Strategic Transport and Traffic Modelling Expert Evidence
Prepared by Peter Dunn

In the matter of the North East Link Inquiry and Advisory Committee

Instructed By Maddocks Lawyers
Expert Witness Statement - Strategic Transport and Traffic Modelling
Rep/268222/S003

Expert Witness Statement

| 15 July 2019

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 255822-00

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1 Information pursuant to expert evidence guide

1.1 This report

1.1.1 This is an expert witness report for the Joint Inquiry and Advisory Committee (IAC) for the North East Link (the project) relating to strategic transport and traffic modelling. The structure of the report is as follows:

- Information pursuant to expert evidence guide: Provides details required for an Expert Witness Report including my qualifications and experience, my instructions and a summary of my key findings;
- Introduction: Provides background to the project, my approach and assumptions I have used in providing this evidence;
- Strategic context: Outlines my review of the strategic and policy context applied for the project;
- Project framework: Presents my review of the project assessment framework and the extent that the project is addressing the problem outlined in the Business Case and the Environmental Effects Statement (EES);
- Strategic transport modelling: Outlines my review of the strategic transport modelling that informs the business case and the project design presented in the EES;
- North East Link traffic forecasts and performance: Contains my assessment of the traffic projections for the project in 2036 presented in the EES;
- Local area impacts: Outlines my assessment of the potential project impacts on the adjacent transport network; and
- Conclusion: Summarises my findings and recommended actions.

1.2 Name and Address

1.2.1 My name is Peter Dunn. I am an Associate Principal with Arup Australia Pty Ltd (Arup) practicing from 151 Clarence Street Sydney, NSW.

1.3 Qualifications and Expertise

1.3.1 I am an Associate Principal with Arup and a Member of the Institution of Engineers Australia and hold a degree in Engineering (Civil). I have over 30 years’ experience directing and managing a wide range of strategic transport planning and transport modelling studies in Australia and overseas. My overseas experience includes major transport studies in UK, Ireland, Hong Kong, North America and New Zealand.
1.3.2 My area of expertise is strategic transport planning and transport modelling which I have applied to a number of major city planning and major infrastructure projects over my 30-year career. I have strong knowledge of the Melbourne transport planning and modelling environment and the study area itself having resided in the outer north east of Melbourne for a substantial part of my career.

1.3.3 A copy of my curriculum vitae with relevant experience is attached in Appendix A.

1.4 Key contributors

1.4.1 I prepared this report with the assistance of the following at Arup:

<table>
<thead>
<tr>
<th>Team member</th>
<th>Title</th>
<th>Tasks</th>
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</thead>
<tbody>
<tr>
<td>Paul Carter</td>
<td>Associate Principal</td>
<td>Transport planning and traffic engineering</td>
</tr>
<tr>
<td>Bruce Johnson</td>
<td>Principal</td>
<td>Strategic transport planning and modelling</td>
</tr>
<tr>
<td>Fiona Grant</td>
<td>Transport Planner</td>
<td>Analytical support</td>
</tr>
<tr>
<td>Annabel Kerr</td>
<td>Transport Planner</td>
<td>Analytical support</td>
</tr>
</tbody>
</table>

1.4.2 The qualifications and experience of these key contributors are provided at Appendix B.

1.5 Instruction which defined the scope of this report

1.5.1 I have been requested by Maddocks Lawyers by letter of instruction dated 27 June 2019, on behalf of Banyule, Whitehorse and Boroondara Councils, to provide expert evidence in the area of strategic transport and traffic modelling. Specifically, I have been asked to – “prepare an expert witness report that contains your opinion on the following matters, as relevant to your area of expertise:

1.5.2 (a) does the traffic modelling in the EES adequately document and assess the nature and extent of the traffic and transport and greenhouse impacts of the Project? In addressing this question please explain where you are satisfied with the content of the EES and why, and if not, what if any deficiencies exist in the documentation and/or assessment of the nature and extent of the traffic and transport impacts contained in the EES;

1.5.3 (b) can the Project as described in the EES achieve a level of traffic and transport performance which is consistent with relevant legislation, documented and endorsed policy or acknowledged best practice? if the Project, as described in the EES cannot achieve a level of traffic and transport performance which is
consistent with relevant legislation, documented and endorsed policy or acknowledged best practice, are there any recommendations that you would make as to specific measures which you consider necessary and/or appropriate to prevent, mitigate and/or offset adverse effects? If so, please explain your reasoning in detail. To the extent that it is within your expertise to comment upon the feasibility of any of your recommendations, please state whether or not any recommendations are feasible, explaining your reasoning.

1.5.4 (c) to the extent that the content of the draft planning scheme amendment, works approval application or environmental performance requirements (EPRs) lies within your expertise, do you have any recommendations for changes that should be made to the draft planning scheme amendment, works approval or planning approval and/or EPRs in order to improve the environmental outcome of the Project.”

1.5.5 To this end I have prepared and completed an expert witness report based on the outcomes of my assessment.

1.6 Facts, matters and assumptions relied upon

1.6.1 I have familiarised myself the subject study area and the relevant EES and Business Case material provided by the North East Link Project (NELP).

1.6.2 I have not undertaken a peer review of transport models, but have relied upon the peer reviews commissioned by NELP and particularly acknowledge the transport model review undertaken by Luis Willumsen.

1.6.3 In the course of my investigations I have:

a) Reviewed project documents and plans provided by Maddocks Lawyers including publicly available documentation of the North East Link (NEL) Business Case and Environment Effects Statement (EES);

b) In particular, I have reviewed the Technical Report A: Traffic and Transport Impact Assessment (TTIA), Chapter 9: Traffic and Transport of the EES, the peer reviews undertaken by Luis Willumsen on the strategic transport modelling and the publicly available Business Case reports;

c) Reviewed relevant legislation and policy documents such as the Transport Integration Act, Plan Melbourne and the Victorian Infrastructure Plan;

d) Drawn upon best practice guidelines such as Austroads Guidelines to inform my findings; and

e) Instructed staff members to assist with my assessment of the project.

1.7 Documents taken into account

1.7.1 The following documents have been used for reference:
1.7.2 Documents prepared by Maddocks Lawyers, which include:

- Submission on North East Link Project: Environment Effects Statement Works Approval Application and Draft Planning Scheme Amendment, on behalf of Banyule City Council, Boroondara City Council and Whitehorse City Council;
- Additional information by NELP in response to submitters.

1.7.3 Documents prepared and submitted for the EES which include:

- EES Summary Report; and
- EES Main Report – Chapter 9 Transport.

1.7.4 Documents prepared for the business case:

- NEL Business Case Executive Summary;
- Appendix K: Transport Assessment Project Case Report; and
- Appendix R: Transport Modelling Report.

1.7.5 Transport Model Peer Review Report prepared by Luis Willumsen.

1.8 Summary of my opinions

1.8.1 My approach to the review has been based on key policy documents that guide Victoria and Melbourne’s future development. I have not undertaken peer review of models, but rather rely upon, the documentation provided by NELP and applying best practice to my review of the EES findings and outcomes related to transport and traffic. Whilst I agree with many areas relating to transport and traffic modelling presented in the EES, this statement focuses on key issues that I consider have not been addressed satisfactorily in the EES. I believe that proper consideration of these issues will influence the outcomes of the EES and could materially affect both the project design and the outcome of the project for the community. I am concerned about both the strategic and technical aspects of the NEL EES and these concerns are outlined in detail in the following sections of this report. My key findings from the assessment are summarised as follows:

1.8.2 **NEL has been developed in isolation and not as part of an integrated solution to address the identified problem.** NELP has not fully considered the needs of the places and communities within the study area, nor has it considered complementary public transport and travel demand management initiatives with North East Link as a package to deliver the best outcome. The outcome it provides for the community is therefore one-dimensional and not in line with the objectives and principles outlined in the Transport Integration Act 2010 (VIC) (TIA). In my opinion consideration of alternative and/or complementary transport
measures that could address some of the identified issues in the EES would lead to a more effective and less impactful North East Link project.

1.8.3 The process to develop a preferred solution is flawed and the project has expanded to address a range of issues beyond the problem it was originally trying to solve. The project lacks a longer term strategic narrative that connects it to the objectives laid out in Melbourne’s blueprint for the future (Plan Melbourne). My observation is that the project is not contained to addressing the problem stated in the Business Case and EES. The project has expanded beyond its primary objective to facilitate orbital travel between the outer northern suburbs and the south-east of Melbourne, to also enhancing private vehicle travel on the Eastern Freeway servicing the CBD and nearby areas.

1.8.4 There is a high degree of uncertainty in the traffic forecasts for 2036: In my opinion the information provided in the EES does not provide confidence that the evidence accounts for the high degree of uncertainty in the forecasts. Small changes in the demand could result in different project design outcomes, particularly for a network approaching capacity. Willumsen’s peer review highlights that the model potentially overestimates traffic levels in the peak periods and the model’s forecasts suggest a bias toward higher traffic demand compared to public transport modes. While sensitivity tests were conducted in the EES there is no evidence that these considerations impacted the project design presented in the EES.

1.8.5 Traffic forecasts on North East Link are likely high in 2036: The uncertainties in traffic forecasts likely result in higher than expected traffic forecasts on North East Link and connecting motorways in 2036. There are a range of strategic and technical contributing factors that influence my view. A complementary public transport strategy has not been developed to address the deficiencies of public transport access across the Yarra River crossings. This is a well documented problem that the State Government is currently investigating with the Suburban Rail Loop. I would have expected both the Business Case and EES to consider further public transport initiatives, travel demand management measures and other policy measures as part of a package of measures for 2036. In my opinion, this would reduce private vehicle travel demand on North East Link in 2036 and in future years.

1.8.6 In my opinion the supporting road network beyond the defined project boundary is unlikely to have capacity to feed the forecast traffic volumes on NEL. The limitations of the strategic model, which does not model intersections or bottlenecks in detail, results in higher forecasts than the network can accommodate in the peak period. For example, capacity constraints at locations such as Hoddle Street will restrict the traffic able to get to and from the motorway network.
1.8.7 NEL is likely to be overdesigned for 2036: In my opinion the uncertainty in the strategic modelling forecasts leads to higher than expected traffic volumes in 2036. The analysis presented in the EES also suggests a higher Level of Service at the design year in some locations compared to generally accepted practice. These issues in combination would have a consequential impact on the project footprint that may contribute unnecessarily to some of the project’s adverse environmental or social impacts.

1.8.8 NEL will have significant impact on local centres: The business case highlights that NEL aims to protect local areas from through traffic, however there are a number of important centres that would be significantly impacted. These centres and local areas include Watsonia, Macleod, Box Hill, Blackburn and Nunawading. As the EES assesses approximately 9 years after opening (based on current published opening dates) there is potential that NEL could have an even more significant impact on local areas in the longer term.

1.9 Declaration

1.9.1 I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel.

Yours sincerely

[Signature]

Peter Dunn
Associate Principal
2 Introduction

2.1 The Project

2.1.1 As documented in the EES in Chapter 8.2 "North East Link is a proposed new freeway-standard road connection that would complete the missing link in Melbourne’s Metropolitan Ring Road, giving the city a fully completed orbital connection. North East Link would include a new north-south motorway to connect the M80 Ring Road (otherwise known as the Metropolitan Ring Road) to the Eastern Freeway, and also includes upgrades to the Eastern Freeway. The project would also support the provision of a range of complementary and associated works, such as the improvement of walking and cycling connections."

2.1.2 "The project would also improve existing bus services from Doncaster Road to Hoddle Street through the Doncaster Busway as well as pedestrian connections and the bicycle network with connected shared use paths from the M80 Ring Road to the Eastern Freeway"

2.1.3 The project has metropolitan wide significance as noted in Chapter 9 (p9-1) of the EES “It has the potential to redistribute traffic and change travel patterns in Melbourne’s north-east and across the broader metropolitan area. Benefits and impacts associated with the construction and operation of North East Link could be experienced by all types of road users, including cars, trucks, buses, on-road trams, pedestrians and cyclists.”

2.1.4 In 2018, NELP released a business case to assess the merits of the NEL investment based on a broader assessment of Melbourne’s transport needs, changing travel patterns and the evolving structure of the city. The business case identified the problems associated with the city’s transport network and the benefits of addressing those problems, with a focus on road based cross-city orbital connectivity and capacity constraints. Based on the corridor option assessment, corridor option A was selected to proceed to business case assessment and the planning and environmental approvals process.

2.1.5 The EES was developed based on the preferred option (Corridor A). As outlined in the EES the project has three elements:

- **M80 Ring Road to the northern portal** – From the M80 Ring Road at Plenty Road and the Greensborough Bypass at Plenty River Drive, North East Link would extend to the northern tunnel portal near Blamey Road using a combination of above, below and at surface road sections. New road interchanges would be provided at the M80 Ring Road and Grimshaw Street.

- **Northern portal to southern portal** – At the northern portal of the tunnel, the road would transition into twin tunnels that connect to Lower Plenty Road via
a new interchange before travelling under residential areas, Banyule Flats and the Yarra River to a new interchange at Manningham Road. The tunnel would then continue to the southern portal located south of the Veneto Club.

- Eastern Freeway – From around Hoddle Street in the west through to Springvale Road in the east, modifications to the Eastern Freeway would include widening to accommodate future traffic volumes and new dedicated bus lanes for the Doncaster Busway. A new interchange at Bulleen Road would connect North East Link to the Eastern Freeway.

2.1.6 The project also includes 25 kilometres of new and upgraded walking and cycling links.

2.1.7 The scale of the project highlights significant ramifications for Greater Melbourne that need careful consideration at a metropolitan level. It is my experience that projects of this scale need to be considered and developed in an integrated manner with other projects of significant scale, such as the Suburban Rail Loop and other major policy decisions.

2.2 Approach

2.2.1 I have reviewed the relevant chapters of the EES and supporting TTIA as well as the peer reviews commissioned by NELP. I particularly acknowledge the peer review of the Strategic Transport Model carried out by Luis Willumsen. I have also reviewed relevant sections of the Business Case. My review has focussed on the strategic transport planning and modelling aspects of the EES and I have not undertaken detailed review of operational modelling or design aspects of the study.

2.2.2 Whilst I agree with many areas relating to transport and traffic modelling presented in the EES, this statement focuses on key issues that I consider have not been addressed satisfactorily in the EES. I believe that proper consideration of these issues will influence the outcomes of the EES and materially affect both the project design and the outcome of the project for the community.

2.2.3 I began my review with an assessment of the strategic context of the project and the project assessment framework. For such a significant project that has metropolitan-wide impacts it is important to be clear about the long-term vision for Melbourne, the integrated transport response that contributes to achieving that vision and the role the project plays in that response.

2.2.4 I then reviewed the transport and traffic assessment that was documented in the EES and the implications of my findings on the traffic and transport forecasts and the potential impact on the project design documented in the EES.
2.2.5 Finally, I provide my conclusions and outline my findings and recommendations.

2.3 Assumptions and Limitations

2.3.1 My review has been based on key policy documents that guide Victoria and Melbourne’s future development.

2.3.2 I have not undertaken peer review of models, but rather rely upon the documentation provided by NELP and applied best practice to my review of the EES findings and outcomes that relate to strategic transport and traffic modelling.

2.3.3 A major limitation of my review arises from the fact that the EES documentation has explicitly avoided identifying the toll levels proposed for the project. Likewise, information around the existing and forecast traffic volumes on the connecting EastLink facility have been excluded from the EES documentation. I comment more on these issues in subsequent sections of this statement.

2.3.4 A further limitation is that the EES documentation has limited information regarding the basis of design or the key options that may have been considered during the design process. This limits the extent to which I can make any assessment on the potential feasibility and performance of alternative design options.

2.3.5 I have drawn on my experience for best practice in Australia and overseas and adopted accepted policy and guidelines used in Victoria including Plan Melbourne, Victorian 30 Year Infrastructure Plan, Transport Integration Act (TIA) and various VicRoads and Austroads guides.
3 Strategic context

3.1 Background

3.1.1 The Transport Integration Act 2010

3.1.2 The purpose of the TIA is to provide a framework for the provision of an integrated and sustainable transport system in Victoria consistent with the vision statement. The TIA provides a vision statement (section 6) as follows:

3.1.3 “The Parliament recognises the aspirations of Victorians for an integrated and sustainable transport system that contributes to an inclusive, prosperous and environmentally responsible State.”

3.1.4 The TIA specifies and defines six objectives (refer Part 2, Division 2) under the following headings:

- Social and economic inclusion;
- Economic prosperity;
- Environmental sustainability;
- Integration of transport and land use;
- Efficiency, coordination and reliability; and
- Safety and health and wellbeing.

3.1.5 The integration of transport and land use objective states that the transport system should provide for the effective integration of transport and land use and facilitate access to social and economic opportunities. In my opinion, the EES does not demonstrate that it meets the requirements of the TIA in several areas.

3.1.6 The TIA says that transport and land use should be effectively integrated to improve accessibility and transport efficiency with a focus on reducing the need for private motor vehicle transport and the extent of travel:

- Facilitating better access to, and greater mobility within, local communities; and
- The transport system should improve the amenity of communities and minimise impacts of the transport system on adjacent land uses.
3.1.7 The NEL EES does not demonstrate how NEL fits in to the wider vision for Melbourne. Aspects of the proposal, particularly the additional traffic lanes provided on the Eastern Freeway west of NEL, would encourage additional private vehicle trips where good public transport alternatives are available toward the city. In addition, the traffic volumes presented in the EES demonstrate that NEL may have significant negative impacts on some communities along the route.

3.1.8 A project of this scale could make significant impacts to safety, health and wellbeing by supporting higher levels of active transport in the corridor. Whilst the project includes several initiatives intended to support active transport, the overall modelling assessment indicates that no change to overall active mode share is expected as a result of the project. The project documentation shows limited attention to supporting such objectives.

3.1.9 It is not clear how the project incentivises freight productivity and associated benefits over short distance private vehicle trips.

3.1.10 The EES’s assessment of transport conditions in the corridor highlights the diminishing performance of on-road public transport in the corridor. However, it appears that no significant public transport upgrades, other than those in the reference case and the Doncaster Busway component of the project, have been considered in the EES. I would have expected consideration of a package of complementary public transport measures in the project area to improve public transport access for the community. This should include a redesign of the public transport system to address the problems in the study area considering, for example, a range of new rail, light rail and bus rapid transit initiatives and priority measures for on-road public transport.

3.1.11 Plan Melbourne

3.1.12 Plan Melbourne (State of Victoria 2017) provides direction as to how land use and transport should be integrated. Some key policies and directions relevant to NEL are summarised in Table 1 with my commentary on their application to the NEL EES.

Table 1: Plan Melbourne Policies and Directions

<table>
<thead>
<tr>
<th>Key directions and policies</th>
<th>Commentary</th>
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<tbody>
<tr>
<td>Provide high-quality public transport access to job rich areas</td>
<td>The strategy promotes the provision of quality services to encourage the use of public transport to access a range of jobs and services. NEL does not propose any major upgrades to the orbital public transport network.</td>
</tr>
<tr>
<td>Improve arterial road connections across Melbourne for all road users</td>
<td>The strategy notes the need to consider all road users and states in Policy 3.1.3 that “roads that service more intense land use, will prioritise walking, cycling and public transport”. This statement clearly relates to the central city. However, notwithstanding the provision of DART, the EES indicates that additional traffic lanes will be provided on the Eastern Freeway toward the central Melbourne encouraging more private vehicle travel.</td>
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<tr>
<td>Improve freight efficiency and increase capacity of gateways while protecting urban amenity</td>
<td>Recognises the importance of an efficient freight network but requires consideration and protection of urban amenity, The EES suggests NEL will protect some locations, such as Rosanna Road from truck traffic. However other locations are forecast to experience higher truck volumes on approach routes to NEL such as Erskine Road, Grimshaw Street, Diamond Creek Road, Bulleen Road, Elgar Road, Blackburn Road and Middleborough Road. These forecast increases have potential to impact on the amenity of local areas.</td>
</tr>
<tr>
<td>Improve local travel options to support 20-minute neighbourhoods</td>
<td>It is not clear how NEL will support better pedestrian and cycling links in the network. In my view there is opportunity to provide an integrated response that improves travel choice for sustainable modes of travel, mitigates the negative impacts of increased vehicular traffic to protect local neighbourhoods. This could include reducing the barrier that the existing Eastern Freeway represents for walking and cycling across the corridor.</td>
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3.1.13 By providing additional traffic lanes on the Eastern Freeway, the project design appears to contradict some key principles above – particularly the role the road network should be playing in prioritising walking, cycling and public transport in central Melbourne.

3.1.14 **Victorian Infrastructure Plan**

3.1.15 The Victorian Infrastructure Plan (VIP) responds to Infrastructure Victoria’s 30-year Infrastructure Strategy. I understand that Infrastructure Victoria’s 30-year infrastructure strategy is currently being updated and refreshed. VIP presents priorities and future directions in 9 key sectors including transport. The North East Link Business Case recognises that:
3.1.16 “In October 2017, the five-year 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.”

3.1.17 The VIP states that our transport system must develop and adapt to the changed needs of Victoria’s people and economy. Noting that “as our population grows and demographics change, so do our transport system demands” and that “we must think ahead and design new transport infrastructure with an eye to the future.”

3.1.18 The VIP vision for transport in Victoria as outlined on Page 27 of that plan is “establishing an integrated and multi-modal transport system and to invest in future transport technologies to meet the needs of Victorian commuters.” In my opinion the EES has not embraced this vision.

3.1.19 Referring to the principles of the VIP outlined in Figure 1, I believe the EES does not demonstrate it is maximising the use of existing assets as the project case has not demonstrated that it has optimised the public transport network and that policy change or demand management measures have been considered as part of the project case. I will expand on these points in later sections.
3.1.20 The NEL EES lacks consideration of current and future customers and lack of adaptability for future needs. Whilst there is a deal of uncertainty around growth, the economy and the impact of new technologies, the EES has not provided a long-term view and has limited its planning horizon to 9 years after opening.

3.1.21 Finally, the EES and Business Case has not demonstrated that it is seeking to minimise the impact of the facility on adjoining land uses or that it is seeking to reduce private vehicle trips.
4 Project assessment framework

4.1 Overview

4.1.1 I consider that the process and assumptions that the project has adopted to develop a preferred solution are flawed. As demonstrated in the previous section the project lacks a longer term strategic narrative of how it works with other land use and transport initiatives to deliver the outcomes desired by those policies. Exacerbating the problem is that the project outcome is not confined to addressing the problem stated in the Business Case and EES and it over-reaches its objectives.

4.1.2 The EES Summary report states – “North East Link aims to deliver substantial transport, economic and liveability benefits. The project has been designed to support business and jobs growth in Melbourne’s north, east and southeast, and to improve cross-city connectivity and address critical traffic, freight and amenity issues.

4.1.3 High-level project objectives guiding the development of North East Link are focused on:

- Improving connections and access for business
- Improving connections and access for residents
- Improving freight efficiency and industrial growth
- Improving safety and reducing local congestion for communities.”

4.1.4 The EES outlines the following key transport objective for North East Link in Chapter 9:

4.1.5 “The EES scoping requirements set out the following draft evaluation objective:

4.1.6 To increase transport capacity and improve connectivity to, from and through the north-east of Melbourne, particularly freight movement via the freeway network instead of local and arterial roads, while managing the effects of the project on the broader and local road, public transport, cycling and pedestrian transport networks.”
4.1.7 The business case identifies that the project is focussed on addressing cross-city orbital connectivity and capacity constraints. However, I am concerned that the project is trying to solve other problems that have not been investigated in an integrated manner. The EES has identified both public transport and traffic solutions to facilitate access to the city not as an orbital movement. The proposed additional traffic lanes on the Eastern Freeway are potentially encouraging additional vehicular access to the city which is contrary to the aims of Plan Melbourne.

4.1.8 The EES leaves an overriding impression that NEL has been developed in isolation and not as an integrated solution – focussed primarily on one project, the motorway - to solve wide ranging transport problems, rather than as an integrated response to the problem. An example of this is that little effort has been made to consider significant improvements to the orbital public transport system including on-road public transport priority to service cross town customers.

4.1.9 A place-based business case approach such as that being applied in New Zealand and the United Kingdom and being adopted in New South Wales would provide a more robust approach to clearly define a package of measures to meet a strategic need, before developing the individual project business case.

4.2 Key issues

4.2.1 The design year chosen in the EES is only approximately 9 years after opening. I would expect that a project of this scale would consider a 20-year horizon after opening as a more appropriate design year. The project should have been assessed in the context of some of the potentially significant policy and infrastructure initiatives being considered. Not doing so presents the risk of project redundancy or it is not aligned to future needs.

4.2.2 The base year scenario should include other initiatives to make best use of current infrastructure and services (a principle outlined in VIP). It is reasonable to expect that managed motorway treatments such as ramp metering should have been assessed as part of the base case.
4.2.3 As noted above the project doesn’t appear to be guided by the TIA and other key policies. NEL’s role and function in the bigger picture of the metropolitan strategy is not defined and accordingly, it has not been assessed in the EES in combination with other major initiatives including public transport, and other road projects.

4.2.4 Figure 2 demonstrates that the provision of additional traffic lanes on the Eastern Freeway supports improved car access to the city and gives some of the largest travel time savings presented by the project. The morning peak travel time savings are forecast to be 11 minutes between Springvale Road and Hoddle Street and would be 6 minutes quicker than in 2017. I consider that this is not in alignment with the strategic intent of the project and would encourage more private vehicle travel into the central city, where public transport and walking and cycling should be encouraged.

![Figure 2: Travel time analysis on key routes](image)

Source: Traffic and Transport Impact Assessment: Figure 9-88, p 387

4.2.5 The EES hasn’t considered a full set of potential options and combinations of initiatives to address the problem sought to be fixed. Of concern, NEL hasn’t been grouped with a significant revamp of the public transport network or travel demand management measures which could reduce demand. In particular, it would be expected that by 2036 some significant improvement to the public transport system would be in place to address current deficiencies in the network. This is exemplified by the Victorian Government’s recently announced Suburban Rail Loop which highlights the need for an orbital public transport link to improve accessibility to priority growth precincts. The Suburban Rail Loop is a potentially significant project of a similar scale to NEL. I would have expected both projects to be considered together with other complementary transport initiatives. Notwithstanding the potential rail loop, and indeed to build the public transport market for rail, improved bus networks would also be expected.
4.2.6 Travel demand measures such as road pricing have not been considered in the modelling presented in the EES. Such measures could reduce private vehicle travel demand during the peak periods potentially reducing the number of traffic lanes required on NEL.

4.2.7 The adoption and take up of future technologies will also impact on future travel demands. I note that future technologies were assessed as part of the peer review conducted by Willumsen and he reported the results of the sensitivity tests of both CAV and MaaS scenarios. These sensitivity tests suggested some quite significant reductions in travel demand could be possible. Whilst they have been considered as sensitivity tests, it appears that they did not influence the project design.

4.3 Implications

4.3.1 I consider that the transport scenario used as a basis for the EES underestimates public transport provision, doesn’t account for travel demand management measures and therefore overestimates traffic demand. Treating the project in isolation has led to adding significant road capacity in an attempt to solve metropolitan transport problems that differ from the original objective of the project. This has potentially resulted in a bigger motorway facility than is necessary. In my opinion, the project does not look far enough into the future resulting in an outcome that is less flexible and adaptable to meet Victoria’s future needs.

4.3.2 I recommend that further scenario development be undertaken as part of an integrated strategy, with North East Link as part of a package of measures including a range of other policies and infrastructure and service interventions.
5 Strategic transport modelling

5.1 Overview

5.1.1 This section presents the findings of my review of the strategic transport modelling undertaken for the project. All strategic transport modelling has an inherent level of uncertainty. In congested network conditions small changes in the demand could result in different project design outcomes, particularly for a network approaching capacity. However, in my opinion there is a high degree of uncertainty in the traffic forecasts used to inform the planning and design of NEL for 2036, which does not provide me confidence in the project outcomes.

5.2 Key issues

5.2.1 Land use forecasts are out of date

5.2.2 There is a long-standing history of underestimating population growth in Melbourne. The modelling is based on VIF 2015 land use forecasts which are out-of-date. More recent versions of land use forecasts predict high growth in some locations. For example, when comparing VIF 2015 and VIF 2016 there has been a 2% increase in the 2031 forecast population for Whitehorse. Given the rate of growth that is occurring in Melbourne is generally faster than each updated forecast, it would be reasonable to expect that the use of VIF2018 could result in the 2031 forecast population being more than 5% above that included within the transport modelling that has been undertaken for the project. This may result in higher travel demands in the study area with potentially shorter trips clustering around key activity centres. Equally important, the pattern of growth is changing with higher density clustering around Melbourne’s metropolitan activity centres and national employment and innovation clusters such as Latrobe, Box Hill and Monash. This clustering around centres is likely to induce shorter trips than the project model is forecasting, reducing the vehicle kilometres travelled per capita.

5.2.3 Distribution

5.2.4 As noted by Willumsen in his peer review (refer page 14), the distribution sub-model is considered the weakest in the four-step modelling process. This is because of the complexity involved in forecasting people’s choice of their location of their homes relative to jobs, education, shopping and other reasons for travelling. In reality, trip distribution involves many factors that cannot be fully explained through transport related parameters such as trip ends and trip lengths. As noted by Willumsen, the distribution model is limited in its ability to represent...
incrementable response to transport projects and tends to provide an exaggerated response to a project – that is people take longer to change locations of home or jobs after the projects opening than transport models represent.

5.2.5 Generally, there is an absence of current and comprehensive origin and destination data on which to calibrate the strategic model. Whilst many plots of modelled flows are presented in the report it is unclear how they relate to observed origin and destination patterns against VISTA data. No travel market assessment of potential NEL link customers has been provided and therefore it is difficult to judge the model’s performance. I have reviewed the trip distribution profile presented in Figure 9.6 of the TTIA. The profile, as shown in an extract from the EES in Figure 3, suggests a mix of local and longer distance trips would use NEL and would generate through traffic in adjacent municipalities. There is a risk that M80 will be used for shorter trips rather than the longer distance orbital trips it was designed for. The tolling strategy could influence the balance between shorter and longer distance trips – however the tolling strategy and prices have not been made available. For example, a tolling strategy could discourage short trips and prioritise longer distance trips.

5.2.6 Select link analysis has not been provide in the EES documentation for the Eastern Freeway so it is difficult to draw conclusions about the forecast impact of the project on private vehicle travel to the city.

Figure 3: Daily origins and destinations on NEL forecast in 2036 (Extract from EES Technical Report A p287)
5.2.7 Strategic model underestimates public transport mode share

5.2.8 The traditional modelling approach has limitations and extrapolates current travel behaviours into the future, particularly in locations which are currently dominated by private vehicle travel such as the outer suburbs of Melbourne. This can result in an underestimation of the level of increase of public transport demand in response to transport initiatives. In addition, as noted in the peer review, the Zenith model’s public transport generalised cost parameters for car access time, wait time and interchange penalty (as noted in the peer review) are outside the range of typically accepted values, and generally this suggests the model would be weighted towards private vehicle mode share. The model has been calibrated assuming the wait time is calculated using half the headway, albeit with a lower than expected wait time generalised cost parameter. However, this could significantly overestimate the perceived cost of travel on public transport for all but “turn up and go” services. Also Luis Willumsen notes that transfer penalties higher above 7 to 12 minutes were used in the model, although the values don’t appear to be documented in the TTIA. My experience in other Melbourne and Australian locations is that transfer penalties are generally in this range. Again, this suggest the model would tend toward overstating private vehicle trips.

5.2.9 As I previously highlighted in Section 4, the EES does not consider an integrated transport response to the problems identified. Given the significance of the project, I would have expected other significant projects and initiatives across the metropolitan region to be included. The inclusion of other public transport and travel demand initiatives could significantly influence the public transport mode share and reduce the traffic demand across the network. Of particular relevance, the Suburban Loop Rail Assessment Report forecasts total daily trips of between 210,000 in 2031 and 400,000 in 2051 on the rail loop with the busiest section between Frankston and the Airport. This section of the Suburban Rail Loop services the same corridor as NEL and the completed orbital motorway network and with forecast daily trip levels comparable to the busiest section of the Eastern Freeway in 2031 and much higher in 2051. In fact, in 2051 the report indicates that it will take 200,000 private vehicle trips off the road. In my opinion, based on this analysis, the Suburban Rail Loop and other public transport improvements would have a significant impact on traffic demand levels in the corridor.

5.2.10 Model validation

5.2.11 All strategic transport models are subject to some level of variability when validating against observed data. The focus for validation tends to be on the area of impact of the project and has been documented in the EES. My review of the validation of the Zenith model suggests variable levels of validation in terms of traffic volumes and travel times on key routes within the study area.
5.2.12 My review of the individual count validation indicates that there are several important roads where there are significant differences between the model’s assigned traffic volumes and the observed counts – these include Elgar Road, Station Street and Springvale Road that have differences greater than 20% in some cases.

5.2.13 Most traditional four step strategic travel models are limited in their ability to represent bottlenecks in highly congested urban networks. The ability of the Zenith model to represent existing queues from Hoddle Street and shock waves along the Eastern Freeway is not documented within the TTIA and is expected to be a limitation of the strategic model. However, the VLC Transport Modelling Reports at Appendix B of the TTIA includes plots (refer sub-Appendix B, Figure B40, page B-75) that show a comparison between travel times forecast by the model and observed travel times averaged across the time period along the Eastern Freeway. An example of these plots (shown in Figure 4) suggest that the Zenith model overestimates delays on the Eastern Freeway between Elgar Road and Chandler Highway by up to approximately 30% of the existing travel times and then underestimates the extent and impact of queuing and delays from Hoddle Street.

Figure 4: Example Zenith travel time validation

5.2.14 On the basis of the over estimation of travel time in the base case and potentially high diversion of traffic to the Eastern Freeway corridor, the economic benefits of the business case could be overstated. Additional detailed modelling information
by the NELP, including sensitivity tests, would be required to fully understand the impact on traffic forecasts for NEL and the Eastern Freeway.

5.2.15 **Model overestimates vehicle kilometres travelled**

5.2.16 Vehicle kilometres travelled (VKT) is a good measure of the performance of a transport network. Estimating vehicle kilometres per capita provides an indication of how the level of private vehicle travel per person changes over time. Recent trends have indicated a flattening and even a reduction in vehicle kilometres travelled per capita across the networks in Australian and overseas cities. BITRE (Information Sheet 74, 2015) investigated current and future trends in road travel in Australia and concluded that a range of outcomes were possible, but that most likely the recent trend of flattening and reduction of VKT per capita that occurred post the Global Financial Crisis was likely to continue. For this reason, BITRE indicated the green line in Figure 5 would be the most likely outcome. The recent Australian Infrastructure Audit undertaken by Infrastructure Australia confirms that there has been a decline in VKT per person since 2009. The Audit states that the decline can be largely attributed to the light vehicle market approaching saturation, increasing competition from domestic air travel, domestic petrol prices catching up to world oil prices, and generational changes in travel demand.

![Figure 6: Base case long-term projections of per capita car use in Australia](image)

*Figure 5: Extract from BITRE Information Sheet 74*
5.2.17 In my opinion the model tends to overestimate the vehicle kilometres travelled (VKT) across the Melbourne network. Whilst much of the growth of the VKT is generated by a substantial increase of population between 2016 and 2036, the trip lengths are forecast to increase. This leads to an assumption of an increase in VKT per capita in the Zenith model as shown in Table 2. Whilst the increase in VKT/capita may appear small, the impact across a population of over 6 million is significant.

Table 2: Zenith model estimates of VKT per capita based on the TTIA

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2016 Base</th>
<th>2036 Base</th>
<th>2036 Project Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>4,402,248</td>
<td>6,105,569</td>
<td>6,105,569</td>
</tr>
<tr>
<td>Employment</td>
<td>2,275,955</td>
<td>3,265,457</td>
<td>3,265,457</td>
</tr>
<tr>
<td>Daily vehicle trips</td>
<td>12,579,000</td>
<td>16,775,000</td>
<td>16,794,000</td>
</tr>
<tr>
<td>Daily vehicle kilometres travelled (vkt)</td>
<td>123,577,000</td>
<td>178,393,000</td>
<td>179,727,000</td>
</tr>
<tr>
<td>Ave trip length</td>
<td>9.82</td>
<td>10.63</td>
<td>10.70</td>
</tr>
<tr>
<td>vkt/capita</td>
<td>28.07</td>
<td>29.22</td>
<td>29.44</td>
</tr>
</tbody>
</table>

5.2.18 Over-estimation of peak period congestion

5.2.19 The peak period is generally the driver for the design of transport infrastructure. Therefore, it is important to consider the strengths and weaknesses of the analytical tools in forecasting the design volumes. I note that the Zenith model tends to over-estimate congestion on the network based on 34 survey locations, as reported in Appendix B of the TTIA and shown in Figure 6. In my opinion, this demonstrates a tendency for the model to over-estimate travel times across the network which could push more traffic onto a new motorway facility such as North East Link.

5.2.20 Over-estimation of peak period traffic volumes

5.2.21 I refer to Luis Willumsen’s peer review of the model which concluded that Zenith over-estimates peak period traffic volumes. Although the TTIA adopted a spreadsheet approach that has been applied to Zenith model outputs to account for peak spreading, it is not clear what impact this has had on the forecast traffic
volumes in the project area. Further there is no information to understand whether the peak spreading approach has been calibrated satisfactorily to current traffic volume profiles. It is also unclear if this approach is consistent with the economic analysis that has been used to justify the project business case, where higher traffic volumes in the peak period would likely exaggerate the benefits.

5.2.22 The adoption of a peak spreading approach, and the issue that bottlenecks are not adequately represented in the strategic model, raises issues if the strategic model is sufficiently attuned to the potential impacts of significant network wide congestion in future years. The implication of peak spreading is that road travel has an additional cost associated with it that is not represented in the model. It raises the question whether more travellers would divert to public transport rather than change their preferred travel time.

5.2.23 **NEL over estimates truck demand**

5.2.24 Commercial vehicle forecasting is always difficult in strategic transport models. The Zenith model highlights some discrepancies between its forecasts and observed commercial vehicle volumes. This suggests a tendency toward the model overestimating truck demand.

5.2.25 The forecasting approach for commercial vehicles uses functions developed by the demand forecasting consultants based on trip generation rates for blue and white collar workers, supplemented by information gained through the West Gate Tunnel project, but doesn’t use the most up-to-date forecasting provided the Department of Transport’s Freight Forecasting Model.

5.2.26 I have reviewed the toll diversion curves and note that commercial vehicles are represented as highly inelastic in the model. Whilst I agree that trucks would be less elastic than private vehicles, the curve in my opinion overestimates the number of trucks that would use NEL.

5.2.27 As identified in the local area model validation report, Zenith over-estimates commercial vehicle volumes on the Eastern Freeway and M80 by approximately 15% (refer Figure 7). This is highly significant for the subsequent operational analysis as trucks have a disproportionate impact on traffic operations.
5.2.28 **Application of tolling**

5.2.29 The toll levels that the analysis has been based on have not been released. This significantly limits any insights I can make into the overall modelling and design response for development of the project and the potential strategic responses to managing impacts of the project. Based on the information provided and the peer review report, the model appears to have a low demand response sensitivity to a change in toll price. The level of toll sensitivity will be dependent on a range of factors including alternative travel options, comparative travel times and the socio-economic characteristics of the potential users. The TTIA (refer Section 11) indicates that even with a low response to a toll increase of 20% the modelling suggests that volumes could reduce by 5% on North East Link which could impact the design and the footprint required for the facility.

5.2.30 However, it is clear from the sensitivity modelling that toll levels could have a significant impact on traffic demand of facility, so understanding the actual levels proposed is important.

5.2.31 In my opinion, there should be a distinction between the tolling strategies for trucks and private vehicles to encourage trucks to use NEL and achieve the strategic objectives and minimise the impacts of trucks on the local road network. The tolls for private vehicles should be used as a way to manage demand and support the use of more sustainable modes such as public transport. In this respect...
it is unclear whether tolling for private vehicles has included considerations such as:

- Changing peak versus off peak tolls as a demand management approach; and
- Higher tolls for movements where public transport is a viable alternative – such as trips to/from CBD.

5.2.32 The overall tolling strategy is not clear – whether it’s addressing strategic network management or maximising revenue to fund the project. There is certainly opportunity to consider differential tolls to help achieve strategic objectives. Travel demand management measures such as road pricing, parking charges, regulation and supply are being considered in many cities to apply to achieve various strategic objectives for a range of travel needs across the day.

5.2.33 An approach that applies travel demand measures to discourage private vehicle travel toward the city, where good public transport alternatives are available, should be a consideration for NEL. Such measures would lead to less demand for private vehicles to use the Eastern Freeway toward the city and which could potentially lead to an effective project with smaller footprint and less social and environmental impact.

5.2.34 Impact of future technologies

5.2.35 The impact of future technologies on travel behaviour and future demand forecasts is difficult to estimate given the uncertainties of implementation, staging and people’s response to the new technologies. It is pleasing to observe that some attempt has been made to assess the potential impacts. However as summarised in Table 3 the impacts on travel demand could be quite significant particularly in the case of the Mobility as a Service (MaaS) scenario which suggest that person car trips across Melbourne could reduce by 19% in 2036. This further highlights the risk that the private vehicle demand forecasts are high in 2036 and/or could reduce in later years.

Table 3: Potential impact of technologies on travel (based on Table 5: NEL Transport Model Peer Review)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>CAV</th>
<th>MaaS</th>
<th>CAV+MaaS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person trips</td>
<td>1%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>Person car trips</td>
<td>2%</td>
<td>-19%</td>
<td>-18%</td>
</tr>
<tr>
<td>Person Public Transport trips</td>
<td>-2%</td>
<td>18%</td>
<td>17%</td>
</tr>
<tr>
<td>Vehicle Kilometres Travelled</td>
<td>5%</td>
<td>-7%</td>
<td>-2%</td>
</tr>
<tr>
<td>Vehicle Hours Travelled</td>
<td>7%</td>
<td>-12%</td>
<td>-7%</td>
</tr>
<tr>
<td>Change in NEL Traffic (2 way)</td>
<td>7%</td>
<td>-10%</td>
<td>-5%</td>
</tr>
</tbody>
</table>
5.2.36 **Induced travel**

5.2.37 Four step models account for induced travel directly related to a project by mode share, distribution and assignment, but not related to trip generation. The EES has not considered the impact of NEL on increasing the propensity for people to travel (trip generation rates). Past work and advice from DOT and VicRoads relate to trip redistribution, mode shift and traffic reassignment rather than new trips. I note that the EES has undertaken some assessment of the potential land use uplift that may occur as a result of the project, but the full details of those assumptions have not been provided. This impact could significantly change travel patterns and particularly impact traffic volumes in locations close the corridor.

5.3 **Implications**

In my opinion there could be significant variation in the traffic forecasts for the Project, which impacts on the problem definition and solution. The issues discussed above could result in private vehicle demand forecasts that are higher or lower across the wider network. However, on balance it is my opinion, the lack of consideration of complementary public transport initiatives, travel demand management measures and future technologies has resulted in higher than expected project traffic forecasts. I believe that the lack of consideration of policy together with technical limitations of the strategic model would likely result with a lower private vehicle forecast on North East Link at 2036 than was identified in the EES.
6 North East Link traffic demand and performance

6.1 Overview

6.1.1 My assessment is that the high level of uncertainty associated with the strategic transport modelling outlined in Section 5 will impact on the North East Link traffic forecasts presented in the EES and would materially impact the proposed project footprint. The focus of my review is on strategic transport and modelling rather than the geometric elements of the design.

6.1.2 In my opinion the uncertainties outlined in Section 5 will likely result in higher NEL traffic forecasts in 2036 than documented in the EES. In addition, it is my opinion that traffic bottlenecks in the wider network, for example Hoddle Street, will restrict the traffic volumes able to get to the facility.

6.1.3 The EES presents traffic forecasts for the North East Link that would potentially increase the average weekday traffic flow in 2036 by 95,000 vehicles per day to over 280,000 vehicles per day on the Eastern Freeway to the east of the proposed NEL interchange. As shown in Figure 8 these are extremely high traffic volumes and are generally much higher than other major motorways in Melbourne and Sydney and others in the United States of America and United Kingdom. Included in this forecast growth, at this location, is an increase of some 7,400 trucks per day from the 2036 base case. It is notable that although a key driver for the project is to assist with freight movements the overall design is dominated by the predicted growth in car traffic.
6.1.4 A significant component of the design is the creation of express carriageways from west of Bulleen Road to east of Tram Road. These and the associated parallel freeway and ramp lanes create a cross-section of 12 to 16 road lanes (plus shoulders and other geometric features) over this section, compared to the existing configuration of 6 lanes, creating a significant increase in overall cross-section width. Similar observations apply to the proposed design in the vicinity of the M-80 interchange. These design elements critically relate to assumptions around demand volumes and the proposed Level of Service (LOS) standards.

6.1.5 The project as presented in the EES is significant and large by world standards. In Table 4, I present a comparison of the additional kilometres of traffic lanes NEL would add to the road network compared to other major projects in Australia.

Table 4: Comparison of road provision for major motorway projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Additional lane kilometres</th>
</tr>
</thead>
<tbody>
<tr>
<td>North East Link</td>
<td>140</td>
</tr>
<tr>
<td>Westconnex</td>
<td>127*</td>
</tr>
<tr>
<td>Western Harbour Tunnel + Beaches Link</td>
<td>60</td>
</tr>
<tr>
<td>M80 Ring Road Upgrade</td>
<td>75</td>
</tr>
<tr>
<td>West Gate Tunnel</td>
<td>40</td>
</tr>
</tbody>
</table>

*Note: Westconnex has potential capacity for 145 lane kilometres
6.2 Key issues

6.2.1 The strategic model doesn’t include detailed representation of intersection modelling or bottlenecks and therefore tends to over-estimate traffic flows that the road network can accommodate within congested peak periods. In order to address this weakness in the strategic model, a peak spreading approach has been applied outside the micro-simulation model area as documented in Section 4.5.3 of the TTIA. However, that peak spreading approach is limited to addressing the capacity limitation on a link by link (midblock) basis rather than an intersection turn basis for each 2036 base and project case forecast volume reported. This approach still fails to fully account for bottlenecks that may occur at intersections restricting both upstream and downstream traffic flow – not necessarily constrained by the capacity of that link. On this basis there is still a strong likelihood that downstream traffic volumes will be over-estimated in the future.

6.2.2 In my opinion it would have been feasible for the study team to use modelling approaches more suited to addressing the limitations I have identified. For example, the Domino macroscopic simulation model developed by VicRoads provides a platform better suited to dealing with issues of junction capacity and network bottlenecks across a wide network.

6.2.3 Based on the documentation provided in the TTIA the micro-simulation model does not go beyond the immediate interchanges (refer to example output in Figure 9). The Hoddle Street and Alexandra Parade interchange that is the major constraint for traffic moving along the Eastern Freeway has not been included in the micro-simulation. This would mean that queues blocking back from Hoddle Street and Alexandra Parade are not represented in the model.
6.3 Key implications

6.3.1 In my experience the peak hour volumes produced by strategic models are always on the high side, and whilst the peak spreading approach reduces the peak demand to some extent, the approach is at a coarse level and doesn’t account for intersection bottlenecks and their downstream impact. This overprediction of peak demands has implications for the proposed design and resultant impacts of NEL as set out in the following section.
6.3.2 My observations in this section relate to the way in which the strategic traffic modelling has been applied to the designated project case scenario. The likely overprediction of traffic caused by this approach further compounds the broader observations I have made in preceding sections on the strategic modelling limitations, including:

- The apparent lack of consideration of alternative strategic transport management approaches to limit growth in car travel, such as enhancement of public transport services, use of tolling strategies (including tolling of sections of the Eastern Freeway) or implementation of road pricing; and

- The technical modelling issues discussed in Section 5 above.

6.3.3 In my opinion the design for North East Link presented in the EES is likely to be overdesigned for 2036 given the overestimation of traffic demand from the strategic model and the limitations of project framework. The operational assessment presented in the EES suggest mainly a LOS C on the Eastern Freeway east of Doncaster Road.

6.3.4 Given the high demand and high level of service standards applied in parts of the corridor, I believe that the design is likely to have a larger footprint than is necessary to meet the core objectives of the project.
7 Impact on local areas

7.1 Overview

7.1.1 One of the key objectives in the business case is for NEL to protect local areas from “rat-running” or through traffic. While the EES highlights that NEL will reduce overall traffic volumes on the arterial road network, the analysis presented also shows it will have a significant impact on local centres close to the corridor. In addition, the EES does not appropriately address walking and cycling in the vicinity of the project. In my opinion the EES does not adequately demonstrate how these issues will be mitigated and the local areas protected.

7.2 Key issues

7.2.1 Traffic

7.2.2 The NEL business case identifies a problem that “high traffic volumes and freight are reducing local amenity and quality of life for residents.” I agree that this is a key issue. However, the EES indicates that there are a number of important local areas and centres that would be significantly impacted including:

- Watsonia: Section 2 (page 2-45) of the Business Case identifies Watsonia Village as a problem that the project is trying to address and that residents have voiced concerns that cars are driving too quickly down Watsonia Road and are rat-running. However, the EES indicates that NEL will push more traffic onto Watsonia Road, by as much as 20% across the day (refer Table 5);

- Box Hill: Elgar Road is forecast to experience higher traffic growth in 2036 due to North East Link with more traffic entering the key Metropolitan Activity Centre; and

- Macleod: Erskine Road, a street that is quite local in nature, is forecast to experience higher traffic volumes, including truck volumes, with traffic potentially rat-running through Macleod to access NEL.
Table 5: Forecast Traffic Daily Traffic Volume Differences based on the TTIA: Appendix D

<table>
<thead>
<tr>
<th>Road Name</th>
<th>2017 Lower</th>
<th>2036 Base Lower</th>
<th>2036 Project Lower</th>
<th>2036 Project to Base % Difference</th>
<th>2017 Upper</th>
<th>2036 Base Upper</th>
<th>2036 Project Upper</th>
<th>2036 Project to Base % Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watsonia Road</td>
<td>12,000</td>
<td>15,000</td>
<td>18,000</td>
<td>20%</td>
<td>16,000</td>
<td>20,000</td>
<td>22,000</td>
<td>10%</td>
</tr>
<tr>
<td>Greensborough Rd - Rail</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erskine Road</td>
<td>7,000</td>
<td>8,000</td>
<td>9,000</td>
<td>13%</td>
<td>9,000</td>
<td>11,000</td>
<td>13,000</td>
<td>18%</td>
</tr>
<tr>
<td>Ferguson to Argyle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Plenty Road</td>
<td>26,000</td>
<td>30,000</td>
<td>33,000</td>
<td>10%</td>
<td>34,000</td>
<td>40,000</td>
<td>43,000</td>
<td>8%</td>
</tr>
<tr>
<td>Greensborough Rd - Para Rd</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grimshaw Street</td>
<td>20,000</td>
<td>23,000</td>
<td>26,000</td>
<td>13%</td>
<td>26,000</td>
<td>30,000</td>
<td>33,000</td>
<td>10%</td>
</tr>
<tr>
<td>Watsonia Rd - Greensborough Hwy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulleen Road</td>
<td>13,000</td>
<td>13,000</td>
<td>18,000</td>
<td>38%</td>
<td>16,000</td>
<td>17,000</td>
<td>23,000</td>
<td>35%</td>
</tr>
<tr>
<td>Eastern Fwy - Doncaster Rd</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Princess Street</td>
<td>28,000</td>
<td>33,000</td>
<td>36,000</td>
<td>9%</td>
<td>35,000</td>
<td>43,000</td>
<td>45,000</td>
<td>5%</td>
</tr>
<tr>
<td>Duke St to Wills St</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elgar Road</td>
<td>31,000</td>
<td>35,000</td>
<td>39,000</td>
<td>11%</td>
<td>39,000</td>
<td>45,000</td>
<td>50,000</td>
<td>11%</td>
</tr>
<tr>
<td>Eastern Fwy to Belmore Rd</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Elgar Road</td>
<td>26,000</td>
<td>30,000</td>
<td>32,000</td>
<td>7%</td>
<td>34,000</td>
<td>38,000</td>
<td>42,000</td>
<td>11%</td>
</tr>
<tr>
<td>Belmore Rd to Whitehorse Rd</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Station Street</td>
<td>22,000</td>
<td>28,000</td>
<td>29,000</td>
<td>4%</td>
<td>30,000</td>
<td>36,000</td>
<td>37,000</td>
<td>3%</td>
</tr>
<tr>
<td>Eastern Fwy to Whitehorse Rd</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middleborough Road</td>
<td>28,000</td>
<td>31,000</td>
<td>33,000</td>
<td>6%</td>
<td>37,000</td>
<td>40,000</td>
<td>43,000</td>
<td>8%</td>
</tr>
<tr>
<td>Eastern Fwy to Whitehorse Rd</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surrey Road</td>
<td>20,000</td>
<td>22,000</td>
<td>25,000</td>
<td>14%</td>
<td>26,000</td>
<td>29,000</td>
<td>32,000</td>
<td>10%</td>
</tr>
<tr>
<td>Eastern Fwy to Whitehorse Rd</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Springvale Road</td>
<td>50,000</td>
<td>55,000</td>
<td>60,000</td>
<td>9%</td>
<td>66,000</td>
<td>72,000</td>
<td>77,000</td>
<td>7%</td>
</tr>
<tr>
<td>Eastern Fwy to Whitehorse Rd</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

7.2.3 Apart from those locations highlighted above, the EES indicates that NEL will have a significant impact on the surrounding road network by increasing traffic volumes on many approaches to NEL. A summary of the forecast increases in morning peak traffic volumes between the 2036 No Project Case and the 2036 Project Case presented in the EES on key roads is shown in Table 6.
Table 6: Forecast Morning Peak Traffic Volume Differences based on TTIA Appendix D

<table>
<thead>
<tr>
<th>Road</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grimshaw St Watsonia Rd to Greensborough Hwy Eastbound</td>
<td>69%</td>
</tr>
<tr>
<td>Chapman St Ellesmere Pde to Thomson Dr Eastbound</td>
<td>40%</td>
</tr>
<tr>
<td>Erskine Rd Ferguson St to Argyle St Eastbound</td>
<td>40%</td>
</tr>
<tr>
<td>Elgar Rd Belmore Rd to Eastern Fwy Northbound</td>
<td>32%</td>
</tr>
<tr>
<td>Thompsons Rd North-east of Eastern Fwy Eastbound</td>
<td>29%</td>
</tr>
<tr>
<td>Bulleen Rd Doncaster Rd to Eastern Fwy Northbound</td>
<td>27%</td>
</tr>
<tr>
<td>Greenwood Dr Gresswell Park Dr to Ladd St Eastbound</td>
<td>25%</td>
</tr>
<tr>
<td>Springvale Rd Whitehorse Rd to Eastern Fwy Northbound</td>
<td>23%</td>
</tr>
<tr>
<td>Springvale Rd North of Eastlink Northbound</td>
<td>23%</td>
</tr>
<tr>
<td>Diamond Creek Rd Civic Drive to Yan Yean Rd Westbound</td>
<td>22%</td>
</tr>
<tr>
<td>Watsonia Rd Greensborough Rd to rail line Southbound</td>
<td>22%</td>
</tr>
<tr>
<td>Greensborough Bypass M80 Ring Road interchange to Diamond Creek Rd Westbound</td>
<td>22%</td>
</tr>
<tr>
<td>Elgar Rd Belmore Rd to Whitehorse Rd Northbound</td>
<td>21%</td>
</tr>
<tr>
<td>Andersons Creek Rd Blackburn Rd to Reynolds Rd Northbound</td>
<td>20%</td>
</tr>
<tr>
<td>Main Rd East of Ingrams Rd Eastbound</td>
<td>20%</td>
</tr>
<tr>
<td>Watsonia Rd Princes St to Bungay St Northbound</td>
<td>20%</td>
</tr>
<tr>
<td>Mitcham Rd At Eastern Fwy Southbound</td>
<td>18%</td>
</tr>
<tr>
<td>Surrey Rd Whitehorse Rd to Eastern Fwy Northbound</td>
<td>18%</td>
</tr>
<tr>
<td>Erskine Rd Ferguson St to Argyle St Westbound</td>
<td>17%</td>
</tr>
<tr>
<td>Johnston St Wellington St to Hoddle St Eastbound</td>
<td>17%</td>
</tr>
<tr>
<td>Main Rd East of Wattletree Rd Eastbound</td>
<td>17%</td>
</tr>
<tr>
<td>Settlement Rd Dalton Rd to High St Eastbound</td>
<td>17%</td>
</tr>
<tr>
<td>Cherry St Waiora Rd to Wungan St Eastbound</td>
<td>14%</td>
</tr>
<tr>
<td>Greensborough Bypass M80 Ring Road interchange to Diamond Creek Rd Eastbound</td>
<td>14%</td>
</tr>
<tr>
<td>Alexandra Pde Queens Pde to Hoddle St Westbound</td>
<td>13%</td>
</tr>
<tr>
<td>Balwyn Rd Doncaster Rd to Belmore Rd Southbound</td>
<td>13%</td>
</tr>
<tr>
<td>Middleborough Rd Whitehorse Rd to Eastern Fwy Northbound</td>
<td>13%</td>
</tr>
<tr>
<td>Yan Yean Rd North of Diamond Creek Rd Southbound</td>
<td>13%</td>
</tr>
<tr>
<td>Earl St Princess St to Willsmere Rd Southbound</td>
<td>13%</td>
</tr>
<tr>
<td>Diamond Creek Rd Civic Drive to Yan Yean Rd Eastbound</td>
<td>12%</td>
</tr>
<tr>
<td>Princess St Duke St to Wills St Southbound</td>
<td>12%</td>
</tr>
<tr>
<td>Blackburn Rd Eastern Fwy to Doncaster Rd Northbound</td>
<td>11%</td>
</tr>
<tr>
<td>Bulleen Rd Eastern Fwy to Manningham Rd Northbound</td>
<td>11%</td>
</tr>
<tr>
<td>Burgundy St Rosanna Rd to Upper Heidelberg Rd Eastbound</td>
<td>11%</td>
</tr>
<tr>
<td>Bush Blvd McDonalds Rd to Plenty Rd Northbound</td>
<td>11%</td>
</tr>
<tr>
<td>Keon Pde High St to Dalton Rd Westbound</td>
<td>11%</td>
</tr>
<tr>
<td>McDonalds Rd West of Pindari Ave Eastbound</td>
<td>11%</td>
</tr>
<tr>
<td>Settlement Rd Dalton Rd to High St Westbound</td>
<td>11%</td>
</tr>
</tbody>
</table>
7.2.4 A key issue is the impact of trucks in the local area. As I previously identified I believe the Zenith model is likely to overestimate the number of trucks that will use North East Link with more trucks using the local and arterial road network than presented in the EES. Notwithstanding this comment, the EES demonstrates that NEL would add significant truck volumes to the adjacent road network as trucks access the new facility. Key locations where truck volumes are expected to increase include Erskine Road, Grimshaw Street, Diamond Creek Road, Bulleen Road, Elgar Road, Blackburn Road and Middleborough Road.

7.2.5 Walking and cycling

7.2.6 As I discussed in earlier sections, the project had the opportunity to incorporate active travel as an integrated response, but it does little for those modes. In my opinion, some key areas regarding walking and cycling have not been addressed as follows:

- There appears to be little enhancement to prioritise cycling along the Eastern Freeway corridor (for example, cyclists would still need to come up to grade and cross potentially bigger interchanges than are currently there);
- There has been no assessment of the Level of Service for pedestrians or cyclists. (potentially prioritising vehicles over active modes) I would have expected that a movement and place approach would have been adopted that considers all road users;
- The creation of further barriers, through interchange complexity, crossing the Eastern Freeway with no improvement to the cycling facilities; and
- The potential impact on the quality of the environment for walking and cycling is also concerning and has not been addressed in the EES. For example, there is currently reasonable amenity along sections of the Koonung Creek Trail (e.g. vegetation providing shelter, shade and a buffer to infrastructure) which may be impacted by the design. While the documentation is unclear and discussion in the EES is minimal, the project appears to increase the areas for traffic lanes along the corridor and particularly the Eastern Freeway by reducing the width available for walking and cycling. This is likely to create an environment dominated by hard surfaces in sections which would discourage use.

7.3 Implications

7.3.1 In my opinion while the EES does indicate that some areas will experience reductions of traffic, such as Rosanna Road, other areas and particularly in areas near interchanges with NEL or the Eastern Freeway and the M80 will experience higher traffic volumes with potentially reduced amenity for local areas. The project does not identify mitigation measures to protect these areas, and the impact on local areas such as Watsonia, Macleod, Box Hill, Blackburn and Nunawading could be quite significant. I recommend that these impacts should be mitigated to protect these areas.
8 Conclusions and recommendations

8.1 Conclusions

8.1.1 Whilst I agree with many areas relating to transport and traffic modelling presented in the EES, this statement focuses on key issues that I consider have not been addressed satisfactorily in the EES. I believe that proper consideration of these issues will influence the outcomes of the EES and materially affect both the project design and the outcome of the project for the community.

8.1.2 I am concerned about both the strategic and technical aspects of the NEL EES and these concerns are outlined in detail in Section 2 to 7 of this report. My key findings from the assessment are summarised as follows:

8.1.3 NEL has been developed in isolation and not as part of an integrated solution to address the identified problem. NELP has not fully considered the needs of the places and communities within the study area, nor has it considered complementary public transport and travel demand management initiatives with NEL as a package to deliver the best outcome. The outcome it provides for the community is therefore one-dimensional and not in line with the objectives and principles outlined in the TIA. In my opinion consideration of alternative and/or complementary transport measures, that could address some of the identified issues in the EES would lead to a more effective and less impactful NEL project.

8.1.4 The process to develop a preferred solution is flawed and the project has expanded to address a range of issues beyond the problem it was originally trying to solve. The project lacks a longer term strategic narrative that connects it to the objectives laid out in Melbourne’s blueprint for the future (Plan Melbourne). My observation is that the project is not contained to addressing the problem stated in the Business Case and EES. The project has expanded beyond its primary objective to facilitate orbital travel between the outer northern suburbs and the south-east of Melbourne, to also enhancing private vehicle travel on the Eastern Freeway servicing the CBD and nearby areas.

8.1.5 There is a high degree of uncertainty in the traffic forecasts for 2036: In my opinion the information provided in the EES does not provide confidence that the evidence accounts for the high degree of uncertainty in the forecasts. Small changes in the demand could result in different project design outcomes, particularly for a network approaching capacity. Willumsen’s peer review highlights that the model potentially overestimates traffic levels in the peak periods and the model’s forecasts suggest a bias toward higher traffic demand compared to public transport modes. While sensitivity tests were conducted in the
EES there is no evidence that these considerations impacted the project design presented in the EES.

8.1.6  

Traffic forecasts on North East Link are likely high in 2036: The uncertainties in traffic forecasts likely result in higher than expected traffic forecasts on NEL and connecting motorways in 2036. There are a range of strategic and technical contributing factors that influence my view. A complementary public transport strategy has not been developed to address the deficiencies of public transport access across the Yarra River crossings. This is a well documented problem that the State Government is currently investigating with the Suburban Rail Loop. I would have expected both the Business Case and EES to consider further public transport initiatives, travel demand management measures and other policy measures as part of a package of measures for 2036. In my opinion, this would reduce private vehicle travel demand on NEL in 2036 and in future years.

8.1.7  

In my opinion the supporting road network beyond the defined project boundary is unlikely to have capacity to feed the forecast traffic volumes on NEL. The limitations of the strategic model, which does not model intersections or bottlenecks in detail, results in higher forecasts than the network can accommodate in the peak period. For example, capacity constraints at locations such as Hoddle Street will restrict the traffic able to get to and from the motorway network.

8.1.8  

NEL is likely to be overdesigned for 2036: In my opinion the uncertainty in the strategic modelling forecasts leads to higher than expected traffic volumes in 2036. The analysis presented in the EES also suggests a higher Level of Service at the design year in some locations compared to generally accepted practice. These issues in combination would have a consequential impact on the project footprint that may contribute unnecessarily to some of the project’s adverse environmental or social impacts.

8.1.9  

NEL will have significant impact on local centres: The business case highlights that NEL aims to protect local areas from through traffic, however there are a number of important centres that would be significantly impacted. These centres and local areas include Watsonia, Macleod, Box Hill, Blackburn and Nunawading. As the EES assesses approximately 9 years after opening (based on current published opening dates) there is potential that NEL could have an even more significant impact on local areas in the longer term.
8.2 Recommendations

8.2.1 Based on my findings I recommend the following actions:

- Reassess the project’s alignment with the Transport Integration Act, and relevant State and Local Government policies. This should include a review the project assessment framework in light of this to confirm the project is responding the strategic needs and objectives;

- Undertake an integrated transport study to develop and assess a range of transport initiatives to meet a longer-term vision. This should include understanding how NEL interacts with other major transport initiatives such as the Suburban Rail Loop and upgrades to the on-road public transport network, travel demand management measures such as road pricing and parking restraint and consideration of future technologies;

- Develop a revised range of traffic forecasts for North East Link and assess alternative designs in light of overall strategic objectives locally and regionally. I recommend the application of movement and place principles to consider all road users across the road network;

- Undertake a detailed study of local road impacts and the development of mitigating measures that control speeds, enhance amenity and minimise through traffic volumes through local areas; and

- Given the potentially significant impact of the project on local areas undertake a full assessment and mitigation of level of service impacts for people walking and cycling. The objective should be for no loss of amenity for walking and cycling along the corridor.
Appendix A

CV – Peter Dunn
Peter Dunn

Peter Dunn is a transport planner specialising in strategic transport planning, demand forecasting, and design of transport infrastructure.

As an Associate Principal, Peter is responsible for the project management of transport related work undertaken in Australia and New Zealand. Peter has a firm understanding of transport issues as they relate to the needs of different cities, through being responsible for significant transport planning studies in Australia, North America, New Zealand, England, Ireland and Hong Kong.

Peter has extensive experience developing innovative multi-modal transport solutions for cities, corridors and precincts supported by a strong evidence base. Apart from his strategic transport planning knowledge he is experienced in the application of analytical techniques to assess and provide solutions to complex transport issues. His design experience includes numerous transport planning and design studies.

Canberra Faster Rail Pre-feasibility Study

Peter led Arup’s multi-disciplinary investigation into faster rail and high speed rail connections between Canberra and Sydney for the ACT Government. The purpose of the study was to assess the potential opportunity for faster rail and high speed rail connections for Canberra and identify potential station locations.

Sydney Metro West Integrated Transport Services

Peter was the project director for Arup’s commission to provide integrated transport planning services to Sydney Metro for inform the Sydney Metro West Final Business Case. Peter provided strategic advice and had overall responsibility for delivery of the services.

Cities Research, Infrastructure Australia, Strategic Transport Advisor

Peter provided technical direction for the assessment of transport implications of potential future land use scenarios for Melbourne and Sydney. The project involved using STM and VITM to assess potential transport implications of various land use scenarios. The modelling was augmented by accessibility modelling to provide a more complete picture of the impact on all transport customers across Sydney. The work informed Infrastructure Australia’s internal policy research.

SMPM Peer Review, NSW
Peter is undertaking a peer review of the Sydney Motorway Planning Model for Roads and Maritime Services. SMPM is a complex traffic network assignment model that will be used to inform planning for Sydney’s motorway network.

**Level Crossing Removal Business Case, VIC**

Peter was project director for strategic modelling elements of this business case for the removal of 50 level crossings across Melbourne. Arup’s approach applied an integrated modelling approach, using the Cube-based VITM to inform economic evaluation and provide inputs to a detailed VISUM traffic assignment model. Peter provided project and technical direction including an enhanced highway assignment methodology in the VITM. A range of outputs were generated to illustrate the impacts and benefits of the project.

**Outer Suburban Arterial Roads Program Business Case, VIC**

Arup was engaged to provide traffic advisory services for the Outer Suburban Arterial Roads (OSAR) Program. The OSAR Program is unique in Victoria in that it will be a whole of life capital work, operations and maintenance regime for at least 15 separate transport projects predominately in the outer west and south east areas of Melbourne and potentially also in the north. Peter was the project director and oversaw all aspects of our services including strategic transport modelling. The Victorian Integrated Transport Model (VITM) was utilised to define the demand and benefits of various included road upgrade projects and packaging scenarios. The outputs from the VITM were used to inform the economic analysis underpinning the business case for the OSARs program.

**Auckland Transport for Future Urban Growth Review**

Lead a peer review of the modelling and economics for the Programme Business Case to identify transport initiatives to support significant development that is planned to occur in outer urban areas of Auckland over the next 30 years.

**Coffs Harbour Bypass Concept Design and EIS**

Transport lead within Arup’s team to investigate the strategic business case, develop a concept design and EIS for the proposed Coffs Harbour Bypass. Peter was responsible for scoping the transport workstream and providing advice and review during the project. The project involved development of 4 step strategic transport model in EMME and mesoscopic model in AIMSUN. Peter reviewed economic analysis to support the business case.

**Canberra Light Rail Master Plan**

Peter was lead this study to identify the future light rail network in Canberra to support growth and the goals outlined in the sustainable transport strategy, Transport for Canberra. The work built on planning work already underway for Stage 1 of the light rail network to identify potential future extensions. The study included mode comparison for the selected transport corridors and an integrated transport and land use assessment. The study
identified an integrated transport solution that could be progressively implemented over the next 50 years.

**Moreton Bay West Corridor Strategy Study**
Project director for a study to assess the functionality and transport needs for the Moreton Bay West Corridor for TMR. The project identified the potential corridor alignment, staging opportunities, outlined the functional service requirements to inform downstream route and link planning and develop strategies to guide long term delivery of transport facilities and services.

**Public Transport Project Model Audit, Sydney**
Lead an audit of the Bureau of Transport Statistics’ public transport project model developed in EMME and Python. The main focus of the audit was confirming that the model as implemented in Python, produced expected results. The review recommended improvements to the Python program that could provide run time and usability improvements.

**Major projects patronage review, Melbourne**
Managed the review of patronage forecasts for two major infrastructure projects in Melbourne for the Department of Transport to support the business case submission.

**NSW Long Term Transport Master Plan: Transport for New South Wales**
Worked in-house as part of a team to develop a long term transport master plan for New South Wales. Undertook analysis and development of the master plan with particular focus on Sydney. Specified the study process, identified information gaps and requirements. Undertook international benchmarking. Identified problems and issues associated with transport in Sydney and identified solutions and actions. Involved liaison with internal team. Undertook writing and editing tasks.

**Auckland Public Transport Model: Review of mode specific constant**
Undertook research to recommend an appropriate rail mode specific constant to use for the Auckland Public Transport model to support the business case for the Auckland City Rail Link. The mode specific constant represents the unobservable factors that impact on patronage that are not taken into account in typical generalised cost function in transport models. The study considered international experience and model performance.

**Wellington Transport Model Development**
Study to revalidate Greater Wellington’s strategic transport model (WTSM) and develop a public transport assignment model in EMME. Undertook initial model specification and was an internal reviewer during the project.
Appendix B

CV – Support Staff
Paul Carter

Paul leads Arup’s Transport Planning team in Victoria and South Australia. He has a wide range of experience and has worked in both the consulting and government sectors. His broad experience includes transport strategy, master plans, business case development as well as the design of station interchanges, airport landside infrastructure and strategic road corridors. In these projects he has used a sound understanding of transport planning and traffic engineering principles along with investment planning skills to deliver innovative outcomes and inform sound infrastructure planning for key clients.

Paul is a Certified Transport Planner and has a Masters of Traffic. He is an excellent communicator having performed the role of Expert Witness and presented to a number of Government Executive and Technical Reference Groups. Throughout his career Paul has always sought out challenging projects, which has been driven out of a desire for understanding and demonstrating best practice within the transport field.

Paul’s key strengths lie in his ability to develop, coordinate and deliver sound solutions to complex transport challenges, in alignment with the client’s needs.

Punt Road Transport Investigation, VIC

Paul was the Project Manager for the Punt Road Transport Investigation and provided critical input into the review of the Punt Road Public Acquisition Overlay – both high profile studies for Melbourne. The Hoddle Street-Punt Road corridor is arguably the most important arterial road in inner Melbourne and has a number of challenges in balancing competing priorities for pedestrians, cyclists, buses, trams, commercial and private vehicles. This project also provided input into the Streamlining Hoddle Street initiative.

Through a process of appraisal relative to social, environmental and economic criteria, Paul with the support of the team identified the suitability of the concept options informing the planning for this critical sub-region of Melbourne in the short, medium and long term.

Successfully delivering under compressed timeframes, the study was publicly exhibited in October 2015. This report formed part of the panel hearing for the review of the Public Acquisition Overlay. Paul presented as an Expert Witness to the advisory committee completing the ‘end to end’ service for this study.

Streamlining Hoddle Street, VIC

Project Manager for this major initiative to explore a range of innovative ideas to increase the movement of people who journey along and/or across Hoddle Street-Punt Road corridor. This is arguably the most important arterial road within Melbourne and has a number of challenges in balancing competing priorities for pedestrians, cyclists, buses, trams, freight and private vehicles.
Undertaken as two inter-related studies (Punt Road Transport Investigation), separated at the Yarra River, this project included review of improvements that could be implemented in both the short and long term. This involved exploring a number of strategies and innovative solutions from around the world including enhancing intelligent transport systems, revising operations at intersections, prioritising public transport and exploring the use of continuous flow intersections, which are designed to improve traffic flow through intersections by reducing delays caused by right-turning traffic.

This study also involved the development of a network strategy and operating plan to identify how the network should operate in the future. Options were then developed and tested with strategic demand forecasts providing input into a mesoscopic model (VISUM) and intersection models. Through a process of appraisal relative to social, environmental and economic criteria as well as assessments of risk and stakeholder acceptance, a preferred option was identified. The business case for the Streamlining Hoddle Street Initiative was considered as part of the 2016/2017 budget deliberations and was successful in receiving funding for the recommended Stage 1 works.

**Whitehorse Bicycle Strategy, VIC**
Paul was the project director for the preparation of the Whitehorse Bicycle Strategy. This included a new approach that focused on the development of a network of routes that are built around the principles of low stress cycling. The proposed network engages the ‘interested but concerned cyclists’ and extends the reach of existing trunk cycling routes.

**Outer Suburban Arterial Roads Program, VIC**
Paul is the project manager for the Outer Suburban Arterial Roads (OSAR) Program Traffic Advisory Services. The OSAR Program is unique in Victoria in that it will be a whole of life capital work, operations and maintenance regime for at least 15 separate transport projects predominately in the outer west and south east areas of Melbourne and potentially also in the north. The traffic advisory services role includes utilising the Victorian Integrated Transport Model to define the demand and benefits of various included road upgrade projects and packaging scenarios. The outputs from the VITM have been used to inform the economic analysis underpinning the business case for the OSARs program.

In addition, Paul has provided input and review on the concept design for three projects (confidential) to be considered as part of the OSARs program.

**M80 Upgrade Evaluation, VIC**
Paul was the Project Director responsible for the post-project completion evaluation of the three completed stages of the M80.

This is one of the first major post completion project evaluations undertaken under the VicRoads Investment Evaluation Framework. Under the guidance of the evaluation framework the project investigated the planning (appropriateness), delivery
(efficiency), benefit delivery (effectiveness), unintended outcomes and benefit sustainability relative to the expectations set out in the business case.

The findings of the assessment included key learnings for establishing KPIs for measuring benefit delivery, recommendations on procurement approach and demonstrating the importance of continuing with the investment in the M80 project to complete the remaining sections for upgrade.

**West Gate Freeway Managed Motorway Evaluation, VIC**

Paul was the Project Director responsible for the post-completion evaluation of the West Gate Freeway Managed Motorway project. The project comprised an upgrade from a Level 1 Managed Motorway to a Level 3 Managed Motorway for a 6.5km section of the West Gate Freeway between Williamstown Road and the M80 Ring Road.

The evaluation assessed the delivery of benefits as a result of the project and identified learnings during the planning, design and delivery that can be used to inform future projects.

**M80 Upgrade Economic Analysis Peer Review, VIC**

Paul was the Project Director for the economic analysis peer review that Arup undertook for the M80 Upgrade Project (Sydney Road to Edgars Road). The peer review that was undertaken recommended a strengthening of the narrative to connect stated project benefits with the economic analysis undertaken. This provided VicRoads and the Department of Treasury and Finance with additional confidence in the analysis undertaken and the strength of the investment narrative.

**East West Link Tender Design, VIC**

Paul was the transport planning and modelling technical lead for the Arup and SMEC Joint Venture (SAJV) tender design for the Ferrovial Samsung Ghella Construction JV (FSGJV) for the East West Link Project. These design and construction joint ventures form part of as part of the Inner Link Group (ILG) Consortia PPP bid to Linking Melbourne Authority. Stage 1 of the East West Link comprises a 6 kilometre freeway standard road link between Eastern Freeway Clifton Hill and CityLink in Parkville.

This five month tender design involved extensive option testing and an iterative refinement of the two separate design schemes to minimise the project cost and maximise the performance of the proposed transport network. The design development included extensive assessment of the freeway network performance, intersection performance as well as the design of new pedestrian and cycling and public transport linkages.

In this role, Paul also presented on behalf of the Inner Link Group consortium to the executive team of the Linking Melbourne Authority at the positive guidance interactive workshops.
Bruce Johnson

Bruce is a Principal in Arup’s Planning Group and has regional responsibility for the group’s strategic transport planning activities. He has extensive experience across the transport planning and transport infrastructure sectors throughout Australia and internationally.

Bruce is a strategic transport planner, experienced in the planning and operations of transport infrastructure across multiple modes. He has expertise in strategic transport planning, demand assessment, network modelling for roads and public transport, economic assessment, and traffic engineering and management. Bruce has strong communication skills and experience in stakeholder consultation.

He has managed and provided technical input for many strategic planning, policy development and business cases for transport network planning and major project feasibility studies. Bruce has strong knowledge of evaluation techniques and polices adopted by major infrastructure agencies in multiple jurisdictions.

His experience includes extensive involvement in design development, bid and project delivery phases of major infrastructure projects. In such projects he has been leader of transport planning and traffic engineering teams coordinating inputs with other discipline team leaders.

Bruce draws on his extensive experience across many facets of the transport sector to deliver insight, innovation and sound advice to clients.

East West Link Tender Services, Victoria

Member of SMEC Arup Design JV (SAJV) undertaking the Tender Services for the Ferrovial Samsung Ghella Construction JV (FSGJv) as part of the Inner Link Group (ILG) Consortia PPP bid to Linking Melbourne Authority. Undertook review of transport planning and traffic engineering aspects of the bid.

Peninsula Link, Victoria

Provided operations and maintenance advice as part of Arup’s Independent Technical Advisor role on behalf of the sponsors and financiers associated with the Connect11 consortium’s bid. The project is a new 25km freeway facility being delivered under a PPP availability framework.

Eastern Freeway Tunnel, Victoria

For McConnell Dowell Contractors and Clough Engineering JV, undertook traffic demand assessment, operational assessment and traffic engineering for tender design of this major freeway and tunnel project connecting the Eastern Freeway to Maroondah.
Intersections, Proceedings 16th ARRB Conference, Perth, 1992
Johnson BA and Singleton DJ
Economic Assessment of Urban Road Projects, National Transport Conference, Institution of Engineers, Australia, Brisbane, 1991

Highway in Melbourne. Included input to design of tunnel control systems.

**Melbourne Urban Corridor Study, Victoria**

Expert review role to prepare and contribute to a brainstorming workshop reviewing challenges, deficiencies and strategic priorities for Melbourne's transport strategy as part of the AusLink program.

**Streamlining Hoddle Street, Victoria**

Transport Planning Lead for this corridor study and business case for VicRoads which explored a range of innovative ideas to increase the movement of people who journey along and/or across Hoddle Street. Strategies and innovative solutions considered include enhancing computerised traffic management systems, revising operations at intersections, prioritising public transport and use of innovative intersection designs. A Visum mesoscopic corridor model was developed for the study.

**Melbourne Metro Demand Forecasting, Victoria**

Provision of transport modelling services to PTV, assisting with the preparation of the business case for this project. Melbourne Metro is a $10.9 billion project to expand the core of Melbourne’s rail network. Modelling involved refinement and application of VITM. Bruce was also involved in the related previous work undertaken for the Melbourne Rail Link project.

**Melbourne City Link Docklands Road Network MAE Arbitration, Victoria**


**Investment Decision Framework for Civil Infrastructure Asset Management, Australia**

This research project was undertaken as part of the Cooperative Research Centre for Construction Innovation in which Arup is a founding partner. Bruce had an expert reviewer role for the project which included investigation of optimisation of data sampling for pavement strength and a methodology for a risk adjusted maintenance budget considering variability in pavement strength.

**Automated and Zero Emissions Vehicles Infrastructure and Policy Advice, Victoria**

Bruce was Project Director leading the multi-disciplinary team to develop technical advice on transport engineering considerations for Automated and Zero Emissions Vehicles. Arup’s advice has informed Infrastructure Victoria’s key recommendations seeking to assist the State of Victoria navigate through the inherent challenges and uncertainties that new technology brings, while maximising the benefits and minimising the risks associated with
its introduction. Recommendations addressed where government can take immediate action to prepare for and influence introduction of new vehicle technologies.

Victoria’s 30-year Infrastructure Strategy – Economic Appraisal and Demand Modelling Study

Bruce led Arup’s input for this study which was used to inform Infrastructure Victoria’s (IV) 30-year infrastructure strategy. Arup completed modelling to test the metropolitan Melbourne wide impacts of numerous options including autonomous vehicles, advanced traffic management, transport network pricing and eight major road and rail investments. The projects and policy reforms were assessed against IV’s core objectives of improving social, economic and environmental outcomes for Victorians.

Outer Western Suburbs Public Transport Strategy, Victoria

Project Director for the development of this strategy in a rapidly developing urban area. Applied the MITM, developed by Arup, to assess potential bus and train improvement projects. The assessment addressed demand projections, operational issues and economic evaluation. Responsible for the overall delivery of the strategy and development of assessment techniques which provided, in the Melbourne context, a new approach to this issue.

Building Better Business Cases - Demand Forecasts Workshops

Bruce assisted Infrastructure Australia in preparing and presenting workshops providing guidance to project proponents enabling them to produce more robust and transparent demand forecasts for business cases.

Westall Road Extension Project Peer Review, Victoria

For VicRoads Bruce led peer review of the strategic and microsimulation models developed to support the project planning investigation and business case.

Abu Dhabi Integrated Public Transport Network Phase 1 Business Case, UAE

Project Manager leading preparation of the business case for the feasibility study of a proposed 18 km Metro line and three LRT lines (41 km in total) to serve the Abu Dhabi CBD. Working within the Project Management Consultancy for the Department of Transport coordinated technical inputs from external consultants, specified and reviewed strategic transport network modelling, prepared economic evaluation and developed the overall business case.
Fiona Grant

Fiona joined Arup as a graduate in September 2013 after completing an MEng in Civil Engineering at Newcastle University. She is a transport planner specialising in strategic modelling, with an interest in sustainable development and urban design. She completed studies in civil engineering at Newcastle University in the UK. Fiona is adaptable with excellent computer skills, strong experience with the VITM and great attention to detail. Her diverse technical background in combination with several years of experience in a consulting environment enables her to produce effective results to tight deadlines.

Alongside a wide range of skills in transport planning and modelling, Fiona brings specialist G skills to projects across the consulting group.

Maribyrnong Defence Site, VIC (Ongoing)

Arup has been commissioned to provide both Strategic and Mesoscopic modelling and analysis to assess both development options for land use on the site, and transport interventions in the wider northern Maribyrnong area. This work will inform a Transport and Land use Framework for the area. As the Project Manager, Fiona is responsible for leading the Strategic modelling team as part of this engagement; delivering technical modelling tasks with Cube software and effectively communicating results to the project steering committee.

Melbourne Metro, VIC (Ongoing)

As part of Arup’s role in the Cross Yarra Partnership Joint Venture, Fiona was responsible for producing Sub Area matrices from the VITM for use in subsequent Microsimulation modelling. Further to the network review and sub area extraction, Fiona undertook matrix estimation on the sub area matrices to ensure they were suitable for use. She was also responsible for providing future year forecasts and sub area matrices for use in Microsimulation modelling.

Outer Suburban Arterial Roads Program Business Case, VIC (Oct 2017)

Arup was engaged to provide traffic advisory services for two refreshed Outer Suburban Arterial Roads (OSAR) Program packages. The OSAR Program is unique in Victoria in that it will be a whole of life capital works, operations and maintenance regime for a number of separate road projects in the outer west, south-east and northern areas of Melbourne. The traffic advisory services role included strategic transport modelling, which was delivered by Fiona. The VITM was utilised to define the demand and benefits of various included road upgrade projects and
The outputs from the VITM were used to inform the economic analysis underpinning the business case for the OSARs program.

**Yan Yean Road Business Case, VIC (September 2017)**

A VicRoads scheme to investigate potential capacity upgrade options for the Plenty Road Corridor. The VITM was utilised to define the demand and benefits of various options and comparison scenarios. Fiona was responsible for delivery of reporting elements of the study, alongside completing strategic modelling tasks with the VITM. The outputs from the were used to inform the economic analysis underpinning the business case for the Yan Yean Road Improvements.

**Plenty Road Business Case, VIC, (August 2017)**

A VicRoads scheme to investigate potential capacity upgrade options for the Plenty Road Corridor. Fiona contributed towards both technical and written elements of the study, completing strategic modelling tasks with the VITM and preparing reporting.

**A19/A184 Testos Downhill Lane Improvement (2014-Present)**

A Highways England scheme to upgrade a strategic junction on the A19 in South Tyneside. Fiona was involved in the development of the DIADEM variable demand and SATURN highway assignment model for the appraisal of the scheme. Fiona was instrumental in network development and validation. Fiona extended the simulation area of an existing model through use of a spreadsheet tool used to output junction coding to SATURN. The flow of information between the model and a GIS system was considered essential from the beginning, and Fiona made use of the ITN layer to inform journey time validation and to facilitate presentation of model results.

Fiona was responsible for constructing a database of traffic counts which was used to inform the model throughout the calibration and validation process. She has undertaken appraisal of the scheme options in TUBA and COBALT and was responsible for the assessment of all Distributional Impacts. She was responsible for the production of the Traffic Data Collection Report, and contributed a number of aspects to the Local Model Validation Report and the Economic Impact Report.

**A64 Hopgrove Improvements (2016-2017)**

A Highways England scheme to upgrade the A64 Hopgrove junction within Yorkshire to relieve delay on this route in non-traditional congested times (holiday periods and weekends). Fiona identified the cause of the congestion in the area was not at the roundabout as previously thought and therefore the project developed to incorporate dualling options as well as junction improvements.

Due to the lack of a suitable model in which to assess this scheme, Fiona was responsible for developing a number of spreadsheet models in which to assess the different options. She was also responsible for undertaking the EAST assessment of the
Scheme Options and produced the Option Assessment Report for the PCF Stage 0 option assessment exercise.

**M6 J13 – 15 Smart Motorways Project (2015-2016)**

Fiona was a traffic modeller on the M6 J13-15 Smart Motorways Project for Highways England. The project comprised the development of a SATURN highways and a DIADEM variable demand model. She was responsible for developing both networks and matrices for future year scenarios.

**Tees Valley Multi Modal Model (2014-2015)**

A commission to assist Tees Valley Unlimited in rebuilding a strategic 4 stage model in CUBE Voyager and revalidating to a current base year. The model was built using WebTAG principles and the key deliverable was a fully functioning base year model, which could be used to assess and prioritise schemes within a local assessment framework. The model is based on a bespoke set of scripts which were developed alongside Citilabs, the software developers. Fiona was responsible for processing large amounts of data prior to use. She built the Public Transport Matrices from bus ticket data and LENNON Rail data, and was responsible for undertaking the calibration and validation of the PT model.

**Middlehaven Dock Bridge, Middlesbrough (2014)**

A commission by Middlesbrough Council to produce traffic forecasts and economic appraisal of the proposed Middlehaven Dock Bridge, to support the scheme within the Local Growth Fund process. The new bridge was considered to be critical in supporting the regeneration of the Middlehaven area. Fiona was responsible for model development including creating and converting a sub model in CUBE Voyager from an existing CUBE Trips model, matrix estimation, calibration and validation of the model, and traffic forecasting, alongside the economic assessment of the scheme through use of TUBA.

During calibration, Fiona used GIS to interrogate TrafficMaster link time information to provide journey time information and compare this to the modelled journey time routes easily.

**North East Rail Strategy, United Kingdom (2014)**

As the GIS specialist Fiona Development of a Rail strategy for the North-East of England, covering all aspects of passenger and freight operations within the region, and links with other regions. It provided a review of aspirations for the Rail network in the North East linking this to the issues which are constraining development and economic expansion. Fiona took the GIS lead role in this project interrogating and manipulating large datasets and undertaking spatial analysis across all transport and planning specialisms, together with development of presentational material.
Annabel Kerr

Annabel is a transport planner who is passionate about using data to drive informed decision making and sustainable thinking. With a background in transport modelling and mathematics, she combines technical expertise in spatial and statistical analysis with a keen appreciation of the transport context. She has demonstrated strengths in providing insightful and transparent analysis and visualisation of complex datasets for clients. Throughout her career, Annabel has engaged in a wide variety of projects, collaborating closely across the public and private sectors. Key contributions include a major role in the Sydney to Canberra Faster Rail Market Assessment, focussing on accessibility impacts, and a long-term secondment developing the Sydney Motorways Planning Model.

Annabel brings a thorough understanding of the value of accessibility-focussed transport planning and the application of tools to shape the way we live and work for the better.

Transport Canberra and City Services | Sydney to Canberra Faster Rail Strategic Assessment | Planner | 2019

In the light of opportunities for Fast Rail connections between Sydney and Canberra, Arup is helping Transport Canberra to understand their future visions for the shape of the city. Annabel worked with urban designers and land use planners to produce a set of potential land use scenarios that could arise. She had oversight of a multi-step process that took into account strategic land use projections, accessibility impacts, spatial factors and planning controls.

The results of this study were incorporated into a multi-disciplinary assessment of the impact of Fast Rail on Canberra. Key visuals and summarised data outputs will be used by Transport Canberra to engage with neighbouring transport agencies to realise the benefits of this massive infrastructure investment.

World Bank | Public Transport Development Study for Sustainable Urban Mobility in Hanoi | Planner | 2019

The study aimed to restructure Hanoi’s existing bus network to complement newly introduced BRT and rapid transit corridors. It was part of an overall strategy to improve the efficiency and attractiveness of the public transport network for the city’s residents, with accessibility metrics used as a key indicator for Planners.

Annabel facilitated a training session for Hanoi’s planners and transit operators around Accessibility Theory and use of the Conveyal accessibility tool. She was on hand to assist key officials and the World Bank interpret and understand reporting on accessibility metrics in the study submission.
Transport Canberra | Sydney to Canberra Faster Rail Market Assessment | Analyst | 2018

Annabel led travel time and accessibility analysis for travel between Greater Sydney and Canberra. Using the Conveyal Accessibility toolkit and FME, she developed a methodology for comparing the accessibility to jobs, residents and key attractions afforded by Faster Rail and High Speed Rail options compared to the existing offering. These findings informed the market assessment for Faster Rail, by providing a snapshot of the accessibility experienced by each of the target customer groups.

Crucially, Annabel was involved throughout the entire process, from analysis and spreadsheet development to production of visualisations presented to the ACT Government.

Queensland Transport and Main Roads | Demand Responsive Transport – Planning and Analysis Study (Phase 2) | Analyst | 2018 – 19

Annabel developed spatial analysis processes (ArcPy) to assess the performance of Demand Responsive bus services being trialled in regional Queensland. Key indicators were chosen to determine how well the trial services provided residents with access to jobs, housing and social infrastructure; how well the services integrated with the fixed public transport network, and the socio-economic characteristics of the trial regions.

She also provided guidance around the cost-benefit analysis of the DRT trials and establishing consistent measures for cost per passenger kilometre travelled across a range of transport operators with varying data quality. The performance analysis became a key input into stakeholder workshops and provided a flexible skeleton that will be re-used in Phase 3 of the project.

RMS | Southern Sydney Road Network Plans | Analyst | 2018 - 19

Roads and Maritime Services requested strategic transport planning services for three road corridors in Southern Sydney. Annabel led the production of maps and other visuals used to illustrate how the corridors perform at present, and likely future performance considering the impact of changing policy, land use and transport infrastructure. The graphics became a vital tool for Stakeholder Workshops and for the project team to identify performance deficits for all road users.

The workflow developed allowed lessons learned from one corridor to be easily adopted for the remaining two study areas, improving efficiency and ease of analysis across the project team.

Annabel also helped develop a suite of targeted recommendations for each corridor. Here, there was a strong focus on creating and preserving good accessibility to places to live, work and socialise by a range of modes – not only motor vehicles – using the guidelines of the 30-minute city.
RMS | Strategic Traffic Modelling – Major Motorways Projects | Modeller | 2015 – 17 (Jacobs, previous position)

Between 2015 and 2018, Annabel worked with Roads and Maritime Services (RMS) to provide traffic modelling inputs using the WRTM strategic model for the design and assessment of major road infrastructure projects including WestConnex M4-M5 Link, Western Harbour Tunnel, Beaches Link and F6 Extension. This role involved coding design options using Emme and MapInfo GIS software and testing of various tolling and demand scenarios. She also performed post-analysis involving extracting and analysing model outputs in bulk using Excel VBA, MapInfo and R to assess the performance of each option.

IFM Investors | Strategic Traffic Modelling – WestConnex Bid Development | Modeller | 2018 (Jacobs)

As a transport modeller at Jacobs (January – June 2018), Annabel helped develop a strategic model in Emme to forecast traffic demand on WestConnex toll facilities. Forming part of a four-step model, the patronage and revenue forecasts were used to inform IFM’s bid to purchase a majority share in WestConnex from Sydney Motorway Corporation.

Annabel made extensive use of Python programming capabilities to produce traffic demand matrices from third-party land-use models, freight demand modelling, and statistical analysis of high-level travel patterns in Greater Sydney.

During model calibration and validation, Annabel used MapBasic, Python and Emme/2 scripting to analyse collected GPS travel time data, traffic counts from diverse sources (including classified intersection counts and RMS Traffic Volume Viewer) and strategic model outputs. Given time constraints and a multi-city project team, her focus was on presenting data clearly and succinctly, primarily through MS Excel.

RMS | Road Network Plan – Sunnyholt Road and Campbelltown Road (Jacobs)

Roads and Maritime Services requested strategic transport planning services for major road corridors in Greater Sydney. Annabel analysed GTFS public transport timetable data and ticketing information (Opal data) to provide detailed insights into bus service provision and bus performance along thirteen corridor segments. Key outputs included services by time of day; average speed of travel and passengers boarding and alighting at stops by day, time of day and road segment.

A high level approach using database methods allowed a large volume of input data to be processed with speed, accuracy with the added benefit of greater flexibility. The report outputs were later used to inform transport planning and investment decision-making aligned with the Movement and Place framework.