The Missing Link
A comparison study of public transport options to Rowville

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Victorian Parliamentary Internship Report
Prepared for: Mr Rodney Barton, Member of Legislative Council for the Eastern Metropolitan Region
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Executive Summary
This report undertakes a comparative analysis of two proposals to improve public transport to the south-eastern suburb of Rowville. The first proposal is a tram line to Rowville. In 2018, the Victorian state government announced plans to build a new tram line between Caulfield and Rowville. The second proposal is a train line between Huntingdale station and Rowville. The 2018-19 federal budget allocated $475 million for this line, dubbed the Monash Rail. A train line to Rowville was first proposed in 1969. Despite strong public support for the project, it has remained off the political agenda until this announcement.

The report begins by analysing the current public transport network and identifying where improvements can be made. Extending public transport coverage to outer suburbs and providing more cross-town connections can generate strong increases in patronage and reduce reliance on cars. Trains and trams mainly provide efficient services to inner and some middle suburbs of Melbourne. Majority of outer suburbs rely on buses, that are all too infrequent and often get delayed due to congestion. This makes cars the primary mode of transport for millions of Melburnians. This also the case in the Eastern and South-eastern metropolitan regions of Melbourne that are the focus of this report.

This region hosts some of Victoria's most important economic and intellectual hubs such as Monash University, Chadstone shopping centre and the Monash National Employment and Innovation Cluster (NEIC). This cluster contains the highest concentration of jobs outside the Melbourne CBD. Despite its significance, the region has poor public transport links which has fostered a culture of car dependence. This report finds that there are significant drivers of demand that will make a tram line feasible. Chadstone Shopping centre and Monash University are the biggest shopping centres and university in Australia, respectively. There are also several businesses parks between Clayton and Rowville that are additional trip generators. The median strips along Dandenong road and Wellington road are suitable for the construction of a tram line.

A train line to Rowville has been theorised for decades. While numerous feasibility studies have been undertaken over the years, the idea of a Rowville rail has not moved beyond the initial planning phase. The most recent study undertaken in 2012 concluded that the line was justified, and construction was feasible, contingent on capacity improvements in the train corridor between Caulfield and the city. The Melbourne Metro tunnel, currently under construction, will provide the capacity needed to accommodate trains from Rowville. The 2012 feasibility study did not undertake an economic analysis for the train line.

This report recommends that the tram line between Caulfield and Rowville should be constructed. The significant benefits that can be derived from the Rowville Rail warrant the
recommendation that a detailed business case be undertaken soon to ensure that the line is ready for construction once the Melbourne Metro tunnel works are completed in 2025.

A key message of this report is that there is an urgent need to improve public transport connectivity, not just to the Eastern and South-Eastern Metropolitan region, but to all outer suburbs whose residents are facing acute public transport disadvantage. Melbourne’s infrastructure planning has been based around improving the road network at the expense of the public transport network. Melbourne is projected to face strong population growth in the coming decades. The state should planning and undertaking public transport expansion projects now to ensure that future demand can be met.

**Methodology**

This report has been prepared using the following sources:

- Plans and reports from local, state and federal governments
- Data from government agencies such as Australian Bureau of Statistics and Infrastructure Victoria
- Interviews with experts and local councils
- Reports from interest groups and consultancy firms.

**Limitations**

The main limitations of this report are:

- This report has utilised costings from previous feasibility studies and similar projects currently under construction in Gold Coast and Sydney. These figures may not be up to date or directly comparable to Melbourne and have been used primarily to provide a starting point for cost considerations. This report also does not undertake an economic cost benefit analysis due to limitations in obtaining credible financial estimates.
- The author was unable to determine estimated patronage for the proposed tram line due to that information not being publicly available.
- This report is not intended to be a planning or a technical document. Its focus is on analysing the need for improved public transport connections to the Monash NEIC and surrounding suburbs, rather than discussing the technical and engineering aspects of construction.
- While some institutions and government agencies were contacted for interviews, they did not respond in time for this report. This report uses existing public records to determine their stance on the proposed train and tram line.
Section 1: Introduction

Melbourne is tipped to become Australia’s largest city, with a population of 8 million by 2051. In 2017-18, Melbourne’s population increased by 119,400, making it Australia’s fastest growing city. To accommodate its ever-increasing population, Melbourne has continued to develop new suburbs. In 2018 alone, 17 new suburbs were added to the Greater Melbourne area. These growth areas are located far from the employment rich city centre and typically have poor public transport links. This leads to people spending a longer portion of their day commuting to and from work and increases congestion on the roads.

To reduce congestion and improve quality of life for people, Melbourne planning documents such as Plan Melbourne aim to create 20-minute neighbourhoods. These are neighbourhoods that “give people the ability to meet most of their everyday needs within a 20-minute walk, cycle or local public transport trip of their home.” An important part of this is creating regional employment hubs or clusters that enable dispersion of employment from the CBD to middle and outer suburbs. The Victorian Planning Authority has identified seven such National Employment and Innovation Clusters (NEIC) in Melbourne. The biggest cluster is the Monash NEIC which is anchored by Monash University, Clayton. It is home to important institutions such as the CSIRO, the Australian Synchrotron and the Victorian Heart Hospital (due to open in 2021). Despite having the highest concentration of jobs outside the Melbourne CBD, this cluster has poor public transport links. In 2018, both the state and federal government proposed new projects to improve public transport connections to the Monash NEIC.

In April 2018, the Victorian government announced a new 18-kilometre tram route that would run between Caulfield and Rowville. The route proposes to link Monash University’s two largest campuses, Clayton and Caulfield, Chadstone shopping centre and the suburb of Rowville. Construction is expected to take place in two stages: Stage one will connect

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Caulfield and Monash University’s Clayton campus and stage two between Clayton and Rowville will be built a later, unspecified date\(^5\). The Victorian budget for 2018-19 allocated $3 million to study route options and to prepare cost estimates for the route.

In May 2018, the Federal government announced funding for a train connection between Huntingdale and Rowville\(^6\). $475 million were allocated as initial funding this line (Monash Rail) in the Federal budget for 2018-19 and the Victorian government was called upon to match that commitment\(^7\). A train line to Rowville was first proposed in 1969. Numerous feasibility studies have since been undertaken and despite strong local support for the line, it has remained off the political agenda.

The state and federal governments are currently awaiting a business case for the tram line before deciding whether trains or trams are more suitable\(^8\). The following report compares the two proposals to evaluate which would a better option for the region. The report is structured as follows:

Section 2 contains background information on Melbourne’s current public transport system, with more focus on the train and tram network. This section discusses the transport disadvantage faced by residents in Melbourne’s outer suburbs and makes the case for improving public transport to our growing regions.

Section 3 reviews the federal proposal of a train line from Huntingdale to Rowville. A brief history of previous proposals for the line and the main beneficiaries of the train line are discussed.

Section 4 includes a discussion of the proposed tram line. The proposed route passes through some of Melbourne’s busiest activity centres such as Chadstone Shopping Centre, Monash University Clayton and the Monash National Employment and Innovation Cluster (NEIC). The current public transport services to these areas and their future growth potential is examined. This section includes a brief discussion of the feasibility of building

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5 Premier of Victoria, *New tram to connect city’s South-East*, April 10, 2018

6 Adam Carey, “Turnbull government finally buys into Melbourne’s congestion problem”, *The Age*, May 7, 2018


8 Noel Towell, “Federal money talks in Melbourne transport debate”, *The Age*, May 15, 2018
a tram line along Dandenong and Wellington roads. A technical analysis of construction of the line is beyond the scope of this report.

Section 5 contains a direct comparison between the two proposals and the conclusion.
Section 2: The case for improving public transport in Melbourne

Melbourne’s public transport system consists of trains, trams and buses. In 2017-18, 565 million trips were undertaken by public transport⁹. Of these, 240.9 million trips were taken on trains, 206.3 million on trams and the remaining 117.8 million by buses. Melbourne has 234 route kilometres of dedicated metropolitan passenger railway tracks, supplemented by 250 route kilometres of tram tracks which makes Melbourne’s tram and train network the biggest network in Australia¹⁰. Buses are an important part of the PT network too. With over 300 routes, buses fill in important service gaps in areas where trains and trams do not operate. However, their hours of operation are limited, with some routes not operating on weekends. In contrast, trains and trams operate from 5 am to 1 am on weekdays, with a service frequency of around 20 minutes outside of peak hours.

<table>
<thead>
<tr>
<th>Train network at a glance</th>
<th>Tram network at a glance</th>
<th>Bus network at a glance</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 lines (including the infrequently used Showgrounds and Racecourse lines)</td>
<td>25 routes</td>
<td>336 routes</td>
</tr>
<tr>
<td>222 metropolitan stations</td>
<td>1,763 tram stops</td>
<td>16 metropolitan bus operators</td>
</tr>
<tr>
<td>226 six carriage trains</td>
<td>518 trams in the fleet</td>
<td>1,760 buses</td>
</tr>
<tr>
<td>2,200 services everyday</td>
<td>5,200 daily services</td>
<td>16,500 daily services</td>
</tr>
<tr>
<td>240.9 million annual journeys</td>
<td>206. million annual journeys</td>
<td>117.8 million annual passenger journeys</td>
</tr>
<tr>
<td>900 people is the standard capacity of a train</td>
<td>210 people is the carrying capacity of an E-class tram</td>
<td></td>
</tr>
</tbody>
</table>

The benefits of an extensive public transport network however are not distributed equally across Melbourne. Currently, only 36% of dwellings in Melbourne are located within 400 metres of a public transport stop that provides frequent services (at least one service every

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30 minutes). As the map below outlines, inner and some middle suburbs have a higher concentration of public transport services than outer suburbs.

Figure 1 Proportion of households served by accessible, frequent public transport

Source: The Conversation

1.4 million in Melbourne’s outer suburbs do not have access to public transport. This leaves residents no choice but to rely on cars as their primary mode of transport. Cars are the most dominant mode of transport in Melbourne. On average, 70.7% of all weekday trips in Melbourne are undertaken in a car while public transport accounts for only 9% of all weekday trips. As shown below, this proportion gets even lower as the distance from the central business district (CBD) increases.

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12 Ibid
A key reason for this is the city-centric nature of our public transport system. Melbourne’s rail and tram network are radial with lines branching from the CBD to suburbs\textsuperscript{15}. Radial networks are excellent for transporting workers to their jobs in the city centre but are generally uncompetitive for non-CBD work journeys and other reasons for travelling. There are limited PT options for cross-town journeys and to the airport. All trains only operate to and from the CBD. Of the 25 tram routes, only two routes operate purely between suburbs. All others travel via the city. This hub and spoke model makes public transport unattractive for destinations that do not lie along the same route.

The demand for orbital transport is demonstrated by the success of Smart Bus routes. These bus routes were rolled out between 2005 and 2010 to provide orbital connections that trains and trams do not. These routes are now amongst some of Melbourne’s busiest bus routes\textsuperscript{16}.


\textsuperscript{16} John Stone and Ian Woodcock, Transport Strategy Refresh: Background paper on public transport network, report prepared for the City of Melbourne, Melbourne 2018. https://s3.ap-southeast-
The foundations of our current public transport system were laid in early 20th century. Transport maps have remained virtually unchanged since then. This is despite the fact that Melbourne’s population and metropolitan area have increased significantly since then. Most of transport infrastructure planning and investment has gone towards expanding Melbourne’s roads and freeways, as the graph below demonstrates.

Figure 4 Investment in roads versus public transport

Source: Transport Strategy Background Paper\textsuperscript{17}. Grey lines indicate the train lines and green lines highlight the tram network.

\textsuperscript{17} ibid

This chronic underfunding puts existing infrastructure under enormous pressure. Despite accounting for only 9% of journeys, trains and trams are routinely overcrowded during peak hours, with passenger load surveys showing regular load breaches on trains and trams. In contrast, cars in Melbourne have an average occupancy rate of 1.06 occupants in peak hour.

Section 2.1 Melbourne trains
Melbourne’s train network is managed by Metro Trains Melbourne which is a consortium of three organisations: Hong Kong based MTR Corporation, John Holland Group and UGL Rail. Trains are the backbone of Melbourne’s PT network, carrying 240.9 million people a year in 2017-18. Rail patronage has steadily increased over the last decade. Nearly 70% of all public transport journeys are undertaken on trains.

Figure 5 Train patronage in Melbourne

Source: Metro trains

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The electrified metropolitan rail system was established in the 1920’s\textsuperscript{24}. The last full train line to be constructed was the Glen Waverley line in 1930. Since then, all work undertaken on the rail lines has been to increase capacity. This has involved track duplications, electrification of some erstwhile V/Line routes, extending some train lines and more recently, level crossing removals.

The Andrews government has released bold plans for extending the train network. The most ambitious of these is the Suburban Rail Loop which is envisaged as a 90-kilometre orbital loop connecting suburbs to growing employment, health and education facilities\textsuperscript{25}. Establishing cross-town connections can increase economic development activities as areas that are well connected by transport links tend to attract employment and investment\textsuperscript{26}.

**Section 2.2 Trams**

The first electric tram was introduced in Melbourne in 1889. Since then, the tram network has grown to become one of the largest in the world. In 2017-18, 200 million trips were taken on trams. This equates to 80% of the volume carried by trains. They are an important link to the employment centres in the CBD and along St Kilda road. 600,00 trips are taken on trams each day, and this number is expected to increase to one million a day by 2031\textsuperscript{27}. Despite being an important part of the network, trams have generally been overlooked for investment. Despite being the largest network in the world with over 250 kilometres of tracks, it only covers a small part of Melbourne. The western and north-western suburbs have no tram at all. Melbourne’s population and metropolitan area have quadrupled since trams were introduced, but the tram network has hardly been expanded to cater to the growing population\textsuperscript{28}. No new tram lines have been built recently. Like for trains, most of the investment has been in increasing capacity along existing routes and buying new trams rather than extending the network. Since 2000, less than ten kilometres of new tram tracks have been laid\textsuperscript{29}.

\footnotesize
\begin{itemize}
  \item \textsuperscript{26} Parliament of Australia, *Role of public transport in delivering productivity outcomes*, Canberra 2014.
  \item \textsuperscript{27} Yarra Trams, https://yarratrams.com.au/projects/st-kilda-junction-substation-st-kilda
  \item \textsuperscript{29} Ibid
\end{itemize}
Route extensions are an expensive task and planning and construction of new routes can potentially take years. Currently, more than 75% of all jobs in Melbourne are beyond the reach of trams.\(^{31}\) If planned properly, network extensions can greatly increase connections to growing employment centres and can encourage more people to use public transport.

Melbourne is currently facing a severe infrastructure backlog, especially in growth corridors. Technological developments are beginning to enable much faster and economical transport options. One such option, trackless trams, is discussed in the next subsection.

**Section 2.3 Trackless trams**

Autonomous vehicles (AV) are predicted to be become one of the biggest game changers in the transport sector. They are expected to be available to the public by 2025. Numerous governments around the world are modifying their legal systems and physical infrastructure to accommodate AVs. A similar technology can also be utilised in the public transport vehicles to make them more efficient and environment friendly. Trackless trams are one such possibility. The Chinese city of Zhuzhou unveiled the world’s first trackless tram route in 2018.

\(^{30}\) ibid

Trackless trams (TT) have many advantages over conventional trams. TTs run on lithium-ion batteries located on the roof of the vehicle\textsuperscript{32}. These can be recharged in 30 seconds at purpose built solar powered tram stops. Currently, a ten-minute recharge at the end of the line enables the trams to run for fifteen kilometres\textsuperscript{33}. The next generation of TTs are expected to cover 50 to 60 kilometres on a single recharge\textsuperscript{34}. Since TTs are powered by the batteries, they do not need overhead wires to power the tram. Unlike conventional trams that run on steel wheels, TTs have rubber wheels that enable them to operate directly on the road surface. This eliminates the need for building tracks on the road. This makes them less disruptive to build as laying tracks requires digging up the ground and moving any utilities present underground\textsuperscript{35}. This can add considerably to the cost of construction. Sydney is currently building a new light rail route at a cost of $120 million per kilometre and there have been significant cost blowouts to that project due to the presence of underground utilities\textsuperscript{36}.

Perhaps the biggest advantage of TTs over conventional trams is the ability of TTs to alter their course to avoid obstructions\textsuperscript{37}. In Melbourne, trams often get stuck behind turning vehicles or due to obstructions such as crashes or broken-down cars. The ability to manoeuvre around obstructions can significantly increase the average operating speed and thus reduce journey times for passengers.

TTs are capable of autonomous operations by employing an autonomous optical guidance system. They utilize GPS and light detection and ranging (LiDAR) technology to help guide the tram along a virtual track on the road\textsuperscript{38}. While TTs can run autonomously, a driver can be present to monitor the automation and override it if necessary\textsuperscript{39}. This can make the role of a tram driver akin to that of an airline pilot who does not directly fly a plane but monitors the computers that fly the plane.

\textsuperscript{32} Peter Newman et al, “Is it the transit and city shaping catalyst we have been waiting for?”, Journal of Transportation technologies, vol. 9 (2019): 31-55
\textsuperscript{35} Interview with Professor Graham Currie, May 6th, 2019.
\textsuperscript{37} Interview with Professor Peter Newman, May 3\textsuperscript{rd}, 2019.
\textsuperscript{39} Professor Newman interview, May 3\textsuperscript{rd}, 2019.
TTs are significantly less expensive to build than conventional trams. A kilometre of trackless tram costs between $7 to $10 million, compared to $25 to $30 million for light⁴¹. Gold Coast is in the process of building its light rail network. The 13-kilometre-long first stage from Broadbeach to Gold Coast University Hospital cost $1.5 billion, an amount that would be sufficient to build 4 routes for trackless trams⁴².

Professor Graham Currie, an engineering expert, believes that TTs have great potential⁴³. Currently, they have only been trialled in China and Chinese road conditions are not directly comparable to Australian conditions. Victoria has a backlog of infrastructure projects. As outlined earlier in the section, significant portions of Melbourne do not have access to reliable public transport. TTs can be set up quickly and at a considerably lower cost than trams. This could enable Melbourne to expedite delivery of transport infrastructure to areas that

⁴⁰ Newman, “Why trackless trams are ready to replace light rail”.
⁴² Interview with Professor Graham Currie May 6th, 2019.
⁴³ ibid
desperately need it. This report recommends that further research regarding suitability of trackless trams in Melbourne be carried out.
Chapter 3: Monash –Rowville Rail Proposal

The federal government announced funding for a Huntingdale-Rowville rail link in 2018-19 budget. $475 million were allocated to the project, to be disbursed over 4 years. This money is allocated for planning and pre-construction activities such as gaining approvals. A rail link to Rowville was first proposed in the 1969 Melbourne Transportation Plan. Since then, multiple studies have been undertaken into the feasibility of the line.

Section 3.1 A brief history of Rowville rail proposals

1969 Melbourne Transport Plan

This plan was prepared by the Melbourne and Metropolitan Board of Works, which was the statutory planning authority for the metropolitan area. The plan aimed to integrate transport options with land use. It proposed building more freeways and to improve public transport. Under this, a rail line was proposed to link Monash University, Waverley Park, Stud Park and Rowville. The plan envisaged the Monash-Rowville link to extend to Ferntree Gully. This plan also proposed building the City Loop. While most of the freeways recommended by this project have since been built, proposals for building train lines to Rowville and Doncaster were not adopted. This reinforces the notion that infrastructure planning has been very car-centric.

1998 Scoresby Transport Corridor Environmental Effects Statement

This statement revisited the premise of increasing public transport connectivity to Rowville. Several options, including light rail and bus rapid transport were analysed. However, the study eventually favoured a road and recommended that bus links to Rowville be improved instead. The Scoresby Arterial Road, now known as the Eastlink, was eventually constructed instead.

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**1999 Australian Labor Party Plan**

The ALP released a list of transport action plan prior to the 1999 state elections. The plan explicitly mentioned better links to the outer-east and investigating route options for the Rowville rail\(^7\). However, no feasibility studies were undertaken following the election\(^8\).

*Figure 8 Melbourne rail network envisaged by the 1969 Melbourne transport plan*

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**2004 Knox Council Pre-feasibility study**

The Knox Council commissioned an independent study into the feasibility of Rowville rail. The comprehensive study looked at route options, engineering and construction requirements, expected patronage levels and cost estimates. The study found that construction of the line

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was feasible. It estimated the cost of construction of a single-track line between Huntingdale and Rowville to be around $413 million (in 2004 dollars)\(^\text{49}\), excluding the cost of trains.

**2012 Rowville Rail Study**

This independent study carried out by Sinclair Knight Merz (SKM) was the first stage of a feasibility study commissioned by the Victorian government. It investigated the rail operations, design, patronage, environmental and social impacts of the Rowville rail. The report noted that capacity would need to be improved along the Dandenong corridor and near the city to accommodate additional trains from Rowville. It concluded that the line was “worth pursuing further” and urged the government to fulfil its commitment for the rail.

**2013-14 PTV Study**

This PTV study was the second part of the Rowville rail study and built on recommendations from the 2012 study. PTV analysed route options and station locations. The report noted that the required capacity improvement works, such as the Melbourne Metro tunnel, were more than a decade away from completion. It identified interim measures such as increasing frequency of existing buses to meet the PT requirement. PTV concluded that further analysis would be required should the government decide to proceed with the construction of the Rowville rail. This report however was criticized as incomplete due to its lack of economic analysis and cost-benefit considerations.

The following discussion about the route’s feasibility is primarily based on the 2004 Knox council and 2012 Rowville rail studies.

**Section 3.2 Rowville Rail route specification**

The 2012 SKM study identified a 13-kilometre-long route that would originate at Huntingdale station and travel along North Road and Wellington Road to Stud Road, before terminating at Stud Park\(^\text{50}\). Four new stations are planned along the route:

- Monash University
- Mulgrave
- Waverley Park
- Rowville


The proposed route passes through some of Melbourne’s heavily travelled arterial roads such as Wellington Road, the Monash freeway and Blackburn road. To minimize impact on traffic, significant portions of the route need to be either underground or elevated. This can significantly increase the complexity and cost of construction.

*Figure 9 Alignment of Rowville Train*

From Huntingdale, the line will follow the Dandenong corridor, used by Cranbourne and Pakenham trains, to the city. The SKM study envisaged a service every 10 minutes from Rowville during peak hours. The Dandenong corridor is currently incapable of accommodating this frequency.

**Dandenong corridor restrictions**

Given the current signalling and track infrastructure, the Dandenong corridor has the capacity to accommodate maximum 20 trains an hour\(^{51}\). Currently, 16 metropolitan and 2 V/Line trains an hour use this corridor\(^{52}\). The maximum capacity is not utilized to provide a buffer in case of delays. Without increasing capacity along the corridor, the only way to accommodate Rowville services would be to reduce existing Cranbourne/Pakenham services. This option is not viable as despite frequent services, peak hour Cranbourne/Pakenham trains are routine.

\(^{51}\) Public Transport Users Association, “Myth: We can’t have Rowville trains because there is no room”, 2018 [https://www.ptua.org.au/myths/rowville/](https://www.ptua.org.au/myths/rowville/)

\(^{52}\) Ibid
over-crowded. The Melbourne Metro tunnel, currently under construction, will help free up capacity along the corridor for Rowville trains. The PTV study concluded that the Metro Tunnel was crucial to the feasibility of the Rowville rail. The Metro tunnel is scheduled to complete by 2025. Construction of the Rowville rail is expected to take 4 years. So, the earliest the line can be operational is 2029.

An alternate scenario envisaged was that the route would be ‘shuttle’, operating only between Rowville and Huntingdale. Passengers would need to board city-bound trains from Cranbourne/Pakenham at Huntingdale station to continue their commute to the city. This proposal was later dropped as it would have required hundreds of passengers to change trains from one station and trains from Cranbourne/Pakenham are already filled to capacity during peak hours.

**Section 3.3 Beneficiaries of the Rowville Rail and projected patronage**

Passenger demand modelling undertaken during by SKM estimated that 64,000 people would use the line on an average weekday by 2046.

*Figure 10 Projected patronage of Monash Rail by 2046*

<table>
<thead>
<tr>
<th>Rail line</th>
<th>Number of stations</th>
<th>Modelled 2046 weekday station usage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Per station</td>
</tr>
<tr>
<td>Lilydale to Ringwood</td>
<td>4</td>
<td>83,000</td>
</tr>
<tr>
<td>Rowville to Huntingdale</td>
<td>4</td>
<td>68,000</td>
</tr>
<tr>
<td>Ringwood to Camberwell</td>
<td>12</td>
<td>193,000</td>
</tr>
<tr>
<td>Dandenong to Caulfield</td>
<td>12</td>
<td>171,000</td>
</tr>
<tr>
<td>Caulfield to South Yarra</td>
<td>5</td>
<td>50,000</td>
</tr>
<tr>
<td>Sandringham to South Yarra</td>
<td>11</td>
<td>98,000</td>
</tr>
<tr>
<td>Frankston to Caulfield</td>
<td>19</td>
<td>151,000</td>
</tr>
<tr>
<td>Pakenham to Dandenong</td>
<td>7</td>
<td>54,000</td>
</tr>
<tr>
<td>Epping to Clifton Hill</td>
<td>14</td>
<td>100,000</td>
</tr>
<tr>
<td>Glen Waverley to Burley</td>
<td>12</td>
<td>65,000</td>
</tr>
<tr>
<td>Belgrave to Ringwood</td>
<td>8</td>
<td>52,000</td>
</tr>
<tr>
<td>Cranbourne to Dandenong</td>
<td>4</td>
<td>25,000</td>
</tr>
<tr>
<td>Hurstbridge to Clifton Hill</td>
<td>17</td>
<td>94,000</td>
</tr>
</tbody>
</table>

Source: VITM modelling of Rowville rail line

---

53 As part of the Melbourne Metro project, a pair of nine kilometres tunnels will be built between South Yarra and Kensington. This tunnel will allow Cranbourne and Pakenham trains to bypass the congestion at City Loop and increase their frequency. Source: [https://metrotunnel.vic.gov.au/about-the-project/benefits-for-your-train-line](https://metrotunnel.vic.gov.au/about-the-project/benefits-for-your-train-line)


As the table indicates, the weekday patronage per station between Huntingdale and Rowville is projected to be significantly higher than that of some existing stations.

Figure 12 Catchment area for the Rowville rail

---

The biggest trip generators for this line are expected to be:

- Monash University Clayton
- City of Monash
- City of Knox
- Rowville

Section 3.3.1 Monash University Clayton
As Australia’s largest university, Monash University is expected to be the biggest trip generator this line. 53,000 people visit the Clayton campus on any given weekday\(^5\)
There are 42,738 students enrolled at the Clayton campus\(^5\)

Buses are the main public transport connection to the university. Currently 12 bus routes service Monash university. Huntingdale is the closest station to the university. The 601 bus which runs between Huntingdale and Monash University. With over 7,600 users a day, 601 is the busiest bus service in Victoria\(^5\). This is a 109% increase in patronage since its introduction in 2011\(^6\). It only runs on weekday only service with a frequency of 4 minutes during semesters and 12 minutes between semesters. Despite this frequency, there are often long queues for the bus.

Figure 13 Buses servicing Monash University Clayton\(^5\)

<table>
<thead>
<tr>
<th>Route No.</th>
<th>Route</th>
<th>Nearest stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>601(^*)</td>
<td>Huntingdale – Monash University</td>
<td>Monash University/Wellington Rd</td>
</tr>
<tr>
<td>630</td>
<td>Elwood – Monash University</td>
<td>Monash University/Wellington Rd</td>
</tr>
<tr>
<td>631</td>
<td>Southland SC – Waverley Gardens SC</td>
<td>Monash University/Wellington Rd</td>
</tr>
<tr>
<td>703</td>
<td>Middle Brighton – Blackburn [SmartBus]</td>
<td>Monash University/Wellington Rd</td>
</tr>
<tr>
<td>733</td>
<td>Oakleigh – Box Hill</td>
<td>Monash University/Wellington Rd</td>
</tr>
<tr>
<td>737</td>
<td>Croydon – Monash University</td>
<td>Monash University/Wellington Rd</td>
</tr>
<tr>
<td>742</td>
<td>Eastland SC – Chadstone SC</td>
<td>Monash University/Research Way</td>
</tr>
<tr>
<td>800</td>
<td>Dandenong – Chadstone SC</td>
<td>Wellington Rd/Princes Hwy</td>
</tr>
<tr>
<td>802, 804, 862</td>
<td>Dandenong – Chadstone SC</td>
<td>Monash University/Wellington Rd</td>
</tr>
<tr>
<td>900</td>
<td>Rowville – Caulfield [SmartBus]</td>
<td>Monash University/Wellington Rd</td>
</tr>
</tbody>
</table>

\(^5\) Monash University, “Monash University welcomes proposal for dedicated light rail”, April 10\(^th\), 2018


\(^5\) Monash University, “The 601 bus service remains popular”, May 25\(^th\), 2016.

\(^6\) Ibid

The university supplements these buses by running free campus shuttles between Clayton and Caulfield campuses and from Clayton to its Peninsula campus. The Clayton-Caulfield shuttle runs every 15 to 25 minutes. It is a very popular service with most buses filled and no standing room available. The high volume of usage of both public and university buses indicates that there is a strong demand for public transport access to the university.

Lack of reliable transport options leaves many of the staff and students with no alternative but to drive to campus. Commuting to Clayton by public transport, especially from the western and northern suburbs can be an onerous task requiring multiple changes of trains and buses. Driving is therefore understandably a more convenient option.

Annual parking permits at Clayton cost between $460 to $1512 for staff and $421 for students. The steep permit costs can put financial burden on students who may be struggling financially but have no viable alternative transport options. Despite paying the high permit costs, many students struggle daily to find a parking spot.

Source: Daniel Bowen, 2018


Monash University, 2019 parking permits https://www.monash.edu/people/transport-parking/parking/parking-permits
Monash University has been campaigning for better public transport connections and it strongly supports the Rowville rail⁶⁴.

**Section 3.3.2 City of Monash and City of Knox**
As shown in figure 12, the cities of Monash and Knox are expected to be important sources of demand for the tram line. Both councils have been active campaigners for the Rowville rail. They have since adopted motions supporting the train line⁶⁵. This section discusses the demographics of the 2 councils.

*Table 1 Demographics of Monash and Knox Council⁶⁶*

<table>
<thead>
<tr>
<th></th>
<th>City of Monash</th>
<th>City of Knox</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>196,856</td>
<td>161,842</td>
</tr>
<tr>
<td>Population density</td>
<td>24.57 people per hectare</td>
<td>13.12 people per hectare</td>
</tr>
<tr>
<td>Labour Force</td>
<td>87,329</td>
<td>81,932</td>
</tr>
<tr>
<td>Number of registered businesses</td>
<td>20,420</td>
<td>13,411</td>
</tr>
<tr>
<td>Number of registered cars</td>
<td>122,861</td>
<td>105,285</td>
</tr>
<tr>
<td>Number of people driving to work</td>
<td>51,775</td>
<td>58,114</td>
</tr>
<tr>
<td>Number of train/trams only commuters</td>
<td>7,528</td>
<td>2,727</td>
</tr>
<tr>
<td>Number of bus commuters only</td>
<td>1,441</td>
<td>773</td>
</tr>
<tr>
<td>Number of people using a combination of public transport</td>
<td>5,367</td>
<td>3,410</td>
</tr>
<tr>
<td>Commuting by other modes including walking, cycling, motorbike and taxi</td>
<td>2,970</td>
<td>1,605</td>
</tr>
<tr>
<td>Median commuting distance from place of residence</td>
<td>11.6 km</td>
<td>11.1 km</td>
</tr>
<tr>
<td>Average commuting distance from place of residence</td>
<td>13.3 km</td>
<td>13 km</td>
</tr>
</tbody>
</table>

---


The top 3 employment destinations for Monash council residents are Monash council (29%), CBD (18.1%) and the city of Greater Dandenong (6.6%). Nearly 70% of all residents travel outside the council for work, with the majority driving to work.

Source: Profile. Id

Source: profile.id, City of Monash

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67. id The population experts, City of Monash: Resident’s place of work

There are 4 train lines that service the area. There is also an extensive bus network within the council.

Source: PTV\textsuperscript{69}

\textsuperscript{69} Public Transport Victoria, City of Monash.  
65% of employed Knox residents work outside the council area. The 3 major employment destinations are Knox (29.6%), Monash (11.3%) and the CBD (9.7%). Like for Monash council, driving is the common form of transport to work.

Source: Profile.id City of Knox

Profile.id The population experts, City of Knox: Resident’s place of work

Profile.id The population experts, City of Knox: Method of travel to work
Figure 20 Public transport for Knox

Source: PTV

72 Public Transport Victoria, City of Knox https://www.ptv.vic.gov.au/assets/default-site/more/maps/Local-area-maps/Metropolitan/df3b689c21/24_Knox_LAM.pdf
Unlike Monash council, Knox is not well-serviced by trains. The Cranbourne/Pakenham lines and Belgrave lines traverse through the edge of the council boundaries. Buses are the main public transport providers for the Knox council. Lack of reliable transport leaves many people unable to access required services and employment and social opportunities\(^73\).

**Section 3.3.3 Rowville suburb**
Rowville is located about 26 kilometres from the CBD, making it an outer suburb. It falls within the Knox city council. It has a population of 35,150 as of 2016. There is a very high rate of car ownership. Nearly 95% of households have at least one car, with over 73% having access to 2 or more cars. 65% of employed people work outside of Rowville, with the majority driving to work. The top 3 employment destinations are similar to that of Council as a whole: Knox council (29.6%), Monash council (11.3%) and Melbourne CBD (9.7%).

*Figure 21 Rowville method of commute*

[Diagram showing method of travel to work, 2016]

Source: Profile.id, Suburb of Rowville\(^74\)

\(^73\) Interview with Matthew Hanrahan, Manager - Sustainable Infrastructure Knox city council, May 8, 2019.

Figure 22 Public transport in Rowville

Source: PTV

Public Transport Victoria, City of Knox: [https://www.ptv.vic.gov.au/assets/default-site/more/maps/Local-area-maps/Metropolitan/df3b689c21/24_Knox_LAM.pdf](https://www.ptv.vic.gov.au/assets/default-site/more/maps/Local-area-maps/Metropolitan/df3b689c21/24_Knox_LAM.pdf)
Traffic congestion is a serious problem in Rowville due to the heavy car dependency. Only 5% of Rowville residents used public transport to get to work. This also increases the occurrence of traffic incidents, some of which can be fatal.

Planning document Melbourne 2030 identifies Rowville as a ‘major activity centre’. These are defined as “places that provide a suburban focal point for services, employment, housing, public transport and social interaction”. Several prominent businesses are headquartered in Rowville, within 10 minutes of the proposed station. These include:

- Parmalat Dairy manufacturing and distribution office
- Sigma pharmaceuticals head office

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76 Sinclair Knight Mertz, Rowville Transport Study, prepared for Knox City Council, 2013


78 ibid

79 Department of Environment, Land, Water and Planning, Activity Centres Overview
• A recently opened Darrell Lea chocolate “centre of excellence”\textsuperscript{80}
• Head office for Twinning Australia
• Distribution centre and office for refrigerated truck company Cold Xpress

Stud Park shopping centre is also an important activity centre, with over 60 businesses, a council library and supermarkets located there.

The primary argument against a train line is Rowville’s low population density. Infrastructure Australia believes the train line is not feasible and will only return $0.30 to $0.50 of every dollar invested. However, Knox council has plans in place to increase density and attract new development\textsuperscript{81}. They are, however, constrained by the lack of reliable public transport to the area. This leads to a chicken or egg situation where a train line is not justified due to low-density and the council cannot increase density due to transport limitations.

The train line can generate several benefits that can promote economic development in the region. Benefits and limitations of the line are discussed in section 5.

\textbf{Section 3.4 Cost of construction}

The cost of construction for a double track link to Rowville was estimated to be around $2.09 billion, with the breakdown of the cost as below\textsuperscript{82}:

\textit{Table 2 Cost breakdown of Rowville Rail}

<table>
<thead>
<tr>
<th></th>
<th>Length (in kms)</th>
<th>Cost ($mn per km)</th>
<th>Total Cost ($ mn) by municipality of rail construction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Monash (C)</td>
<td>Knox (C)</td>
<td>Monash (C)</td>
</tr>
<tr>
<td>Below ground</td>
<td>5.5</td>
<td>2.0</td>
<td>$200 mn</td>
</tr>
<tr>
<td>Above ground</td>
<td>4.4</td>
<td>1.5</td>
<td>$100 mn</td>
</tr>
<tr>
<td>Total</td>
<td>9.9</td>
<td>3.5</td>
<td>$300 mn</td>
</tr>
</tbody>
</table>

The cost of constructing stations was estimated to be $200 million each. So, the four proposed stations would add $800 million over the $2.09 billion cost for the train line.

\textsuperscript{80} Ian Royall, “Darrell Lea chocolates coming back after a rocky road”, \textit{The Daily Telegraph}, October 24\textsuperscript{th}, 2018

\textsuperscript{81} Interview with Mr Hanrahan, Knox council.

These costs were estimated in 2013 and may no longer to accurate. As highlighted earlier, it is beyond the scope of this report to undertake an accurate cost-benefit analysis due to lack of publicly available current information.
Section 4: Analysis of Caulfield to Rowville tram

The Andrews government announced the construction of a new tram line between Caulfield and Rowville. The 18-kilometre route is proposed to service some of Melbourne’s most visited and economically important destinations such as Chadstone shopping, Monash University Clayton and the Monash NEIC. Monash NEIC has the largest concentration of jobs outside the Melbourne CBD. Despite this, it is lacking in reliable public transport access. As will be discussed below, this corridor can greatly benefit from the proposed tram.

Trams were once a feature across many Australian cities, but they were gradually phased out following the end of petrol rationing and increasing affordability of cars in the 1950s. However, trams are now making a comeback with cities like Sydney, Newcastle, Canberra and the Gold Coast spending billions of dollars to establish their light rail networks.

As previously mentioned, Melbourne's tram network is biased towards the CBD and inner suburbs. New tram routes, like the Caulfield – Rowville route will help public transport more accessible. Currently, bus route 900 runs along the same proposed route between Caulfield and Rowville. Being a Smart Bus, it has more frequency than conventional buses. It has a weekday frequency of 10 minutes and 30 minutes on weekends. However, it follows a meandering route in some sections of the journey, pushing the total journey time to 55 minutes, not accounting for traffic. This makes it unattractive to many users. The tram is expected to take 40 minutes to complete the journey and provide a significantly higher frequency.

Trams routes are expensive to build, and their construction can be justified only if there is sufficient demand along the routes. The presence of major trip generating locations can make a tram more viable. The following section discusses the major trip generators for the tram: Chadstone Shopping Centre and the Monash NEIC. Monash University Clayton is discussed in the Monash Rail chapter.

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83 ibid
84 Public Transport Victoria, 900 Stud Park SC Timetable, https://www.ptv.vic.gov.au/route/services/12753/900-rowville-caulfield-via-monash-university-and-chadstone/#RoutePage:::datetime=2019-06-16T05%3A54%3A00Z&direction_id=291&stop_id=14323&_auth=d8254ca68ee55e94154a3e82d5ea064a5f7a10840b01cac090c622f81c5aa1
Section 4.1 Major trip generators for the tram line

Section 4.1.1 Chadstone Shopping Centre

Chadstone is Australia’s largest shopping centre and one of the largest in the southern hemisphere. Chadstone recorded more than $2 billion in annual sales in the 2017-18 financial year, which ranks it amongst the top five malls in the world in terms of sales⁸⁶. The centre expects 23 million customer visits this year⁸⁷. Nearly 450,000 international tourists visit Chadstone each year⁸⁸. The shopping centre is a major employer as well, with 2,500 people working at Chadstone’s office towers and 4,500 retail workers at peak times⁸⁹. To accommodate parking requirements for its employees and visitors, Chadstone has had to keep expanding its car parks. Currently, it has 10,500 parking spots. This makes it the third largest carpark in Australia, behind Sydney airport and Melbourne airport⁹⁰. Despite this number, visitors often struggle to find free parking spots.

Figure 25 Parking at Chadstone shopping centre


⁸⁹ Interview with Michael Whitehead, Centre Manager- Chadstone Shopping Centre, May 8th, 2019.

⁹⁰ ibid
Current public transport connectivity

The nearest station to Chadstone is Hughesdale, which is 900 metres away. Buses are the main mode of transport to Chadstone. Currently there are 14 bus routes that go through Chadstone each day. However, the frequency of most buses is very low. Even on weekdays, some buses only run twice an hour. This drops to one service an hour on weekends. Some buses do not run at all on Sundays and public holidays, which are arguably the busier days for a shopping centre. Buses run on Sunday frequency even on Boxing Day, which is the busiest day of the year for Chadstone. In 2017, 170,000 people were expected to visit Chadstone on Boxing Day. There were no additional bus services added to cater to the large number of visitors. By contrast, extra train services were added to accommodate the 88,172 people that attended the Boxing Day cricket match at the Melbourne Cricket Ground (MCG).

Chadstone supplements buses by providing free tourist shuttles from the Melbourne CBD to Chadstone. Chadstone management strongly support the tram proposal. They have been lobbying the government to explore better transport options to accommodate their increasing number of visitors.

Buses to Chadstone face the same issues that buses everywhere in Melbourne face. Their limited frequency is compounded by the fact they do not have on-road priority and get caught up in congestion. They also usually travel on long, indirect routes going via side streets. While this increases public transport coverage, it also increases travel time for passengers on board. These factors combined make buses an unappealing transport option.

“An average Saturday for us is 85,000 people, which is equivalent to what you would get at an MCG. And look at the public transport infrastructure that goes into a game at the MCG. Extra trains, extra trams, everything. At Chadstone, we have nowhere near that structure.”

- Interview with Chadstone management, 8th May 2018.

94 Ibid
Currently, only 6% of visitors to Chadstone use public transport to get there. This equates to nearly 1.4 million trips on buses. Melbourne trams generally enjoy a higher patronage compared to buses. It is thus likely that patron for the proposed route would be even higher than 1.4 million trips a year, from Chadstone shopping centre alone.

Section 4.1.2 Monash National Employment and Innovation Cluster

The concept of National Employment and Innovation Clusters (NEIC) was first introduced in Plan Melbourne. These clusters are defined as "a small number of high tech/ knowledge based inner/middle urban activity clusters, which form the basis for a polycentric city and focal points for inner/middle urban growth." Plan Melbourne identified 7 such clusters:

- Monash
- Dandenong
- Werribee
- La Trobe
- Parkville
- Sunshine
- Fisherman’s Bend

The Monash cluster is the largest in Melbourne, with the highest concentration of jobs outside the Melbourne CBD. There are prominent institutions from various industries based here.

Some of these include:

![Image of various companies](https://vpa.vic.gov.au/project/monash-employment-cluster/)

The cluster collectively employs approximately 75,000 people and contributes over $9.4 billion to the Victorian economy. As shown below, the cluster attracts employees from all over Melbourne.

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95 Interview with Michael Whitehead, Chadstone
Its lack of reliable public transport and proximity to major roads such as the Monash freeway, Dandenong Road and Wellington road make driving to work an attractive option. 89% of all employees drive to work\textsuperscript{97}.

\textit{Figure 27 Mode of journey to work for NEIC employees}

\textsuperscript{97} Steve Dunn, “Delivering a polycentric city”, Metropolitan Planning Authority, 2016. 
Poor transport links have been identified as the cluster’s greatest weakness, with a study finding it is the biggest barrier in attracting new businesses to the area. There are ambitious plans to establish this cluster as a centre with the highest job density outside of a capital CBD in Australia. Improving transport connections can attract more businesses and employees to the region and can unlock the full economic potential of this cluster.

Monash university, as described in the previous chapter, is another major source of patronage for the tram. There are several student accommodations near Monash university’s Caulfield and Clayton campuses. These students, many of whom are international students without access to a car, are other potential users of the tram. Many of these students frequent Chadstone shopping centre between classes. Education is Australia’s third largest export and the number of international students in Melbourne is expected to grow strongly. Monash University has strong plans for future growth. University students are more likely to use public transport, where it is available, to commute to university, as demonstrated by figure 28. Providing a reliable public transport connection can give students the freedom to travel and increase public transport patronage.

*Figure 28 Proportion of students taking public transport*

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99 ibid


101 Interview with Mr Michael Whitehead, Chadstone shopping centre, May 8th, 2019.


103 Interview with Professor Graham Currie, May 6th 2019.

Section 4.2 Route specification

While technical aspects of construction are beyond the scope of this report, the following section analyses some factors that could be implemented to improve efficiency of the route.

The proposed tram line will run parallel to the Cranbourne/Pakenham rail corridor. Trains can offer significant time savings compared to trams. Nearly 80% of Melbourne’s tram network operates in mixed traffic and trams often face delays due to congestion. Melbourne’s trams have an average speed of 16 kilometres an hour, making them one of the slowest in the world. There are certain features that can enable trams to have higher average operating speeds which include:

**Segregated right of way:** 40% of a tram’s operating time is spent in congestion, which increases journey times and reduces average operating speed and punctuality. In segregated routes, such as the route 75 along Burwood road, trams can reach average speeds up to 30 kilometres an hour. Segregated routes also mean that trams can avoid getting stuck behind right turning vehicles. The median strip along Dandenong and Wellington roads provide the opportunity for dedicated tram lanes.

**Increased distance between stops:** the average distance between tram stops in Melbourne is 250 metres. This prevents trams from picking up speed as they need to stop often. Intersections along Dandenong road are at a significant distance from each other. Constructing tram stops only at intersections would enable trams to run faster over longer distances.

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105 ibid
107 Interview with Professor Graham Currie, May 6th, 2019.
**Signalling priority and stop placement:** Trams spend nearly 17% of their operating time at traffic lights. Traffic lights in cities like Zurich, Switzerland detect oncoming trams and provide them with priority to clear intersections, often without needing the tram to slow down\(^{108}\). Installing such automated systems along the proposed routes can also boost speeds for trams. Tram stops should also be placed after the intersection, not before\(^{109}\). Currently, despite having a green light, trams need to stop at intersections for passengers to disembark and board. This often leads to trams missing the signal. Placing stops after clearing intersections can help ensure that green lights are not ‘wasted’.

The suggested route along Dandenong and Wellington roads has the potential to fulfil these conditions and make trams competitive compared to cars and trains.

**Section 4.3 Cost of construction**

In 2014, the Victorian Department of Treasury and Finance estimated the construction cost of one kilometre of tram tracks to be approximately $15 million AUD\(^{110}\). This equates to roughly $16.1 million in 2019 dollars. This figure is used due to lack of other publicly available costings for this tram route. Other additional costs associated with construction are\(^{111}\):

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform tram stops</td>
<td>$1.7 million each</td>
</tr>
<tr>
<td>Work at major intersections</td>
<td>$2.8 million each</td>
</tr>
<tr>
<td>Substations to provide required electric power (one every 5 kilometres)</td>
<td>$5 million each</td>
</tr>
<tr>
<td>Terminus works, on either end</td>
<td>$5 million each</td>
</tr>
</tbody>
</table>

For an 18 kilometre, the basic construction cost (excluding the costs in the table) would be: 18 kilometres * $16.1 million = $289.8 million. E-class trams, that are proposed to be used along this route, cost $7 million each\(^{112}\). Purchasing new trams might be another cost to consider. Estimation of the total cost is beyond the scope of this report as this depends on the number of stops along the route and actual route itself.

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109 Interview with Professor Graham Currie, May 6\(^{th}\), 2019.


111 Ibid

112 Interview with Professor Graham Currie, May 6\(^{th}\), 2019.
Section 5: Comparison of the two proposals

The proposals of both tram and train have significant merit. There are some common benefits that both the tram and train can provide, including:

- Both projects will generate employment during the construction phase and ongoing employment for operational and maintenance procedures.
- Introducing public transport connections can stimulate investment and economic development. Trams and trains can also boost property prices. A study found that trams can push up prices for properties within 800 metres of a tram line by 30%\textsuperscript{113}. The Gold Coast tram line is a prime example of this. Since its introduction, there has been economic development worth $5 billion along the tram corridor\textsuperscript{114}. In Perth, the Mandurah line was constructed in a low-density region, which has since seen strong development along the train line\textsuperscript{115}.
- Public transport projects can reduce congestion and lead to positive environmental effects.

Benefits of trams over trains

- The biggest advantage of tram over train is that trams can service Chadstone shopping centre. Trams can also stop more often than trains, giving access to more locations.
- Construction of tram will also be quicker than trains. As stated earlier, the earliest the rail can be operational is 2029. The tram line can be operational within four years.
- Trams can provide much better frequency than trains or buses. The Caulfield-Rowville tram is proposed to run every 4 minutes during peak hours.
- Chadstone and Monash university both have significant plans for expansion in the future. This will provide sustained demand for the tram line.
- A segregated tram line can significantly reduce travel time between Caulfield and Rowville.
- A desirable feature of public transport systems is having a network effect where one service can connect to a range of other services\textsuperscript{116}. There are significant opportunities along the tram line to provide this. Chadstone shopping centre, Stud Park shopping

\textsuperscript{113} Matthew Burke, “Why Gold Coast light rail was worth it (its about more than patronage) The Conversation, https://theconversation.com/why-gold-coast-light-rail-was-worth-it-its-about-more-than-patronage-78190
\textsuperscript{114} ibid
centre and Monash University have a significant bus interchange that can enhance the network effect.

Limitations of the tram

- Construction of the line will require significant disruption to traffic along some of Melbourne’s busiest routes.
- The median strip along Dandenong and Wellington roads is quite narrow in some places. This will necessitate taking lanes away from traffic to accommodate the tram, if the tram were to have a segregated route.
- The tram will not be beneficial to people wanting to travel to the city from Rowville.
- There are trees planted along the median strip that will need to be uprooted to accommodate the tram. This could create an adverse environmental impact.

Benefits of the train line

- Trains are the fastest mode of public transport in Melbourne. The Rowville rail will reduce travel times to the city by 30 minutes.
- Rowville’s proximity to major employment centres such as the Monash NEIC can encourage people to settle there, which will increase density in the area. The increased density can increase the financial viability of the train line.
- As with the tram, the presence of bus interchanges at Monash university and at Stud Park can increase the network effect.
- Most of the land required for this project is already public land. There will be no acquisition of private property required.
- Train lines are proven to increase density and attract investment to the region.

Potential shortcomings of the train

- Construction will take a considerably long time. It will take at least a decade for the line to be operational.
- Infrastructure Victoria believes that the line is not economically viable as Rowville is a low-density suburb.\(^{117}\) This issue is however being addressed by the Knox council with active plans to increase density in the area.
- It is estimated to cost $100 million per kilometre for above ground and $200 million per kilometre for underground construction. This does not include the cost of trains

\(^{117}\) Infrastructure Victoria, *Victoria’s draft 30-year infrastructure strategy*, October 2016
required for this line. The cost of construction of the train will be significantly higher than that of a tram line.

- This line is expected to induce only 1% of drivers to switch to using public transport\(^{118}\). Most of the patronage will be from people currently using other train lines. However, the reduced over-crowding on other train lines can be a stimulant for demand on those lines. So, while there may not be mode shift in Rowville, the benefits could still be felt elsewhere.

**Final recommendation**

This report recommends that the tram line should be constructed. There are significant demand generators along the route that can underwrite the financial viability of the tram. Engineering wise as well, construction is feasible along the proposed route. Further research into trackless trams should be undertaken as well.

With regards to the train line, this report recommends that a thorough business case be undertaken to establish the economic feasibility of the train. Ideally, this business case should be completed well in advance of 2025, when the required capacity will be available on the train network with the completion of the Melbourne Metro tunnel.

Transport planning strategy in Australia has so far been to wait for people to move into a suburb before providing infrastructure. This strategy, as discussed earlier, is putting enormous pressure on existing infrastructure and depriving people of the required transport connections. In order to cope with the predicted population increase, transport planning needs to be proactive and start taking steps now that will be hugely beneficial in the future.

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