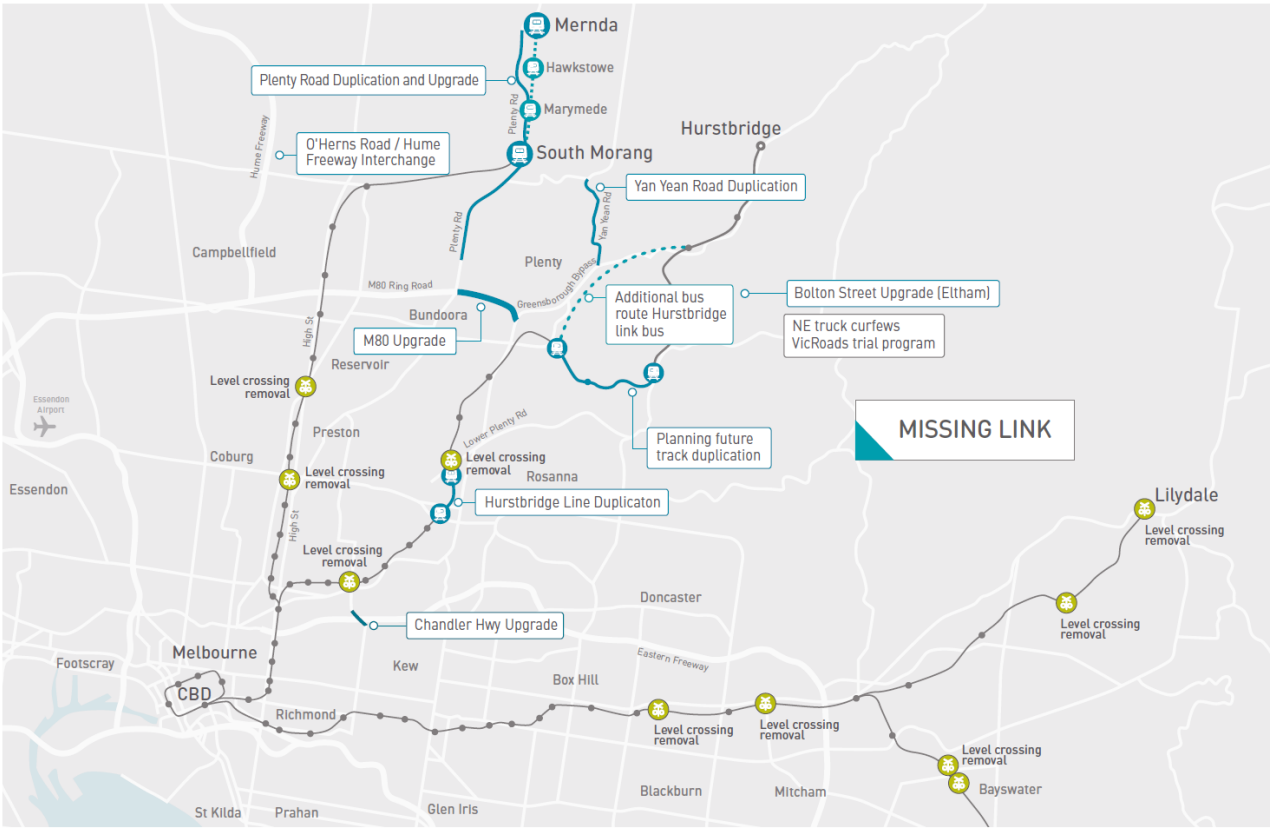
Ongoing congestion and declining levels of accessibility make it harder for residents to reach jobs and for businesses to connect to workers and other businesses in the north east and other parts of Melbourne. There is increasing reliance on the M1 corridor for cross-city trips, funnelling these trips into an already congested inner city road network. Diminishing freight efficiency is increasing the cost of doing business in Victoria. As increasing volumes of traffic attempt to navigate the north east transport network to get to their destinations, the liveability of the area suffers. These problems are explored in greater detail in Chapter 2 of the business case.

The State Government has acted to address these problems by funding projects in Melbourne's north and east (shown in Figure 1-10), including:

- A package of works to duplicate the rail track between Heidelberg and Rosanna to deliver additional services and improve reliability on the Hurstbridge and South Morang railway lines (including removing level crossings at Grange Road, Alphington and Lower Plenty Road, Rosanna) and add a new bus route between Greensborough and Diamond Creek

- Removal of level crossings at Bell Street in Preston and High Street in Reservoir as part of the Government's program to remove 50 dangerous and congested level crossings across the city.
- Construction of the Mernda Railway line extension, which includes three new stations, bus connection improvements and new walking and cycling paths
- Widening of Chandler Highway to six lanes and building a new bridge to the west of the existing bridge
- Upgrades to Plenty Road between McKimmies Road and Bridge Inn Road
- Upgrades to Yan Yean Road between Diamond Creek and Kurrak roads in Plenty
- Upgrade of the M80 from Laverton to Greensborough, which includes widening from three to four lanes in each direction from the Princes Freeway to the Western Highway, and from two to three lanes from Plenty Road to Greensborough Highway, to connect to the already improved sections on the freeway.

Figure 1-10 Victorian Government transport projects in Melbourne's north and east



While these investments and other steps taken to improve Melbourne's transport network are expected to alleviate road congestion and improve accessibility and productivity, the full economic potential of the network will not be realised in the absence of improved cross-city movements through the north east. The problems identified in Chapter 2 of this section of the business case reflect the current challenges, issues and impacts caused by Melbourne's unconnected freeway network and constrained cross-city orbital movements.

2 Problem

Three key problems have been identified in relation to transport connectivity in the north east corridor:

1 Melbourne's poor orbital connectivity is constraining the economic potential of the city and Victoria

2 Inefficient freight movement between the north and south east of Melbourne is limiting supply chain competitiveness and hindering the growth of high value industries

3 Congestion and heavy vehicles on neighbourhood roads in the north east is harming liveability and community wellbeing.

This chapter of the business case describes the causes of these problems and their effects.

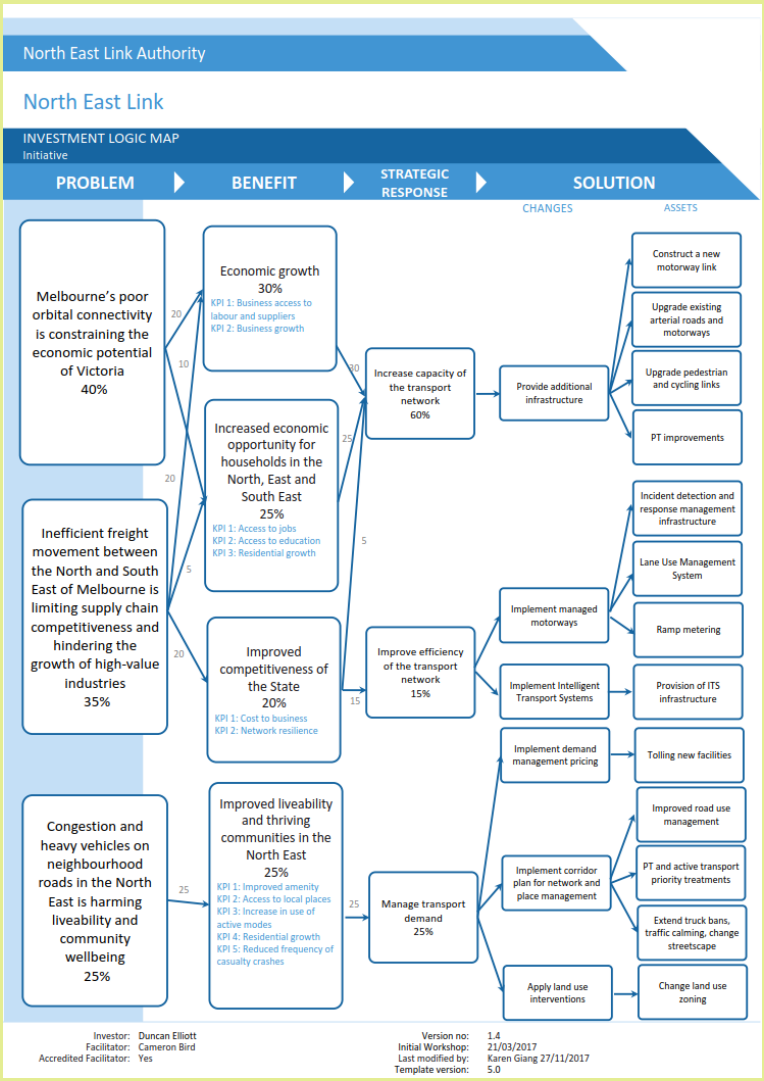
Identifying the problems

To improve decision-making in relation to complex major projects, the Victorian Department of Treasury and Finance (DTF) has developed an Investment Logic Map (ILM) approach that summarises the rationale behind an investment. To develop an ILM for the NEL Project, North East Link Authority worked with DTF, Transport for Victoria, the Office of the Coordinator General, VicRoads, the Department of Environment, Land, Water and Planning (DELWP), the Victorian Planning Authority (VPA) and the Department of Premier and Cabinet (DPC) and technical experts.

The ILM in Figure 2-1 identifies and weights three high-level problems related to transport connectivity in Melbourne's north east that the North East Link Project seeks to address, along with the key benefits that would be realised from tackling these problems successfully. It also identifies potential solutions that would address these problems.

The ILM has guided the development of the NEL Project business case, providing the basis for examining in greater detail the causes of transport connectivity problems and potential responses and solutions to these problems. This process has followed DTF guidelines for assessing and appraising infrastructure investments, and the framework for problem identification, assessment and prioritisation set out in the Australian Transport and Planning Guidelines.

Figure 2-1 Investment Logic Map for the North East Link Project



2.1 Problem 1 - Melbourne's poor orbital connectivity is constraining the economic potential of the city and Victoria

As described in Chapter 1, Melbourne's orbital movement corridor connects major population, employment, service and industrial centres across the city's north, east and south east. It facilitates access to Melbourne Airport and other significant gateways and freight hubs, and provides links to the wider metropolitan road network. It supports important and high value economic journeys across and around metropolitan Melbourne, including commuter journeys to employment and activity centres, business-to-business trips and metropolitan, regional and interstate freight movements.

The orbital corridor's poor connectivity in the north east between the M80 and the Eastern Freeway and EastLink means that it is struggling to support these journeys. With no freeway-standard link in this part of the corridor, arterial roads accommodate orbital movements as well as local traffic movements. Increasing demand for travel through, within and to and from the north east has led to high levels of congestion, increased travel times and poor reliability for road users, and created a significant barrier to the movement of people and goods around Melbourne and Victoria.

As a consequence of poor orbital mobility, businesses located in employment and activity centres in Melbourne's major population areas in the north, east and south east lack access to the large labour markets that underpin productivity and competitiveness. Movement between businesses in these areas and their customers and suppliers is constrained, putting them at a disadvantage compared to businesses in other locations with greater connectivity. Workers are restricted in accessing employment opportunities across the metropolitan area, which disproportionately affects lower-income households and entrenches social disadvantage.

For Melbourne to continue to support economic development and jobs growth, and lift levels of labour productivity and workforce participation, it must be a well-connected city where businesses and residents have access to a range of travel options. If a fully connected cross-city freeway network cannot be completed, ongoing fragmentation of labour markets, poor business-to-business travel and diminished access to jobs will impose higher costs on business and households, limit the productive potential of the city and constrain the competitiveness of Melbourne and Victoria.

2.1.1 Businesses in the north, east and south east lack access to deep labour catchments

Maximising the full economic potential of a large city requires workers, consumers and suppliers to exchange labour and goods easily and to interact frequently.

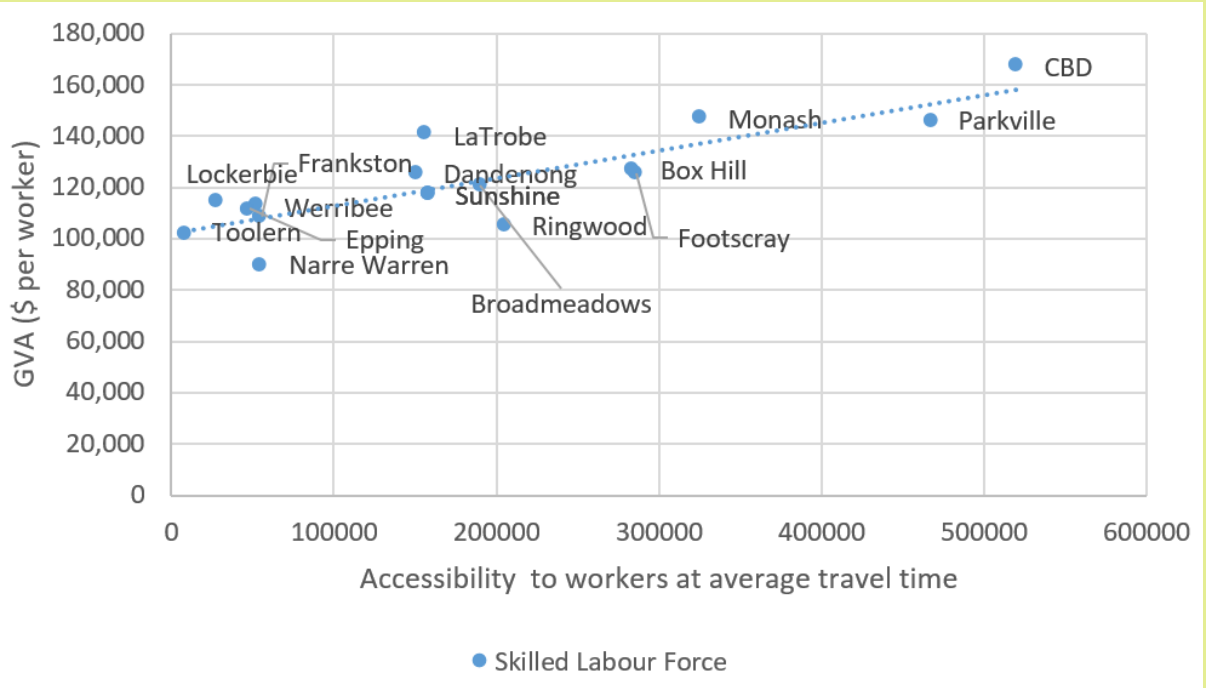
Businesses located in areas where they have access to a large labour market have better prospects of matching skilled workers with jobs and building a workforce with the right mix of skills, improving their labour efficiency and productivity. The location of workers' residences relative to employment locations and the speed of commuter travel determines the effective size of a labour market.

Productivity can increase if travel between residential areas and business locations is relatively reasonable, but there are limits to the time that workers are willing to spend on commuting. These limits impose a constraint on commuting distances and, consequently, the size of urban labour markets and the productivity potential of specific locations. Put simply: the greater the access to workers, the higher the productivity of a location (as described in the box on the next page).

Access to more workers unlocks higher productivity

The importance of a well-connected transport system is evident when comparing high labour productivity in central and inner Melbourne with the relatively lower productivity of the middle and outer suburbs. Analysis of the relationship between the size of a labour market catchment for an employment location and the productivity of workers at that location shows that access to a larger number of workers leads to higher productivity. As illustrated below, for every additional 100,000 workers accessible to an employment location, the Gross Value Added (GVA)* per worker in that location increases by around $11,000.

Figure 2-2 GVA vs access to a skilled labour force



* Gross Value Added (GVA) measures the contribution to an economy, producer, sector or region. It provides a dollar value for goods and services produced, less the cost of inputs and raw materials that are directly attributable to that production.

Source: Analysis based on ABS 5222.0 - Australian National Accounts: State Accounts (2017), ABS 6291.0.55.003 - Labour Force, Australia (2017), 2011 Census – Total Personal Income (weekly) (INCP) by Place of Usual Residence, VLC (2017)

To grow the economy and create competitive industries, Plan Melbourne promotes the clustering of business activities of national significance in National Employment and Innovation Clusters (NEICs) and jobs and regional service activities in Metropolitan Activity Centres (MACs). These centres need access to a large pool of workers if they are to make a major contribution to the Victorian economy, deliver services across large urban areas and generate and sustain jobs outside central Melbourne. Currently, businesses located in or near these centres in the north, east and south east lack access to deep labour catchments because of poor connectivity, increasing travel times and unreliable trip times.

Long commute times limit accessible labour markets

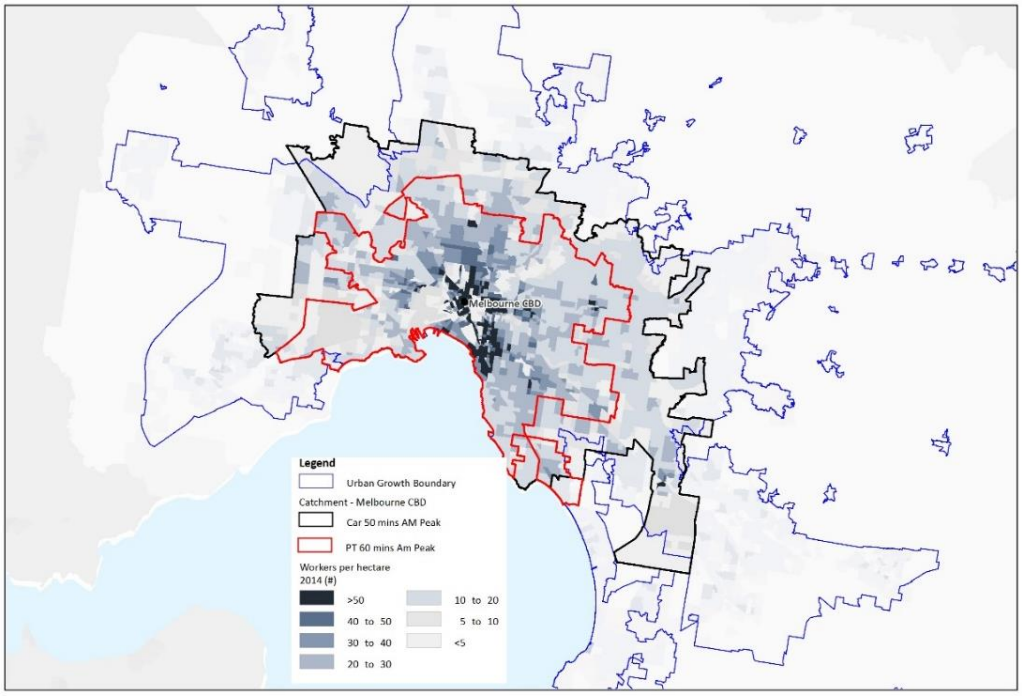
Analysis of morning commuting times across the metropolitan area shows stark differences in the travel times workers are willing to tolerate and provides a way to determine the size of labour markets accessible to an employment location[1]. The analysis shows that:

[1] Analysis by EY based on VLC Zenith model outputs 2017

- Most people are willing to travel for up to 50 minutes by car and 70 minutes by public transport to access jobs in the central city[2], after which the number of trips declines significantly. Accordingly, a travel time threshold of 50 minutes has been used in this business case to analyse labour markets available to the central city.
- Most people travelling to NEICs and MACs are willing to drive for up to 35 minutes to reach their destinations, which has been used as the travel time threshold to analyse the labour markets available to these locations. It is likely that people are willing to travel longer to jobs in the central city due to the higher wages and other benefits of working there.
- Public transport users are willing to travel around 80 minutes to reach NEICs and MACs (although it is likely that this higher travel time threshold is due to a small sample size of users travelling by public transport to NEICs and MACs and is not representative of overall public transport travel behaviour[3]). Transport planning consensus is that 60 minutes is the travel time threshold for public transport trips in Melbourne[4] and this threshold has been used to analyse public transport travel to NEICs and MACs for the business case.

The radial nature of Melbourne's public transport network and a significant part of the road network creates high levels of accessibility to labour markets for the central city, as shown in Figure 2-3: 56 percent of Melbourne's total labour force is accessible to the central city within a 50-minute car journey in the morning peak and 38 percent within 60 minutes by public transport.

Figure 2-3 Accessible labour market catchment for the central city by car and public transport



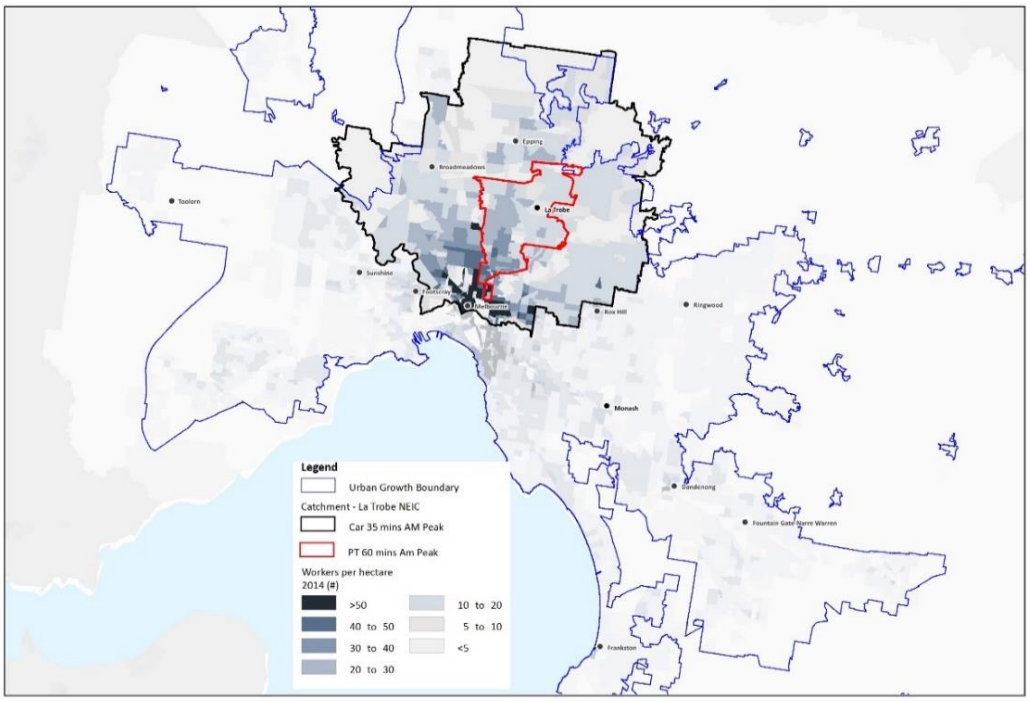
Source: Analysis based on VLC Zenith model outputs 2017

[2] For analysis purposes, the central city includes the CBD, Docklands, Southbank and East Melbourne.
[3] Strategic transport models are designed to forecast movements with significant demand and may not best represent public transport commuter trips to areas outside of the central city.
[4] Gent, C. and Symonds, G., Advances in public transport accessibility assessments for development control - a proposed methodology, Transport Research International Documentation, 2005

Although central Melbourne has a greater advantage in terms of labour market accessibility, close to 80 percent of all jobs are located outside the central city[5]. Essential services such as dentists, child care workers and hairdressers will always be needed where people live. Affordable land and good links to freeways, ports and airports are typically important for freight businesses. Nonetheless, all these kinds of work are becoming increasingly skilled and specialised, with greater use of technology. As this occurs, the imperative for employers to have the best possible choice of employees will continue to become more intense across the economy. With Melbourne's population centre now lying to the east of the central city around Glen Iris (between the middle northern and south eastern suburbs), the La Trobe and Monash NEICs will play an increasingly important role in boosting employment and productivity growth across the city (see box on next page).

However, compared to the central city, these NEICs have much smaller accessible labour market catchments, as shown in Figure 2-4 and Figure 2-5. Only five percent of Melbourne's total workforce is accessible to the La Trobe NEIC within 60 minutes by public transport in the morning peak period. The Monash NEIC, which has greater train and bus accessibility, fares slightly better: 13 percent of the city's workforce can get to the centre within one hour by public transport.

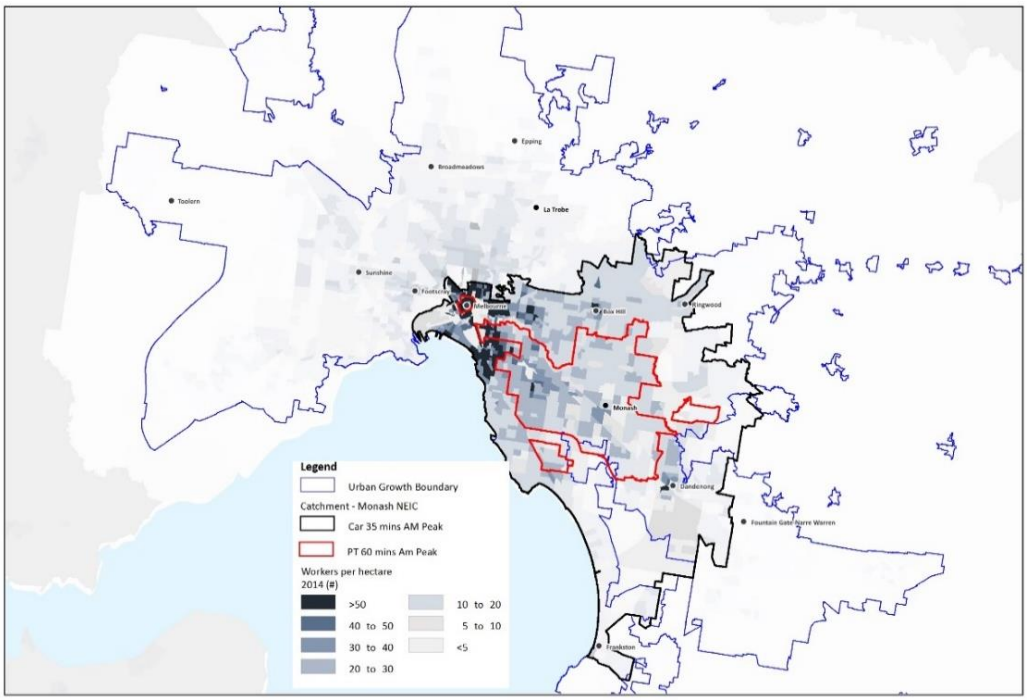
Figure 2-4 Accessible labour market catchments for La Trobe NEIC by car and public transport



Source: Analysis based on VLC Zenith model outputs 2017

[5] See Figure 1-5 in Chapter 1

Figure 2-5 Accessible labour market catchments for Monash NEIC by car and public transport



Source: Analysis based on VLC Zenith model outputs 2017

La Trobe and Monash NEICs

The Victorian and Australian Governments are actively promoting the clustering of business activity of national significance in National Employment and Innovation Clusters (NEICs). These centres are intended to become a focus for knowledge-based businesses and are considered crucial for maximizing access to high-productivity jobs for Melbourne's middle and outer suburbs and growth areas.

Monash NEIC is the largest concentration of employment outside the central city, with approximately 75,000 jobs. Monash NEIC includes Monash University and leading education, health, research and commercialisation facilities. It also encompasses three MACs: Brandon Park, Clayton and Springvale.

La Trobe NEIC is an emerging cluster with an expanding education, health and research role, home to approximately 28,500 jobs. It includes La Trobe University and the Austin Biomedical Alliance Precinct, and retail activities in and around the Northland Shopping Centre and the Heidelberg Major Activity Centre. La Trobe University plans to grow its research activities at the NEIC and encourage the commercialisation of research and the growth of existing businesses.

As acknowledged in Plan Melbourne, these centres will need access to a large pool of workers if they are to make a major contribution to the Victorian and Melbourne economies, deliver significant regional services and generate and sustain jobs outside central Melbourne. They will also need good transport links with other major industrial areas, export gateways, health and education precincts and MACs.

Source: Victorian Planning Authority

In addition to the La Trobe and Monash NEICs, all other key employment locations in the middle and outer north, east and south east suburbs have low levels of accessibility to workers when compared to the central and inner city (as shown in Table 2-1).

Table 2-1 Labour market catchment accessibility for NEICs and MACs, 2014

NEICs and MACs	Labour market catchment accessible by car	Labour market catchment accessible by PT	% of total Melbourne employment
Central city	57.6%	40.2%	11.5%
Parkville	58.4%	26.0%	1.3%
Monash	42.6%	13.7%	1.7%
La Trobe	30.2%	5.3%	0.3%
Box Hill	45.1%	16.7%	1.1%
Ringwood	38.4%	7.8%	0.7%
Dandenong	37.2%	3.7%	3.0%
Fountain Gate-Narre Warren	31.2%	4.2%	0.5%
Frankston	24.2%	4.0%	0.9%
Epping	21.5%	0.4%	0.6%
Broadmeadows	33.9%	8.3%	0.6%

Source: Analysis based on VLC Zenith model outputs 2017

Access to skilled labour markets is fragmented

These relatively low levels of accessibility suggest that businesses located in these NEICs or MACs may face difficulties in attracting and retaining workers and building skilled workforces. The knowledge-intensive nature of activities at each NEIC compounds the problems associated with smaller labour catchments. Businesses operating in sectors such as education, advanced manufacturing, health sciences, finance and information technology need access to highly specialised labour markets. Skilled workers also bring expertise, innovation and entrepreneurship, which are important for the adoption and use of new technologies and for boosting productivity and industry and jobs growth.

Without access to skilled and specialised workers, NEICs and other employment locations in the north, east and south east may be unable to realise their full potential, particularly when competing for these workers with the central and inner city where firms have access to much deeper labour catchments. A business intentions survey commissioned by the Victorian Planning Authority in 2016 confirmed this disadvantage, finding that the main limitations for businesses locating to the La Trobe NEIC were distance from clients, distance from where staff live and lack of access to public transport[6].

As for labour market accessibility in general, access to highly skilled workers is concentrated largely in the central city and the inner suburbs (as shown in Table 2-2):

- Two thirds (68 percent) of all highly skilled workers living in Melbourne can access the central city within 50 minutes by car and approximately half (53 percent) can access the central city within 60 minutes by public transport. This gives the central city a significant competitive advantage over the rest of Melbourne when sourcing highly skilled labour, notwithstanding the majority of industry and employment being located outside of the central city.
- The proportion of Melbourne's highly skilled workforce accessible to the La Trobe NEIC is much lower than the central city, with 34 percent able to access the cluster within 35 minutes by car and six percent within 60 minutes if travelling by public transport.

[6] State Significant Employment Precincts Business Intentions Survey, prepared by Essential Economics for Metropolitan Planning Authority (now the Victorian Planning Authority), August 2016

- While accessibility to highly skilled labour is greater for the Monash NEIC than for the La Trobe NEIC, it is still significantly less than in the central city: 50 percent can access the Monash NEIC within 35 minutes by car and 16 percent within 60 minutes by public transport[7].

Compared to the central city, Parkville and Monash, the rest of the city's NEICs and MACs have low levels of accessibility to highly skilled workers.

Table 2-2 Highly skilled worker (HSW) labour market catchment accessibility for NEICs and MACs, 2014

NEICs and MACs	HSW labour market catchment accessible by car	HSW labour market catchment accessible by PT	% of Melbourne's total skilled employment
Central city	68.4%	53.2%	15.9%
Parkville	69.3%	34.7%	2.2%
Monash	50.5%	15.8%	2.2%
La Trobe	33.9%	5.9%	0.5%
Box Hill	56.2%	22.1%	1.2%
Ringwood	43.3%	7.5%	0.5%
Dandenong	36.2%	2.1%	2.1%
Fountain Gate-Narre Warren	28.2%	2.5%	0.3%
Frankston	20.1%	3.5%	1.0%
Epping	20.4%	0.2%	0.5%
Broadmeadows	35.6%	8.3%	0.5%

Source: Analysis based on VLC Zenith model outputs and ABS 2011 Census – Employment, Income and Unpaid Work by Place of Usual Residence 2017

As more and more journeys to work take longer than 45 minutes – and as growing congestion reduces the timeliness and reliability of travel and accelerates the fragmentation of labour markets – higher productivity levels will become more difficult to achieve for businesses relying on the cross-city freeway network. This will diminish the growth potential of NEICs and other employment locations outside central and inner Melbourne, as shown in Table 2-3 and Table 2-4. Note that public transport access increases in 2036 for most NEICs and MACs which is likely due to the future expansion of the public transport network. Although public transport accessibility is expected to increase, the proportion is still significantly less than the central city. With employers increasingly looking to locate to areas with access to labour markets within acceptable timeframes, these centres will also find it harder to attract new businesses, constraining their economic development and job creating potential.

In other words, by limiting the effective size of the labour market for key employment locations in Melbourne's north, east and south east, the transport system is holding back the productive potential and competitiveness not only of these locations, but also the wider city.

[7] Analysis by EY based on VLC Zenith model outputs and ABS 2011 Census – Employment, Income and Unpaid Work by Place of Usual Residence 2017

Table 2-3 Labour market catchment accessibility for NEICs and MACs, 2036

NEICs and MACs	Labour market catchment accessible by car	% change	Labour market catchment accessible by PT	% change
Central city	28.5%	-51%	42.5%	6%
Parkville	38.4%	-34%	34.5%	33%
Monash	24.7%	-42%	11.5%	-16%
La Trobe	9.7%	-68%	7.7%	45%
Box Hill	21.6%	-52%	26.1%	56%
Ringwood	18.3%	-52%	18.6%	138%
Dandenong	16.2%	-56%	6.2%	68%
Fountain Gate-Narre Warren	19.2%	-38%	7.2%	71%
Frankston	13.4%	-45%	4.3%	7%
Epping	13.6%	-37%	3.3%	725%
Broadmeadows	15.3%	-55%	18.3%	120%

Source: Analysis based on VLC Zenith model outputs 2017

Table 2-4 Highly skilled worker (HSW) labour market catchment accessibility for NEICs and MACs, 2036

NEICs and MACs	HSW labour market catchment accessible by car	% change	HSW labour market catchment accessible by PT	% change
Central city	41.7%	-39%	54.8%	3%
Parkville	51.5%	-26%	45.5%	31%
Monash	30.2%	-40%	13.5%	-15%
La Trobe	11.8%	-65%	8.4%	42%
Box Hill	28.9%	-49%	35.9%	62%
Ringwood	20.5%	-53%	22.7%	203%
Dandenong	14.6%	-60%	3.7%	76%
Fountain Gate-Narre Warren	15.5%	-45%	4.6%	84%
Frankston	10.3%	-49%	3.7%	6%
Epping	10.5%	-49%	2.2%	1000%
Broadmeadows	16.7%	-53%	21.4%	158%

Source: Analysis based on VLC Zenith model outputs 2017

2.1.2 Movement between businesses and their customers and suppliers is highly constrained

In addition to accessing labour markets, fast and reliable transport connections between businesses and their customers and suppliers are critical to keeping business transport costs down and boosting business productivity. Efficient business-to-business interaction also enables the exchange of ideas and promotes collaboration and innovation to improve productivity.

Business-to-business travel is long and unreliable

Currently, business-to-business travel between key centres in the north, east and south east –and to the central city – is long and highly variable.

As shown in Table 2-5, on average, travel time by car between key employment locations and the Melbourne CBD in the AM peak is between 20 and 80 minutes. Average travel times between NEICs and other MACs have similar variability: a trip from Monash to Epping can take between 60 and 80 minutes, as can a trip between Dandenong and Broadmeadows. Similarly, travel between the La Trobe and Monash NEICs can take between one hour and an hour and a half.

Table 2-5 Business-to-business to travel by car between NEICs and other MACs in AM peak, 2014

Travel times (mins)		Destination								
		La Trobe	Monash	Dandenong	Narre Warren	Epping	Broadmeadows	Box Hill	Ringwood	Melbourne
Origin	La Trobe		60-80	60-80	60-80	20-40	20-40	40-60	40-60	40-60
	Monash	40-60		10-20	20-40	60-80	40-60	20-40	20-40	40-60
	Dandenong	60-80	20-40		10-20	60-80	60-80	20-40	20-40	40-60
	Narre Warren	60-80	20-40	20-40		80-100	60-80	40-60	40-60	60-80
	Epping	20-40	80-100	80-100	80-100		20-40	60-80	60-80	60-80
	Broadmeadows	20-40	40-60	60-80	60-80	20-40		40-60	40-60	20-40
	Box Hill	20-40	20-40	20-40	20-40	40-60	40-60		10-20	20-40
	Ringwood	40-60	20-40	20-40	20-40	40-60	60-80	20-40		40-60
	Melbourne	20-40	20-40	20-40	20-40	40-60	20-40	20-40	20-40	

Source: Analysis based on VLC Zenith model outputs – preliminary modelling for North East Link

As Melbourne's economy shifts towards services and knowledge-intensive activities – and as new digital technologies transform how businesses operate – patterns of travel between businesses and their customers and suppliers are changing. Rather than storing supplies, businesses rely increasingly on ordering and receiving materials as and when they need them; there are more LCVs moving around the city delivering goods ordered online; and businesses in the growing home-based services sector also need to move quickly around the city. With networking a key element in innovation, businesses in knowledge-intensive sectors require ready access to collaborators and partners, as well as to professional and technical support services.

The long and variable trip times shown in Table 2-5 indicate that these and other evolving business travel demands are under pressure, suggesting that NEICs and other employment centres along the orbital corridor are missing out on vital opportunities to expand.

2.1.2.1 The cost of airport journeys from the north, east and south east is increasing

In addition to moving high value freight (discussed under Problem 2 below), access to Melbourne Airport is important for businesses for a range of reasons, including face-to-face meetings with interstate and international customers, suppliers, collaborators and partners. However, access to the airport from the north east, east and south east is becoming increasingly constrained and costly.

With no direct orbital connection, journeys between the airport and these areas use the east-west Maroondah Highway or the M1 (to connect with the Tullamarine Freeway) or north-south arterial links (to connect with the M80). As Table 2-6 shows, a trip to and from the airport from these locations by motor vehicle can take well over an hour. At peak periods, congestion along these routes increases the costs of private car travel, as well as taxi and Uber fares.

Table 2-6 AM peak travel times by car to Melbourne Airport

Origin	Travel time (mins) to Melbourne Airport
Noble Park North	63
Whittlesea	50
Heidelberg - Rosanna	43
Ringwood	70

Source: VLC Zenith model 2017

The time and cost associated with travel to the airport is an important consideration for many businesses when choosing where to locate. If travel to the airport from centres in Melbourne's north east, east and south east becomes further constrained and costlier, businesses involved in knowledge-intensive sectors will be less interested in locating to these centres. This will undermine efforts to distribute jobs in these expanding sectors across the city.

Supporting growth in centres along the orbital corridor

Plan Melbourne notes the importance of links between NEICs and key industrial clusters, transport gateways, health and education precincts and MACs. A number of these centres are located along or adjacent to the northern and southern orbital corridor, including Melbourne Airport, health precincts at the Austin Hospital and Monash Medical Centre, education precincts anchored by universities at Burwood, Bundoora and Clayton, and the centres of Box Hill, Epping, Ringwood, Fountain Gate-Narre Warren.

Currently, these precincts and centres rely to varying degrees on cross-city and orbital mobility – a reliance that will become increasingly critical to attracting and accelerating investment and creating local jobs. Without such links, future opportunities may be limited, with precincts and centres potentially having difficulty in attracting students, skilled professional and technical workers, and businesses that require good connectivity with Melbourne Airport.

2.1.3 Arterial roads in the north east are unable to cater to growing and competing travel demands

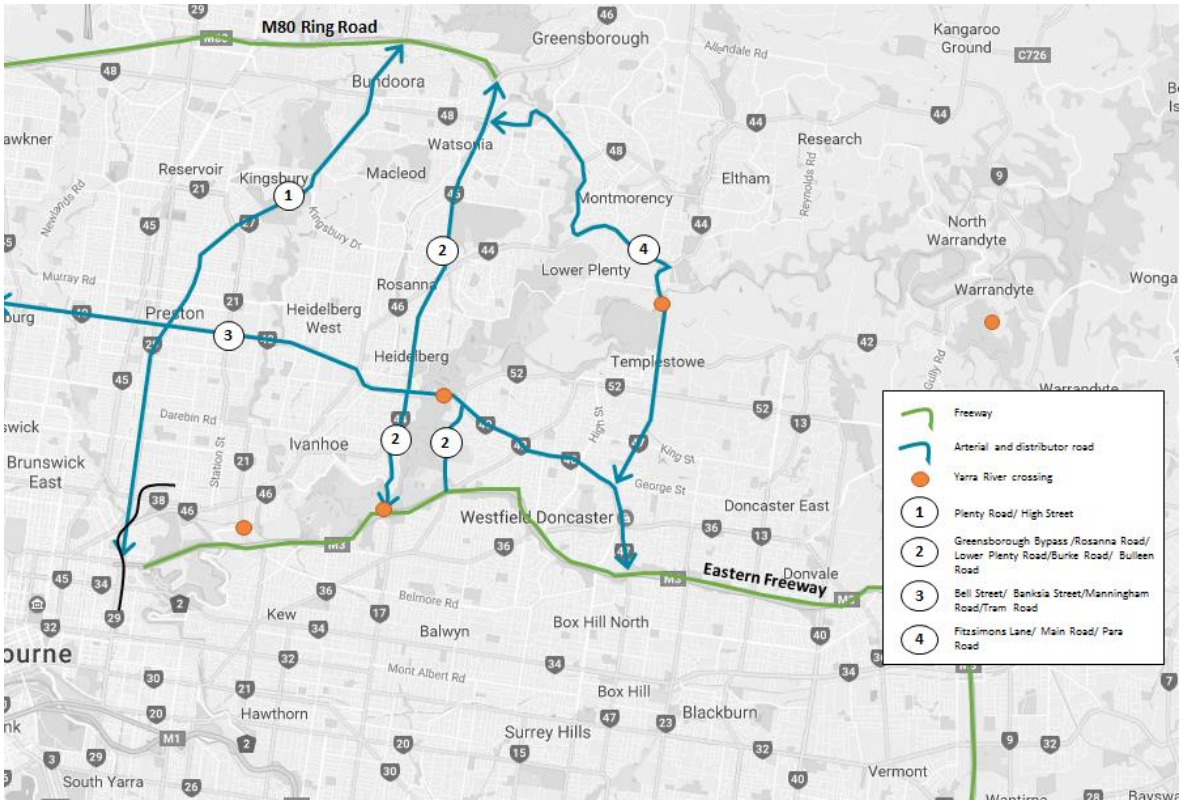
As outlined in Chapter 1, orbital movements between the eastern terminal of the M80 and the Eastern Freeway (M3) and the northern terminal of EastLink are facilitated via a handful of key arterial roads (shown in Figure 2-6):

- **Plenty Road**, between the M80 and High Street, serves as a major north-south traffic route and tram route for No.86 Bundoora RMIT to Waterfront City, Docklands. It also serves as a key route for bicycles and bus services. It is a key route connecting central Melbourne, the inner northern suburbs and the La Trobe NEIC and the primary access route to the M80 from this part of the city.

- **Bell Street/Templestowe Road/Reynolds Road** facilitates major east-west movements and functions as a bus route for most of its length and a bicycle route at its eastern end. It serves as an alternative route to CityLink and the Tullamarine Freeway for vehicles avoiding central city congestion during peak periods of the day. It also facilitates movements for freight vehicles travelling between industrial precincts and distribution centres in the city's north west and south east.
- **Greensborough Road/Rosanna Road** is the main route for vehicles travelling between the M80 and Eastern Freeway/CityLink. It serves multiple functions as a north-south traffic route, a Principal Freight Network route and Principle Bicycle Network route, connecting population and employment centres in the north and east, providing access to local neighbourhoods and enabling freight journeys between the M80 and the Eastern Freeway.
- **Fitzsimons Lane/Main Road/Para Road** provides alternative connectivity for traffic between the M80 and the Eastern Freeway and serves SmartBus orbital routes 901 and 902. It traverses the suburbs of Templestowe and Lower Plenty, connecting to the Eastern Freeway via Templestowe Road.

These roads are accommodating increasing volumes of traffic and multiple competing demands, including significant volumes of traffic traversing the area between the south east and the north (or between the Eastern Freeway and the M80).

Figure 2-6 Key arterial roads in the north east

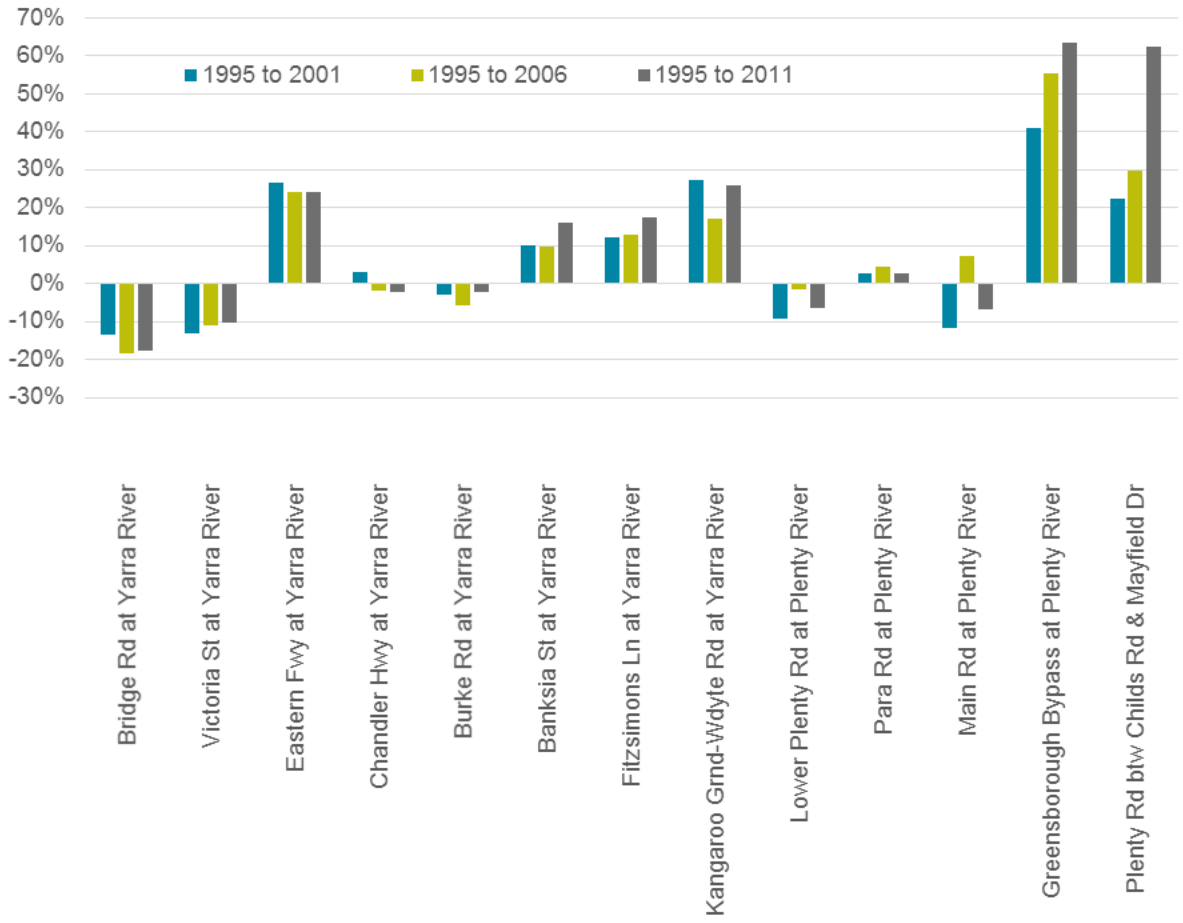


Traffic volumes are growing rapidly

Compared to inner city roads (such as Chandler Highway and Burke Road), where traffic volumes generally decreased between 1995 and 2011, traffic volumes along key arterial roads in the north east roads have grown rapidly and some sections now operate above their design capacity (see Figure 2-7). This could be due in part to transport infrastructure not keeping pace with the significant development that has occurred in the north east[8].

These growing volumes are placing the network under increasing pressure, making it more and more difficult to accommodate the varied travel demands competing for limited road space through the area. Without any action being taken, these traffic volumes will continue to rise, with significant increases expected on Plenty Road north of the M80, Greensborough Road and Templestowe Road (discussed further under *Traffic volumes and travel times are forecast to rise* below).

Figure 2-7 Growth in daily traffic volumes on north eastern roads



[8] Reduced traffic volumes in the inner city could be due to higher private vehicle operating costs because of congestion and parking charges, and greater access to public transport.

Competing demands are creating bottlenecks, delays and unreliable trip times

Across the north east arterial road network, different travel demands compete for road space. Private cars, buses, light commercial vehicles and heavy trucks all need to use the network at various times of the day. As part of the cross-city orbital network, key arterial roads in the area also accommodate important cross-city economic journeys – adding another layer of demand.

For example, as shown in the figures below, a high proportion of heavy vehicles moving through the area along Rosanna Road are headed to the M80 or Eastern Freeway. Figure 2-8 shows that 89 percent of trucks that cross the Yarra River and continue beyond the dotted circle (at Heidelberg) along Rosanna Road are heading north to the M80. Figure 2-9 shows that of the 91 percent of trucks heading south from the M80 along Rosanna Road that pass the dotted circle, 74 percent are crossing the river and heading to the Eastern Freeway. These figures illustrate that most of the freight moving along Rosanna Road is 'through' traffic: trucks that have no local origin or destination. These trucks would likely divert away from Rosanna Road if a higher quality alternative route was provided.

Figure 2-8 Heavy vehicle movements north along Rosanna Road

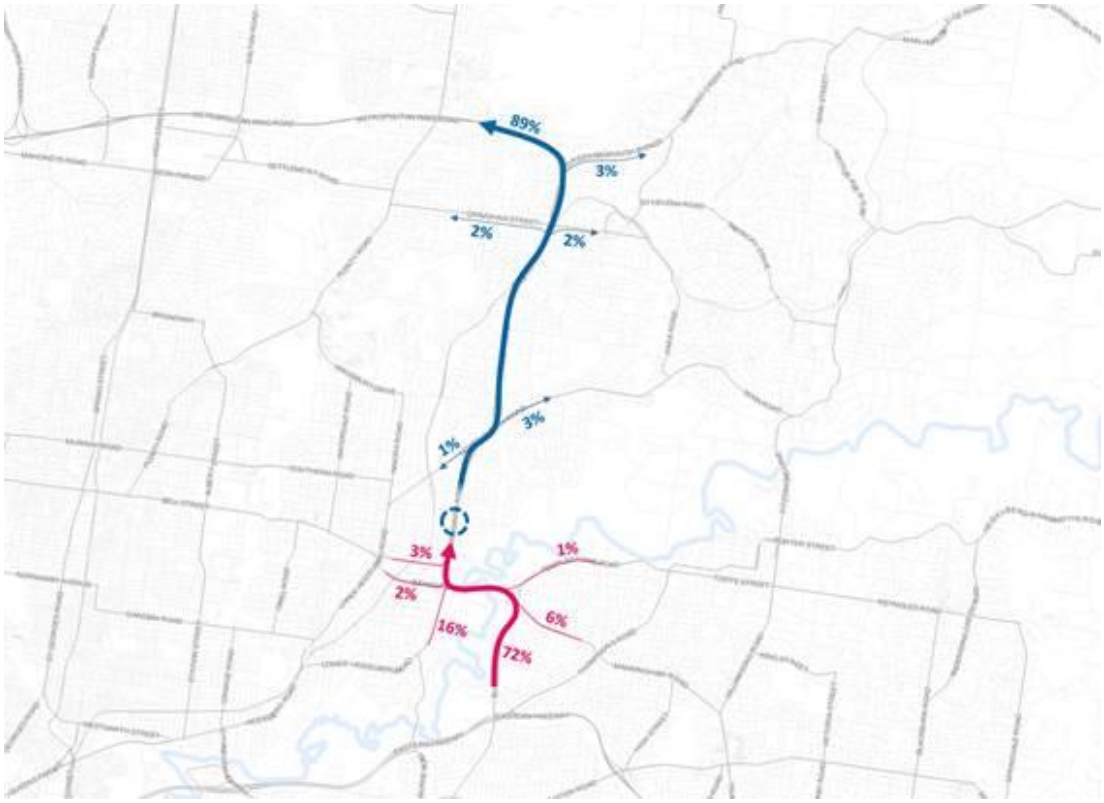


Figure 2-9 Heavy vehicle movements south along Rosanna Road

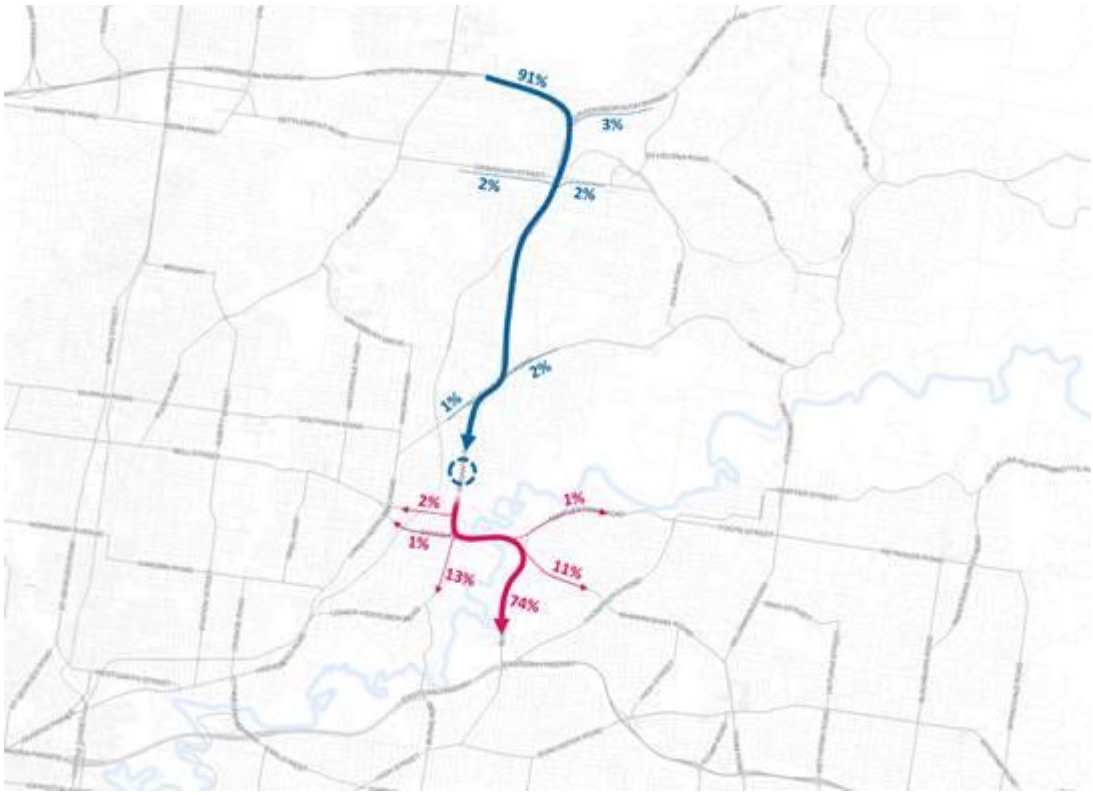
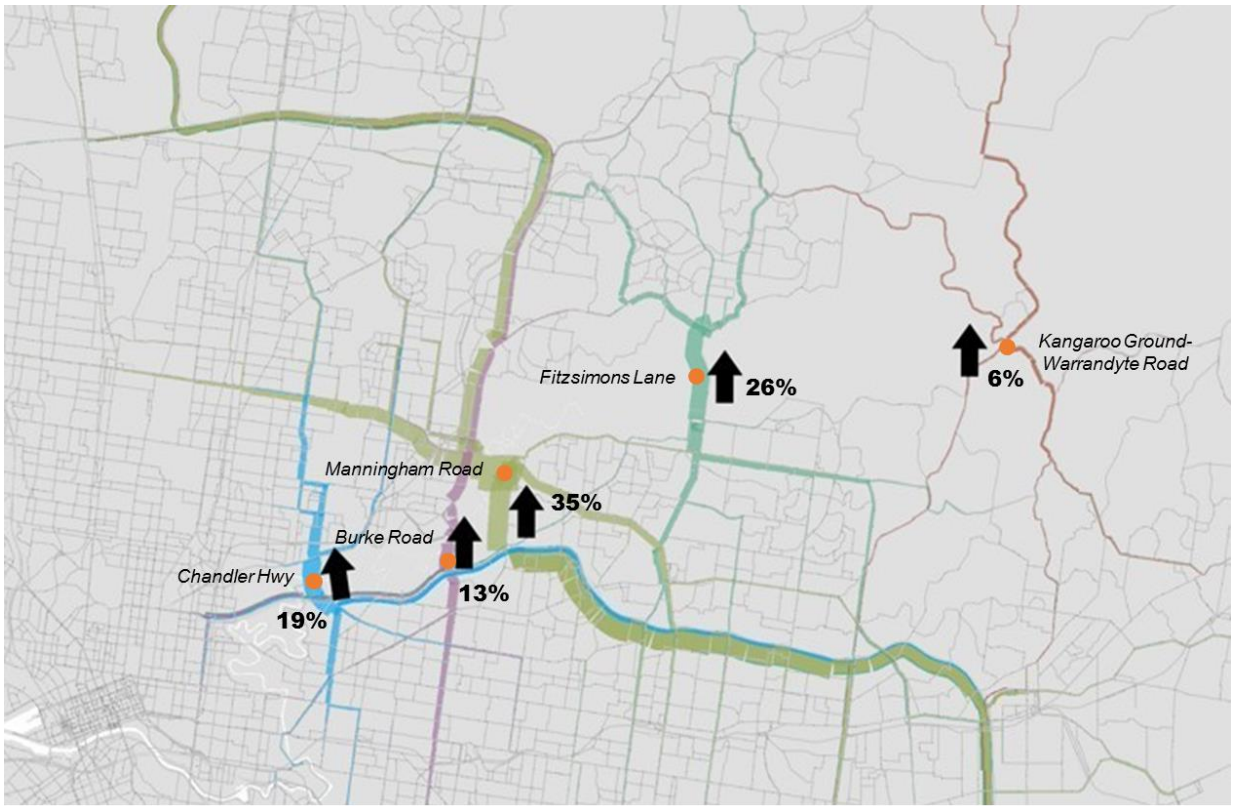


Figure 2-10 shows that significant volumes of trucks crossing the Yarra River use the north east arterial road network. For example, of all trucks travelling north across the river, 35 percent move along Manningham Road and 26 percent use Fitzsimons Lane. These truck volumes create additional pressure on key arterial roads through the north east.

Figure 2-10 Trucks crossing the Yarra River

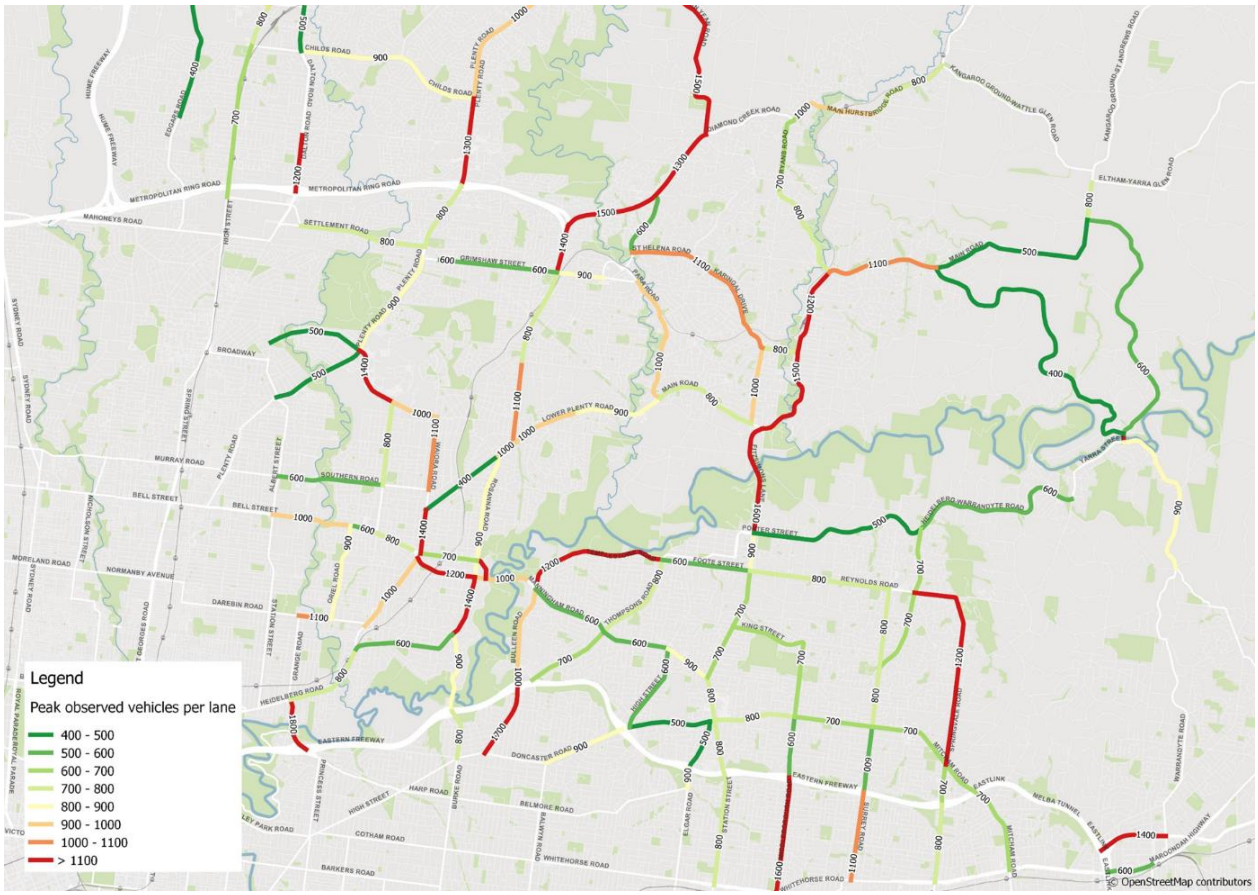


The combination of increasing traffic volumes and competing uses impacts road capacity and creates bottlenecks and delays on arterial roads and intersections in the north east, particularly during peak periods.

A typical arterial road with interrupted flow is over capacity when the hourly demand in each lane exceeds 800 to 900 vehicles. However, as shown in Figure 2-11, many arterial roads in the north east have volumes in excess of 1,000 vehicles per lane during the morning peak period. The most constrained locations are Diamond Creek Road (2,100 vph/lane), Bulleen Road south of the Eastern Freeway (1,700), Middleborough Road (1,600), Greensborough Road (1,500), Yan Yean Road (1,500) and Main Road (1,500).

The five bridge crossings of the Yarra River – Chandler Highway, Burke Road, Manningham Road, Fitzsimons Lane and Kangaroo Ground/Warrandyte Road – are also heavily constrained, with the hourly demand averaging around 1,200 vehicles per lane in the morning and evening peak periods. Daily traffic volumes on these river crossings are forecast to increase significantly by 2036 (discussed further under *Traffic volumes and travel times are forecast to rise* below).

Figure 2-11 Vehicles per lane per hour during the AM Peak 2017

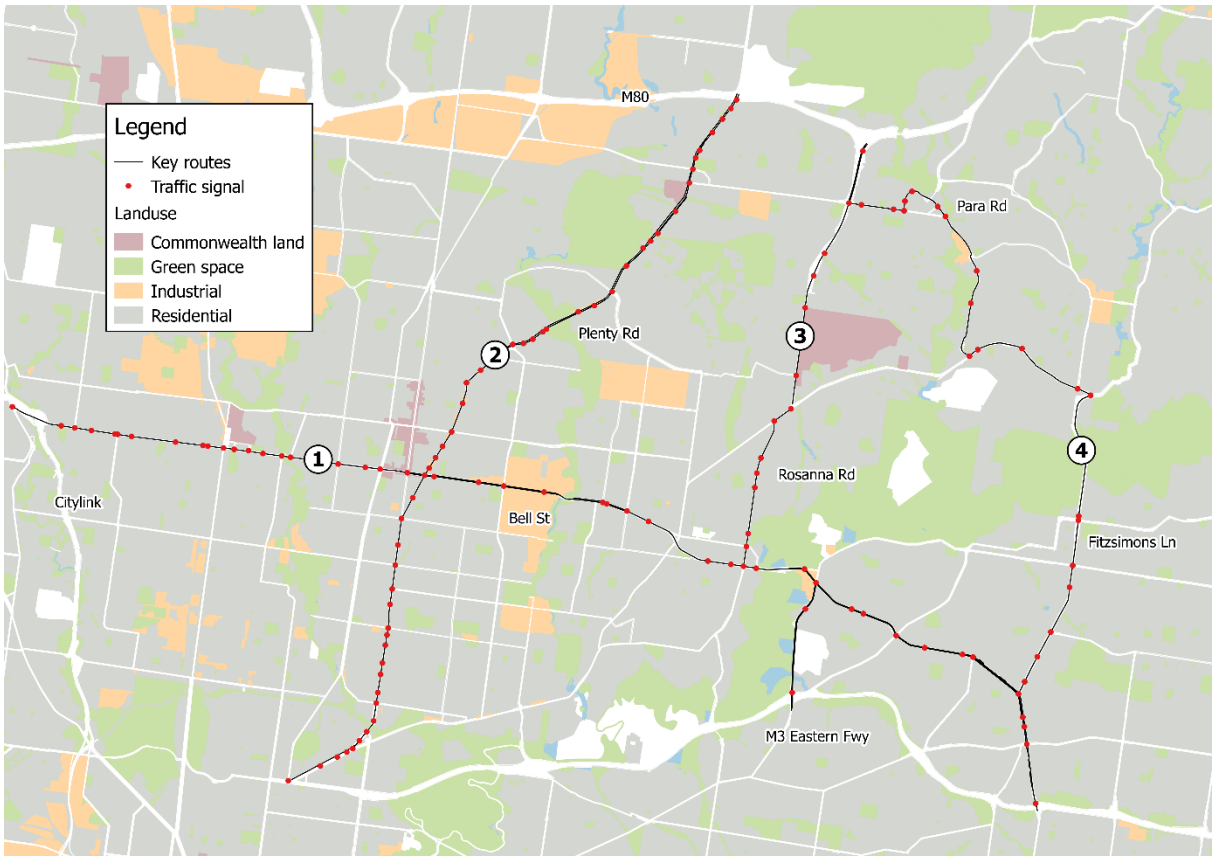


Increasingly, high levels of delay and congestion are not limited to peak periods, but are spreading out across the day. On roads such as Plenty Road, Chandler Highway, Manningham Road, Greensborough Road and Lower Heidelberg Road, traffic volumes do not drop below 85 percent of the peak traffic volume until well into the evening – reflecting the strategic importance of these roads and the types of trip they are accommodating[9].

Many of these arterial roads also serve an access function, meaning they interface with local property access, uncontrolled intersections and signalised intersections. This means that through movements on key parts of the network are hampered by stop-start conditions from multiple traffic signals and by traffic entering from uncontrolled intersections. Figure 2-12 shows the number of traffic signals on key arterial roads between the M80 and Eastern Freeway. As an example, vehicles travelling from the M80 to the Eastern Freeway via Rosanna Road must pass through 19 sets of signals over a six-kilometre length of road. This means that road users encounter one set of traffic lights every 316 metres.

[9] See Appendix C Transport Assessment: Existing Conditions Report

Figure 2-12 Traffic signals along key arterial routes (includes signalised roundabouts)

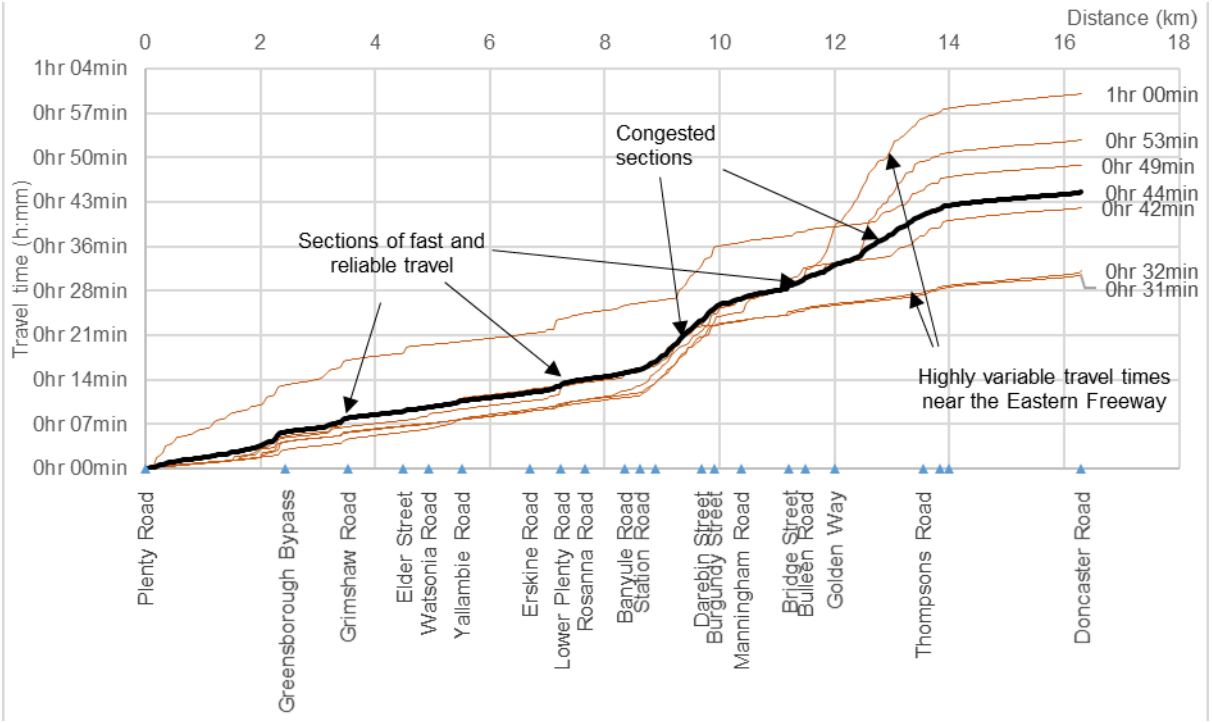


These stop-start conditions on the network contribute to fluctuation in traffic flow across the day, affecting travel speeds, travel times and journey reliability. In both peak periods, there are high levels of variability in speed and travel times for key routes.

The variability in travel times can be seen in Figure 2-13, which shows the minimum and maximum observed travel times between the M80 and the Eastern Freeway via Greensborough Road, Rosanna Road and Bulleen Road. Individual travel time 'runs' along this route are shown as thin orange lines, while the average travel time is highlighted in black. As the figure shows, travel time variability is highest on Bulleen Road near the Eastern Freeway. The slowest trip recorded (approximately one hour) was more than twice the length of the fastest trip (approximately half an hour).

Similarly, travel time southbound from Kangaroo Ground to the Warrandyte Bridge has a median morning peak of approximately nine minutes, but the longest trip recorded was more than 2.3 times the median at approximately 21 minutes. Travelling southbound between Lower Plenty Road and Manningham Road via Fitzsimmons Lane has a median travel time of 11 minutes; however, the longest trip recorded along this route was approximately 75 percent longer than the median, at 19 minutes.

Figure 2-13 Variability in travel times between M80 Ring Road at Plenty Road to Eastern Freeway at Doncaster SB via Greensborough Road, Rosanna Road and Bulleen Road – AM Peak



Travel time variability creates uncertainty in travellers before any trip. Depending on their level of uncertainty, road users may change their travel behaviour patterns: they may alter their departure times or choose to travel by a different route or mode. This can result in less efficient time management and lower productivity for travellers.

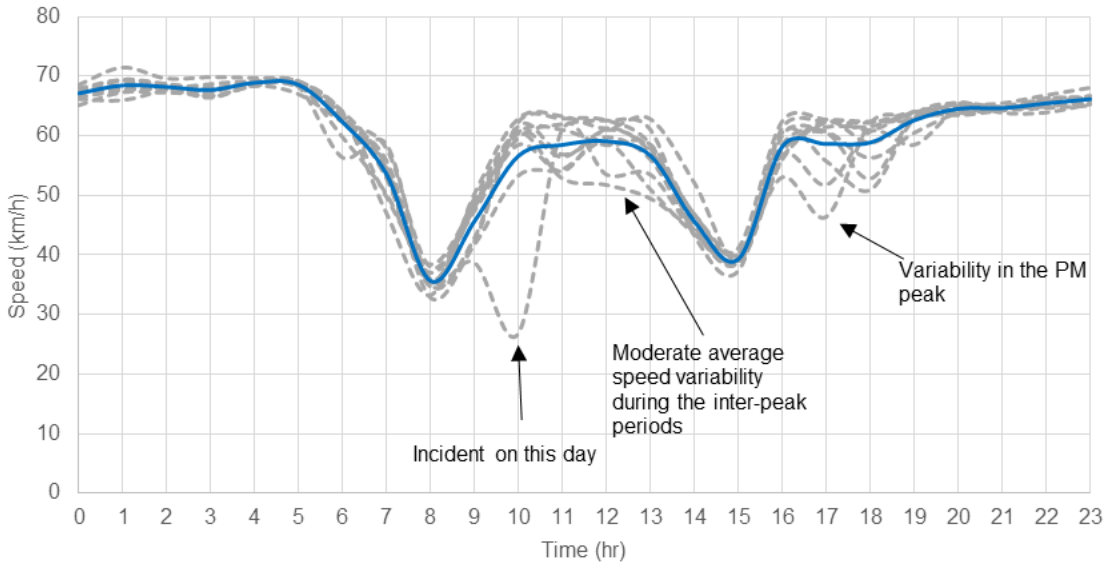
Variability on Bulleen Road

Although the posted speed on Bulleen Road is 70km/h, recorded average speeds fluctuate on a daily basis. The weekday average hourly speeds on Bulleen Road (midblock section) across a two-week period are shown in the figure below. The dashed lines represent average hourly speed profiles for each weekday and the solid line represents the average weekday speed.

The figure shows that during off-peak periods, vehicles can travel at a speed of between 65km/h and 70km/h. However, the speed can vary from around 45km/h to 65km/h during the evening peak period. Likewise, in the AM peak period the travel speed can range from 32km/h to 40km/h. The speed can slow to 25km/h if there is an incident on the day.

A southbound trip along Bulleen Road starting from Manningham Road typically takes three minutes in uncongested conditions. However, during the AM peak period, this can take as long as 15 minutes – five times slower than free flow conditions.

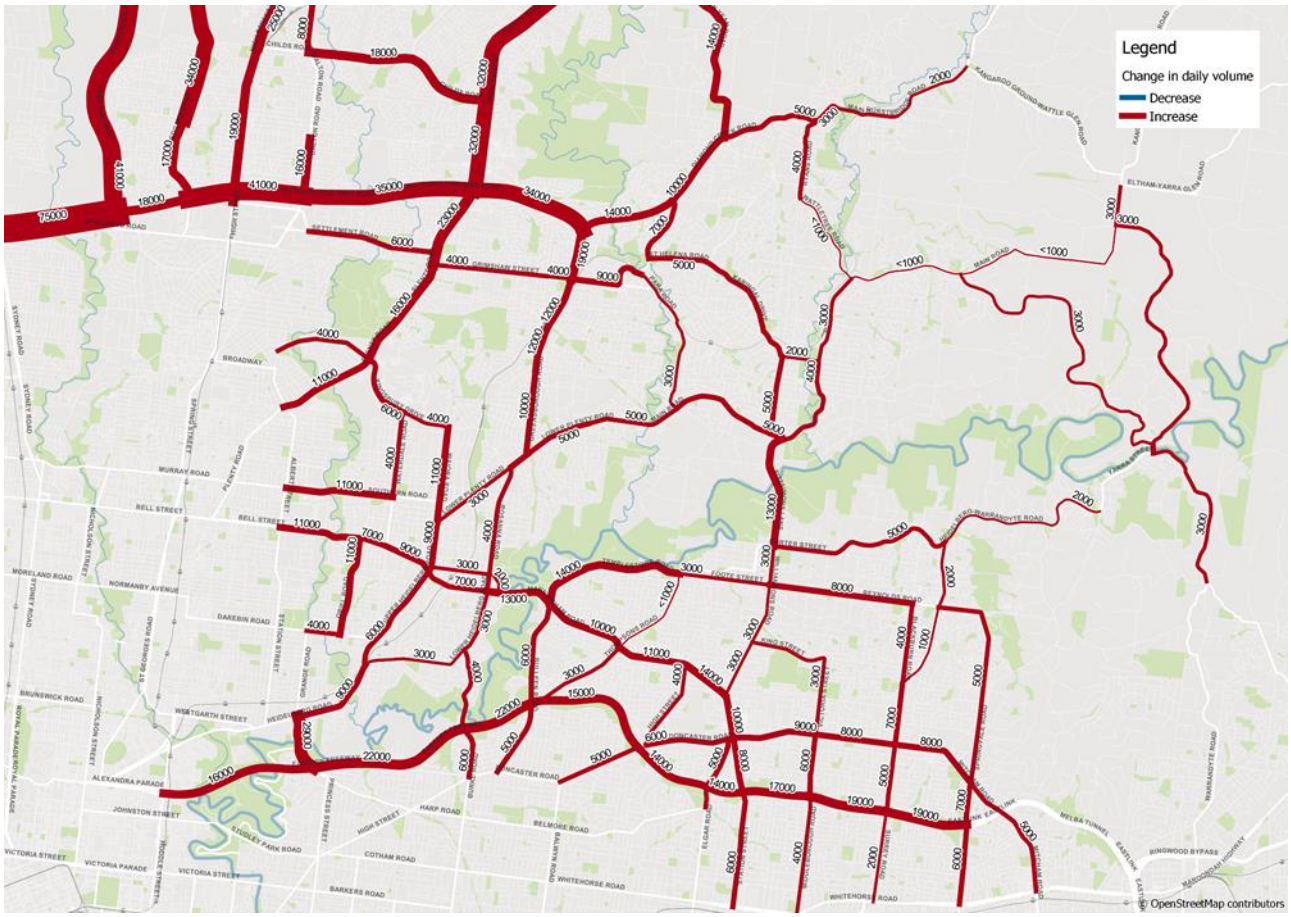
Figure 2-14 Average weekday speeds on Bulleen Road (midblock section)



Traffic volumes and travel times are forecast to rise

Despite significant investment in transport infrastructure over the period to 2036, travel demand for the north east arterial road network is expected to continue to grow. Figure 2-15 indicates a large increase in traffic on the M80 as a result of increasing demand pressure from growth areas in the outer north. Moderate growth is forecast on key roads in the north east such as Plenty Road north of the M80 (32,000 more vehicles per day), Greensborough Road (10,000 to 19,000 more vehicles) and Templestowe Road (14,000 extra vehicles). This is because the arterial road network is already operating close or at capacity throughout the day.

Figure 2-15 Change in daily traffic volumes between 2017 and 2036



Source: VLC Zenith model 2017

Traffic modelling estimates an average 25 percent increase in traffic volumes across the Yarra River between 2017 and 2036[10]. Table 2-7 shows that the largest increase is across Chandler Highway, likely enabled by widening works[11]. Volumes along Manningham Road, Fitzsimons Lane and Warrandyte Road are predicted to grow by between 20 and 30 percent, with most of this growth occurring outside the peak periods where there is some capacity. Growth on Burke Road, north of the Eastern Freeway is limited at nine percent due to its inability to carry any more additional traffic. This is likely to place additional pressure on the adjacent river crossings at Chandler Highway and Manningham Road.

[10] See Appendix C Transport Assessment: Future 'No Project' Scenario Report

[11] Chandler Highway is currently being widened to six lanes, with a new bridge to the west of the existing Chandler Highway bridge. This project will be completed by late 2018.

Table 2-7 Traffic volumes 2036 for Yarra River screen line (without North East Link)

River crossing	Number of lanes (two way)	Traffic volumes (daily, two way), without North East Link	Traffic volumes percentage change 2017 to 2036
Chandler Highway	2 (2017) 6 (2036)	63,000 – 82,000	+65%
Burke Road	4	37,000 – 49,000	+10%
Manningham Road	6	71,000 – 92,000	+20%
Fitzsimons Lane	4	63,000 – 82,000	+20%
Kangaroo Ground-Warrandyte Road	2 (2017) 3 (2036)	21,000 – 27,000	+30%
Total			**+25%**

Source: VLC Zenith model 2017

Analysis presented in Table 2-8 shows that travel times within the north east are forecast to increase significantly between 2017 and 2036.

Table 2-8 Travel time changes 2017 to 2036 (without North East Link)

Origin	Destination	2017 travel time (mins)	Percentage change (2017 – 2036)
South Morang	Box Hill	45 to 100	20%
Eltham	Ringwood	25 to 50	20%
Greensborough	Heidelberg	10 to 35	30%
Doncaster	La Trobe	20 to 40	15%
Epping	Northland	25 to 60	45%
Eltham	Swinburne University	30 to 70	15%

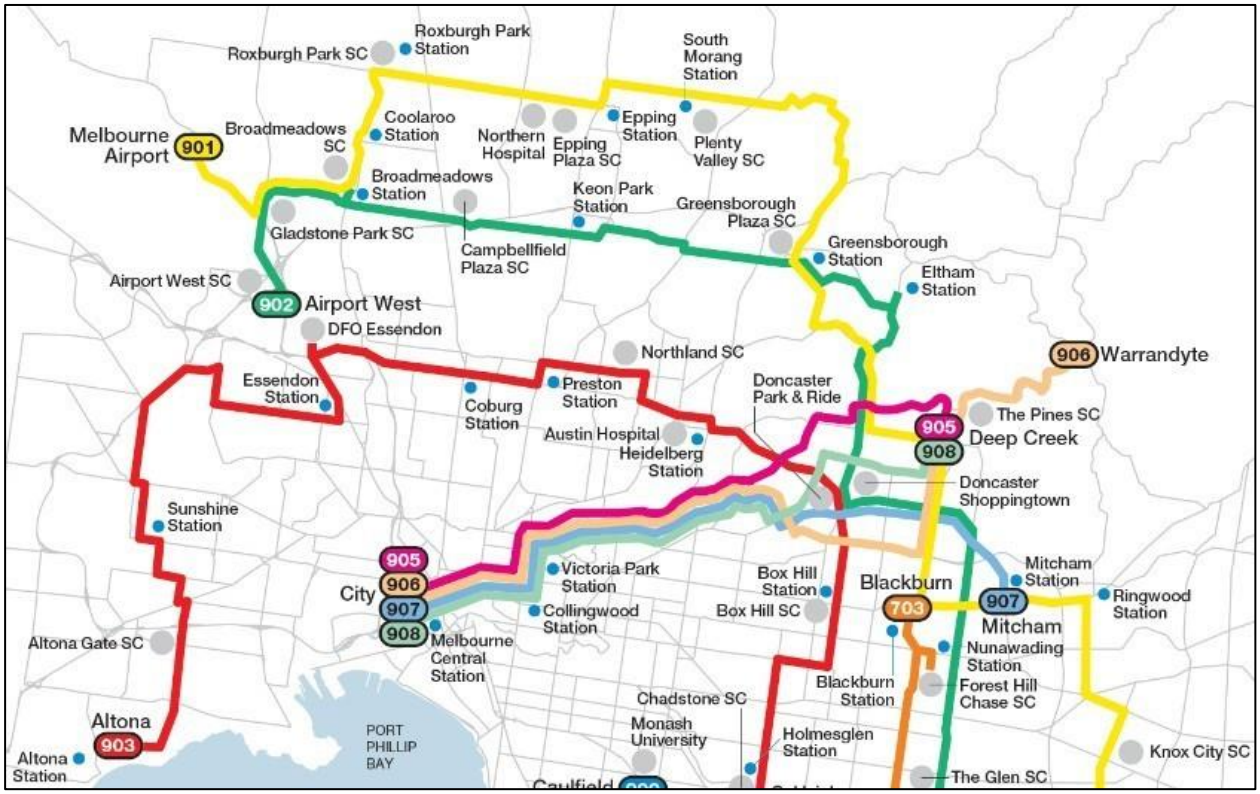
Source: Google Maps and VLC Zenith model 2017

On-road public transport is slower and less reliable

Moving a sizeable proportion of the population by public transport is a hallmark of successful cities around the world. To accommodate an estimated future population of eight million, Melbourne will need to significantly increase the number of people moving around the city by train, tram and bus. As buses and trams compete for road space with general traffic, maintaining good connectivity across the network matters for the reliability and timeliness of these services – attributes that are critical to attracting and retaining customers.

Upgrades to the Hurstbridge line and extension of the Mernda extension to the South Morang line will assist in increasing public transport access and reliability, however the greatest coverage of public transport in the north east is provided by tram and bus services that travel along radial, orbital and cross-city routes (shown in Figure 2-16). Orbital bus services that traverse the NEL study area – such as routes 901, 902 and 903 – are well patronised, carrying upwards of 14,000 passengers each day.

Figure 2-16 SmartBus routes

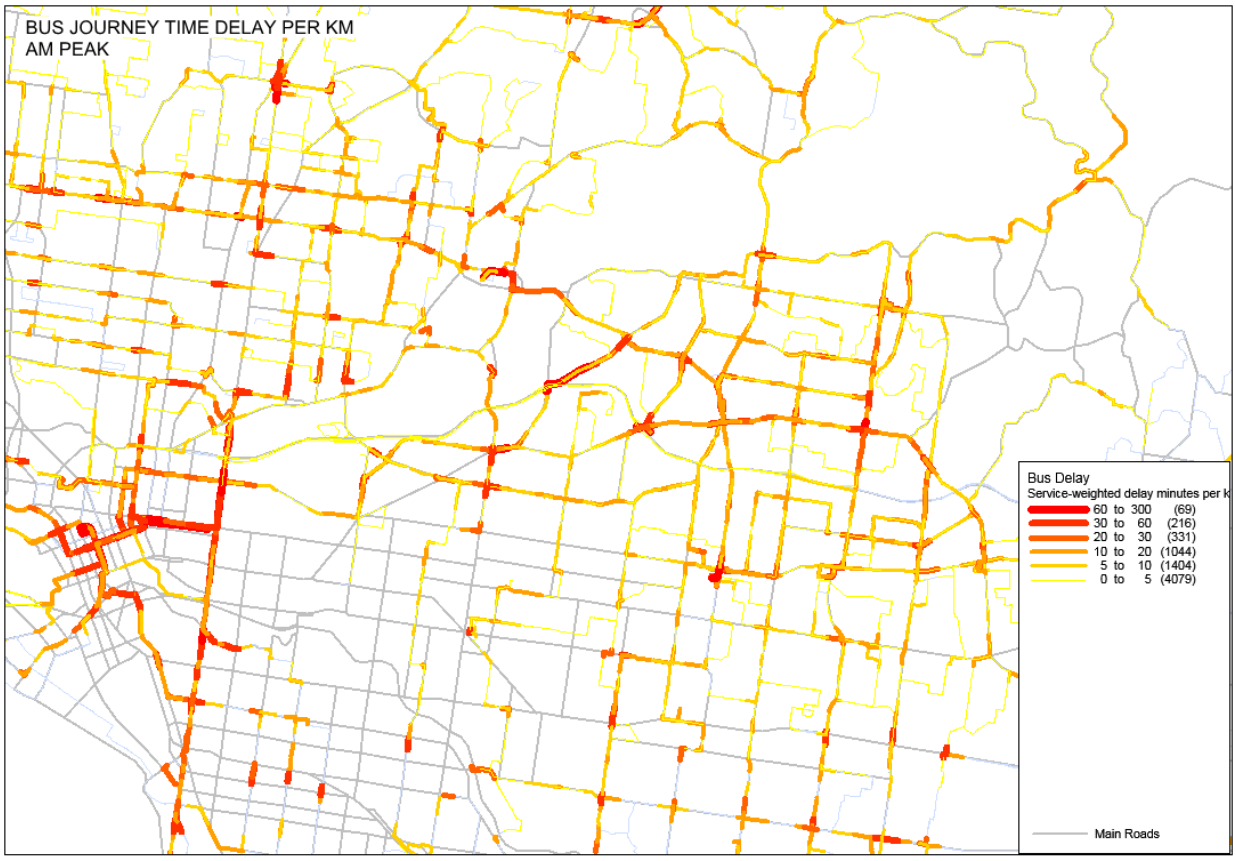


Source: PTV

However, bus services within the north east are often affected by congestion and capacity limitations on the arterial road network, hampering efforts to improve the frequency and coverage of local and cross-city services. Significant delays to bus services are experienced on Bell Street, Manningham Road, Grimshaw Street and Doncaster Road in the morning peak, shown in Figure 2-17. The limited provision of bus lanes through the area further exacerbates these issues.

To allow for the variability in journey time caused by delays, SmartBus services must schedule extra time of between six and 16 minutes into their timetables, which has flow-on impacts to the consistency and reliability of services.

Figure 2-17 Bus journey time delay per km in the AM Peak



Source: Network Planning, Transport for Victoria 2017

By 2036, the number of trips completed by public transport in Melbourne is expected to double to nearly 3.2 million trips a day[12]. This means that the proportion of trips completed by public transport is expected to increase from 10.5 percent of all trips today to 14.5 percent of all trips in 2036[13]. However, this growth will be limited mainly to destinations around the inner and middle ring suburbs, approximately 10 kilometres or less from the CBD, with destinations further away from the CBD continuing to have a low proportion of trips completed by public transport[14]. Public transport is expected to continue to serve radial trips in and out of the central and inner city, with a smaller role in supporting orbital journeys, which will continue to be better suited to car travel. Slow and unreliable bus travel times discourage commuters from travelling by this mode in the outer suburbs, which – in turn – encourages greater car use and leads to more cars on the road.

[12] See Appendix C Transport Assessment: Future 'No Project' Scenario Report
[13] See Appendix C Transport Assessment: Future 'No Project' Scenario Report
[14] See Appendix C Transport Assessment: Future 'No Project' Scenario Report

Getting the right traffic onto the right roads

Creating a more productive city, while maintaining Melbourne's reputation for liveability, requires identifying key strategic transport corridors of demand and making sure that these corridors have the capacity to meet future demand. These strategic corridors provide the standard and scale of transport link needed to support the centres, precincts and industry sectors considered vital to Melbourne's future productivity and competitiveness.

Making the best use of these links means ensuring they are suited to the type of transport service needed to meet the travel demand along the corridor. For example, large trucks will need a freeway-standard corridor connecting with freight gateways, while buses may need to be given priority along a major commuting corridor to the central city. Getting the right traffic mix along these corridors also means that inappropriate traffic – such as heavy vehicles and through-traffic – can be kept off local streets.

2.1.4 The resilience of the city's road network is being compromised

A resilient road network can accommodate unexpected and unusual conditions – such as incidents and accidents, disruption from construction activities and special events – without severe consequences. Melbourne's poor orbital connectivity contributes to a less resilient and less reliable metropolitan road network, meaning that many important economic journeys and locations are highly vulnerable to incidents occurring on key arterial roads in the north east.

When unexpected incidents occur on these roads, there is no spare freeway-standard orbital capacity in this part of the network and limited alternative north-south and east-west routes available to redistribute traffic. The resulting congestion and delays can have a compounding effect, disrupting traffic across the north east and spreading to arterial roads further to the east and south east. This means that the flow-on impact from an incident can extend across the wider road network, with the resulting congestion lasting several hours.

As the north east arterial road network is already at capacity, heavy reliance on these roads for orbital connectivity makes the Melbourne and Victorian economies vulnerable to risks that include:

- Additional costs to road users due to lost time, detours, missed appointments, late deliveries, absenteeism at work and lost productivity
- Additional direct costs to the transport industry, including more fuel used and lower productivity
- Impacts on community amenity in the north east from commercial vehicles using local streets to avoid delays
- Negative impact on regional businesses and industries based in the east and south east needing to move goods through the city, such as the dairy and horticulture industries
- Negative impact on business and employment growth in Melbourne's north east.

Managing Melbourne's road network into the future

Advances in technology are enabling the more efficient management of urban transport networks. Intelligent Transportation Systems (ITS), which use technologies such as GPS (Global Positioning System), mobile telecommunications and the internet, give road network managers sophisticated tools to improve the operation, performance and efficiency of the network. These tools include centralised traffic control, freeway and lane use management systems, real-time information and warning systems for drivers, electronic pricing and priority systems for public transport.

Applying these tools means that the metropolitan freeway network can be managed holistically, rather than in sections. Adopting a network-wide approach can have significant positive impacts, including improved safety, better traffic flows, fewer delays and more reliable travel times. It can also support the allocation of road space to maximise efficient use of the network, such as monitoring and enforcing high-occupancy vehicle lanes and priority bus lanes.

These technology-enabled tools are likely to become increasingly important in managing Melbourne's freeway network. A disconnected orbital movement network will compromise the management of the city's freeway network; for example, traffic flow and control systems will be less effective if they cannot be applied across a fully connected, freeway-standard orbital network. It will also reduce the network's ability to take full advantage of anticipated technology developments, such as driverless vehicles, GPS-enabled pricing platforms that track movements or vehicle fleets and directly charge users and new logistics systems.

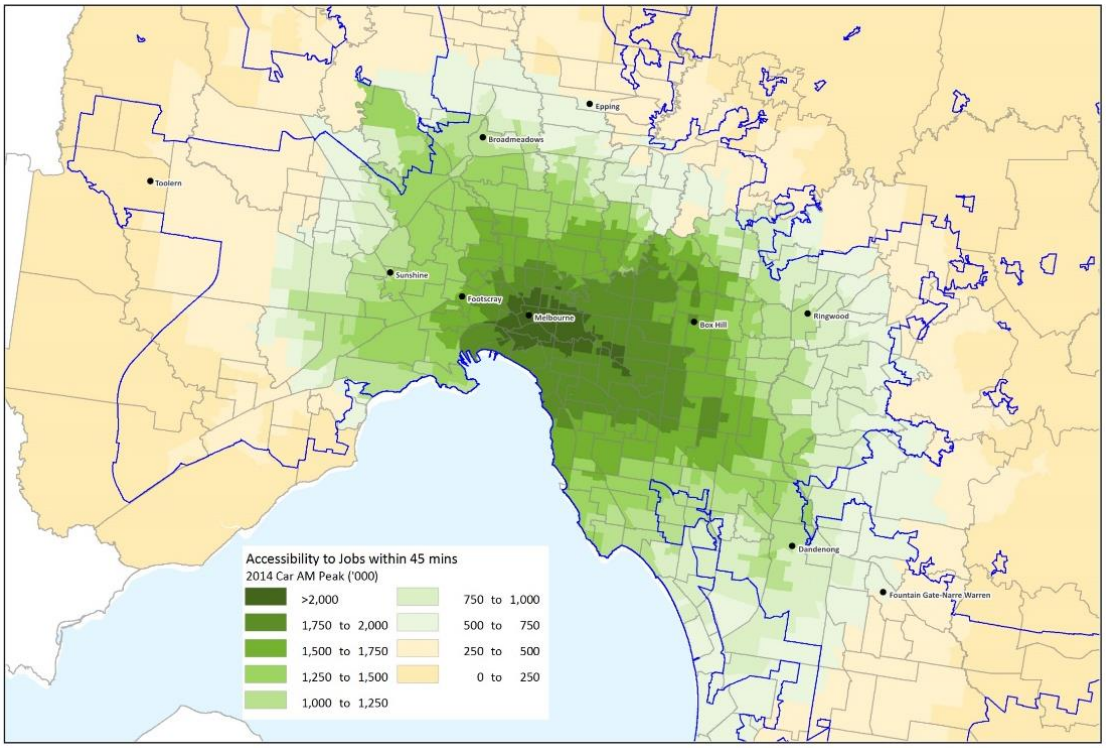
2.1.5 Households are increasingly unable to access economic opportunities

Inner urban areas offer far more transport options to access jobs and other opportunities than the outer and middle suburbs, with the number of jobs accessible within 45 minutes by car and 60 minutes by public transport decreasing with distance from the central city (shown in Figure 2-18 and Figure 2-19).

A similar pattern of diminishing accessibility also occurs across the city in relation to tertiary education opportunities[15].

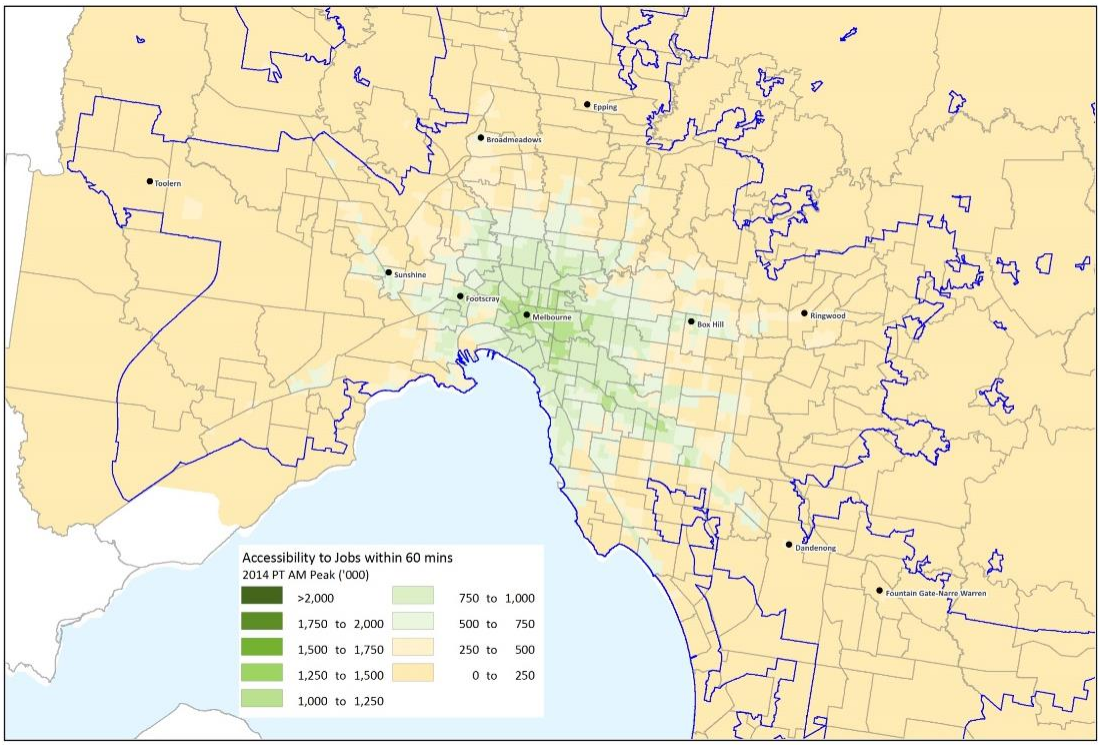
[15] EY analysis based on VLC Zenith model outputs 2017

Figure 2-18 Accessibility to jobs within 45 minutes by car



Source: Analysis based on VLC Zenith model outputs 2017

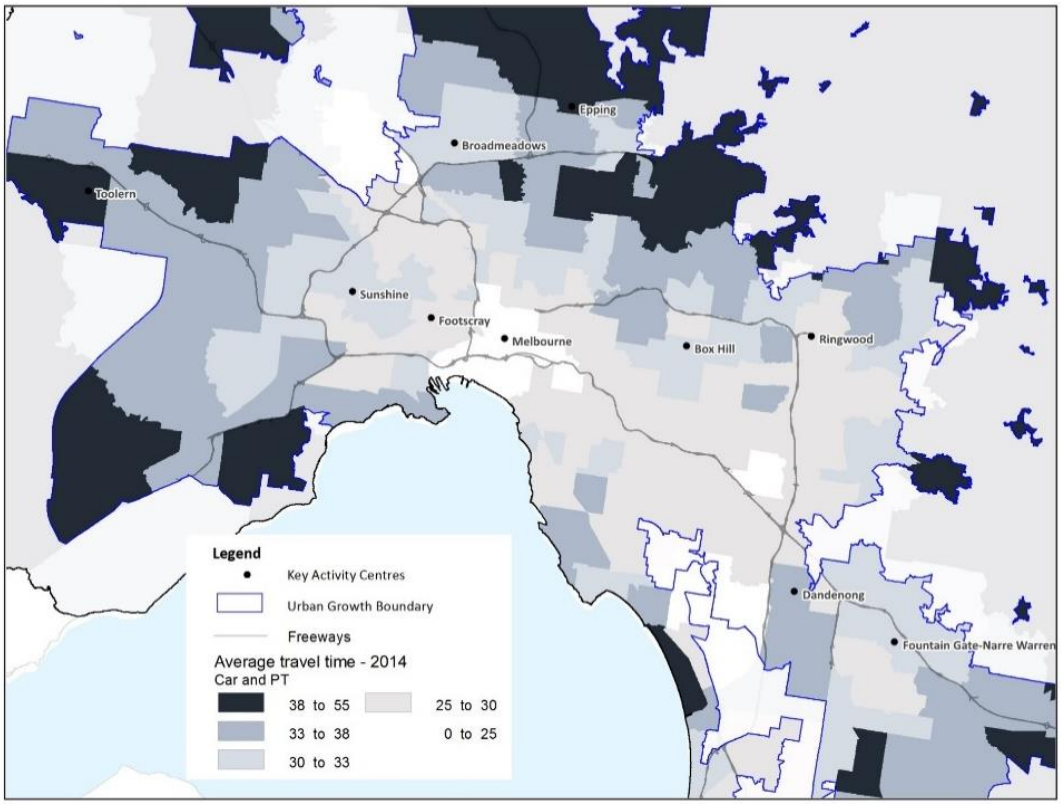
Figure 2-19 Accessibility to jobs within 60 minutes by public transport



Source: Analysis based on VLC Zenith model outputs 2017

As Melbourne has expanded geographically, commuting distances and times have also increased. Compared to someone living in the inner-city, a person living in the outer suburbs typically has fewer local employment opportunities, forcing them to either travel further or longer for work. This is evident in Figure 2-20, which shows that the average travel time by car and public transport in the AM peak is longer for areas in the north and north east compared to suburbs closer to the central city.

Figure 2-20 Average travel time by mechanised modes (car and public transport) for AM peak



Source: Analysis based on VLC Zenith model outputs 2017

Analysis undertaken by the National Institute of Economic and Industry and Research for NORTH Link in 2009 found that residents of outer local government areas in Melbourne's north (including Hume, Nillumbik and Whittlesea) spend a higher percentage of their weekly income travelling to and from work compared to inner municipalities such as Yarra, Darebin, Moreland and Banyule[16].

Long commuting times also have social consequences for commuters and households. Individuals with long commutes are less likely to have time to spend socialising or to belong to a sporting group or community organisation[17].

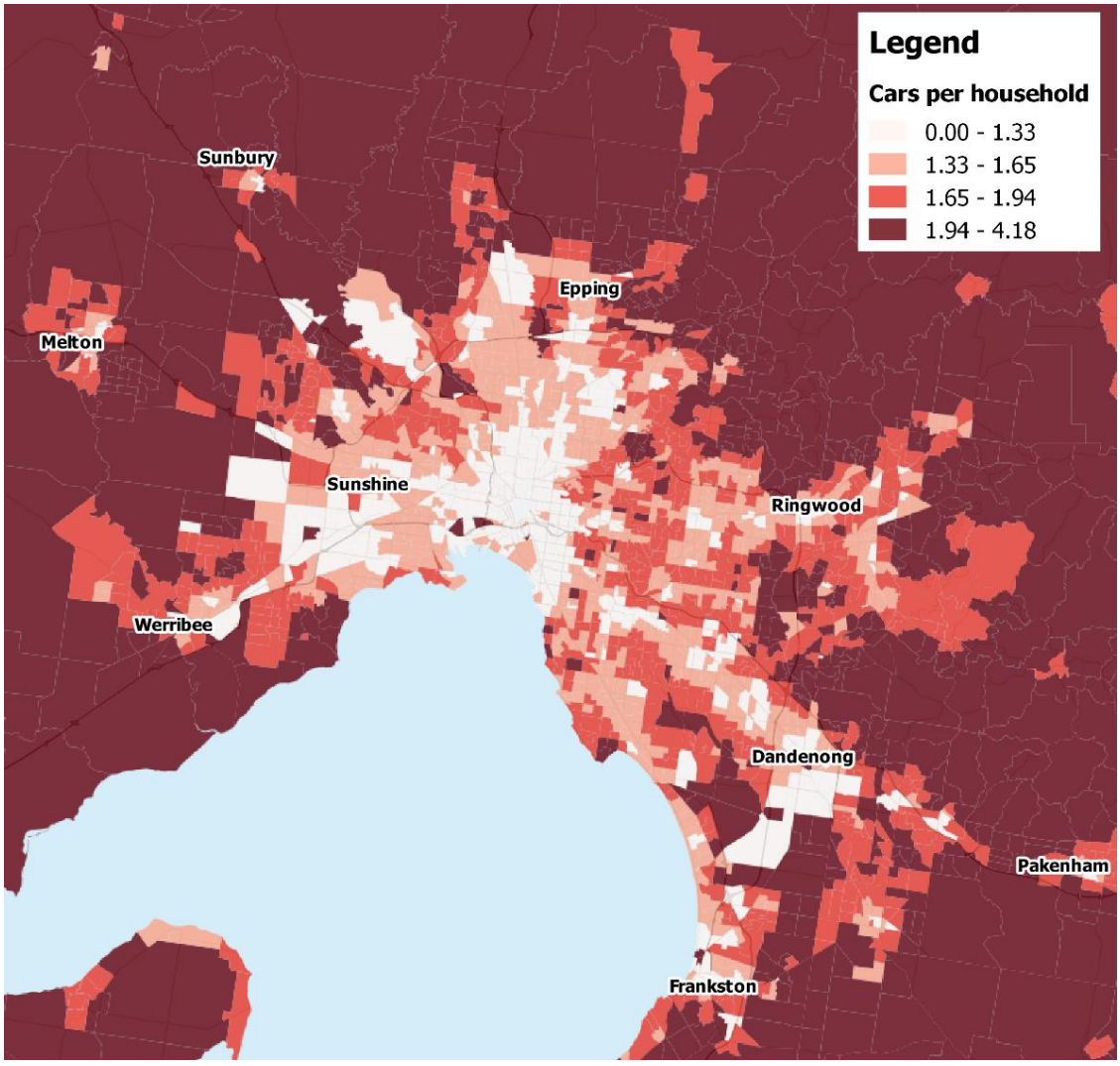
[16] Melbourne's North – the new knowledge economy, NORTH Link, 2009

[17] Kelly, J-F, Breadon, P, Davis, C, Hunter, A, Mares, P, Mullerworth, D & Weidmann, B 2012, Social cities, Grattan Institute, Melbourne. Occupational and Environmental Health, vol. Lindstrom, M 2008, 'Means of transportation to work and overweight and obesity: a population-based study in southern Sweden', Preventive Medicine, vol. 46(1) 2008, pp.22-28

A long commute time also impacts family life. It is a recognised determinant of work-family conflict[18] because it decreases the time available for people to spend with their families.

Diminished accessibility, especially in relation to public transport (see Figure 2-19 above), leads to higher levels of car ownership. This relationship is demonstrated clearly in the figure below, which shows levels of car ownership increasing with distance from the central city and 'transport rich' inner suburbs. There are large geographic pockets in the north, north east and south east where relatively poor transport accessibility means that households, especially families, need more than one car to get to work, services and activities. These households incur higher costs from operating more than one vehicle, such as registration, insurance, fuel and maintenance expenses.

Figure 2-21 Cars per household



Source: ABS Census 2011

[18] Pocock, B & Masterman-Smith, H., Work, families and affordable housing, Centre for Work + Life, University of South Australia, Adelaide, 2006

The combination of longer commuting times, limited availability of public transport and higher vehicle operating costs impacts disproportionately on people on low incomes and those without access to a car (such as elderly people and people with disabilities). High rates of unemployment also tend to be concentrated in areas with relatively poor transport access.

With congestion forecast to increase as Melbourne grows, transport inequality and disadvantage in the outer and middle suburbs is also likely to increase, along with a rise in transport costs. Worsening cross-city connectivity will exacerbate these issues, making it even harder for households in the outer north and south east to access employment and education. This is likely to further entrench disadvantage in areas that already have high densities of population experiencing socio-economic disadvantage, such as Dandenong, Broadmeadows, Whittlesea, Casey and Frankston[19].

Many of these areas are expected to enjoy significant improvements in transport accessibility if cross-city orbital connectivity is enhanced. This would give disadvantaged individuals and households better access to economic opportunities and potentially contribute to reducing disadvantage in communities in the outer north and south east.

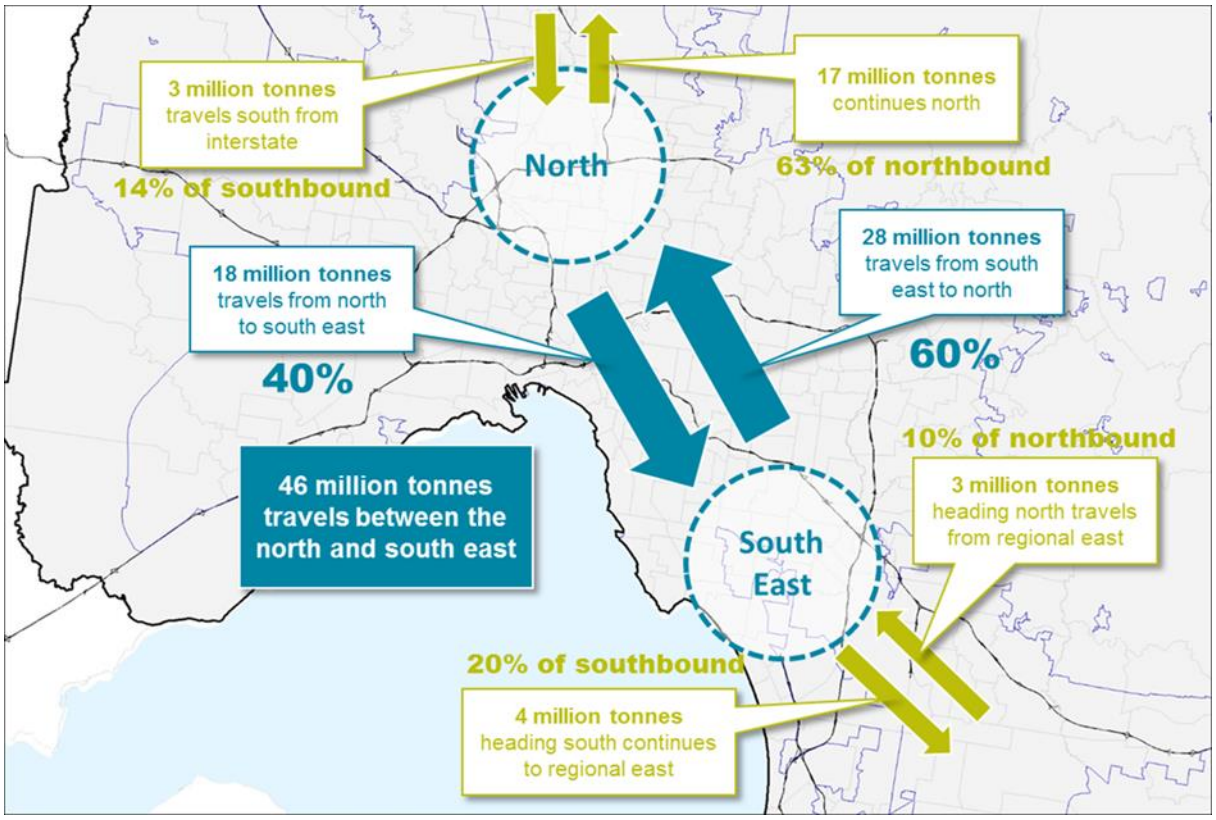
2.2 Problem 2 - Inefficient freight movement between Melbourne's north and south east is limiting supply chain competitiveness and hindering the growth of high value industries

The north east corridor plays a vital role in facilitating freight flows across Melbourne from the north to the east and south east (as illustrated in Figure 2-22). This includes linking regional areas such as Gippsland and industrial areas, freight gateways and distribution centres in the south east (such as Dandenong and the Port of Hastings) with the Hume Freeway and Melbourne Airport to facilitate interstate and international exports. It supports specific transport and logistics tasks associated with the Melbourne Metropolitan Fruit and Vegetable Market, the Melbourne Airport Industrial precinct and Coles and Woolworths distribution centres in the north, east and south east.

With strong growth expected in the Victorian and Melbourne freight tasks over the next 30 years, moving goods through this corridor efficiently is critical to business competitiveness, to supporting high value industries and to sustaining Melbourne's position as the nation's leading freight and logistics hub.

[19] EY analysis based on ABS Socio-Economic Indexes for Areas 2011

Figure 2-22 Key annual freight movements through the north east



Representative sample % of tonnage travelling along the north east corridor
Source: North East Link Needs Assessment, XAct Solutions, 2017

Most freight moving through Melbourne is carried on freeways and arterial roads by trucks[20]. As noted in Chapter 1, while the movement of freight on the rail network will grow over time, the fixed infrastructure of rail does not have the flexibility to support shorter, time-critical trips between economic centres or the growing demand for door-to-door deliveries and freight trips with multiple pick-up and drop-off points.

While the freight task attributable to the Port of Melbourne is considerable, cross city and orbital movements comprise a significant proportion of all freight movements across the wider city, as goods move between freight gateways, logistics and distribution centres, businesses and households.

One tenth
of the total Victorian freight task travels along the north east corridor each year

33%
of tonnage originating in the north is destined for the south east and eastern regional Victoria

20%
of the total Victorian freight task travels between the north and south east of Melbourne

28%
of tonnage originating in the south east uses the north east corridor for deliveries to the north

One third
of the total Victorian metropolitan tonnage carrying goods for supermarkets uses the north east corridor

[20] Overview of Victoria's Freight and Logistics Task, Department of Transport, 2012

International air freight is forecast to grow from 303,000 tonnes in 2018 to 393,000 tonnes by 2033 (or 1.8 percent annually)[21], driven in part by the growing demand for higher value and time sensitive products. As industry shifts towards eCommerce delivery models, there is also growing demand for express parcel deliveries and collections.

Constrained cross city orbital connectivity increases the delays and costs incurred by freight operators and reduces reliability for businesses delivering commodities, consumer goods and materials around the city. Poor connectivity through the north east leads to significant inefficiencies (and associated costs) in the freight task:

- With access for High Productivity Freight Vehicles (HPFVs) restricted in the north east, more trucks are required to move the same volume of freight, resulting in increased congestion and impacts on noise, air quality and road safety. Businesses based in the north east have less flexibility and limited (and costlier) options for transporting larger loads, reducing their productivity and competitiveness. In addition, broader productivity and economic benefits associated with the use of HPFVs are not being realised in Victoria.
- The north east 'gap' in the freeway network is a significant supply chain bottleneck that constrains cross-city orbital freight movements and increases the cost of transporting goods from where they are produced to customers in Melbourne, Victoria or overseas. This is potentially a significant competitive disadvantage for businesses operating in high value industry sectors.
- Traffic congestion and poor reliability on key transport routes diminishes the provision of efficient freight systems to support the requirements of businesses.
- The lack of efficient cross-city orbital access through the north east places additional pressure on other key routes across the network, with supply chains increasingly reliant on the M1 corridor, which is heavily congested for a large and growing part of the day, and is increasingly susceptible to incidents and long periods of disruption.
- Melbourne has a strong competitive advantage in being home to the nation's largest curfew-free airport. Poor orbital connectivity means that the opportunities presented by this advantage are not being fully realised.

[21] Melbourne Airport Master Plan 2013 approved by the Commonwealth Minister of Infrastructure and Regional Development on the 18 December 2013

Growth in eCommerce

Currently, online retail spend in Australia represents around 6.6 percent of traditional retail spend (as reported in the NAB Online Retail Sales Index June 2014). Studies of the Australian eCommerce market consistently predict strong year-on-year growth in Australian online spending through to 2020.

As eCommerce increases – and customers expect faster delivery times – new distribution models are emerging. These generally focus on small, regular local deliveries to multiple destinations, supported by larger regional distribution centres. 'Reverse' logistics are also required for fast customer returns.

Australia Post has identified the growth of cross-border eCommerce as one of its biggest business opportunities in its 2015/16 Annual Report. The organisation is building its eCommerce partnerships in Australia and internationally, joining with Asian eCommerce giants JD.com and Alibaba on popular online shopping platforms and Aramex, a global express delivery and logistics company, in 2016.

The demand for quality Australian products is also helping to unlock eCommerce opportunities for local businesses wanting to grow into China.

One Melbourne-based business succeeding in the world of eCommerce is deals website Catch of the Day, which has established itself as a top online destination for thousands of deals on the latest streetwear, fashion, homewares, toys, groceries and more. Catch of the Day first set up its online shop in 2006 with five employees and a 200m^2 warehouse and has since grown to become one of the largest parcel distributors in Australia. It now has a robotic automated picking system at its 25,000m^2 inventory warehouse in Melbourne's south east (Hallam).

Together with its sister brands (Scoopon, Mumgo and Grocery Run) Catch of the Day's parent company, Catch Group, fills more than 8,000 orders every day. Catch of the Day offers customers a range of delivery options, including express post, delivery to parcel locker, parcel collect and PO Box, and easy returns backed by seven-day customer service. Many of these orders make their way across Melbourne's road network to consumers and to Melbourne Airport from Hallam via the north east for interstate deliveries.

Source: Australia Post Annual Report 2016

2.2.1 Lack of HPFV access along the north east corridor affects industries that transport larger loads and impacts productivity and competitiveness

High Priority Freight Vehicles (HPFVs) are large truck-and-trailer combinations that have been operating in Australia for over a decade. HPFVs allow operators to move increased freight volumes and mass on approved routes, with larger, safer and more productive trucks.

HPFVs are more productive than standard B-Double truck configurations, carrying 23 percent more payload tonnes, enabling 17 percent fewer trips and using on average eight percent less fuel[22].

In Victoria, HPFVs must comply with mass and length limits, adhere to mandatory speed limits and only operate along designated routes, such as duplicated highways. As shown in Figure 31, the current road network in Melbourne's north east does not support access for HPFVs and travel is restricted during peak hours at key points in the network, such as the West Gate Bridge. As a result, operators must take longer and diverted routes along the M1 and M80.

As the north east orbital corridor plays an integral role in facilitating interstate line haul from and to the south east region, the lack of HPFV access creates multiple issues and implications for freight operators, industries and the broader Victorian and national economies.

[22] XAct Solutions, North East Link Needs Assessment, 2017

Figure 2-23 Victoria's HPFV Mass Network Map

Source: http://vicroadsmaps.maps.arcgis.com

Local industries are constrained in moving larger loads

HPFVs generate direct operational economic benefits for freight operators and their customers through cost savings. Where operators needing to move large loads are unable to use HPFVs, these saving are not available. These operators have no option but to increase the number of vehicles required to transport goods.

This has an impact on traffic congestion, noise levels and air quality, as well as increasing safety risks on the road network. The greater number of heavy vehicle movements required also means that the costs to service industries in the south east may be higher than other parts of Melbourne, reducing their competitiveness.

Based on sample data on the north east orbital corridor, Table 2-9 shows that a lack of HPFV access in the north east is estimated to increase the number of heavy vehicle trips by 15 percent[23].

[23] XAct Solutions, North East Link Needs Assessment, 2017

Table 2-9 Estimated impact of no HPFV access in the north east

Weekly sample analysis	No HPFV		With HPFV	
	HPFV	B-Double	HPFV	B-Double
Estimated trips of sample data (north east corridor)	0	154	94	37
Estimated total trips	**154**		**131**	

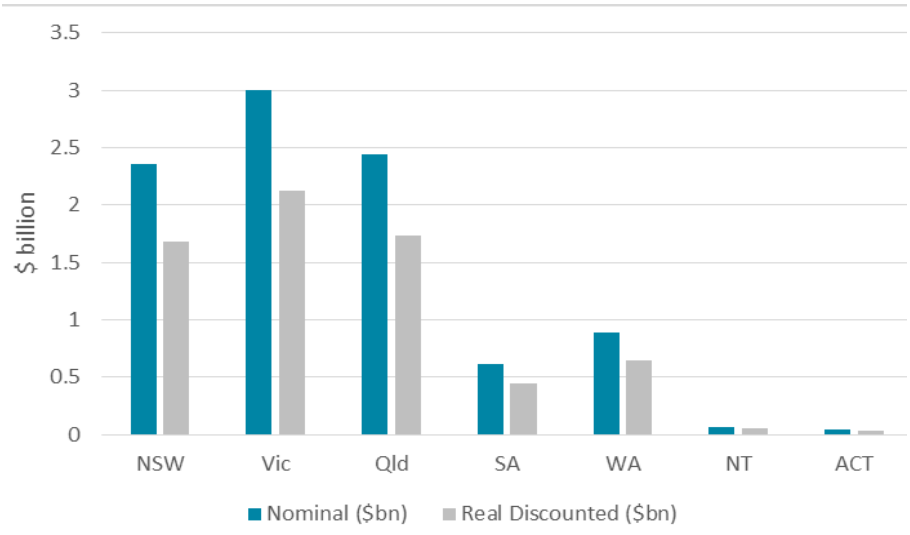
Note: Analysis undertaken using XAct Solutions transport sample data set

Realisation of broader benefits is being jeopardised

HPFVs also deliver higher productivity and direct safety benefits compared to standard heavy vehicle combinations by reducing the on-road exposure of heavy vehicles and decreasing the number of truck movements, helping to alleviate pressure on the road network.

Research undertaken by Austroads in 2014 found that Australia will gain $6.9 billion in direct benefits (savings)[24] if staged access for HPFVs to the major highways connecting Brisbane, Sydney, Melbourne and Adelaide is achieved by 2030[25]. The report noted that two thirds of the operational benefits of opening the major interstate highway network to HPFVs between these cities is attributable to the direct benefits flowing from access to the Hume Highway. Figure 2-24shows that Victoria would contribute the most to these estimated national HPFV direct benefits.

Figure 2-24 Direct HPV benefits by state



Source: Austroads, Quantifying the Benefits of High Productivity Vehicles, 2014

These direct benefits have flow-on economic benefits. The Austroads research found that a small percentage switch to HPFVs could result in a small, but calculable, road maintenance saving for a typical Australian highway. Sensitivity tests were undertaken on the make-up of the daily truck fleet for a 900 km long Australian highway link to assess the impact of an uptake of different HPFVs (as shown in Table 2-10).

[24] Direct benefits include fatalities savings, insurance savings, CO2 savings and operating savings.
[25] Austroads, Quantifying the Benefits of High Productivity Vehicles, Research Report AP-R465-14, 2014

Table 2-10 Hypothetical highway trips and maintenance savings

Truck fleets	Current	HPFV fleet 1	HPFV fleet 2	HPFV Fleet 3
Trucks/day	3,200	3,037	3,001	2,950
Percentage change truck numbers	0%	-5.0%	-6.2%	-7.8%
Percentage change in truck trips	0%	-5.1%	-6.2%	-7.8%
Total maintenance savings %	0.0%	-1.7%	-2.0%	-2.9%

Source: Austroads, Quantifying the Benefits of High Productivity Vehicles, 2014

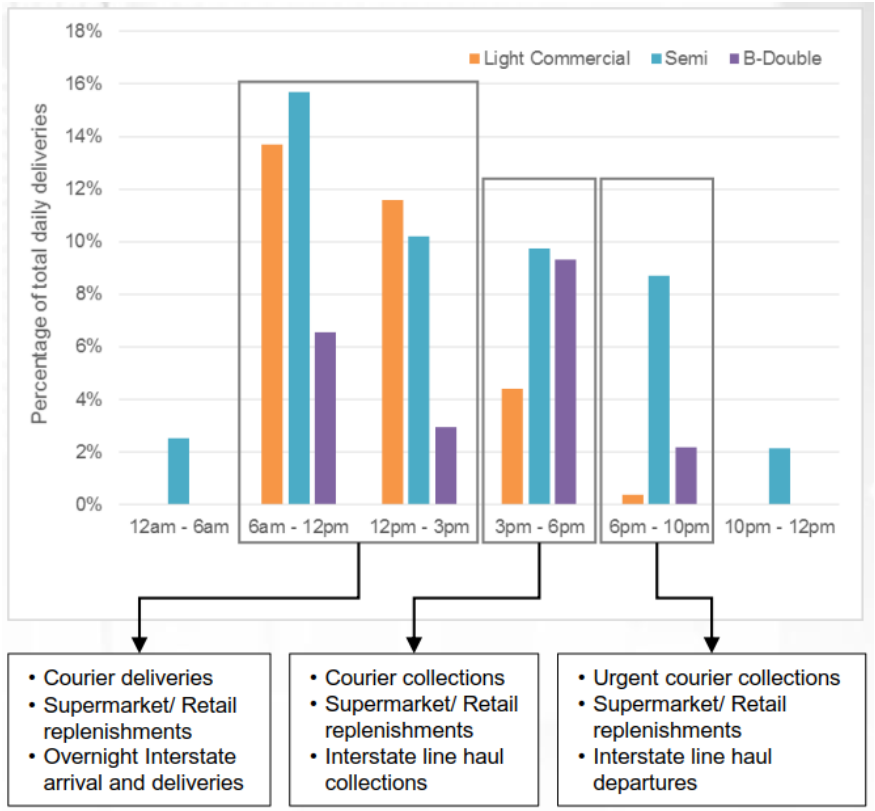
The lack of HPFV access in the north east jeopardises the current and future realisation of these benefits for the Melbourne, Victorian and national economies.

2.2.2 Traffic congestion and poor reliability contribute to diminished freight productivity

Melbourne's ability to provide efficient freight systems to support the requirements of businesses is diminished by traffic congestion and poor reliability on key transport routes.

Analysis of a typical weekday delivery profile highlights that the main freight task during the morning peak involves the arrival of interstate line haul freight, supermarket/retailer replenishments and courier deliveries. Figure 2-25 shows that as the day progresses, the main freight task shifts to collections and interstate line haul departures.

Figure 2-25 Percentage of deliveries by vehicle type across a typical day



Source: XAct Solutions, North East Link Needs Assessment, 2017

Congestion and poor reliability on key transport routes affects the ability of the freight network to support these delivery patterns. The sample north to south journey through the north east corridor shown in Figure 2-26 reveals high variability across different times of the day to make the same trip. Regardless of when travel is undertaken on the north east arterial road network, it is hard to gauge exactly how long the trip will take. While this may be a minor inconvenience for commuters or other private car trips, it has a particularly significant impact on the freight and logistics industry where travel time reliability is a critical factor in day-to-day operations.

Figure 2-26 Example of congestion impact on north to south east route

Source: XAct Solutions, North East Link Needs Assessment, 2017

With one third of metropolitan freight flows originating in the north being destined for the south east and regional east[26], high variability in the north east corridor can have a particularly detrimental impact on logistics and efficiency. For one supermarket chain, 33% of its total metropolitan tonnage travels along this corridor[26], making deliveries from the distribution centres to suburban retail outlets complex to plan for and requiring multiple trips. These journeys are highly time-critical and drivers have tight windows to make deliveries or risk financial penalties. An inquiry on grocery prices by the Australian Competition and Consumer Commission found that less than five percent of truck drivers received payment for time spent waiting and that, on average, a long distance driver will spend more than 20 hours per week waiting to unload. In extreme cases, drivers have spent up to 40 hours per week waiting to unload[27].

To meet tight deadlines and avoid penalties or waiting, drivers make every effort to arrive on time. In some cases, this makes drivers prone to engaging in unsafe practices, such as driving for too long, speeding and running red lights. In turn, unsafe behaviour may cause more congestion by increasing the risk of incidents on arterial roads and freeways, which further diminishes freight productivity[28].

[26] XAct Solutions, North East Link Needs Assessment, 2017 based on weekly transport data for Metro Melbourne – Supermarket chain
[27] Australian Competition and Consumer Commission, Grocery Prices Inquiry, 2008
[28] Australian Competition and Consumer Commission- Grocery Prices Inquiry, 2008

2.2.3 Inefficient cross-city orbital access through the north east places pressure on other key routes

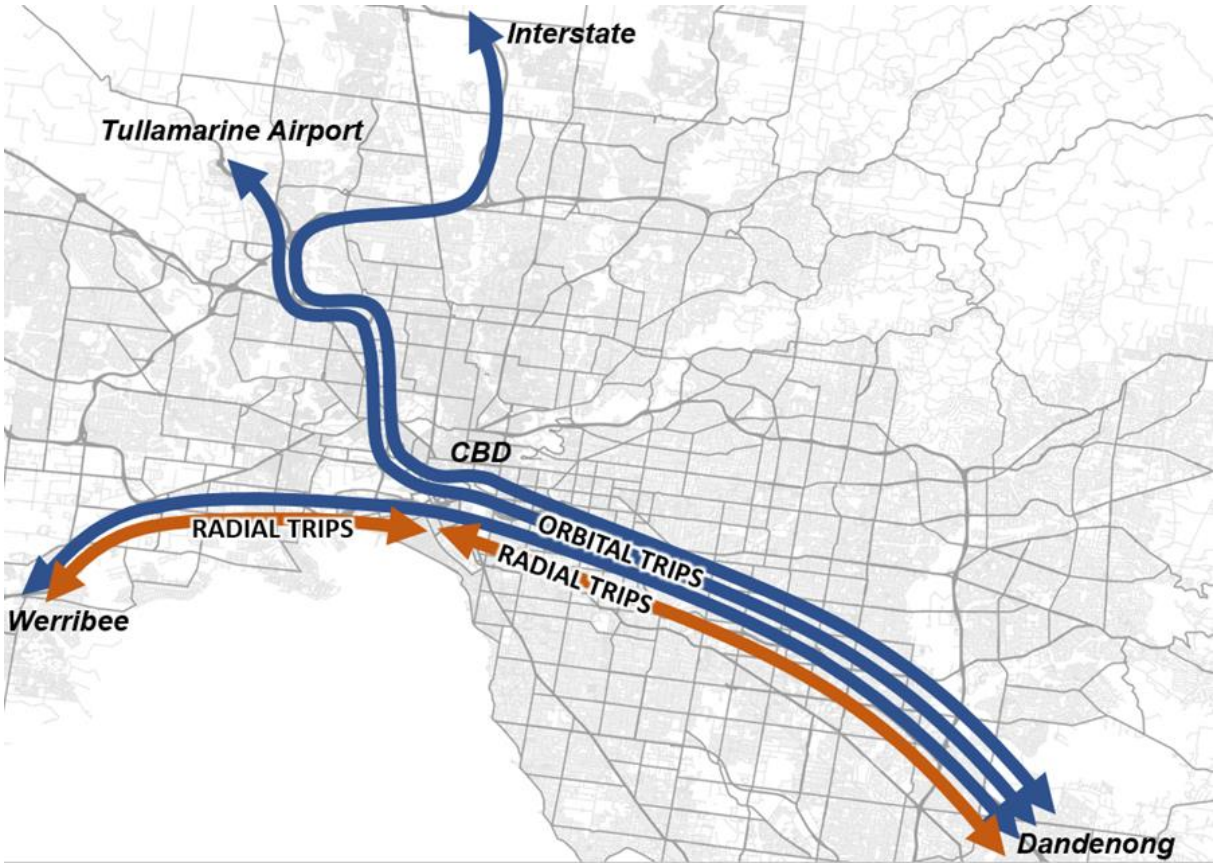
The lack of efficient cross-city orbital access through the north east means that, on average, traffic travels 19 percent slower between the north and south east compared to the north and south west, increasing travel time by 24 percent[29]. This is especially problematic for freight operators and business customers moving goods from interstate to destinations in the south east industrial areas and beyond. In comparison to the east, Melbourne's western regions have good connections with the northern industrial area, facilitating the effective and efficient flow of freight.

To improve travel times, freight vehicles seek alternative routes along freeway corridors that are already accommodating heavy traffic volumes: the Westgate/Monash Freeway (M1) through the city via CityLink/Tullamarine Freeway (M2) and the M80 (72km length) or via EastLink, the Eastern Freeway, Bulleen and Greensborough Roads and the M80 (64km).

Although the travel distance is shorter via the orbital route along EastLink, travel times vary significantly during the day. For example, the EastLink route is quicker than the M1 route to the M80 in the morning peak, but slower than the M1 route for the rest of the morning. The EastLink route is faster in the afternoon, but slower during the evening peak[30]. For freight transport operators wishing to complete cross-city orbital trips across the city (such as a trip between Dandenong in the south east and Melbourne Airport in the north west), reaching the EastLink (M3)/M1 intersection means a decision needs to be made on the key route based on time of day and traffic conditions. Many of these operators choose the M1/City Link, funnelling additional traffic onto an already congested inner city road network. Figure 2-27 shows the current competing orbital demand for freight trips across the city from the south east to the north west.

[29] XAct Solutions, North East Link Needs Assessment, 2017
[30] See Appendix C Transport Assessment: Existing Conditions Report

Figure 2-27 Competing orbital and radial demands on the M1 corridor

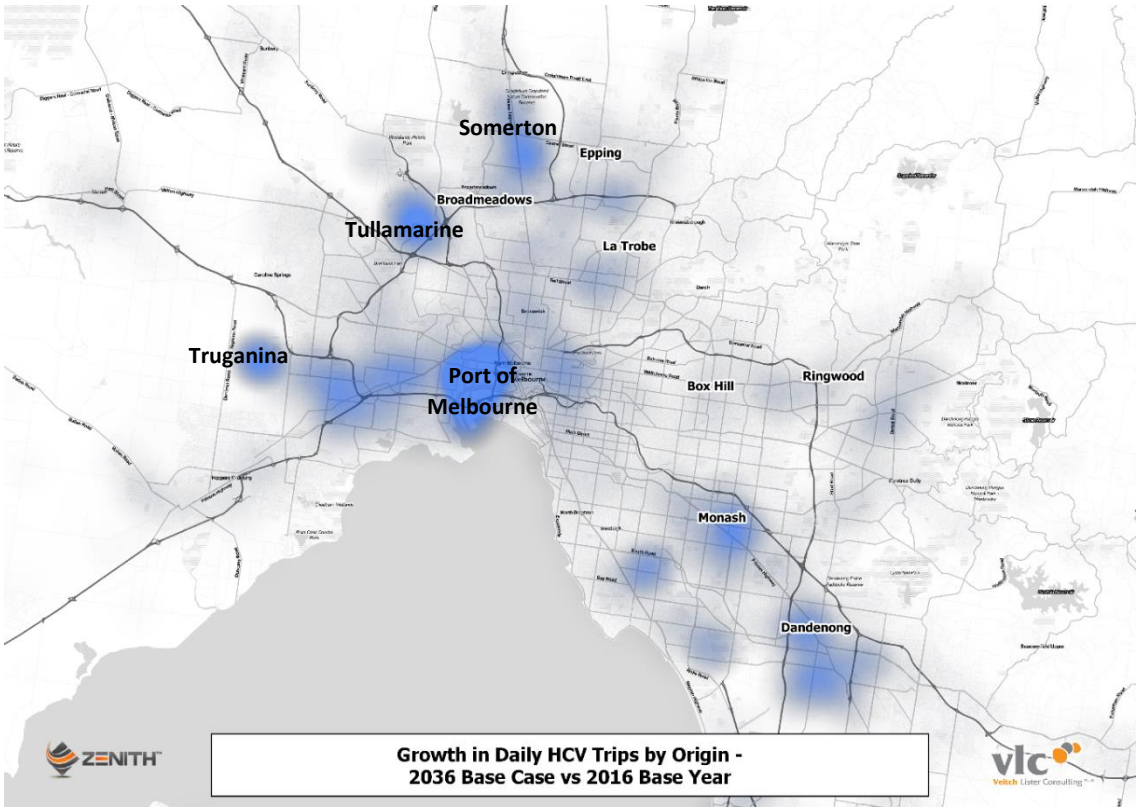


The M1 corridor is Melbourne's most important land freight route with more than 24,000 heavy vehicles per day travelling over the West Gate Bridge[31]. It plays a key role in accommodating movements to and from the Port of Melbourne. With landside access to the port already constrained, the addition of non-port related freight movements to the M1 corridor is 'clogging up' one of the port's major access routes.

As shown in Figure 2-28, growth in freight trips originating from the north and south east is expected to continue to 2036. Without efficient routes between the north and south east, freight vehicles servicing these areas are likely to continue to use the M1 corridor, potentially compromising the long-term viability of the port.

[31] VicRoads, Traffic volume data, 2014a

Figure 2-28 Growth in freight trips by origin (2016 to 2036)



Source: VLC Zenith model 2017

2.2.4 Poor freight accessibility in the north and north east raises the cost of moving goods and doing business

The need to move freight is a cost inherent in the production and sale of goods. An efficient freight and logistics system means lower costs for firms, enabling them to produce goods that may otherwise be less competitive. These savings flow through to productivity gains across the economy and can be a major contributor to economic development over the long term.

With no fully connected freeway link, freight flows across Melbourne from the north to the east and south east currently rely heavily on arterial roads through the north east to travel between the M80 and the Eastern Freeway[32]. As noted under Problem 1, these roads are struggling to cater to growing and competing travel demands, which constrains cross-city access for freight and contributes to increased transaction costs.

A truck curfew is also in place across several arterial roads across Melbourne's north east. VicRoads introduced this curfew in 2015 to reduce truck traffic through the area at night and potential impacts on the community. Trucks over 16.5 tonnes are restricted from using certain roads between the hours of 10:00pm and 6:00am, further limiting routes that freight can use (see Figure 2-29) and typically forcing heavy vehicles to either head west towards CityLink via Bell Street or use the M1 corridor and travel through the central city.

[32] Report for East West Link Needs Assessment Response Team Review, 2008

Figure 2-29 Current north eastern suburban truck curfew locations

Source: VicRoads

In addition, some of the terrain of the arterial road network in the north east is not suited to efficient truck movements, with long, steep roads that increase fuel consumption and operating costs. Traffic counts show that 90 percent of heavy vehicles travelling on Fitzsimons Lane are small trucks, with larger trucks choosing to travel down Rosanna Road to the river crossings at Manningham Road and Burke Road due to the flatter terrain[33].

Excluding congestion impacts, these constraints in the north east are estimated to cost freight operators 12 percent more than equivalent distance deliveries in the north west[34].

Strong growth is expected in the industrial precincts of Somerton and Tullamarine (in the north) and Dandenong (in the south east) over the next 20 years. Additional industrial precincts are also likely to develop alongside growing areas such as Craigieburn and Beveridge (north) and Pakenham, Officer and Cranbourne East (south east). As these precincts expand, higher volumes of freight will be moving to, from and between them. The lack of a freeway-standard orbital connection for these movements is likely to increase heavy vehicle traffic through the north east arterial road network.

One industry sector affected by these constraints is food and fibre. Victoria is Australia's biggest food and fibre exporter, with exports reaching an all-time high of $12 billion in 2014-15[35]. The sector accounts for 4.9 percent of GSP and in 2014-15 accounted for around half of the State's total goods exports. Recently, the Victorian Government has focused on promoting food and fibre products from eastern Victoria to export markets. However, poor cross-city orbital connectivity through the north east is affecting the competitiveness of industries based in Victoria's east.

[33] North East Link Traffic Survey 2017
[34] XAct Solutions, North East Link Needs Assessment, 2017
[35] DEDJTR, Food and Fibre Sector Strategy, March 2016

Since the relocation of Melbourne's wholesale fruit and vegetable market to Epping, the industry's freight task has been constrained further by poor connectivity. AUSVEG Victoria estimates that 60 percent of vehicles accessing the market daily are from the south east, with operators using arterial roads to get from the Eastern Freeway to the M80[36]. Travelling from the Gippsland region to the market via the M1 and Tullamarine Freeways is estimated to take four hours and 40 minutes[37].

Increased freight costs are passed on to customers, resulting in higher cost domestic and exported goods. The Victorian Chamber of Commerce and Industry has identified that rising transport costs in Australia are restricting businesses from taking advantage of new international business opportunities[38].

Businesses running efficient 'just-in-time' inventory management systems are also experiencing chronic delivery problems that require them to increase their inventories. Operating costs increase faster for 'last mile' deliveries, as congestion limits the productive time available to complete deliveries. Furthermore, increased travel times from congestion are shrinking the radius of existing distribution operations. This could potentially result in smaller plants with higher unit costs and less access to specialised inputs, making existing servicing difficult and increasing the likelihood of having to expand into new locations with more efficient transport networks.

2.3 Problem 3 – Congestion and heavy vehicles on neighbourhood roads in the north east is harming liveability and community wellbeing

Congestion on the north east arterial road network – along with a lack of safe and appropriate walking and cycling facilities – results in longer and less predictable travel times for residents and reduced access to local services, recreation facilities and valued community places such as parks. Residents are also exposed to higher levels of noise and emissions, and an increased risk of road crashes.

These factors are diminishing the State Government's ability to realise a key platform of Plan Melbourne – the 20-minute neighbourhood – and are reducing the capacity of the north east to contribute to managing Melbourne's future population growth in a sustainable way that supports liveable, healthy and attractive communities.

2.3.1 Access to key destinations and valued community places is restricted

Overly trafficked roads in the north east increase residents' daily commutes to work and restrict their access to other important local destinations, such as schools, hospitals, retail centres, recreational facilities and valued community places.

People commuting to work from the north east by car already spend a significant part of their total journey time moving through local and arterial roads to reach higher capacity parts of the network. Without significant new capacity or new roads, these journeys are likely to be restricted even further. Between now and 2036, travel times between key destinations in the north east will worsen by between 15 and 50 percent[39].

[36] XAct Solutions, North East Link Needs Assessment, 2017
[37] Google maps 2017
[38] Victorian Chamber of Commerce and Industry
[39] See Appendix C Transport Assessment: Future 'No Project' Scenario Report

Limited public transport services and poor walking and cycling infrastructure add to the problem. This relatively poor accessibility is undermining the potential to deliver the 20-minute neighbourhoods envisaged by Plan Melbourne (see box on next page) and making it more and more difficult for residents to access important local destinations and places.

The 20-minute neighbourhood

A key platform of Plan Melbourne is to deliver '20-minute neighbourhoods' across the city so that residents can 'live locally' by accessing most of their daily needs within a 20 minute walk, cycle or public transport trip from their homes. Local travel – as opposed to journey to work travel – occurs throughout the day rather than just at peak times. It involves short trips to social, recreational and service activities, as illustrated in the figure below.

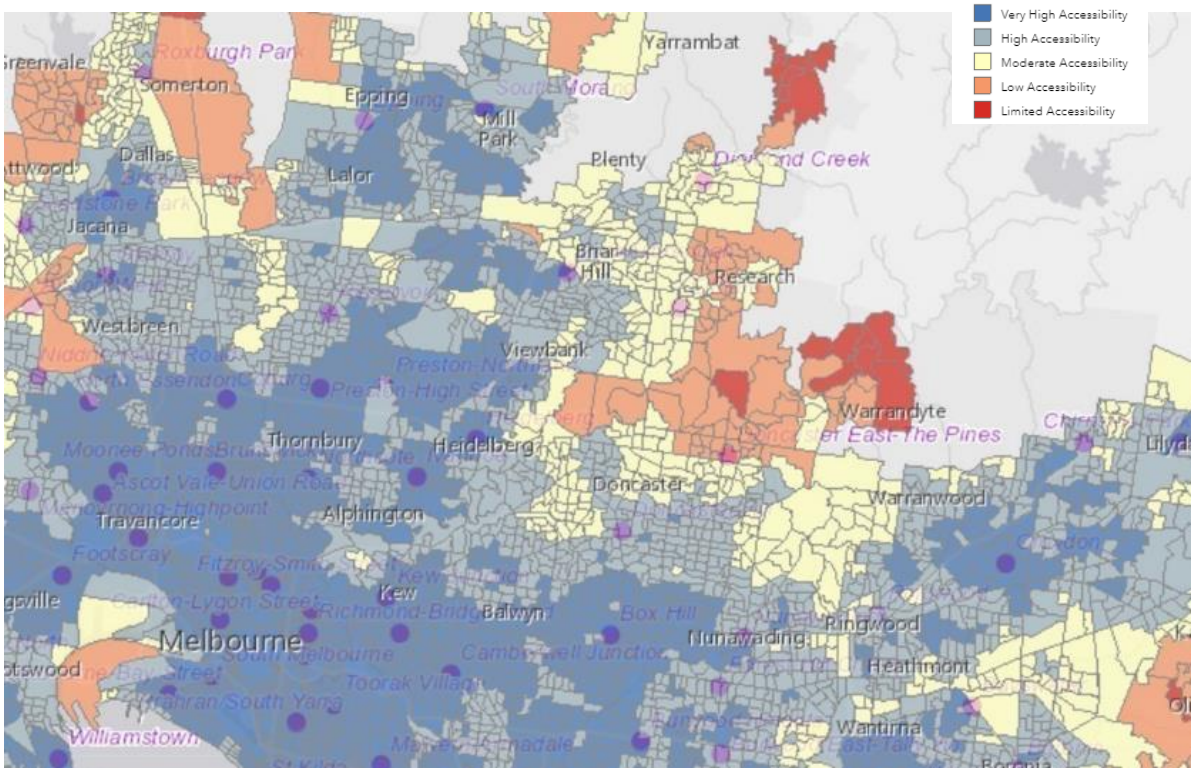
Figure 2-30 Plan Melbourne 20-minute neighbourhood

Source: Plan Melbourne 2017-2050

In a 20-minute neighbourhood, all residents should be able to easily access the services they need within their local communities. By enabling short neighbourhood daily trips, residents have the choice to access amenities and services by walking or cycling, rather than having to rely on private car. This is particularly important for households with limited access to private motorised transport.

These accessibility constraints are highlighted by the Metropolitan Accessibility/Remoteness Index of Australia (METRO ARIA), which compares accessibility within and between capital cities. It shows the ease or difficulty that people face accessing basic services, derived from the road distances people travel to reach education, health, shopping, public transport and financial and postal services. The accessibility index for Melbourne's north east (shown in Figure 2-31) indicates that while some parts of the inner north east have high and very high accessibility (such as Thornbury, Preston and Balwyn), accessibility declines significantly in Doncaster East, Park Orchards and Warrandyte.

Figure 2-31 Accessibility in the north east local area



Source: Metro ARIA 2014 Accessibility Index, GHD

2.3.2 High traffic volumes and freight are reducing local amenity and quality of life for residents

People living in the north east experience the full effects of growing traffic volumes and limited road capacity, as the combination of strong demand, an unconnected freeway network, a limited arterial road network and capacity constraints during peak periods create bottlenecks and result in 'seepage' of vehicle traffic from arterial roads into local roads.

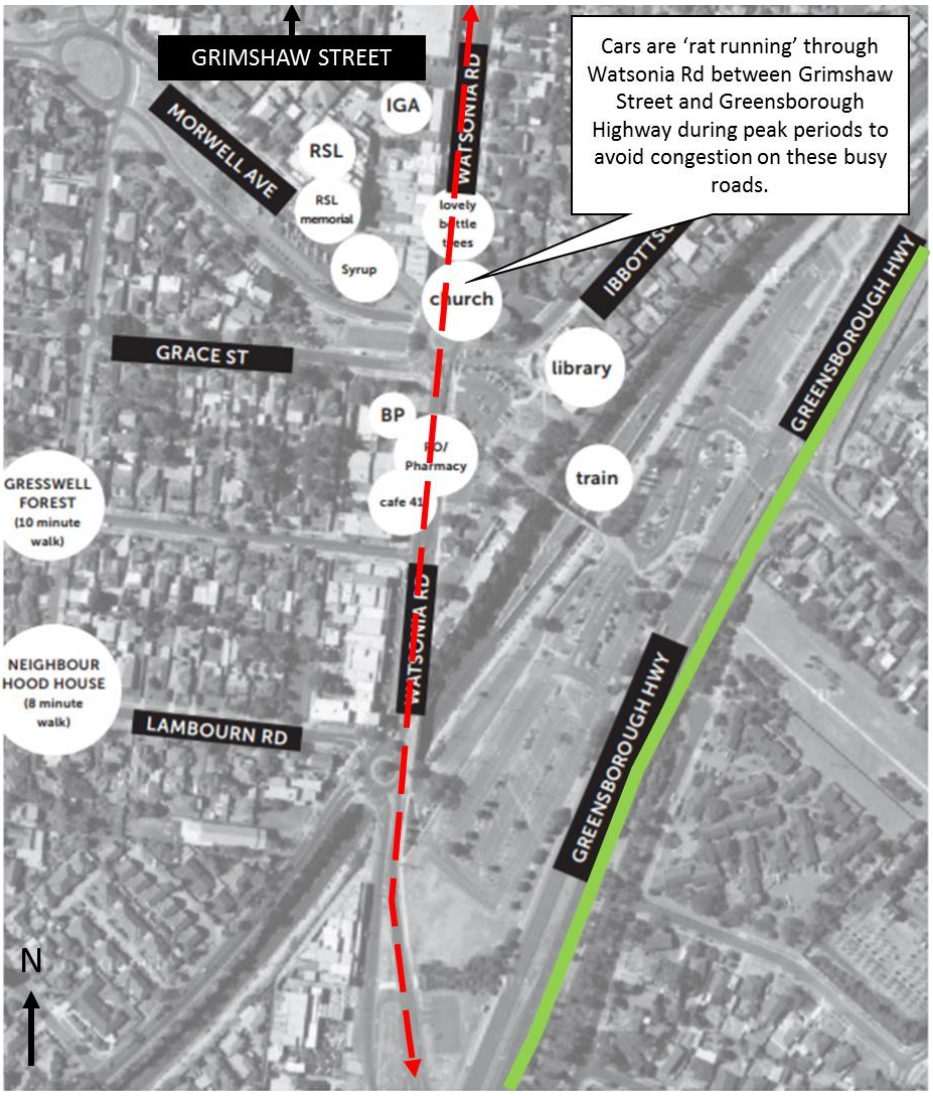
Feedback from community information sessions in the north east and a community information survey hosted by North East Link Authority indicated that traffic volumes experienced on some local roads are fast becoming unacceptable to residents. For example, 68 percent of survey respondents admitted to 'rat running' often or when the traffic is slow[40].

Watsonia residents have voiced concerns about cars driving too quickly down Watsonia Road and the area being used as a 'rat run' between the Greensborough Highway and Grimshaw Street during peak periods[41]. Because of this, many locals consider the Watsonia shopping precinct to be uncompetitive and the retail area near the Greensborough Highway is considered underused with high vacancy rates. Forecast residential and jobs growth in locations across the north eastern suburbs is expected to drive further travel demand and exacerbate these problems.

[40] Based on over 7,400 responses from more than 360 postcodes inside and outside the north east from 26 May to 28 July 2017. Source: Community Survey Report, May – July 2017, North East Link Authority

[41] Banyule City Council, Appendices: Summary and analysis of the Watsonia 2050 Engagement Process for Picture Watsonia – A vision for Watsonia Village, 2014

Figure 2-32 Local traffic patterns through Watsonia Village



Source: Banyule City Council, Picture Watsonia – A vision for Watsonia Village, 2014

Adding to the problem is the growing number of freight vehicles using arterial roads for through movements between the north and east or south-east. Figure 2-33 shows average truck volumes through the north east on a daily weekday. These volumes reach around 9,000 trucks per day along Greensborough Road north of Grimshaw Street, with other roads carrying high truck volumes including Fitzsimons Lane, Bulleen Road, Plenty Road at Darebin Creek and Rosanna Road (where nearly 30 percent of freight vehicles using the road are large articulated trucks[42]).

These volumes are forecast to increase as more and more trucks travel between the growing north and south east industrial precincts. Without new transport infrastructure, daily truck volumes along Rosanna Road will increase by approximately 1,300, which means that by 2036 between 3,800 and 5,000 trucks will be moving along the road every day (Figure 2-34).

[42] VicRoads, North East truck curfew trial, 2016

Figure 2-33 Truck volumes in the north east (2017 daily weekday volume)

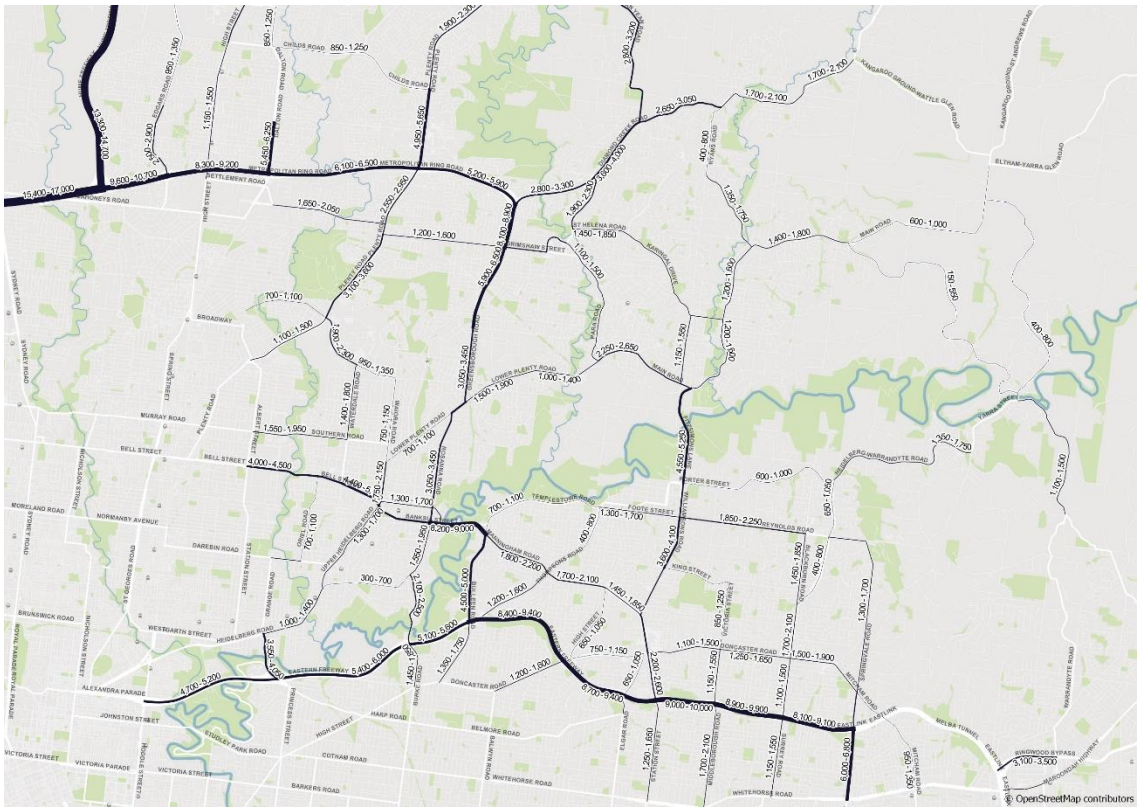
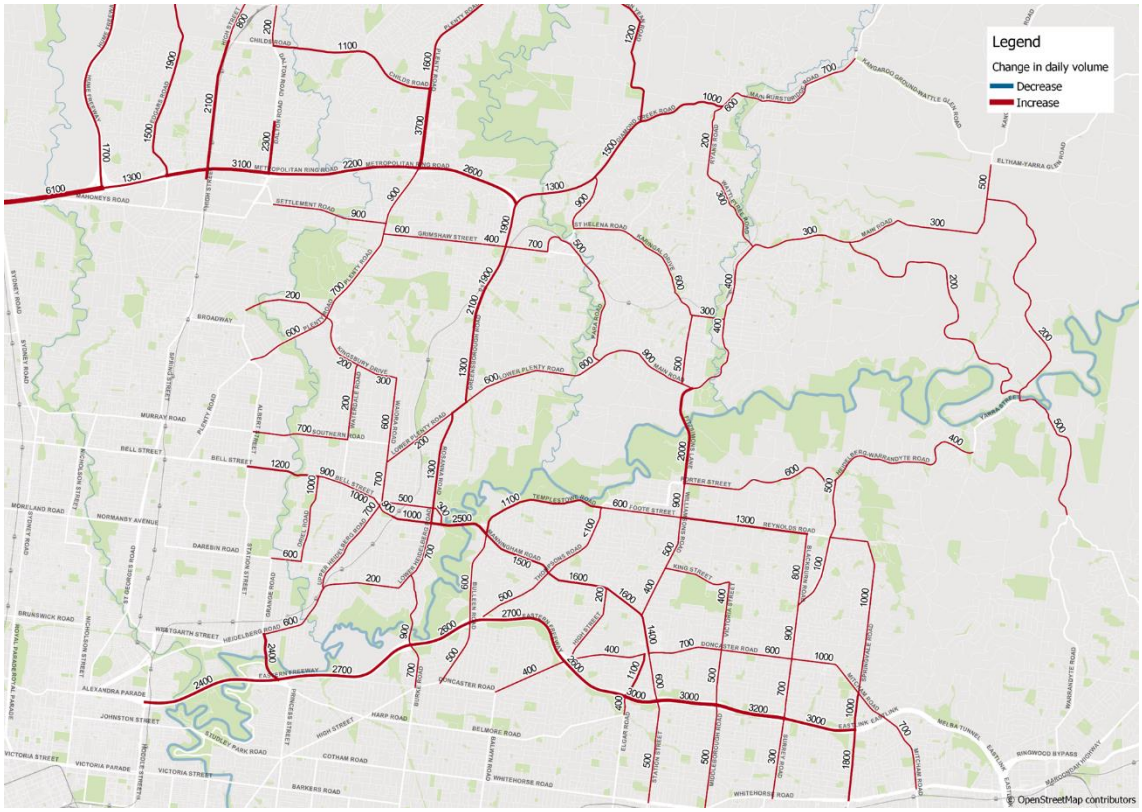


Figure 2-34 Change in daily truck volumes between 2017 and 2036 (without North East Link)



These heavy vehicle movements are a significant factor in growing local traffic congestion, contribute to increased emissions and traffic noise, and create greater safety risks for motorists and pedestrians. These impacts may also restrict options for future land uses and make it harder to attract new residents to the area.

While truck curfews are in place along key arterial routes (see Figure 2-29 above), some of the displaced trucks are using Bell Street, Plenty Road, High Street and other routes to avoid the curfew, effectively pushing the problem to other parts of the network. Feedback during the VicRoads' north east truck curfew trial in 2016 indicated that trucks were using local streets as rat runs to avoid main roads such as Plenty Road and Rosanna Road in an attempt to avoid curfews[43]. This feedback was supported by the 2017 community survey where respondents suggested enforcing penalties for breaking curfews and 'rat running'[44]. Other respondents believed the curfews are not working.

Amenity impacts experienced by residents include:

- *Increased traffic noise* – A study undertaken by VicRoads as part of the north east truck curfew trial found the overall median noise level from a rigid truck was around 74-75 dB; however, this increases to 91-92 dB when the engine brakes are used. A 10 dB difference is considered to be twice as loud[45]. Community feedback from the trial was positive, with residents noting that noise had dropped noticeably (particularly along Rosanna Road) since the introduction of the trial. This indicates that trucks are a major source of noise issues in the community.
- *Higher emissions* – Transport emits about 16 percent of Victoria's total greenhouse gases. Modelling shows that Melbourne's outer suburbs have more carbon intensive transport than other parts of the city[46] due to a greater reliance on cars and greater distances travelled to reach activities and services in these areas. Although the city's air quality has improved significantly over the last decade, growing traffic on local and arterial roads in the north east means that vehicle emissions will continue to pose health concerns[47] for residents living close to busy roads such as Rosanna Road.
- *Increased safety risk* – High traffic volumes and congestion levels contribute to more road crashes. Impatient road users such as pedestrians are often willing to take risks to move through traffic if they need to wait longer to cross the road. This risky behaviour can result in crashes.

[43] VicRoads, North East truck curfew trial, 2016

[44] North East Link Authority, Community Survey Report, May – July 2017

[45] Feedback was received from multiple suburbs including Greensborough, Eltham, Diamond Creek and Alphington. VicRoads, North East truck curfew trial community engagement report, 2016

[46] Parliament of Victoria, Outer Suburban/Interface Services and Development Committee Inquiry into Liveability Options in Outer Suburban Melbourne, December 2012

[47] Attachment One: Background information to support the DPCD submission to the Environment and Planning References Committee *Inquiry into Environmental Design and Public Health*. For comparison, a key arterial road in Melbourne's inner west facing similar truck issues is Francis Street in Yarraville. A monitoring study for noise and air quality was undertaken by EPA Victoria from May 2012 and September 2013 at Francis Street. The study measured air pollution at higher levels than the EPA's other fixed air monitoring stations in residential suburbs of Melbourne and found that road traffic noise levels were high enough to cause annoyance and disturb speech and sleep (according to the World Health Organisation guidelines for community noise), Trucks and the inner west, EPA Victoria: accessed from http://www.epa.vic.gov.au/our-work/current-issues/odour-and-air-quality/trucks-and-the-inner-west

Rosanna Road and the 14-hour peak period

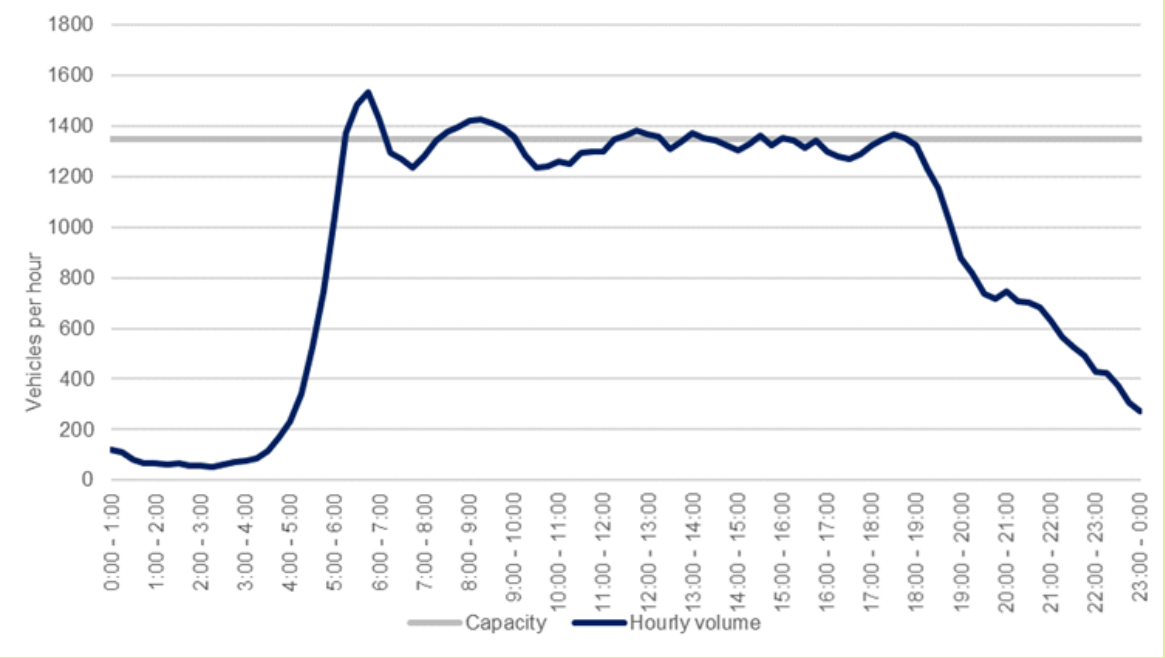
Rosanna Road is one of the busiest arterial roads in Melbourne's north-east, carrying up to 47,000 vehicles per day, of which roughly seven percent are commercial vehicles. It is a four-lane, two-way undivided road, with low density residential dwellings along both sides of the road.

Rosanna Road is designated as part of the Preferred Freight Network (PFN), over-dimensional network (OD route 1), placarded load network and is a B-Double route. The resulting truck traffic is often ill-suited to the road's narrow lanes and, combined with limited separation between on-coming traffic and between the road and the footpaths, this leads to poor amenity outcomes for nearby residents.

Additionally, the lack of alternative north-south routes in the area means that there is a high degree of reliance on Rosanna Road for general traffic movement through the north east. This means that there are long periods of congestion throughout the day and significant reliability issues.

Hourly traffic flows over a typical weekday on Rosanna Road (in the southbound direction) are shown in the figure below. Across the two lanes of traffic, the road can accommodate approximately 1,350 vehicles an hour (due to capacity constraints at the Lower Plenty Road and Banksia Street intersections). This means that the road reaches capacity at around 5:00 am in the morning and remains busy all day until 7:00 pm at night. This means that there is significant delay and congestion on Rosanna Road for 14 hours a day

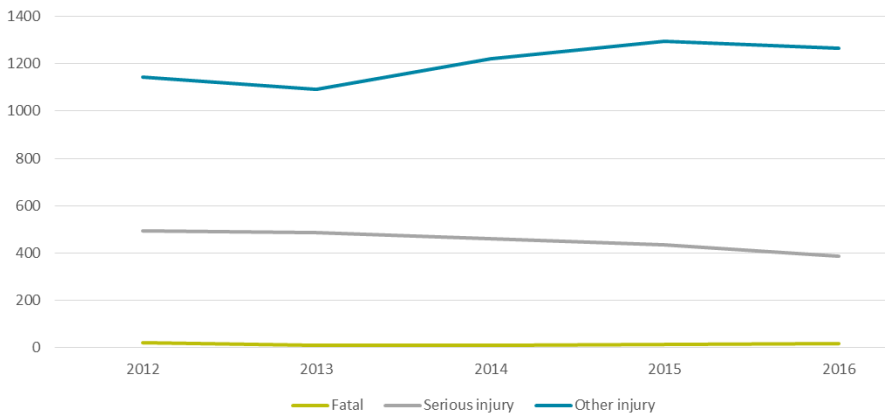
Figure 2-35 Hourly traffic volumes on Rosanna Road (southbound)



Source: VLC Zenith model 2017

Although traffic volumes have increased, Figure 2-36 reveals that the number of crashes in the north east has remained relatively constant between 2012 and 2016. Based on the types of accidents recorded, this is likely to be the result of vehicles slowing down in congested conditions.

Figure 2-36 Crashes in Melbourne's north east between 2012 and 2016



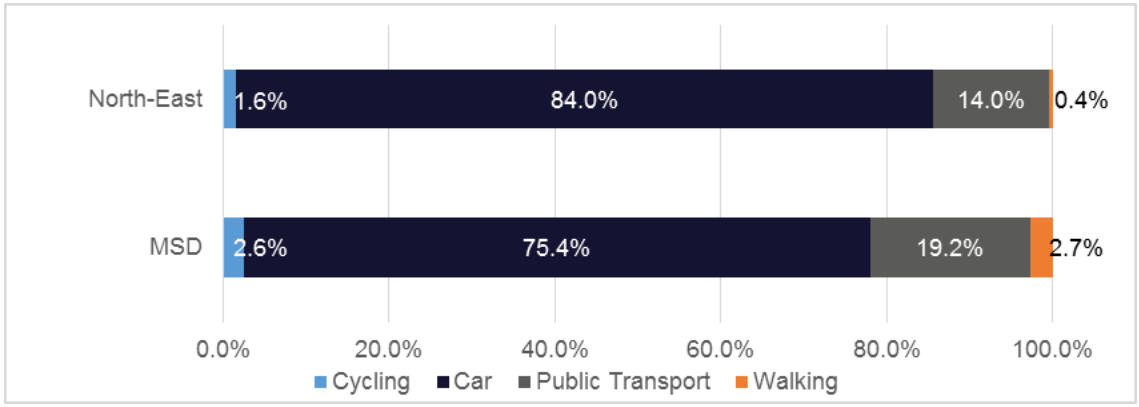
Source: VicRoads crash data, 2012 to 2016

The most common type of crash recorded (23 percent of all crashes) was rear-end collisions between vehicles in the same lane[48]. These crashes are usually caused by stop-start conditions in a low speed environment. Vehicles turning right at an intersection and colliding with opposing vehicles was the second most frequent type of crash (11 percent). This type of crash is generally caused by frustrated drivers taking risks to enter main traffic on congested roads or poor control at intersections.

2.3.3 Reduced opportunities to improve bus, cycling and walking connections are eroding liveability, health and wellbeing, and increasing community dislocation

A key requirement to achieving 20-minute neighbourhoods in the north east is making walking and cycling attractive and safe travel alternatives. As Figure 2-37 shows, only two percent of trips originating in the north east are on foot or bicycle, compared with 5.1 percent across Melbourne (Melbourne Statistical Division or MSD). Public transport mode share is also much lower than the Melbourne average: 14 percent compared to 19.2 percent.

Figure 2-37 Transport mode share in the north-east vs Melbourne



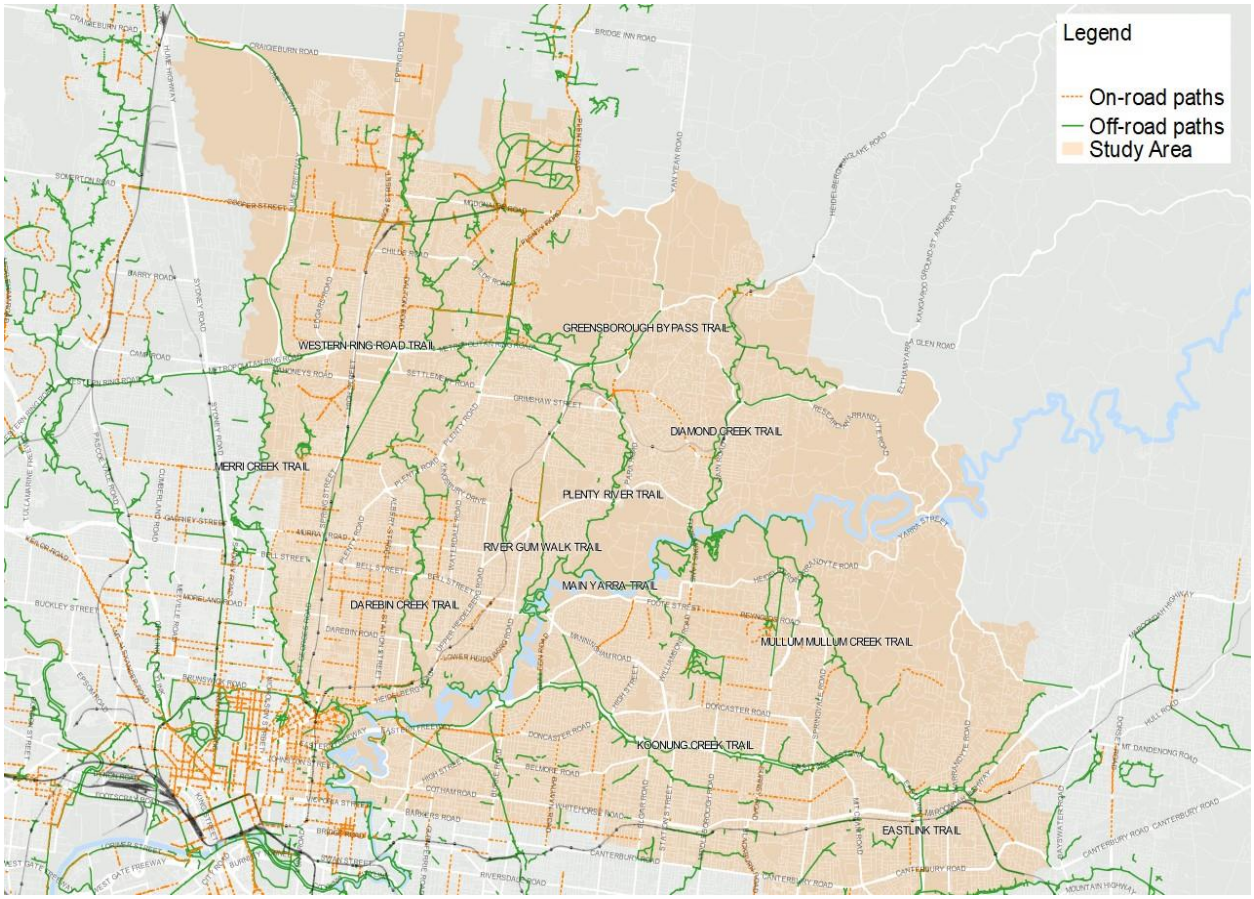
[48] Analysis based on VicRoads crash data, 2012 to 2016. See Appendix C: Transport Assessment – Existing Conditions Report

Source: Analysis based on VLC Zenith model outputs, 2017

Among the factors influencing walking and cycling decisions are the quality of cycling and pedestrian infrastructure, a sense of personal safety and comfort and appropriate infrastructure for the speed and volume of traffic.[49]

Figure 2-38 shows the relative paucity of on- and off-road bicycle paths in the north east compared to much more dense networks in other parts of the city. Generally, cycling paths in the north east are disconnected or located on congested arterial roads, putting cyclists at greater safety risk and discouraging people from opting to cycle to local destinations. Few major activity centres in the north east are connected via commuter-quality cycling facilities.

Figure 2-38 Existing bicycle network

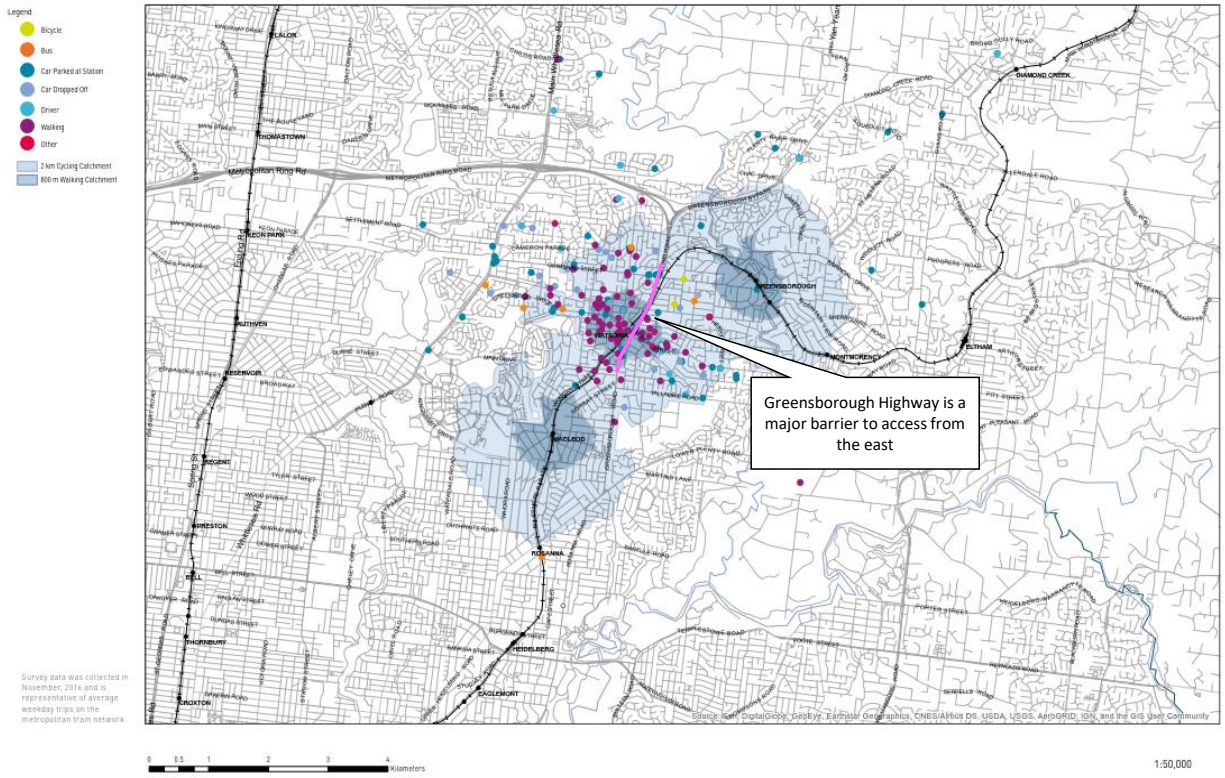


Congested arterial and road networks also discourage walking and, for people choosing to walk, may encourage risk taking behaviour when crossing roads. A community survey found that 85 percent of people living or using the road network in the north east either strongly agreed or agreed that it was not safe to ride a bike on busy roads in the north east, while 47 percent of respondents stated that there are not enough places to safely cross roads[50].

[49] Department of Infrastructure and Transport, Walking, Riding and Access to Public Transport, 2013 (refer to Figure 1.1, page 3)
[50] North East Link Authority, Community Survey Report, May – July 2017

One example is Greensborough Road, which is a major thoroughfare in the north east but also a major barrier to pedestrian and cycling access to Watsonia railway station from the east. To access the station, pedestrians and cyclists need to cross a six-lane arterial road (seven lanes at the existing at-grade signalised pedestrian crossing at Elder Street) carrying 56,000 vehicles a day. An analysis of the origins by mode to access Watsonia station (presented in Figure 2-39) shows there are considerably fewer residents accessing the station from east of the arterial road compared to the west.

Figure 2-39 Trips to Watsonia railway station – origins by mode



Source: GHD

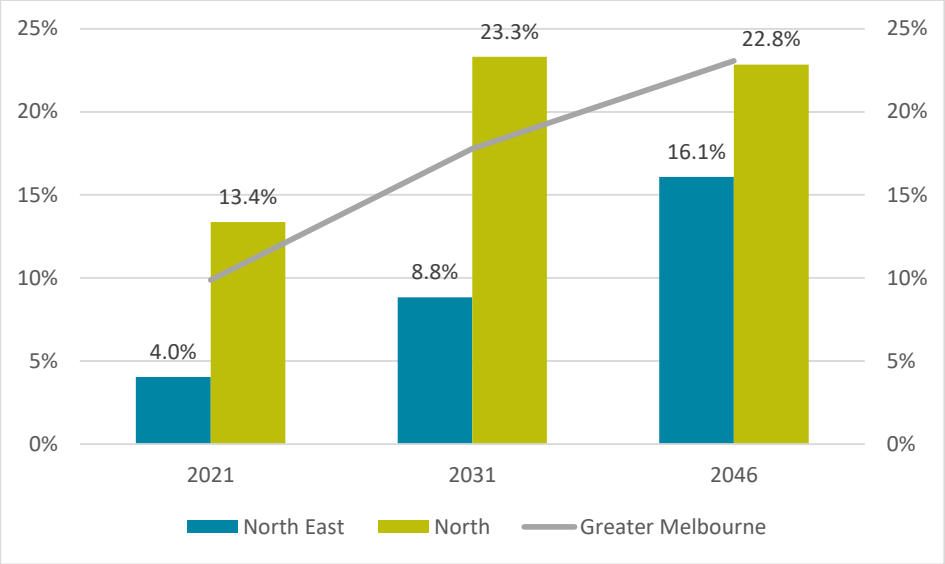
Public transport mode share in the north east is expected to increase only marginally to 2036: from 7.5 to 10.5 percent[51]. This is primarily due to most public transport in the area being on-road bus services that do not have dedicated lanes. As noted under Problem 1, this means that buses are affected by congestion on the arterial road network, which makes travelling by bus less attractive than using a private motor vehicle.

[51] See Appendix C Transport Assessment: Future 'No Project' Scenario Report

2.3.4 Sustainable and productive growth in the north and north east is being put at risk by low levels of accessibility and amenity

Plan Melbourne 2017-2050 establishes the spatial directions for growth and land use change across the city over time. With Melbourne's population forecast to reach eight million by 2051[52], suburbs in the north and north east will need to accommodate a significant proportion of the city's growth between 2016 and 2046[53] (as shown in Figure 2-40). The ability of these parts of the city to support this growth is being put at risk by an unconnected freeway network and an already congested arterial road network that are unable to meet current and future transport needs.

Figure 2-40 Expected percentage population change from 2016



Note: North East LGAs: Banyule, Nillumbik, Manningham, Maroondah, Yarra Ranges
North LGAs: Darebin, Whittlesea, Hume, Moreland

Source: Victoria in Future 2016

Cars are the principal mode of transport in the north and north eastern suburbs. While some shift towards public transport is expected to occur, car travel will remain the dominant mode of transport for the foreseeable future. Unreliable bus travel times and infrequent services, particularly in the outer suburbs, will encourage even higher levels of car dependence, making more efficient, demand-responsive bus travel an increasingly important public transport option. This means that the road network will continue to be fundamental to linking home and work and ensuring safe, attractive and functional communities in the north and north east.

[52] DELWP, Victoria in Future 2016
[53] DELWP, Victoria in Future 2016

The ability to freely move between home and local services or employment locations is a key determinant of household location decisions. People want to live in areas with good transport connectivity, within reasonable commuting times to work and with easy access to local shopping centres, community facilities and recreational amenities. If growth in traffic volumes persists through the north east corridor, neither the region itself nor the faster growing northern suburbs will be able to support Melbourne's growth in a sustainable and productive way.

Growing traffic volumes, less reliable travel times, declining accessibility and loss of amenity could deter household and business investment. They could also curtail land use planning options, restricting the ability of the State Government and local councils to respond to changing economic and demographic conditions.

If the problems associated with orbital movements through the north east are not addressed, planned population growth will not be achieved, placing growth pressures on other parts of the city. Addressing congestion, accessibility and amenity issues – and providing for efficient, reliable and safe orbital movements – will attract people and jobs to the north east and ensure that Melbourne is to able maintain its liveability and achieve its productive potential.

2.4 The future without an orbital link

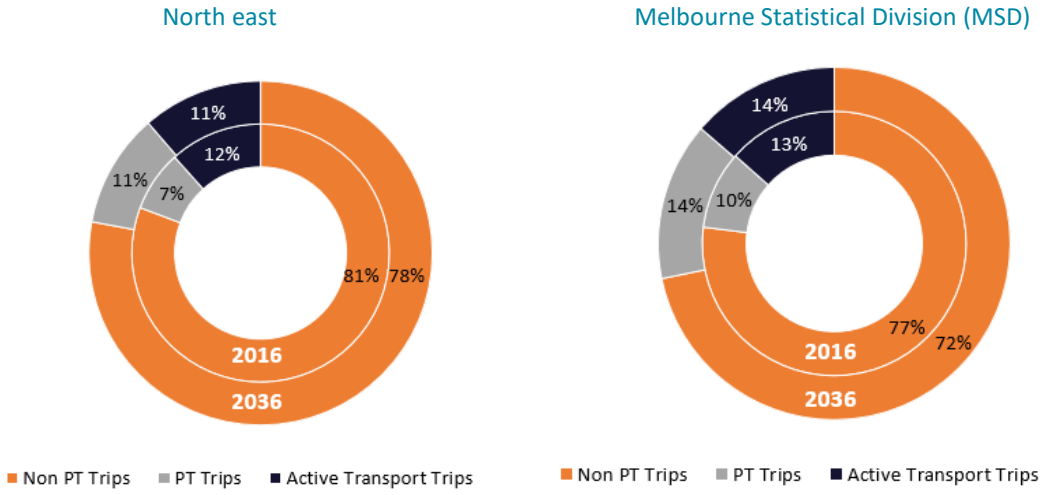
Without North East Link, road network performance in Melbourne's north east will deteriorate significantly[54]:

- Orbital through movements between the north and east will increase from 40,000 trips a day to between 50,000 to 60,000 trips a day by 2036, whilst trips into and out of the north east from the north, inner east, east and outer east will increase from nearly 200,000 trips per day to over 400,000 trips per day.
- The continued reliance on Rosanna Road will increase the conflict between local and 'through' traffic use of the road. Trucks volumes on Rosanna Road will increase by approximately 1,300 a day, meaning that by 2036 between 3,800 to 5,000 trucks a day will use the road.
- Overall, the traffic between now and 2036 throughout the arterial road network in the north east will increase by approximately 5,000 to 10,000 vehicles per day.
- Traffic volumes across the Yarra River are expected to increase by 25 percent.
- The total number of trips and total vehicle kilometres travelled are expected to increase (by 27 and 30 percent), but not by as much as the Melbourne average (32 and 44 percent). This is largely due to a lower forecast population growth rate within the study area.
- While the growth in vehicle trips in the north east is lower than the rest of Melbourne, average vehicle speeds are expected to decline at a faster rate than the rest of Melbourne. This is largely due to the limited capacity on the road network and relatively little infrastructure upgrades planned to accommodate the additional growth. Average vehicle speeds are expected to decline by up to 16 percent during the peak periods (compared to a 13 to 14 percent decline in the Melbourne average), which means an already slow commute in the north east (compared to the rest of Melbourne) will be even slower in the future.

[54] All data in the following bullet points derived from analysis based on VLC Zenith model outputs, 2017. See Appendix C Transport Assessment: Future 'No Project' Scenario Report

- The growth in public transport use is expected to be lower in the north east (79 percent) when compared to Greater Melbourne (111 percent) due to the limited access to public transport facilities in the area. As on-road public transport services in the north east generally do not have dedicated lanes, buses sit in congestion, making them a less attractive to use. Compared to the estimate 2035 Greater Melbourne average of 14.5 percent, public transport mode share is expected to increase marginally from 7.5 to 10.5 percent, as presented in Figure 2-41.

Figure 2-41 Number of public transport trips compared to all traffic trips (2016 vs 2036 without North East Link scenario)



Source: VLC Zenith model 2017

Growth in Melbourne's outer north will generate increased travel demand to the middle ring suburbs, continuing to put pressure on the arterial road network in the north east, especially during the morning and evening peak periods. Given the arterial road network in the north east is already saturated (and few major infrastructure upgrades are planned), the capacity to cater for additional trips in the future is limited. More commuters and freight travelling between the outer north and south east need will need to seek alternative routes that have greater capacity to reach their destinations. For example, trucks travelling between the northern industrial precincts and south eastern industrial precincts will continue use the already congested M1. This has significant consequences for the broader Melbourne and Victorian economies.

3 Benefits

3.1 Benefits to be delivered

This chapter outlines the anticipated key benefits of a fully connected, freeway-standard orbital network across Melbourne. It identifies objectives based on achieving these benefits and presents Key Performance Indicators (KPIs) to measure the achievement of benefits. It also considers the alignment of the project objectives with Victorian and national strategic policies and plans.

The key benefits expected to be delivered as a result of the North East Link Project are:

- Productivity, employment and economic growth
- Improved competitiveness of the State
- Increased economic opportunity for households in the north, east and south east
- Improved liveability and thriving communities in the north east.

Specific benefits have been assessed and quantified for the proposed North East Link Concept Design (presented in Chapter 6). These benefits are described in Chapter 8.

3.1.1 Productivity, employment and economic growth

When deciding where to locate, businesses consider how well-connected a place is to interstate and international gateways and/or other parts of Melbourne and Victoria that are sources of workers, suppliers and customers. Better links between the north, east and south east will attract more investment in these areas by making them more viable options for business start-ups, expansions and relocations.

The metropolitan area accommodates a relatively large number of businesses and a significant proportion of Melbourne's labour supply, both of which are heavily dependent upon cars for mobility given the dispersed patterns of population and employment across the city. By providing a faster, more reliable and direct orbital connection to key employment areas in the north, east and south east, North East Link will improve access to a larger pool of skilled labour so that businesses are better placed to address their skills needs.

These businesses would also gain agglomeration benefits, which are vital to the competitiveness, productivity and viability of the growing number of knowledge-based businesses in the north, east and south east. The improved connectivity provided by North East Link will enhance the ability of businesses to share infrastructure, inputs, ideas and innovation, and to match skilled workers to jobs. This will facilitate business-to-business interactions and create the potential for greater interactions between firms involved in regional supply chains, helping businesses in these areas to grow.

Benefits to businesses will increase their capability to undertake their business functions efficiently. The resulting higher levels of business productivity will contribute to an increase in GSP and growth in permanent full-time employment.

3.1.2 Improved competitiveness of the State

Investment to increase connectivity and reduce congestion in the city's north east will help meet the growing demand for cross-city orbital movements, improving Victoria's competitiveness and productivity.

Greater orbital connectivity will provide a basis for a range of supply chain improvements and efficiencies, including in the movement of interstate goods from the north to the east and south east. These savings will flow through to lower consumer prices and enable productivity benefits across the wider economy, allowing the economy to produce goods that may otherwise have been uncompetitive.

Efficient connections in the north east can lessen delays and associated costs incurred by freight carriers and business travellers, and provide greater reliability and on-time running for firms delivering services.

Broader benefits will be enjoyed by businesses across Melbourne, particularly those involved in the physical delivery of goods and services. Manufacturing firms in Melbourne's east and south east will be able to access Melbourne Airport and key distribution facilities in the city's north more efficiently. Some capacity on the M1 corridor should also be released, providing further efficiency for freight movements.

Providing an alternative, fully connected route for HPFVs will reduce reliance on the M1 corridor for heavy vehicle freight movements and allow more line haul freight to be carried on HPFVs between the city's north and south east.

3.1.3 Increased economic opportunity for households in the north, east and south east

Improving orbital connectivity and addressing capacity constraints in the north east will reduce congestion and improve travel time reliability, increasing households' access to jobs and education,

Better access to employment and education opportunities will expand the range of jobs available and boost household income levels, particularly in the city's outer suburbs where access to these opportunities is restricted. This will help to ensure that forecast population growth in these areas is sustainable and that they provide the economic opportunities required to make them attractive places to live.

With transport accessibility being critical for the knowledge-intensive and advanced business services sectors, better cross-city connectivity will be critical in distributing jobs in these sectors more evenly across Melbourne. It will also support the development of vibrant, 'employment rich' suburban hubs in the north, east and south east of the city, giving residents in these areas more job choices and options for working closer to home and providing the potential for these centres to generate new economic opportunities from Melbourne's expanding services sector.

M80 Ring Road

Completed in 1999, the M80 extends 28 km from the junction of the Princes and West Gate Freeways in Laverton to Greensborough Bypass in Greensborough. The benefits from this city shaping project have included improved business-to-business interaction, reduced freight costs, the opening up of suburban industrial zones and greater access to La Trobe University.

By connecting individual freeways that service Melbourne's sea and airports, the M80 has relieved freight traffic along Sydney Road, Pascoe Vale Road and Geelong Road and helped to reduce travel times for transport firms accessing the Port of Melbourne.

With its greenfield location, the project helped to generate new demand that has facilitated the growth of industrial and residential areas in Melbourne's west. Analysis by SGS Economics in 2012 showed that the areas containing on- and off-ramps to the M80 (such as Hume, Whittlesea and Brimbank) experienced a positive uplift in employment due to increased accessibility to the west.

An estimated 19,300 additional households moved to Melbourne due to the M80 in 2011. As a result, land values increased in suburbs located along the freeway corridor and to the west.

3.1.4 Improved liveability and thriving communities in the north east

More efficient links between the north, east and south east will reduce the reliance on local and arterial roads as key orbital routes in the north east. This will boost amenity in the north east by reducing the number of private and heavy vehicles moving through residential areas.

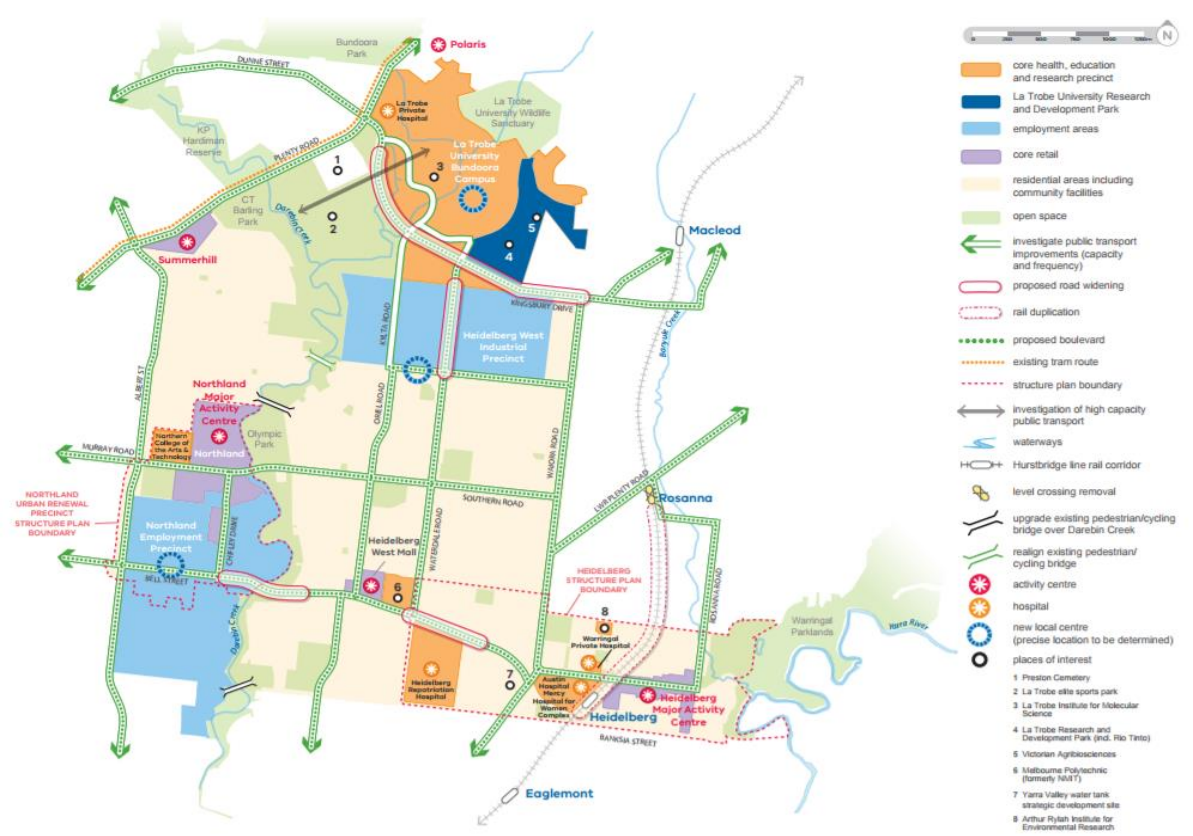
Benefits for residents and businesses will include reduced noise pollution, improved air quality, safer local roads, less time lost sitting in traffic and reduced feelings of stress. Freeing up arterial connections in the north east to carry the appropriate vehicles and trips will also better connect residents to key local destinations (such as hospitals, schools and recreational facilities) and encourage more people to take up walking and cycling. The cumulative effect of these benefits will be improved quality of life and wellbeing for people living in Melbourne's north east.

Supporting the La Trobe National Employment and Innovation Cluster

With the highest concentration of jobs in the north east, La Trobe NEIC has great potential to attract new businesses and jobs to the region. The NEIC is not one individual place, but a cluster of five existing and emerging places that will become one over time, with a likely emphasis on the health sector.

The NEIC is serviced by two train lines (the Hurstbridge and South Morang lines), a tram route, local bus services and a network of arterial roads that provide a good base for further improvements in connectivity. As the cluster grows, developing an efficient transport system will become increasingly important to the productivity, liveability and sustainability of the north east region. To remain competitive, the NEIC will need the support of a cohesive transport network that provides access to a large and skilled labour supply pool and that meets the diverse travel needs the cluster's businesses.

Figure 3-1 La Trobe NEIC Framework Plan



Source: La Trobe National Employment and Innovation Cluster Draft Framework Plan March 2017

3.2 Beneficiaries

North East Link will create extra value for beneficiaries of the new infrastructure:

- **Private road users** will enjoy more reliable travel times
- **Road freight operators** will benefit from improved travel times, leading to lower freight costs
- **Public transport users** will benefit from improved travel time reliability of bus services and enhanced transport integration
- **Cyclists and pedestrians** will benefit from safer roads due to the elimination of conflict points between competing traffic movements and improved local connectivity
- **Victorian workers** will benefit from expanded employment opportunities
- **Businesses** will have access to larger labour catchments and better connections to customers, suppliers and other businesses
- **Communities in the north east** will be better connected and safer, with improved local amenity and liveability
- **Regional centres such as Gippsland** will benefit from improved connections to other parts of Victoria
- **Victorian and Commonwealth Governments** will have a greater ability to deliver policies, initiatives and priorities that benefit the Victorian and national economies.

3.3 Evidence of benefit delivery

Key Performance Indicators (KPIs) and associated measures will be applied to demonstrate whether the benefits have been delivered. A Benefit Management Plan (BMP) has been developed with KPIs that are quantifiable and measurable. The specific baseline metric and targets require extensive data collection and will be undertaken as part of the project's design development.

Proposed KPIs and associated measures are set out in Table 3-1. The BMP is provided in Appendix A.

Table 3-1 Key performance indicators

Benefit	KPI	Measure	Baseline	Target
Economic growth	Business access to labour and suppliers	No. of workers accessible for key business locations within 45 minutes by car.	Refer to Appendix A.	
	Business growth	Commercial development potential and employment growth for key business locations.		
Increased economic opportunity for households in the north, east and south east	Access to jobs	No. of jobs accessible for key residential locations within 45 minutes by car and PT		
	Access to education	No. of education opportunities for key residential locations within 45 minutes by car and PT		
	Residential growth	Residential development potential and population growth for key residential locations		
Improved competitiveness of the State	Cost to business	Travel time and reliability for freight between key locations		
	Network resilience	Reduction in vehicles on M1		

Benefit	KPI	Measure	Baseline	Target
Improved liveability and thriving communities in the north east	Improved amenity	No. of heavy vehicle traffic on key arterial roads in the North East		
	Access to local places	Travel time and reliability between local locations by car and PT		
	Increase in use of active modes	No. of local trips made by walking, cycling and PT		
	Reduce frequency of casualty crashes	No. of casualty crashes		

3.4 Project Objectives and Guiding Principles

As demonstrated by the anticipated project benefits outlined above, North East Link has a strong focus on supporting business and jobs growth in Melbourne's north, east and south-east, while also improving cross-city connectivity and helping to address critical traffic, freight and amenity issues.

High-level Project Objectives and Guiding Principles reflecting this focus have been established based on the problems and benefits identified in the Investment Logic Map (see Chapter 2) and the triple bottom line objectives of the *Transport Integration Act 2010* and Plan Melbourne 2017-2050. These objectives and principles were used to evaluate strategic and project options for North East Link.

Table 3-2 Project Objectives and Guiding Principles for North East Link

Project Objectives			
Objective 1 Improve business access and growth in Melbourne's north, east and south east	***Objective 2*** Improve household access to employment and education in Melbourne's north, east and south east	***Objective 3*** Improve freight and supply chain efficiency and industrial growth across the north, east and south east	***Objective 4*** Improve access, amenity and safety for communities in the north east

Guiding Principles			
Guiding Principle 1 Minimise impacts on communities	***Guiding Principle 2*** Minimise impacts on environmental and cultural assets	***Guiding Principle 3*** Minimise impacts during the construction phase	***Guiding Principle 4*** Optimise the efficient use of resources

3.5 Impacts (dis-benefits)

Significant negative impacts (referred to as 'dis-benefits' for the purposes of cost-benefit analysis) are not expected from the project. However, some potential dis-benefits could occur.

The development and assessment of project options for North East Link has included a clear and strong focus on minimising dis-benefits in line with the project's Guiding Principles.

Table 3-3 Potential dis-benefits

Guiding Principle	Potential dis-benefit
Minimise impacts on communities	**Accessibility diminishes on other parts of the network:** It is possible that improved accessibility in the north east may diminish accessibility on other parts of the network as more traffic is attracted to the area.
	Potential property acquisition: There is potential for property acquisition to facilitate construction of the project. This may include impacts to residential properties, businesses, public open space and community facilities.
Minimise impacts of environmental and cultural assets	**Potential impacts on significant native vegetation and cultural assets:** There is potential loss of native vegetation and impacts to cultural assets to facilitate construction of the project.
Minimise impacts during the construction phase	**Disruption during construction:** Disruptions during construction may result in travel time delays, noise and restricted access for residents, commuters and businesses. These disruptions will be temporary and can be managed with an appropriate traffic management plan and communications strategies.
Optimise efficient use of resources	**Bottlenecks on other parts of the road network:** If a new orbital connection is provided within the north east without addressing existing capacity constraints on other parts of the road network, there may be bottlenecks on connecting and adjacent arterial roads. This could undermine the investment by pushing the problem into other locations.
	Traffic attracted onto the road: There is a potential for attracting more traffic onto the new road than expected. This could lead potentially to greater congestion impacts than forecast. However, these dis-benefits would be offset by the broader transport benefits delivered by the investment.
	Potential development pressures: Changes to the level of transport accessibility can have an impact on future land use patterns. Improved employment accessibility in certain locations is likely to increase the attractiveness of those locations for jobs and housing that may dampen demand for land and property in other parts of the city. Increased demand in areas experiencing accessibility improvements has the potential to place development pressures on these areas.

3.6 Importance of the benefits to government

North East Link is aligned to the Victorian and Australian Governments' priorities and to local government plans and strategies (listed in the table below). A detailed description of how the project aligns to and has considered these policies, plans and strategies is provided in Appendix B.

Table 3-4 Relevant legislation, policies, plans and strategies

Level of government	
Australian Government	Smart Cities Plan (Department of the Prime Minister and Cabinet) National Freight and Supply Chain Strategy Australian Infrastructure Plan (Infrastructure Australia) Heavy vehicle road reform
Victorian Government	*Transport Integration Act 2010* Plan Melbourne 2017-2050 State Planning Policy Framework Victoria's 30-year infrastructure strategy (Infrastructure Victoria) Victoria's Value Creation and Capture Framework La Trobe NEIC Draft Framework Plan (Victorian Planning Authority) Northern Growth Corridor Plan 2012 (Victorian Planning Authority} Yarra River Action Plan 2017 (DELWP) Towards Zero 2016-2020 Road Safety Strategy and Plan Movement and Place (VicRoads) Operational Controls of the Motorway Network Victorian Bicycle Strategy Victoria's freight strategy
Local government	Strategies and plans developed by local governments: Banyule City Council Nillumbik Shire Council Manningham City Council Yarra Ranges Council Hume City Council Boroondara City Council Maroondah City Council Knox City Council Whitehorse City Council

Uncertainties associated with the project

As with any major project scheduled for delivery over several years, future uncertainties exist that may affect the project's implementation and the delivery of anticipated benefits:

- *The timing and impact of other projects planned for the north east* – The timing of other projects may exacerbate disruptions to road users during construction and could also have an impact on longer term demand for the north east road network. Managing these impacts could have implications for the timing of construction for some elements of the North East Link Project and the ability of the proposed Concept Design to accommodate future traffic growth.
- *Impacts on other parts of the north east road network* – Improvements proposed could lead to higher than expected additional traffic to use the road network and exacerbate congestion, safety and amenity problems at other locations.
- *Road pricing*– North East Link will be a toll road and, in all likelihood, the tolling regime will resemble existing regimes. However, if the model for transport pricing used by governments across Australia changes in the future, this may require consideration in the design, development and procurement of the project.
- *New technologies such as autonomous vehicles* – Planning for the project will need to consider rapid advances occurring in vehicle technology, including the possible introduction of driverless or fully autonomous vehicles. As noted in Chapter 1, while it is unclear how the transition from driver-controlled to autonomous vehicles will be managed, the State Government's interest in Victoria leading the way in this area means that North East Link – as part of Melbourne's motorway network –will play an important role in any transition plan.
- *General demand uncertainties* – Uncertainties could arise because of higher than anticipated growth in travel demand (for example, due to greater land use intensification and/or induced demand on the network linked to people re-routing and/or making additional trips) or factors that reduce demand for travel in the area (for example, due to changing work behaviours or technological changes). In the short term, it is likely that general demand uncertainties could lead to higher than anticipated traffic growth.

Approaches to deal with these and other identified uncertainties will be incorporated in the design, development and delivery of North East Link. This could include the use of flexible/scalable project designs to deal with demand uncertainties and a procurement approach and construction timeline that can adapt to the evolving transport environment and the changing economic, employment and land use landscape along the corridor. Commercial arrangements adopted for the project will also be investigated to provide a level of flexibility that allows potential changes in future road pricing policies.

Benefit and cost uncertainties associated with the proposed North East Link Concept Design have been modelled and the results reported in Chapter 10 and Appendix Q1 (Economic appraisal) and Appendix O (Risk Register).

4 Strategic response

The State Government has identified the North East Link Project as a priority investment requirement for Victoria. The Department of Treasury and Finance's High Value High Risk (HVHR) Guidelines require business cases to address questions about the possible strategic responses to the identified problems. This chapter examines a range of strategic options and tests how effective they would be in addressing the problems identified in Chapter 2. Options are tested against five criteria – benefits, cost, time, risk and impacts – to ensure the North East Link Project provides the most effective strategic response to the identified problems.

4.1 Method and criteria

During the development stage of the North East Link Project, a series of facilitated Investment Logic Mapping (ILM) workshops were conducted to identify possible alternative strategic interventions to address the problems and realise the anticipated benefits. The initial ILM and strategic interventions were reviewed during the preparation of this business case. A long list of alternative strategic interventions was then considered, ranging from capital intensive interventions to others giving greater prominence to improving network performance with less capital investment.

High-level actions to address the problems (strategic options) were developed from the list of interventions and assessed against their ability to respond to the cause of the problem and deliver the benefits. The cost, timing, feasibility and risk of each strategic option were also considered. From this comparative assessment, a preferred strategic option was confirmed.

Figure 4-1 Methodology for determining preferred strategic option

4.2 Strategic interventions

A broad range of strategic interventions to address the problems were considered. These fall into three broad intervention types:

- Manage demand on the transport network – addressing the need for services now and into the future
- Improve productivity of the transport network – addressing the demand and supply side through utilisation and efficiency options
- Increase supply of transport assets – addressing the ability to improve services through capacity and availability.

Table 4-1 lists 15 identified strategic interventions of each intervention type, followed by a more detailed explanation of, and rationale for, the interventions.

Table 4-1 Strategic interventions

Intervention type	Strategic intervention
Manage demand	Demand management pricing
	Corridor plan for network and place management
	Land use intervention
	Freight demand management
	Encourage travel behaviour change
Improve productivity	Intelligent Transport Systems
	Managed Motorways
	Modify freight operations
Increase supply	Upgrade to existing roads
	A new freeway link
	Dedicated pedestrian and cycling routes
	Bus improvements
	New arterial road connections
	Improve freight movements
	A new rail connection

4.2.1 Interventions to manage demand

Demand management pricing

Whilst not current government policy, this intervention implements broader transport pricing through measures such as tolling existing and/or new facilities, cordon pricing, pricing based on direction of peak travel or demand and vehicle occupancy incentives and restrictions. As well as offering a potential funding source to offset the cost and operations of new and existing infrastructure, the introduction of pricing capitalises on market forces to manage the use of finite roadway capacity. Price signals can lead to more efficient use of road assets by spreading demand throughout the day. Demand management pricing can postpone or sometimes negate the need for providing additional road capacity in the long term.

Corridor plan for network and place management

This intervention could include one or a combination of measures to manage demand in the north east corridor. For example, a corridor plan could comprise priority measures for public transport on the arterial road network, traffic calming treatments, priority road space allocation depending on time of day, extending truck bans, road use management and turning movement restrictions. These measures can reduce demand on the network from modes such as heavy vehicles by restricting their movements, potentially improving amenity in local neighbourhoods.

Land use intervention

This intervention uses land use zoning to encourage density in employment locations, protect areas from land use changes, enhance the function of places or promote increased accessibility. For example, by encouraging density in employment locations, people will not need to travel long distances to get to work and are more likely to use active transport. This can reduce demand on the network.

Freight demand management

This intervention involves modifying time of day for deliveries, implementing time of day restrictions for hazardous freight vehicles and travel time restrictions for trucks, and/or coordinating delivery times with industrial precincts. Moving delivery activities to off-peak periods can assist with reducing demand on the network during the peak periods.

Encourage travel behaviour change

This intervention encourages people to change their travel behaviour. It can involve awareness campaigns to encourage people to use public and active transport modes or to re-time and/or re-route their journeys. It can also involve promoting flexible working arrangements, offering incentives for workers to use public transport or to travel outside peak periods, and providing bicycle end of trip facilities and/or park-and-ride facilities. More people taking up other modes of transport can help to relieve demand pressure on the road network.

4.2.2 Interventions to improve productivity

Intelligent Transportation Systems (ITS)

This intervention involves providing real-time information to motorists (such as personalised travel information systems) and network-wide active signal management. Network-wide active signal management optimises traffic flows to improve productivity on the network. Traveller information systems advise motorists about real-time traffic conditions (such as predicted travel times and information on congestion or major incidents) via dynamic message signing to manage traffic flow.

Managed Motorways

This intervention involves implementing ramp metering, lane use management system (LUMS), incident detection and response management systems, and variable speed limit systems. Freeway detection systems monitor the operation of the freeway network, which can help to manage traffic flow during incidents (for example, by using a warning system to advise motorists to seek alternative routes). Similarly, variable speed limit systems can assist with managing traffic flow by changing speed limits to respond to traffic and weather conditions. Ramp metering regulates on-ramp traffic flow, helping to reduce stop-start conditions along the freeway mainline

Modify freight operations

Supply chains could be streamlined by introducing vehicle booking systems allowing trucks to book in at any hour, leading to reduced truck queues. Freight can be moved more efficiently through greater use of multimodal freight operations (at intermodal terminals in the west, north and south east) and 24/7 operations management that integrates rail and road conditions with the ports. The transportation of hazardous goods on the network and in tunnels could be re-examined, based on risks and changing vehicle types to effectively contain hazards, to improve productivity.

4.2.3 Interventions to increase supply

Upgrades to existing roads

This intervention involves duplicating or widening arterial roads, strengthening bridges and increasing clearances to allow HPFV/placarded/OD vehicle movements on more arterial roads. This is expected to increase the ability of the road network to carry more vehicles.

A new freeway link

This intervention involves constructing a bypass freeway or a connecting freeway to provide extra capacity on the road network.

Dedicated pedestrian and cycling routes

This intervention involves constructing new or upgraded pedestrian and cycling routes, and/or separating pedestrian and cyclists on key routes. This will add more capacity for active transport users.

Bus improvements

This intervention may include provision of additional bus services, new orbital and shuttle bus routes, dedicated bus lanes, bus priority at traffic signals, an expansion of the SmartBus network and building a new car park and interchange as part of Watsonia Station upgrade. This will provide additional capacity on the public transport network.

New arterial road connections

This intervention involves constructing new arterial roads to provide additional capacity on the road network.

Improve freight movements

This intervention involves constructing an intermodal freight rail network to connect Interstate Freight Terminals. By adding capacity to the rail freight network, more freight can be moved by high productivity modes and the number of freight vehicles travelling on urban roads can be minimised.

A new rail connection

This intervention involves constructing a spur line from Hurstbridge railway line to La Trobe NEIC or extending Tram Route 86 to employment centres in the north east. This will provide additional capacity on the public transport network to relieve pressure on the road network.

4.3 Strategic options

Five strategic options were developed to respond to the problems identified. Each strategic option is made up of a combination of some of the strategic interventions outlined above. The options were developed to achieve sensible and mutually consistent combinations of interventions.

Table 4-2 summarises each of the strategic options considered. The options are identified in the right hand columns and are aligned against the strategic interventions previously defined (listed in the left hand column).

The five strategic options are described in greater detail following the table.

Table 4-2 Strategic options

Strategic Interventions	Strategic options				
	Option 1	*Option 2*	*Option 3*	*Option 4*	*Option 5*
	Network upgrade	Demand and productivity focus	Public transport and freight focus	Bypass freeway	Connected freeway
Demand management pricing		●		●	●
Corridor plan for network and place management		●		Complementary	Complementary
Land use intervention		●		Complementary	Complementary
Freight demand management		●	●		
Encourage travel behaviour change		●			
Intelligent Transport Systems				●	●
Managed motorways				●	●
Modify freight operations		●	●		
Upgrade to existing roads	●			●	●
A new freeway link				●	●
Dedicated pedestrian and cycling routes	●			●	●
Bus improvements	●		●	●	●
Improve freight movements			●		
A new rail connection			●		

4.3.1 Strategic Option 1: Network upgrade

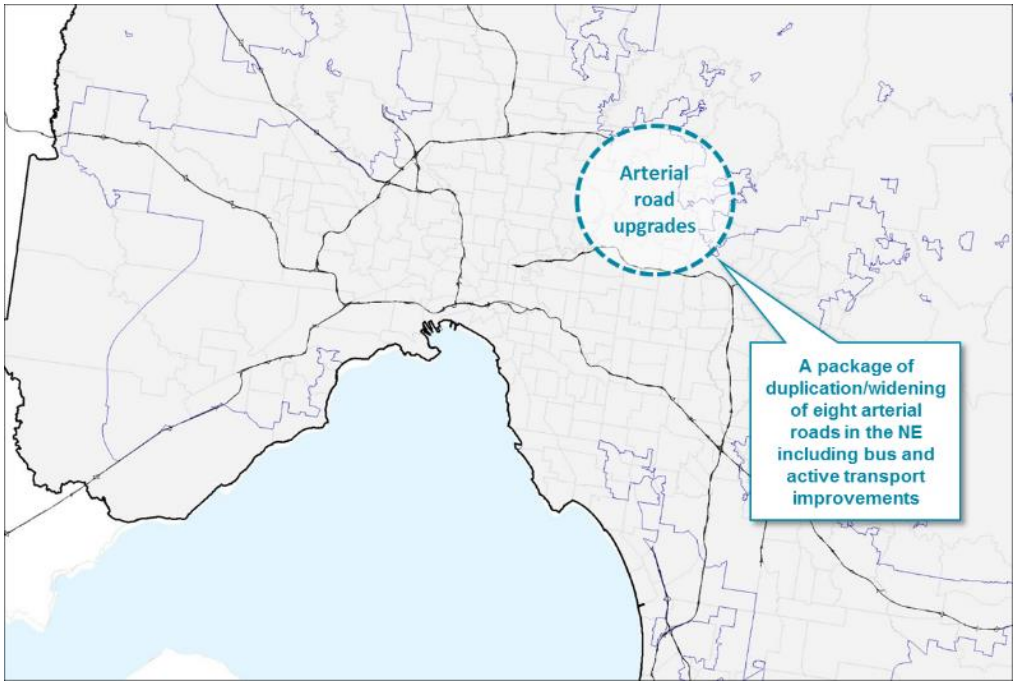
This strategic option focuses primarily on upgrading existing infrastructure to address constraints in the transport network. While some arterial roads in the outer north are being widened or duplicated as part of the Outer Suburban Arterial Roads program, arterial roads in the north east area are not part of this program.

Under this option, seven existing key arterial roads in the north east would be duplicated or widened (Rosanna Road, Fitzsimons Lane, Bulleen Road, Manningham Road, Greensborough Highway, Diamond Creek Road and Lower Plenty Road) and the Eastern Freeway interchange at Bulleen Road would be upgraded. These measures aim to provide more road network capacity to facilitate better business access to labour markets and household access to jobs and education.

As part of these existing road upgrades, separated pedestrian and cycling infrastructure would be delivered to encourage walking and cycling to employment, education, local shops, public open space and parks, and health and community services in the north east. This is expected to improve health and wellbeing for individuals, and potentially contribute to lower rates of car use for short trips, helping to create more liveable communities in the north east.

The additional road capacity delivered by these measures offers an opportunity to provide bus network improvements in the north east. This includes new bus routes and extra buses services on existing SmartBus routes (Route 901 and 902). This is expected to improve orbital connectivity in the north east by providing an alternative travel option that is more accessible, direct and frequent.

Figure 4-2 Strategic Option 1: Network upgrade



4.3.2 Strategic Option 2: Demand and productivity management

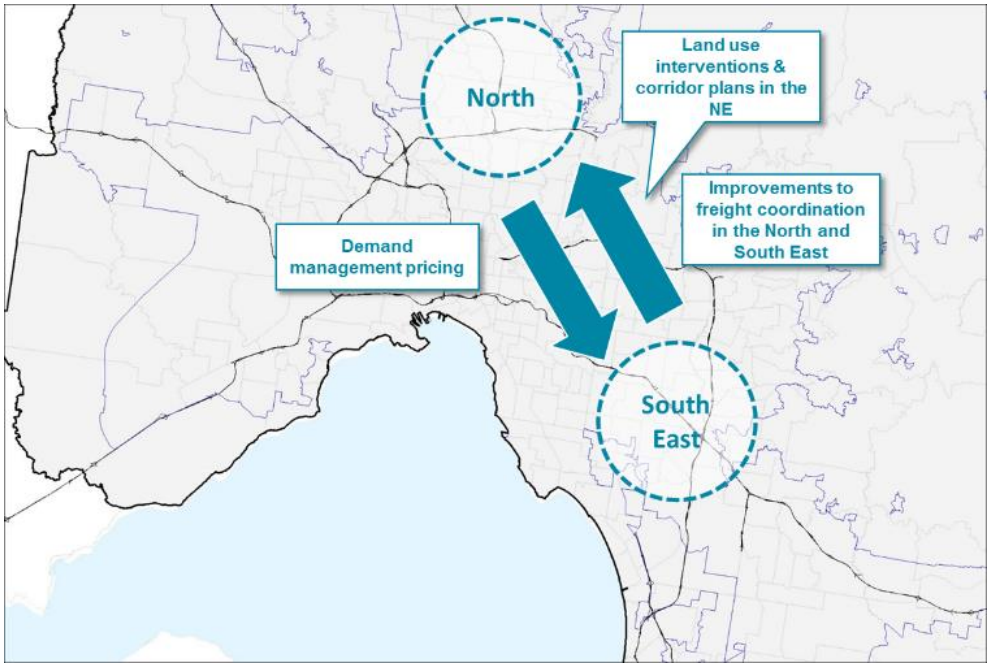
The purpose of this strategic option is to manage demand and productivity on the transport network (without any increase in the capacity of the network). In this option, demand management pricing is implemented, such as tolling existing facilities, cordon pricing, pricing based on direction of peak travel and/or vehicle occupancy incentives.

According to Infrastructure Victoria's analysis, demand management pricing could cut travel times on congested roads at peak hour by up to one third[1]. It could also reduce congestion, improve transport choices and spread peak periods. Infrastructure Victoria also found that road pricing could affect business choices about moving freight – by road or rail or at different times of the day[2].

To support demand management measures on the road network, this option also proposes to implement corridor plans (such as extending truck bans, turning movement bans and parking management, enforcing mode priority during peak periods and undertaking advertising campaigns to encourage mode shift) and land use interventions (such as changing zoning to encourage or discourage density around employment and/or residential areas). Implementing corridor plans will improve road network performance (through road space allocation) and amenity in neighbourhoods (through truck bans). Bringing people closer to where they work through land use interventions is likely to encourage more walking and cycling and reduce travel demand on the road network.

To manage freight demand and productivity, this option also proposes interventions such as better coordination of delivery times between industrial precincts in the north (Somerton and Beveridge) and south east (Dandenong, Lyndhurst and Port of Hastings), and truck travel time restrictions. These measures are expected to assist in reducing business costs and improving the State's competitiveness.

Figure 4-3 Strategic Option 2: Demand and productivity management



[1] Infrastructure Victoria, The Road Ahead, November 2016
[2] Infrastructure Victoria, Victoria's 30-Year Infrastructure Strategy, December 2016

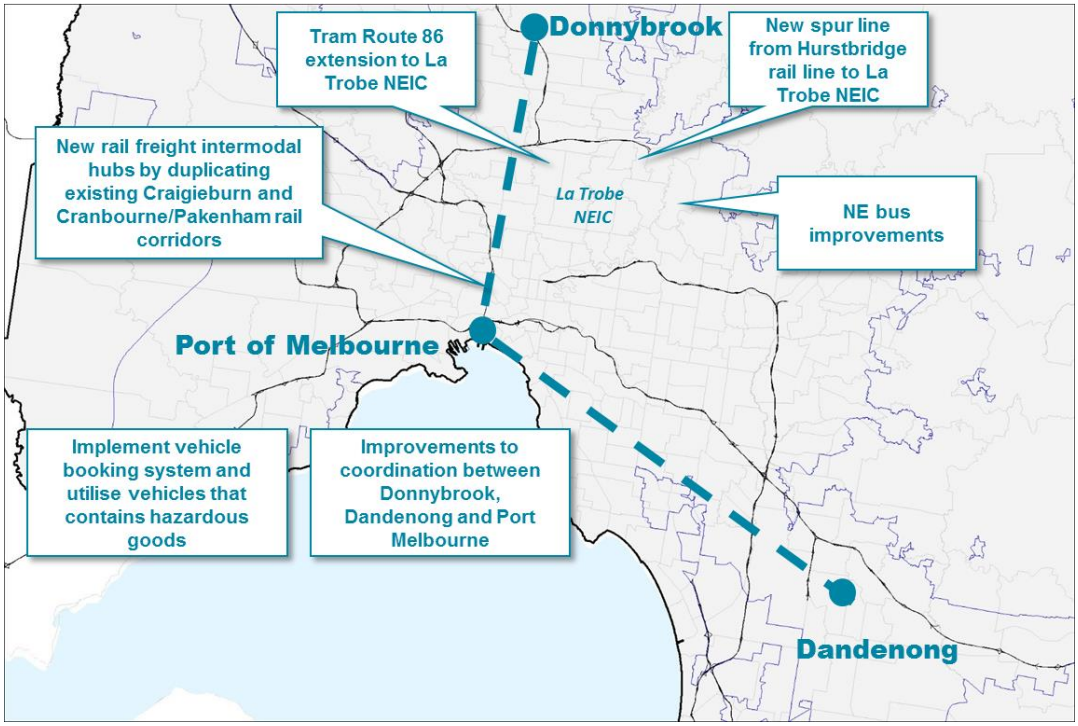
4.3.3 Strategic Option 3: Public transport and freight

This strategic option focuses on public transport investments and managing freight movements.

Significant public transport investments are proposed in this option, including increasing the frequency of SmartBus services (Routes 901 and 902) through priority treatments, constructing a spur line from the Hurstbridge railway line to the La Trobe NEIC (along with station upgrades with additional car parks) or extending tram route 86 with feeder buses to the La Trobe NEIC. These investments are expected to improve some orbital connectivity and will facilitate economic and employment opportunities in the north east by giving businesses and residents direct access to the La Trobe NEIC.

Freight focused interventions include constructing an intermodal freight rail network by upgrading existing passenger rail links to connect the Interstate Freight Terminals in the north (Donnybrook) and south east (Dandenong), improving coordination between these two industrial precincts and the Port of Melbourne, implementing a vehicle booking system and truck travel time restrictions, and using vehicle types that contain hazardous goods to enhance freight productivity. These measures would reduce costs to businesses and help to improve the competitiveness of the State.

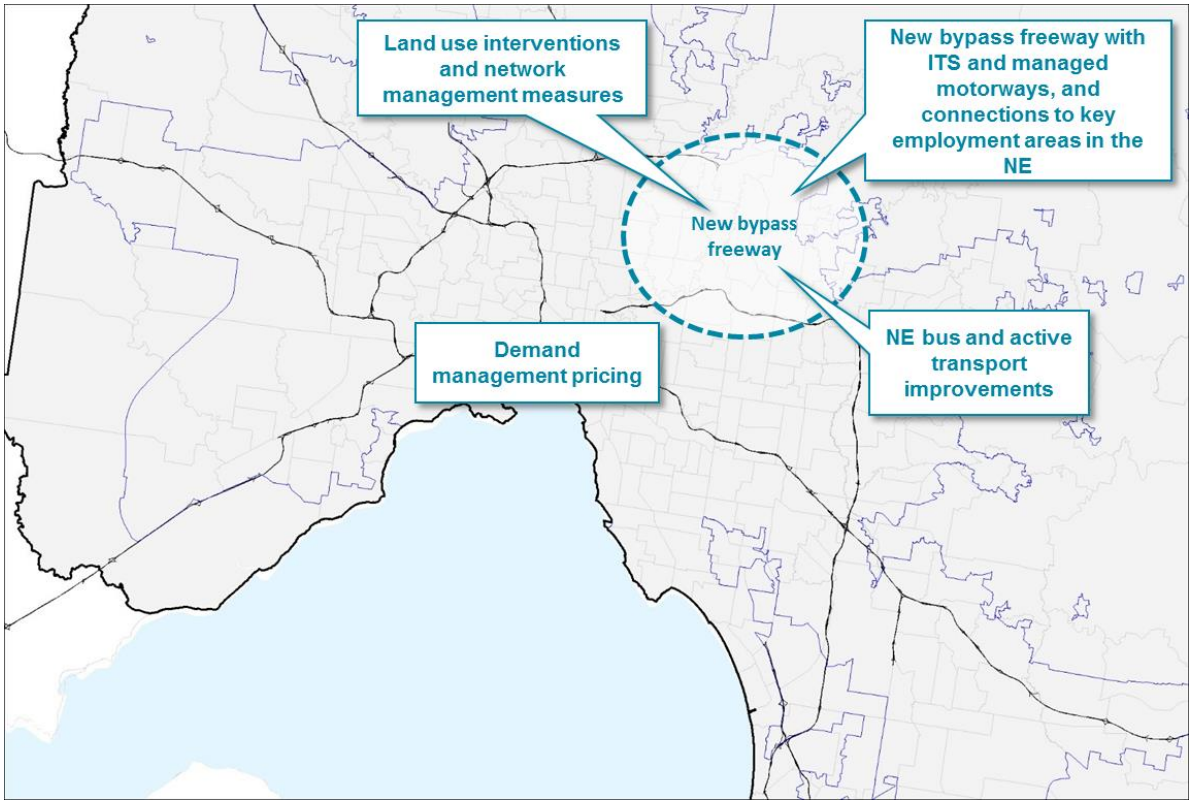
Figure 4-4 Strategic Option 3: Public transport and freight



4.3.4 Strategic Option 4: Bypass freeway

This strategic option proposes to construct a bypass freeway linking the M80 to the Eastern Freeway, without intermediate interchanges, supported by a package of complementary measures which could include enhancing the local bus network, land use interventions, network management measures and improving pedestrian and cycling infrastructure. The bypass freeway is likely to be tolled to manage travel demand, and the application of Intelligent Transport Systems and Managed Motorways will be used to ensure network efficiency and to maximise network productivity. This strategic option will address inefficient freight movements and reduce costs to businesses, making the State more competitive. It will also improve the liveability of communities by moving some heavy vehicles travelling through the north east from local roads to the bypass.

Figure 4-5 Strategic Option 4: Bypass freeway

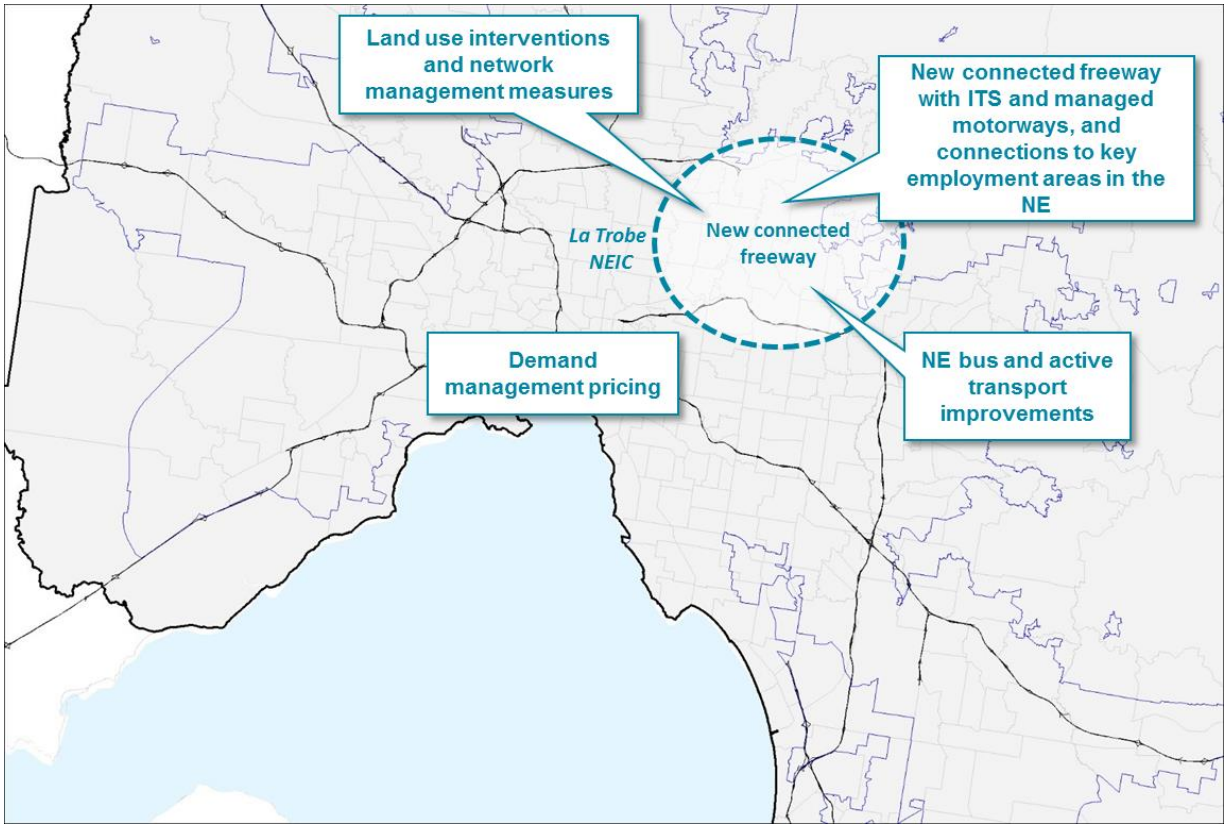


4.3.5 Strategic Option 5: Connected freeway

This strategic option proposes the construction of a connected freeway linking the M80 to the Eastern Freeway known as the 'North East Link', incorporating connections to the wider arterial road network and a package of complementary measures similar to the 'bypass freeway' option. The key difference between this option and Strategic Option 4 is that it provides connections to key employment areas and activity centres in the north east region, which will improve access for businesses to labour markets and access for households to jobs and education opportunities. Like the 'bypass freeway' option, this option is likely to include tolling to manage travel demand and productivity improvement measures such as Intelligent Transport Systems and Managed Motorways.

North East Link has been identified by Infrastructure Victoria as a high priority project in the medium term and largely supports existing land uses. The analysis undertaken by Infrastructure Victoria shows that North East Link will improve the capacity of the freight network, particularly from the south east and Gippsland, by improving freight reliability and travel times. In addition, the link will provide accessibility through some of the most congested parts of the road network, improve access to major employment centres, particularly the La Trobe NEIC and the Epping, Ringwood and Broadmeadows MACs, as improve cross-town travel.

Figure 4-6 Strategic Option 5: Connected freeway (North East Link)



4.4 Strategic options assessment

An initial qualitative assessment was undertaken to validate whether Strategic Option 5: Connected freeway (North East Link) is the most effective strategic response to the identified problems.

The strategic options described above were assessed against the following criteria.

- **Benefits**: The level of benefit delivery was appraised for each option, with an overall benefit score calculated based on the weightings applied to each of the investment benefits. The ratings applied to expected benefit outcomes are shown in the table below.

Table 4-3 Expected benefit outcome ratings

Rating	Equivalent score	Expected benefit outcome
✓✓✓✓✓	5	Very High
✓✓✓✓	4	High
✓✓✓	3	Moderate
✓✓	2	Low
✓	1	Very Low
0	0	None

- **Cost:** Order of magnitude capital and operating costs were estimated to provide an indication of the likely financial impact of each option.
- **Time:** An estimate was made of the time required in years to achieve the benefits (relative to the percentage of full benefit to be delivered) from funding to benefit delivery.
- **Risks:** Key risks likely to have an impact on the achievement of benefits were calculated.
- **Impacts (dis-benefits):** Negative consequences that may occur as a result of implementing the option were identified.

The strategic options have been prioritised based on their identified benefits, cost, time, risk and dis-benefits. This assessment is summarised in Table 4-4below. In accordance with Victorian Government guidelines, the 'percentage of full benefit to be delivered' is calculated by:

- Awarding a score of 0 to 5 (✓✓✓✓✓) for the indicative contribution of each option to each Benefit
- Multiplying the score for each Benefit by the corresponding percentage (from the Investment Logic Map – see Figure 2-1 in Chapter 2) to obtain a weighted score against each Benefit
- Adding the weighted scores across all Benefits to arrive at the weighted Benefit
- Expressing the result as a percentage of the maximum score available (100%).

A commentary on the key findings for each area of assessment is provided after the table.

Table 4-4 Evaluation of strategic options

Benefits			Strategic options				
			Option 1	Option 2	Option 3	Option 4	Option 5
			Network Upgrade	Demand & Productivity Focus	Public Transport & Freight Focus	Bypass freeway	Connected freeway
Percentage of full benefit to be delivered			20%	40%	60%	55%	75%
Benefit 1	Economic growth	30%	✓	✓✓	✓✓✓	✓✓✓	✓✓✓✓
Benefit 2	Increased economic opportunity for households	25%	✓	✓✓	✓✓✓	✓✓✓	✓✓✓✓
Benefit 3	Improved competitive-ness of the State	20%	✓	✓✓	✓✓✓	✓✓✓	✓✓✓✓
Benefit 4	Improved liveability	25%	✓	✓✓	✓✓✓	✓✓	✓✓✓
Cost							
Estimated capital investment cost (Range)			$3b–$4b	$0.3b–$0.5b	$60b–$75b	$7b–$15b	$8b–$16b
Estimated operational costs (Range)			$0.2b–$0.4b pa	$0 pa	$1b–$2b pa	$0.5b–$1b pa	$0.5b–$1b pa
Time							
(Range)			4 – 6 years	20 – 30 years	10+ years	~10 years	~10 years
Risks							
Risk			Moderate	High	High	Moderate	Moderate
Dis-benefit							
Dis-benefit			Moderate	Moderate to High	Moderate	Low to moderate	Low to moderate
Ranking							
(Lowest ranking = preferred response)			5	4	3	2	1

4.4.1 Benefits

A high-level assessment of the benefit outcomes anticipated to be achieved by each of the strategic options indicates that Strategic Option 5 has the potential to deliver the most benefits sought from the investment. A connected freeway will improve business access to labour markets and household access to jobs and education, particularly to the La Trobe NEIC and the Epping, Ringwood and Broadmeadows MACs, which will facilitate economic growth and opportunities for the north, east and south east. It will improve freight efficiency by adding capacity to the freight network, particularly from the south east and Gippsland. This will reduce the cost to business and enhancing the competitiveness of the State. The connected freeway is also expected to improve liveability in the north east by reducing heavy vehicles on neighbourhood roads and upgrading active and public transport infrastructure.

These expected benefits are supported by analysis undertaken by Infrastructure Victoria in 2016, which found that North East Link will improve accessibility to major employment centres, provide accessibility through some of the congested parts of the road network, improve cross-town travel and support existing land uses[3].

Strategic Option 4 will improve amenity by removing trucks from local roads; however, it is expected to provide less benefits in terms of thriving communities compared to Strategic Option 5. The bypass freeway does not provide direct connections to key employment centres and activity centres for residents in the north east.

When compared to Strategic Options 4 and 5, Strategic Options 2 and 3 are expected to provide relatively fewer benefits for economic growth, economic opportunities for households and freight efficiency. Demand management and productivity improvement measures in Strategic Option 2 will provide some initial congestion relief, which will improve accessibility for businesses and households, and freight efficiency. Strategic Option 3's combination of freight investments and improved public transport connections to key employment locations in the north east will also improve accessibility and supply chain efficiency. Strategic Option 3 is expected to provide more benefits to liveability through the provision of public transport and active transport infrastructure in comparison to Strategic Options 2 and 4.

Strategic Option 1 is expected to deliver the least benefits as it does not directly address orbital connectivity problems identified. Duplicating arterial roads provides short term relief to congestion and is likely to attract additional cars and heavy vehicles in the north east in the medium to long term, reducing accessibility and liveability in the area.

4.4.2 Cost

Indicative cost estimates were undertaken for each strategic option based on similar previous projects. These estimates found that Strategic Option 2 will provide the least cost to the state, comprising relatively low-cost demand and productivity management measures of between $0.3 million and $0.5 million. These costs are assumed to be largely administrative and include an advertising campaign to encourage mode shift to public and active transport, and communicate road management measures.

The most costly option is Strategic Option 3, with an estimated $60 billion and $75 billion[4] cost range to construct an intermodal freight rail network between the Somerton and Dandenong Freight Terminals, and construct a spur line from the Hurstbridge line (higher end of the cost range) or a tram line extension from Plenty Road to the La Trobe NEIC (lower end of the cost range). A significant proportion of the cost comprises the new intermodal freight rail network, which assumes a major upgrade to the existing Craigieburn and Cranbourne-Pakenham railway lines (approximately 73 km) to facilitate rail freight between Donnybrook and Dandenong. This would require extensive tunnelling underneath the central city, significant land acquisition along the rail corridors (which traverse densely populated growth areas) and conversion of railway tracks from broad gauge to standard gauge to suit the existing interstate rail network.

This cost estimate assumes one additional railway track that will be separate from the metropolitan railway lines to allow for flexible operations. In addition, the total cost estimate assumes additional car parks and bus interchanges at stations along the Hurstbridge line, and an additional 50 buses for orbital bus services (including SmartBus) each year. Indicative costs for the freight interventions are largely administrative and allow for the conversion of vehicles to contain hazardous goods.

[3] Infrastructure Victoria, Victoria's 30-Year Infrastructure Strategy, December 2016

[4] Benchmarked from estimated project costs of similar large projects including Melbourne Metro and Mernda Rail Extension

Strategic Option 5 is the second most costly ($8 billion to $16 billion), followed closely by Strategic Option 4, as it does not include freeway interchanges.

However, cost does not by itself provide an indicator of value for money. In the absence of monetised benefits, assessing value for money requires an assessment of the cost of each project relative to its qualitative benefit assessment score. Based on this assessment, Strategic Option 5 is most likely to provide the best value for money option.

4.4.3 Time

An estimation of the anticipated length of time from funding to benefit for each of the strategic options indicates that Strategic Options 1, 4 and 5 are most likely to take the least time to implement and deliver benefits. These options are likely to require similar planning and construction lead times. The benefits of each option are expected to be realised within four to six years from funding.

Strategic Option 3 is assumed to comprise significant planning and construction lead time compared to Strategic Options 1, 4 and 5 because any changes to the rail network require additional time for acquisition to secure land and rail infrastructure and implement rail operational changes.

Strategic Option 2 incurs the longest amount of time between funding and benefit realisation, as implementing land use interventions and demand management pricing requires extensive stakeholder and community consultation, impact analysis and design and implementation of regulatory mechanisms and legislation, which can take several years.

4.4.4 Risk

A high-level risk analysis and comparison was undertaken for each strategic option. Strategic Options 1, 4 and 5 present moderate risk, with potential environmental and social impacts; however, these risks can be managed with appropriate mitigation measures.

Strategic Options 2 and 3 are expected to present the most risk. There is a risk of a protracted and costly process to implement land use interventions and demand management pricing for Strategic Option 2. There is a high risk of negative public perception of a new demand management pricing system, which would require extensive consultation with the community and a broad range of stakeholders. Agreement would be required from federal and state governments to introduce a new demand management pricing system. Similarly, land use interventions require agreement from local and state governments and the establishment of legislation, which can be costly and lengthy.

Strategic Option 3 presents a high risk of worsening on-road congestion, which would undermine the large investment. Construction of a passenger spur line into La Trobe NEIC is unlikely to take significant traffic volumes off the network, as strategic modelling indicates that the number of trips into the central city and to La Trobe NEIC in the north east is relatively low.

Furthermore, there are high risks associated with the complexity of upgrading rail infrastructure, such as significant disruptions to three major railway lines servicing Melbourne's growth areas, upgrading the railway track from broad gauge to standard gauge to comply with the interstate network, extensive tunnelling under the central city and long lead times to procure freight trains.

In addition, Strategic Options 1 and 3 involve substantial land acquisition of residential and business properties along high density road and rail corridors respectively, resulting in high costs and long lead times for the project, as well as negative social impacts on the community. Strategic Option 3 requires tunnelling through the central city to connect the Craigieburn to the Cranbourne/Pakenham railway lines.

4.4.5 Impacts (dis-benefits)

Strategic Option 1 provides short- to medium-term relief to transport capacity problems in the north east and has moderate dis-benefits compared to the other options. Duplicating and widening arterial roads in the north east is likely to attract more vehicles onto neighbourhood roads. As these roads are located in urbanised areas, these upgrades are likely to require significant land acquisition of residential and business properties to facilitate widening for a short- to medium-term benefit.

While Strategic Option 2 provides moderate benefit outcomes for a relatively low cost, it has high dis-benefits resulting from measures that are often difficult to implement and take a long period of time to deliver successfully. Land use interventions, demand management pricing and freight interventions require extensive consultation with the community, industry and a broad range of stakeholders. Without providing improvements to active and public transport infrastructure and services, the full benefits of demand management pricing cannot be realised. In addition, corridor plans such as extending truck bans and priority measures are often difficult to enforce. This option does not fully address the freight problem, as a lack of alternative routes – combined with growing congestion – will continue to attract heavy vehicles onto neighbourhood roads.

Strategic Option 3 has moderate dis-benefits. This option will have a significant project footprint, require extensive land acquisition of properties across the north, north east and south east and cause significant disruption to the rail and road network in these areas during construction. It requires substantial investment in the rail passenger and freight network to accommodate the number of freight trains required to have a significant positive impact. The full benefits of providing improved bus services cannot be realised if additional capacity is not provided on the road network due to increasing demand from the outer northern suburbs. Freight improvements can only provide limited benefits without upgrades to the orbital road network in the north east, as this network will still be required to provide last mile deliveries. Changes to freight operations also require extensive industry and community consultation (for example, in relation to the potential noise impacts associated with night time deliveries and freight trains).

Compared to the other options, Strategic Option 4 has low to moderate dis-benefits. It is likely to cause road network disruptions during construction and have some negative economic dis-benefits on local businesses as a result of the bypass freeway. This option will also require land acquisition of residential and business properties.

Similar to Strategic Option 4, the dis-benefits for Strategic Option 5 are low to moderate. The dis-benefits for this option are expected to be road network disruptions during construction, land acquisition of private properties and potentially attracting additional traffic to roads approaching the freeway interchange.

4.5 Recommended strategic option

Based on the analysis, Strategic Option 5 (Connected freeway) is the recommended option to be taken forward for project options development. This option provides the most viable solution to the orbital connectivity and capacity problems identified in Chapter 2 and is expected to deliver considerable benefits to the community and industry in the medium- to long-term.

The option provides the highest amount of benefits in a medium-term timeframe for relatively fewer dis-benefits and risks. It delivers a comprehensive medium- to long-term solution to poor orbital connectivity and capacity constraints on the road network in the north east. It provides connectivity to key employment and residential centres to facilitate economic growth and opportunities for residents, and will move trucks off local roads, improving liveability and wellbeing for communities in the north east. These benefits are supported by modelling and economic analysis undertaken by Infrastructure Victoria, which show the North East Link as being a relatively high-performing project that offers substantial benefits in terms of linking people to employment across the city[5].

The evaluation showed that although Strategic Option 4 (Bypass freeway) provides a medium- to long-term solution to poor orbital connectivity, inefficient freight movements and congestion on neighbourhood roads, it does not provide direct connections to key employment and activity centres to facilitate economic growth and economic opportunities for residents in the north east.

Strategic Option 3 (Public transport and freight) does not fully address freight movement problems between the north and the south east, and last mile deliveries that are carried out mostly via the road network. While a new intermodal freight rail network will carry some of the load off roads, it does not have the flexibility to support shorter, time-critical trips. As the eCommerce market continues to grow and the freight task becomes increasingly more focused on the last mile, the number of freight and delivery vehicles on the local and main road network will increase, impacting on liveability and community wellbeing. Infrastructure Victoria's 30-year strategy identified that a major uplift in capacity on the Dandenong rail corridor is likely to be required in the longer term (at least 30 years or beyond) to support demand for increased passenger and freight rail services from the south east of Melbourne and Gippsland. It also recognises this is a high-cost solution requiring further network planning, including considering how to maximise the benefits of such an investment and reviewing all available options to better use existing infrastructure first[6].

A new spur passenger rail line or tram extension can distribute people to the La Trobe NEIC, but does not facilitate short trips to local destinations. The bus network plays a vital role in these short trips; however, the benefits delivered by improved bus services will be limited if not accompanied by additional capacity on the cross-city orbital road network in the north east. The full benefits of providing frequent and reliable bus services cannot be realised if road congestion worsens.

Strategic Option 2 (Demand and productivity management) does not fully address the freight problem, as there are limited alternative freight routes, which may attract heavy vehicles onto neighbourhood roads. The key measures in this option often require lengthy and extensive consultation with the community, industry and a broad range of stakeholders to deliver successfully. Measures such as road space allocation can provide short-term relief for active and public transport modes, but are likely to create congestion for freight movements due to the lack of alternative routes in the area.

Strategic Option 1 (Network upgrade) provides short- to medium-term relief to transport capacity problems in the north east. There are few alternative north-east arterial roads in the area suitable for widening. As a result, this option does not address the orbital connectivity problem and may attract more heavy vehicles onto neighbourhood roads. It is also likely to require significant land acquisition for a short to medium term benefit.

[5] Infrastructure Victoria, Victoria's 30-Year Infrastructure Strategy, December 2016
[6] Infrastructure Victoria, Victoria's 30-Year Infrastructure Strategy, December 2016