

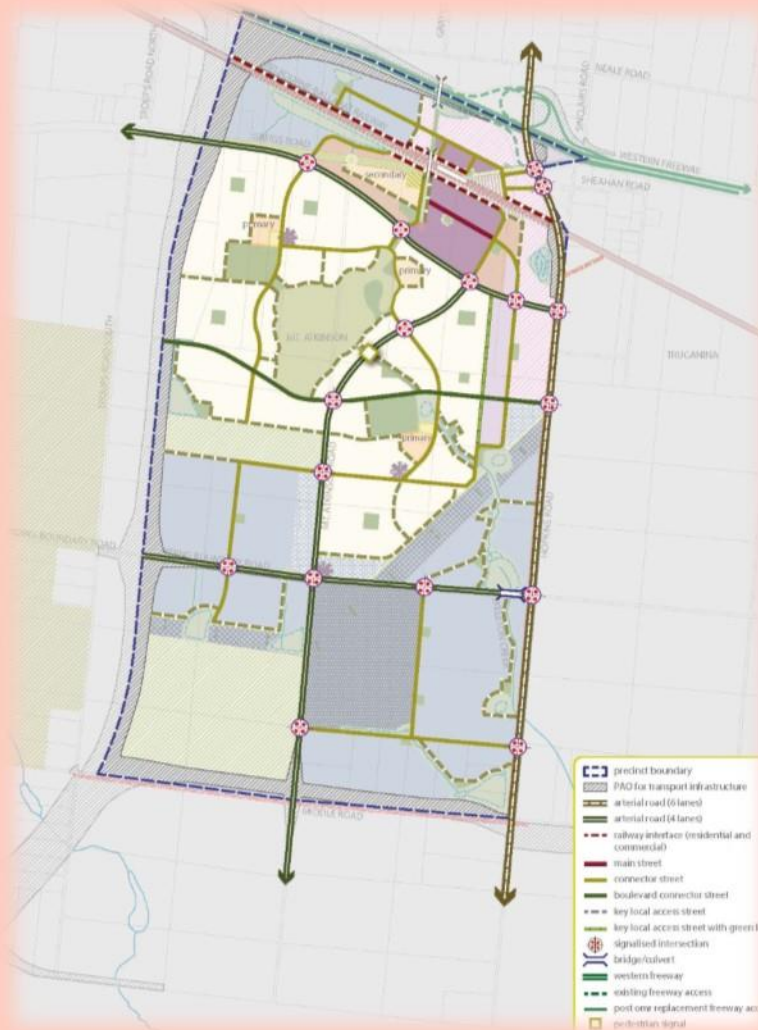
# Expert Witness Statement

## Traffic Engineering

### Melton Planning Scheme

#### Amendment C162

#### Mount Atkinson and Tarneit Plains



**Prepared by Stephen Pelosi**  
**2 September 2016**



## TABLE OF CONTENTS

|  |    |
|--|----|
| Table of Contents .....  | i  |
| 1. Introduction.....   | 1  |
| 2. Proposed Amendment C162 (Mt Atkinson and Tarneit Plains PSP) .....  | 2  |
| 2.1. Overview .....  | 2  |
| 2.2. Design Principles & Relevant Guideline Documents .....            | 2  |
| 2.3. Location .....  | 7  |
| 2.4. The Transport Network .....                                       | 8  |
| 3. Melton City Council Issues.....                                     | 11 |
| 3.1. Intersections IT01 & IT02 – Design adequacy .....                 | 11 |
| 3.2. Road cross sections for primary and secondary arterials .....     | 14 |
| 3.3. Intersection IT05 – Identification of a preferable location ..... | 18 |
| 4. My Opinion .....  | 20 |
| 4.1. Intersections IT01 & IT02 – Design adequacy .....                 | 20 |
| 4.2. Road cross sections for primary and secondary arterials .....     | 20 |
| 4.3. Intersection IT05 – Identification of a preferable location ..... | 20 |
| 5. Declaration .....   | 21 |
| Appendix A – Matters Raised by PPV Guide to Expert Evidence .....      | 22 |
| Appendix B – Curriculum Vitae .....                                    | 26 |



## 1. INTRODUCTION

My name is Stephen Pelosi and I am a Director at *movendo Pty Ltd* and a Consulting Traffic and Transport Engineer. *movendo* conducts business from the Ground Floor at 25 Ross Street, South Melbourne.

I completed a Bachelor degree in Civil Engineering at RMIT in December 1985 and have over 30 years of experience in traffic engineering and transport planning, particularly in the areas of planning and assessment of urban road networks, assessment of the traffic impacts of development proposals, preparation of local area traffic management strategies, town and regional centre traffic studies, pedestrian and bicycle design, parking studies and road safety audits. I have worked extensively across Australia, the Middle East, Asia and Latin America, advising private clients and government agencies on transport and infrastructure issues.

I have held senior executive positions in local government, as well as consultant firms. Prior to becoming a founding Director at *movendo*, I worked at transport consultancies UrbanTrans (2 years), AECOM (Technical Director 10 years), Aurecon (Associate 4½ years). I also worked at the City of Melbourne for 11 years in the traffic engineering office in various capacities.

I have been engaged by Melton City Council to consider various traffic engineering issues in relation to Amendment C162 to the Melton Planning Scheme. More particularly, I have been requested to consider the traffic implications of various aspects associated with the design of the proposed future road network servicing Mt Atkinson and Tarneit Plains, as envisaged in the Precinct Structure Plan associated with Amendment C162. Specifically, the three issues I have examined include:

1. Intersections IT01 & IT02 – Justification for geometric and operational adequacy of these intersections.
2. Road cross sections for primary and secondary arterials – treatment of pedestrian and bicycle facilities.
3. Intersection IT05 – Identification of a preferable location from a traffic engineering perspective.

The scope of my expert evidence is limited to consideration of the above matters, as detailed in this report.

Appendix A contains a statement setting out my qualifications and experience, and the other matters raised by Planning Panels Victoria 'Guide to Expert Evidence'. A copy of my curriculum vitae is provided in Appendix B.

## 2. PROPOSED AMENDMENT C162 (MT ATKINSON AND TARNEIT PLAINS PSP)

### 2.1. OVERVIEW

Amendment C162 (Mt Atkinson and Tarneit Plains PSP) has been prepared to facilitate future urban development over a land area of around 1,530 hectares. The area is bounded by the Western Freeway to the north, Hopkins Road to the east, Middle Road to the south and the Outer Metropolitan Ring (OMR) road reservation to the west. The proposed Amendment provides a framework for a combined residential and employment hub with approximately 6,700 dwellings (resulting in a projected population of around 18,500 people) and realisation of around 18,000 jobs. The Victorian Planning Authority (VPA) is the planning authority in respect of the Amendment.

There is a set of key development objectives guiding the Mt Atkinson and Tarneit Plains PSP area including several that involve “Transport and Movement”. Objective 026 outlines the need to “Provide an efficient road network to serve the state significant Western Industrial Node that ensures access is delivered to the strategic arterial road network to be delivered by VicRoads, and in particular to Hopkins Road”.

There is also a strong emphasis on sustainable transport modes. In Appendix B of the PSP document there are a number of Mt Atkinson Specialised Town Centre Design Principles listed. Principle 5 under the topic ‘Connecting the Region’ describes an objective to “*Design the town centre to prioritise pedestrian and cyclist access and movement to and within the town centre*”. In support of this objective, the PSP highlights the need to provide strong connections and continuous paths of travel to, from and within the town centre to promote walking and cycling, including to Greigs Road, the Mt Atkinson volcanic cone, conservation reserves, and the Kororoit Precinct.

### 2.2. DESIGN PRINCIPLES & RELEVANT GUIDELINE DOCUMENTS

This report examines three traffic engineering matters in relation to the transport network proposed under Amendment C162 (Mt Atkinson and Tarneit Plains PSP). It is therefore relevant, when assessing the adequacy of elements within the transport network, to first understand the principles used in ‘designing’ road networks both as part of a precinct structure planning process and, more broadly, by reference to well-established traffic engineering design guidelines. A number of guideline documents exist to inform the planning of transport networks in growth areas – two of which are particularly relevant in this Mt Atkinson and Tarneit Plains PSP context. These two guideline documents are:

- The “Precinct Structure Planning Guidelines” produced by the State Government’s former Growth Areas Authority in 2009 (and revised in 2013).
- The November 2015 VicRoads ‘working document’ known as “Guidance for Planning Road Networks in Growth Areas”.

Austroroads has also published guidance to help inform bicycle and pedestrian network planning and intersection design – both are relevant to Mt Atkinson and Tarneit Plains PSP. Austroroads is the association of Australasian road transport and traffic agencies. One of the guides published by Austroroads deals with provisions for pedestrians, as part of ‘road design’. It is known as “Guide to Road Design Part 6A: Pedestrian and Cyclist Paths”. With respect to intersection design, Austroroads has published the “Guide to Road Design Part 4A: Unsignalised and Signalised Intersections”. Finally, Austroroads has also published a research report examining pedestrian-cyclist conflict on shared paths and footpaths – the report is titled “AP-R287/06 Pedestrian-Cyclist Conflict Minimisation on Shared Paths and Footpaths”.

A discussion on each of the above five documents is presented in the sections that follow.

---

## **2.2.1 GROWTH AREAS AUTHORITY – PRECINCT STRUCTURE PLANNING GUIDELINES; PART TWO PREPARING THE PRECINCT STRUCTURE PLAN**

Part Two of the guidelines – “*Preparing the Precinct Structure Plan*” (hereinafter referred to as the ‘PSP guidelines’) – provides a step-by-step guide to preparing a Precinct Structure Plan in Melbourne’s growth areas such as Mt Atkinson and Tarneit Plains. The PSP guidelines define 7 key elements to inform the preparation of a design for a precinct:

1. Image and character;
2. Housing;
3. Employment and town centres;
4. Community facilities;
5. Open space and natural systems;
6. Transport and movement, and;
7. Utilities and energy.

There are 15 standards identified for Element Six (Transport and movement) – the most relevant for this report is standard S9:

### Standard S9

Marked bicycle lanes are provided on all collector streets. On all arterial roads, provide a shared bicycle/footpath (segregated where possible) and on road bicycle lanes wherever possible.

---

## **2.2.2 VICROADS – GUIDANCE FOR PLANNING ROAD NETWORKS IN GROWTH AREAS**

This VicRoads document is currently a ‘working document’. It nonetheless provides insights into road elements that are of interest to VicRoads. Importantly it is broadly consistent with the road network planning principles outlined in the Growth Areas Authority (now Victorian Planning Authority) Precinct Structure Planning Guidelines. It is relevant to note, when considering the bicycle and pedestrian cross-sectional elements of arterial roads, that VicRoads advises as follows:

### **Primary Arterials – Recommended Bicycle/Pedestrian Features (section 3.3, page 16)**

Separate footpath and two-way off road bicycle paths to be provided on both sides of the road.

- Footpath to be provided adjacent to the property frontage or loop road i.e. outside road reservation.
- Providing a footpath further away from an arterial road can be considered improving amenity for pedestrians.
- Such an arrangement will require the provision of access/crossing points for users to enable safe passage to access Primary Arterial intersections.
- In the absence of a loop road the footpath is also to be accommodated within the road reservation, adjacent to the two-way off road bicycle path.

### **Secondary Arterials – Recommended Bicycle/Pedestrian Features (section 3.3, page 17)**

Separate footpath and two-way off road bicycle paths to be provided on both sides of the road, complemented with a high level-of-service at intersections to enable pedestrians and cyclists to maintain their overall journey continuity and quality. If additional space is required within the secondary arterial road reservation, then the footpath could be provided adjacent to the property frontage or loop road i.e. outside the road reservation. Such an arrangement will require the provision of access/crossing points for users to enable safe passage to public transport located along secondary arterials as well as to intersections.



---

## 2.2.3 AUSTRROADS – GUIDE TO ROAD DESIGN PART 6A: PEDESTRIAN AND CYCLIST PATHS

This Austroads Guide outlines appropriate conditions applicable to the adoption of ‘shared’ or ‘separated’ bicycle facilities. The key recommendations are as follows:

### Figure 2.1, Section 2.2.3 (page 7):

Path volumes suggested in order to limit the incidence of conflict between users (significantly lower than the capacity of the principal path types)

- Shared paths are ‘recommended’ when pedestrian and cyclist volumes during peak periods on a typical day are low. (*Low demand is defined as ‘Infrequent use of path’ – less than 10 users per hour*).
- Shared paths are not ‘recommended’ when demand is (in both directions of travel) more than 50 users per hour

### Section 3.4 (pages 10-11):

A shared use path may be appropriate where:

- demand exists for both a pedestrian path and a bicycle path but where the intensity of use is not expected to be sufficiently great to provide separate facilities
- an existing low-use footpath can be modified to provide for cyclists by satisfying legal requirements and as necessary upgrading the surface, width and kerb ramps
- there is an existing road nearby which caters well for faster cyclists (e.g. has on-road bicycle lanes), to limit the extent of user conflict on the shared path.

### Section 3.4 (page 11):

A significant issue associated with shared use paths is the variety of users who display various characteristics that can lead to conflict between them. These characteristics include differences in speed, space requirements, age, user expectation (as some users expect exclusive or priority use) and predictability (e.g. cyclists, pedestrians walking dogs, roller bladers, and skateboard riders).

### Section 3.5 (page 12):

- A separated path may be appropriate where there is a significant volume of both cyclists and pedestrians such that shared use would lead to safety and operational problems. These situations typically arise in areas that attract high pedestrian and cyclist recreational or commuting movements (e.g. foreshore promenades and major inner city bridges).

### Commentary 5 (page 108):

There is potential for conflict between the various users of a shared use path. To minimise this, a shared use path design should be to a high standard which provides adequate sight distance between cyclists and other users. It should desirably also provide a clear zone adjacent to the path to enable cyclists to safely run off the path to escape an incident (e.g. potential head-on collision with another cyclist; entanglement with a dog leash or evasive action to avoid a dog that is off the leash). Widths of 4.0 metres or more may be required where the numbers of cyclists and pedestrians are high or there is a high probability of conflict between users (e.g., people walking dogs, roller bladders and skaters, etc.).



---

## **2.2.4 AUSTRADS – RESEARCH REPORT AP-R287/06 PEDESTRIAN-CYCLIST CONFLICT MINIMISATION ON SHARED PATHS AND FOOTPATHS**

**Table 2.1, Section 2.3.3 (page 5)**

Key findings from this research report – with respect to shared paths – are as follows:

- Pedestrian-cyclist conflict is common with significant volume of cyclists and pedestrians or a mix of recreational pedestrians and commuting cyclists
- Level of Service for cyclists can be poor where interference by other path users results in slower speeds
- Shared paths are beneficial to a range of path users but need to be managed effectively
- Appropriate with modest numbers of pedestrians and cyclists
- It is important that the path's design is suitable for its use and demand, that authorities adequately monitor users' behaviour on the path, and that the connections between path, road and driveways are carefully considered

---

## **2.2.5 AUSTRADS – GUIDE TO ROAD DESIGN PART 4A: UNSIGNALISED AND SIGNALISED INTERSECTIONS**

This guide provides insights for the design of intersections.

### **Sections 3.1 and 3.2 (page 15)**

This part of the Austroads Guide identifies that it is fundamental to the safety of intersections that drivers approaching in all traffic streams are able to:

- recognise the presence of an intersection in time to slow down or stop in a controlled and comfortable manner
- see vehicles approaching in conflicting traffic streams and give way where required by law or avoid a crash in the event of a potential conflict.

Intersection safety performance is therefore largely dependent upon adequate sight distance in relation to both horizontal and vertical geometry for all drivers approaching and entering the intersection. Consequently, sight distance is a key consideration in the location and design of intersections and adequate sight distance at proposed intersections and remodelled intersections must be achieved when developing the horizontal and vertical alignments of new and upgraded roads, as is the case for proposed intersection IT05 in the Mt Atkinson and Tarneit Plains PSP.

The types of sight distance that must be provided for vehicles in the design of all intersections include:

- approach sight distance (ASD)
- safe intersection sight distance (SISD)
- minimum gap sight distance (MGSD)

On relatively flat terrain (where vertical alignment is unlikely to be an issue) the placement of intersections on horizontal curves typically achieves the most favourable sight distance outcomes when the junction occurs at the midpoint of the curve segment. This is illustrated in Figure 1.

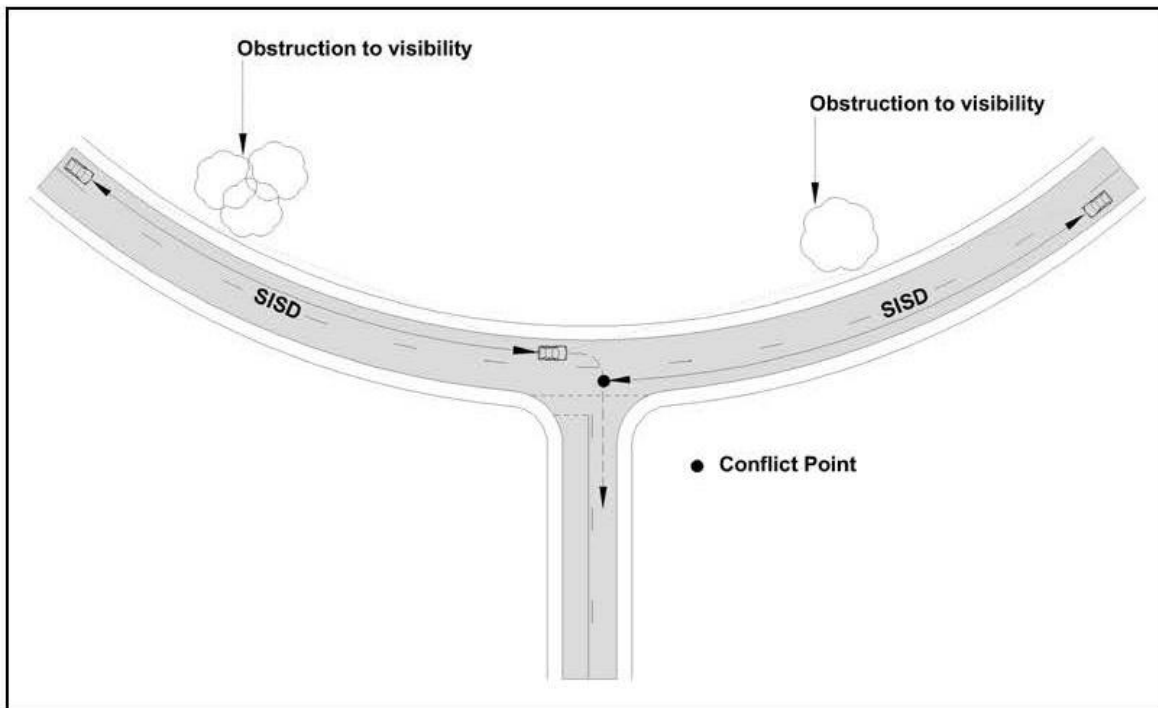


Figure 1: SISD model for minor roads intersecting on the outside of horizontal curves  
(extract from Austroads Guide to Road Design Part 4A – Figure 3.3, page 23)

## 2.3. LOCATION

Amendment C162 applies to land shown in Figure 2, bounded by the Western Freeway to the north, the Outer Metropolitan Ring Road reservation to the west, Middle Road to the south and Hopkins Road to the east. The precinct is located approximately 34 kilometres to the west of the Melbourne CBD.

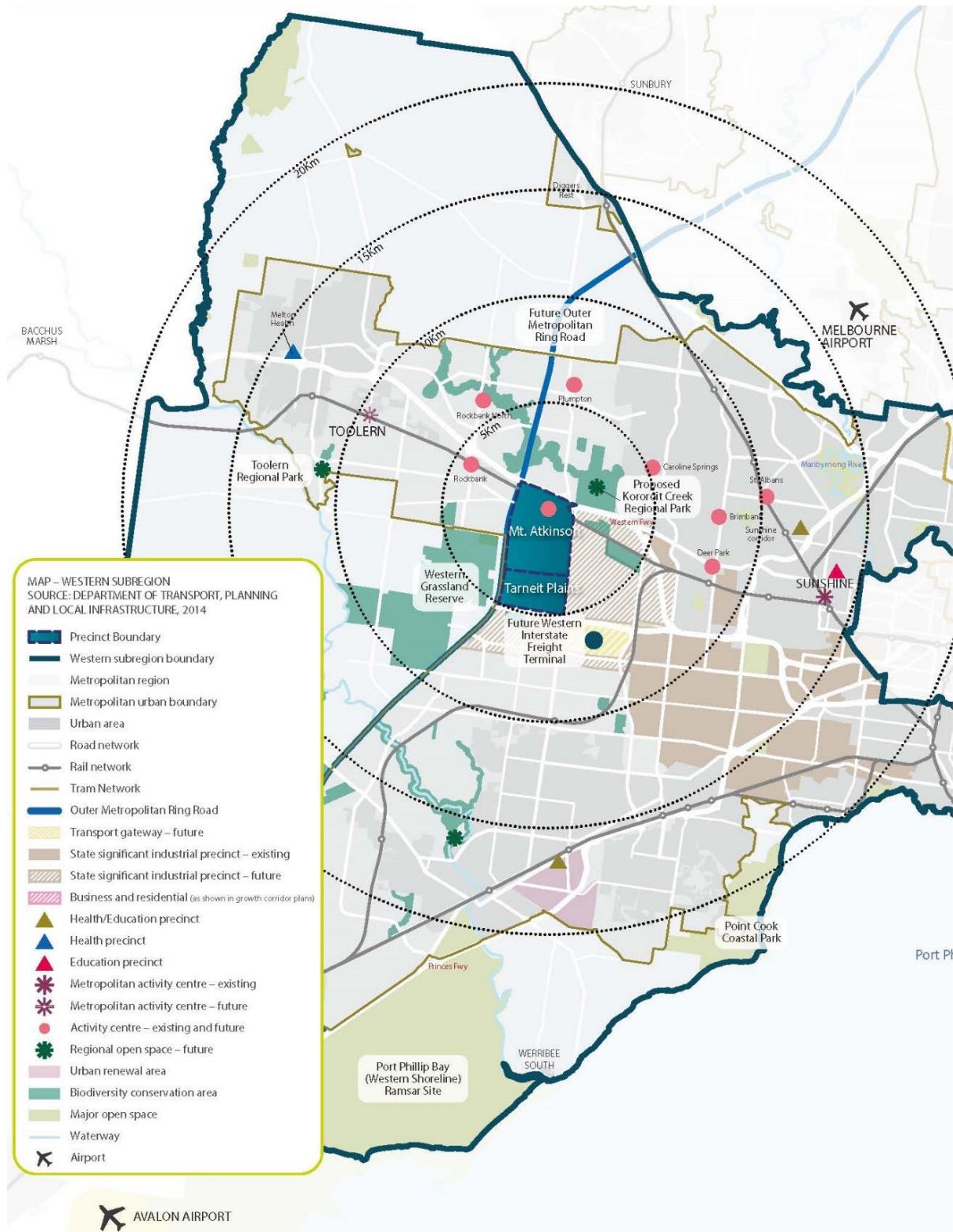


Figure 2: Land affected by the amendment

## 2.4. THE TRANSPORT NETWORK

### 2.4.1 REGIONAL TRANSPORT MODELLING

The VPA did not undertake any transport modelling to specifically take account of the development scenario envisaged under the Mt Atkinson and Tarneit Plains PSP (Amendment C162). Instead, the VPA commissioned Jacobs consultants to review the suitability of using existing Victorian Integrated Transport Model (VITM) runs previously developed for either the 'PSP 1099 Rockbank', or 'PSP 1078 Plumpton and PSP 1080 Kororoit' processes. Specifically, the VPA requested Jacobs' views on whether those model runs would be suitable for the purposes of assessing the transport needs of the Mt Atkinson and Tarneit Plains PSP. Jacobs' findings were included in a report titled "PSP 1082 Mt Atkinson and PSP 1085 Tarneit Plains – Transport Modelling Assessment" dated 4 July 2016.

Jacobs concluded that the most suitable existing version of VITM to use for assessing the traffic impacts in and around the Mt Atkinson and Tarneit Plains PSP is the Rockbank model. Jacobs assessed that the Rockbank model's 2046 scenario included employment, population and school enrolment land use inputs that would generate approximately similar traffic volumes. Jacobs also concluded that the transport zone system, road and Public Transport networks are a fair representation of what is currently planned by VPA in the Mt Atkinson and Tarneit Plains PSP.

In its report, Jacobs recognised that there are no existing model runs suitable for assessing the Mt Atkinson and Tarneit Plains PSP at 2026. In order to create this 2026 scenario Jacobs indicated that it would require:

- Coding the 2026 road network
- Inputting the correct land use assumptions

In summary, the conclusion reached by Jacobs, in its report, was that the preferred model to use is 2046 Rockbank model as it includes a better representation of 2046 population, employment and school enrolments within the Mt Atkinson and Tarneit Plains PSPs (compared with other model runs). However, the 2026 road network coded in the Rockbank VITM model is reflective of the demographic assumption of no development in Mt Atkinson and Tarneit Plains. Essentially, only existing roads are coded in the 2026 model, namely Hopkins Road, Greigs Road and Troups Road. Jacobs concluded that *"the 2026 road network is not suitable to test the proposed development within Mt Atkinson as there will be population and employment in zones that are not connected to the road network"*.

### 2.4.2 KEY FINDINGS FROM THE REGIONAL MODELLING

The Jacobs report concluded that the 2046 Rockbank model is a *"fair representation of the land use and transport networks planned for the Mount Atkinson and Tarneit Plains PSP"*. It also concluded that whilst there are differences in the land use assumptions they are not likely to result in a significantly different distribution of traffic across the planned road network. The Jacobs report also determined that while there is capacity in the planned internal road network to service the proposed development; the surrounding arterial road network is approaching capacity at 2046, particularly along Hopkins Road around the Western Freeway and Boundary Road. It commented that *"Even without any trips being attracted to or from Mt Atkinson the road network has a number pinch points, particularly on Hopkins Road ... and at the southern end of the PSP around Boundary Road"*. The 'pinch points' highlighted by Jacobs are shown in Figure 3.

Importantly, Jacobs stated that *"the lack of a 2026 VITM model suitable for use means that conclusions must be drawn from the 2046 model. Based on the assumption of a 75% build out at 2026 it is recommended that both Hopkins Road and Greigs Road be upgraded to 4-lane arterials by 2026"*.



**Figure 3: 2026 AM Peak Period Volume to Capacity Ratios**

(extract from July 2016 Jacobs Transport Modelling Assessment document – Figure 14, page 26)

As can be seen in Figure 3, the Jacobs report involved examination of Volume-Capacity (VC) ratios across the modelled road networks to determine the suitability of proposed network arrangements. VC ratios indicate the approximate level of congestion on links in the road network, by comparing the forecast volume of vehicles using a link by the link's theoretical capacity. Thus, VC ratios exceeding 0.8 and approaching 1 (those coloured orange, red and black in Figure 3) represent road links approaching their realistic capacity. Jacobs defined five VC levels – each with an associated traffic 'condition' rating as given in Table 1.



| V/C Range | Condition             |
|-----------|-----------------------|
| < 0.6     | Not congested         |
| 0.6 – 0.8 | Approaching congested |
| 0.8 – 1.0 | Congested             |
| 1.0 – 1.2 | Very Congested        |
| > 1.2     | Highly Congested      |

**Table 1: VC ratios and associated forecast congestion levels**

In summary, the VC ratios obtained for the AM peak for the 2026 reference case model show that even without any trips being attracted to or from Mt Atkinson / Tarneit Plains the road network has a number pinch points, particularly on Hopkins Road and Jacobs recommended that, based on the assumption of a 75% build out at 2026, both Hopkins Road and Greigs Road be upgraded to 4-lane arterials by 2026.

### 2.4.3 OTHER MODELLING

The VPA commissioned Cardno to undertake intersection analysis at the northern end of Hopkins Road using specialist software package SIDRA. The two intersections examined were Hopkins Road at the Western Freeway and Sheahan Road/Meskos Road respectively (IT01 & IT02 as denoted in the PSP documentation).

The Cardno assessment did not take into consideration the interim intersection requirements in 2026. Instead, intersection analysis of IT01 and IT02 was only undertaken for the 'ultimate 2046 timeframe' (using 2046 Jacobs traffic volumes as a starting point with some adjustments). This analysis concluded that the two intersections would operate 'outside of capacity' if constructed in accordance with VPA guidelines – resulting in congestion at the intersections during peak hours. The analysis did not take into consideration the interaction between IT01 and IT02 (which are closely spaced) – each intersection was assessed independent of the other. Furthermore, the analysis did not take account of the interaction between Hopkins Road traffic and the existing nearby at-grade Melbourne to Ballarat railway line, primarily used at present for V-line services. The Victorian Government recently announced funding to duplicate this line (with ultimate electrification in the future), which will result in increased services and incidences of boom gates being down (intermittently closing Hopkins Road).

Cardno concluded that a 3-lane cross-section for Hopkins Road in each direction is appropriate for the ultimate 2046 traffic volumes and that the majority of traffic issues are expected to occur on the 'side roads' at IT01 and IT02.

### 3. MELTON CITY COUNCIL ISSUES

The three issues that I have been requested to examine include:

1. Intersections IT01 & IT02 – Justification for geometric and operational adequacy of these intersections
2. Road cross sections for primary and secondary arterials – treatment of pedestrian and bicycle facilities
3. Intersection IT05 – Identification of a preferable location from a traffic engineering perspective

Each is discussed in more detail below.

#### 3.1. INTERSECTIONS IT01 & IT02 – DESIGN ADEQUACY

##### 3.1.1 STATUS – INTERSECTIONS IT01 & IT02

Intersections IT01 and IT02 are located on Hopkins Road just south of the Western Freeway. Hopkins Road is identified in the Mount Atkinson / Tarneit Plains PSP as an arterial road with an ultimate 6-lane cross-section. Hopkins Road is an existing north-south road, with a 2-lane cross-section, which already experiences some peak period congestion at its interchange with the Western Freeway.

Traffic modelling and intersection analyses of the proposed transport network was not provided during the PSP exhibition stage, leading to uncertainties as to whether the proposed transport network will be effective. Some transport assessment has been made available to Council post-exhibition, in the form of reports by Jacobs and Cardno consultants.

##### 3.1.2 COUNCIL'S POSITION

I am instructed that Council is concerned that the VPA has not provided sufficient traffic modelling and/or assessments to demonstrate that the proposed road network can accommodate the forecast traffic. More specifically Council is concerned at the ability of the two closely spaced intersections on Hopkins Road to effectively function in the interim as the key entry/exit points within the northern part of the PSP area.

The specific area of concern, that has been highlighted by the Council, is the north-eastern end of the PSP, as shown in Figure 4. This is the location where there are two closely spaced intersections IT01 and IT02.

Intersection IT01 serves the west bound on and off ramps to the Western Freeway. This intersection will have a regional role providing access to residential and employment areas south of the freeway (including Mt Atkinson and Tarneit Plains PSP and Melton and Wyndham growth areas) and access north of the freeway to residential and employment areas within Plumpton and Kororoit PSPs (proposing a combined population of around 54,000 people). Intersection IT02 is proposed to serve the Mt Atkinson Specialised Town Centre area (north of the railway line), including the proposed rail station and the Warrawee PSP.

The land wedged between the freeway, Outer Metropolitan Ring Road, rail line and Hopkins Road, which includes the Mt Atkinson Specialised Town Centre area (north), is reliant on IT01 & IT02 for primary access and egress. I am instructed that Council is concerned that intersections IT01 & IT02 will not provide reliable connections to allow north-south movement. I am also instructed that Council have proposed to VPA that a connector road (and road bridge over the Melton rail corridor) be provided from IT05 to north of the rail corridor to provide connectivity to the town centre north of the rail line – in the event that IT01 and IT02 are not able to operate satisfactorily. The suggested alignment for the new connector and road bridge is shown in Figure 5.



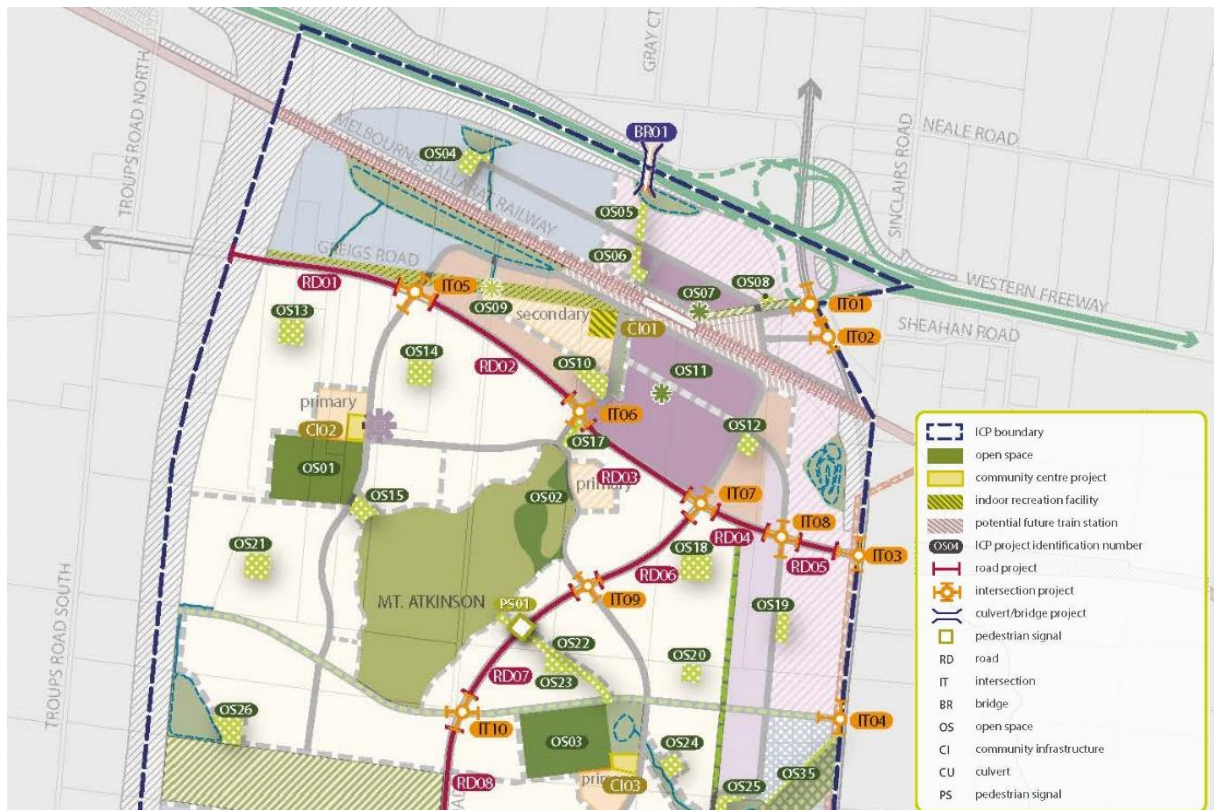


Figure 4: Precinct Infrastructure Plan at Northern End of Mt Atkinson & Tarneit Plains Precinct Structure Plan (extract from April 2016 PSP document – Plan 13, page 68)

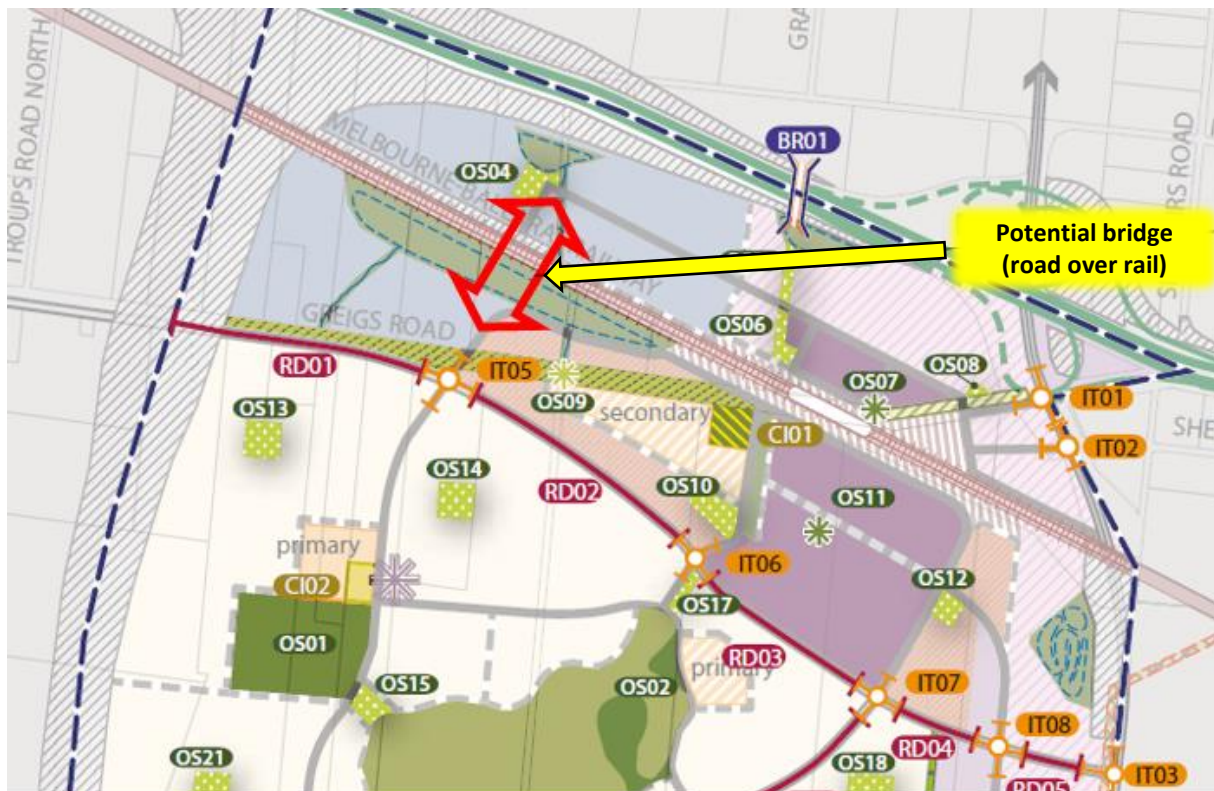


Figure 5: Indicative alignment of possible 'road over rail' bridge (City of Melton Proposal)

---

### 3.1.3 RELEVANT MATTERS FOR CONSIDERATION

1. The Transport Modelling Assessment for the Mt Atkinson & Tarneit Plains Precinct Structure Plan (undertaken by Jacobs consultants on behalf of the VPA) identified that in 2046 the 'Rockbank Model' is a *"fair representation of the land use and transport networks planned for the Mount Atkinson and Tarneit Plains PSP"*. Jacobs also concluded that *"the 2026 road network is not suitable to test the proposed development within Mt Atkinson as there will be population and employment in zones that are not connected to the road network"*.
2. Accordingly, Jacobs indicated that *"the lack of a 2026 VITM model suitable for use means that conclusions must be drawn from the 2046 model"*. On this basis, Jacobs recommended that both Hopkins Road and Greigs Road be upgraded to 4-lane arterials by 2026, based on the assumption of a 75% build out at 2026.
3. The traffic volume forecasts prepared by Jacobs consultants (based on the 'Rockbank Model') have revealed that Hopkins Road will rapidly reach arterial road traffic levels, with an estimated traffic volume in 2026 in excess of 20,000 vehicles per day in the vicinity of the Western Freeway. This growth in traffic occurs even without any trips being attracted to or from most of the Mt Atkinson / Tarneit Plains PSP area. Under the Planning Scheme, a road carrying 20,000 vehicles per day is an arterial.
4. Intersection analysis at IT01 and IT02 for the 'ultimate 2046 timeframe' was undertaken by Cardno on behalf of VPA (using 2046 Jacobs traffic volumes as a starting point with some adjustments). This analysis concluded that the two intersections would operate 'outside of capacity' if constructed in accordance with VPA guidelines – resulting in congestion at the intersections during peak hours. The analysis did not take into consideration the interaction between IT01 and IT02 (which are closely spaced) – each intersection was assessed independent of the other. In addition, the analysis has not considered the interaction between Hopkins Road traffic and the existing nearby at-grade Melbourne to Ballarat railway line, primarily used at present for V-line services. The Victorian Government recently announced funding to duplicate this line (with ultimate electrification in the future), which will result in increased services and incidences of boom gates being down (intermittently closing Hopkins Road).
5. Cardno concluded that a 3-lane cross-section for Hopkins Road in each direction is appropriate for the ultimate 2046 traffic volumes and that the majority of traffic issues are expected to occur on the 'side roads' at IT01 and IT02.
6. The Cardno report did not take into consideration the interim intersection requirements by 2026.

---

### 3.1.4 CONCLUSION

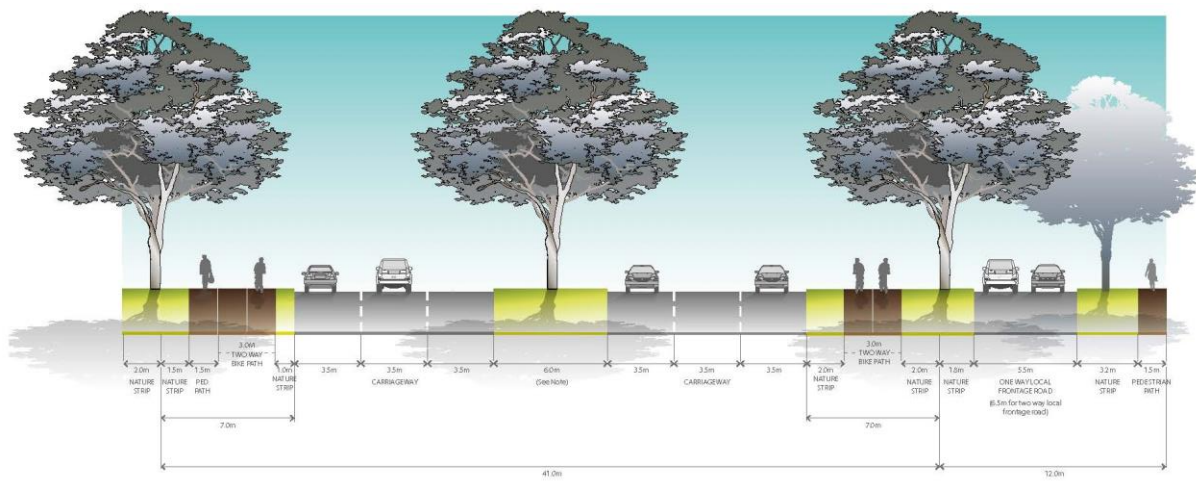
The traffic volume forecasts prepared for Hopkins Road demonstrate that the corridor will reach a traffic volume in excess of 20,000 vehicles per day by 2026 just south of the Western Freeway (even without any explicit traffic contribution from most of the Mt Atkinson & Tarneit Plains PSP area). The intersection modelling for IT01 and IT02 has been undertaken only for 2046 but not for 2026. The absence of 2026 traffic modelling for these intersections (that appropriately incorporates interaction between the two sites and the nearby Melbourne to Ballarat railway line) makes it difficult to confidently predict interim requirements for IT01 and IT02. Additional modelling is required to demonstrate what intersection layouts will be required to accommodate the forecast traffic.

## 3.2. ROAD CROSS SECTIONS FOR PRIMARY AND SECONDARY ARTERIALS

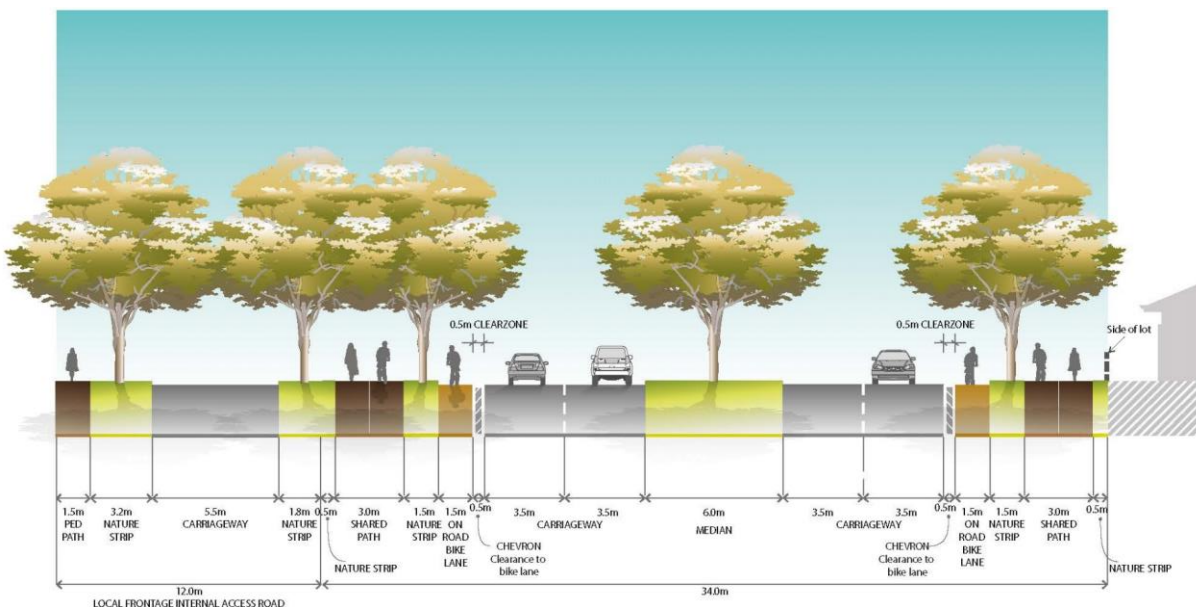
### 3.2.1 STATUS – ROAD CROSS SECTIONS

The proposed design of pedestrian and bicycle facilities on primary and secondary arterials is documented in Appendix D of the Mt Atkinson & Tarneit Plains PSP and reproduced in Figure 6 (primary arterial) and Figure 7 (secondary arterial).

The primary arterial cross section shows the two-way bike path and pedestrian path joined on the opposite side to the 'Local Frontage Road'. There are 6 variations to the proposed secondary arterial cross section (only one of which is shown in Figure 7) – all of which feature the provision of a 1.5-metre wide on-road bike lane in each direction.



**Figure 6: Proposed Cross Section Primary Arterial Road – 6 lane**  
(extract from Mt Atkinson & Tarneit Plains Precinct Structure Plan – Appendix D, page 99)

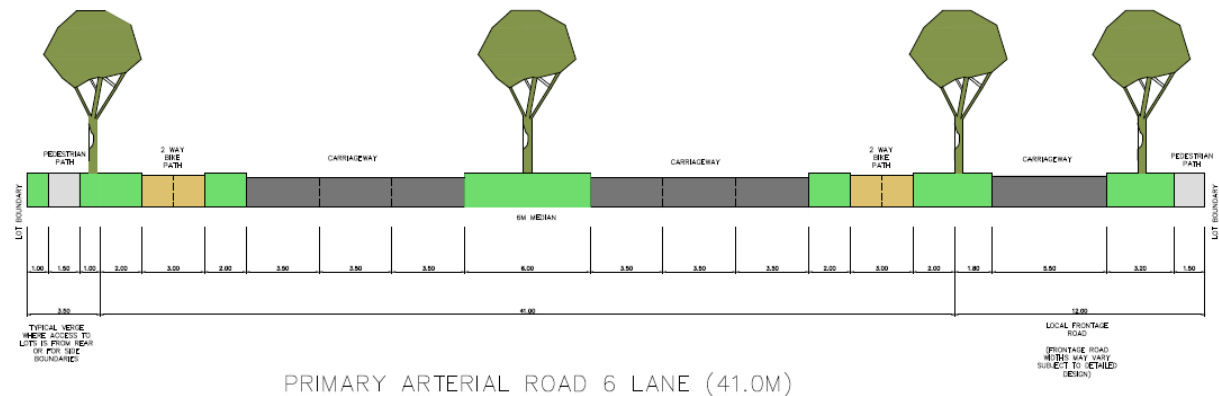


**Figure 7: Proposed Cross Section Secondary Arterial Road – Residential**  
(extract from Mt Atkinson & Tarneit Plains Precinct Structure Plan – Appendix D, page 93)



### 3.2.2 COUNCIL'S POSITION

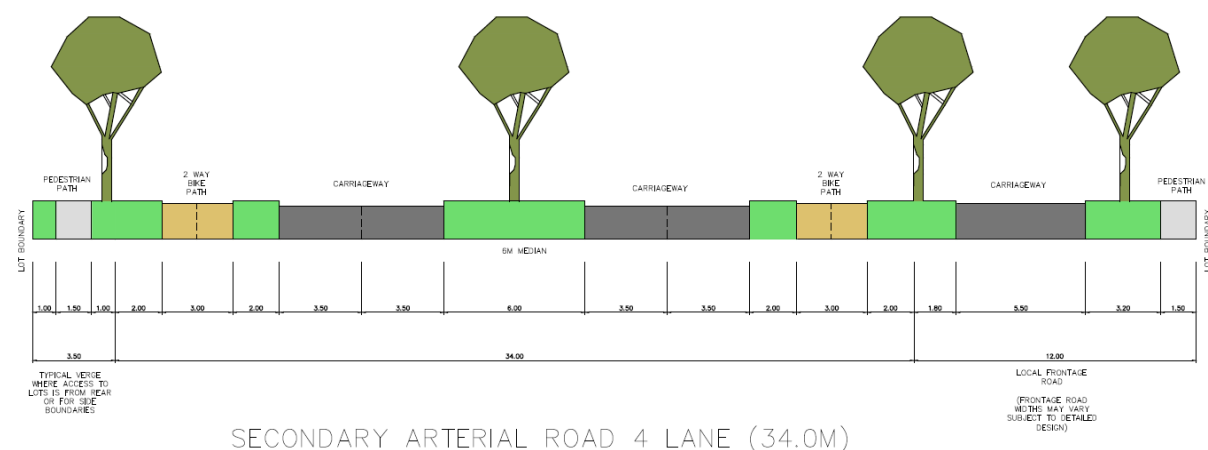
I am instructed that Council is not supportive of joining the two-way bike path and pedestrian path on the opposite side to the 'Local Frontage Road', as proposed by VPA and shown on the Primary Arterial Road cross sections. Council's preference is to provide separation between the two-way bike path and pedestrian path. The cross section in Figure 8 is proposed by Council as an alternative for the Primary Arterial Road cross section shown in the PSP.



**Figure 8: Council-Preferred Cross Section Primary Arterial Road – 6 lane**

I am also instructed that Council is not supportive of providing on road bike lanes, as proposed by VPA, on Secondary Arterial Roads. Council's preference is to provide 'two way off road bicycle paths' on each side of the road reserve, in accordance with the recommended cross section for Secondary Arterials in the VicRoads *Growth Area Network Planning Guidance & Policy Principles (Section 4.5)* document. Cross sections for Secondary Arterial Roads are to be amended to provide 'two way off road bicycle paths' on each side of the road reserve, in accordance with the recommended cross section for Secondary Arterials in the VicRoads *Growth Area Network Planning Guidance & Policy Principles (Section 4.5)* document.

The cross section in Figure 9 is proposed by Council as an alternative for the treatment of bike lanes on Secondary Arterial Roads in contrast to the on road bike lanes shown in the PSP. The cross section in Figure 9 features two way off road bicycle paths in each direction.

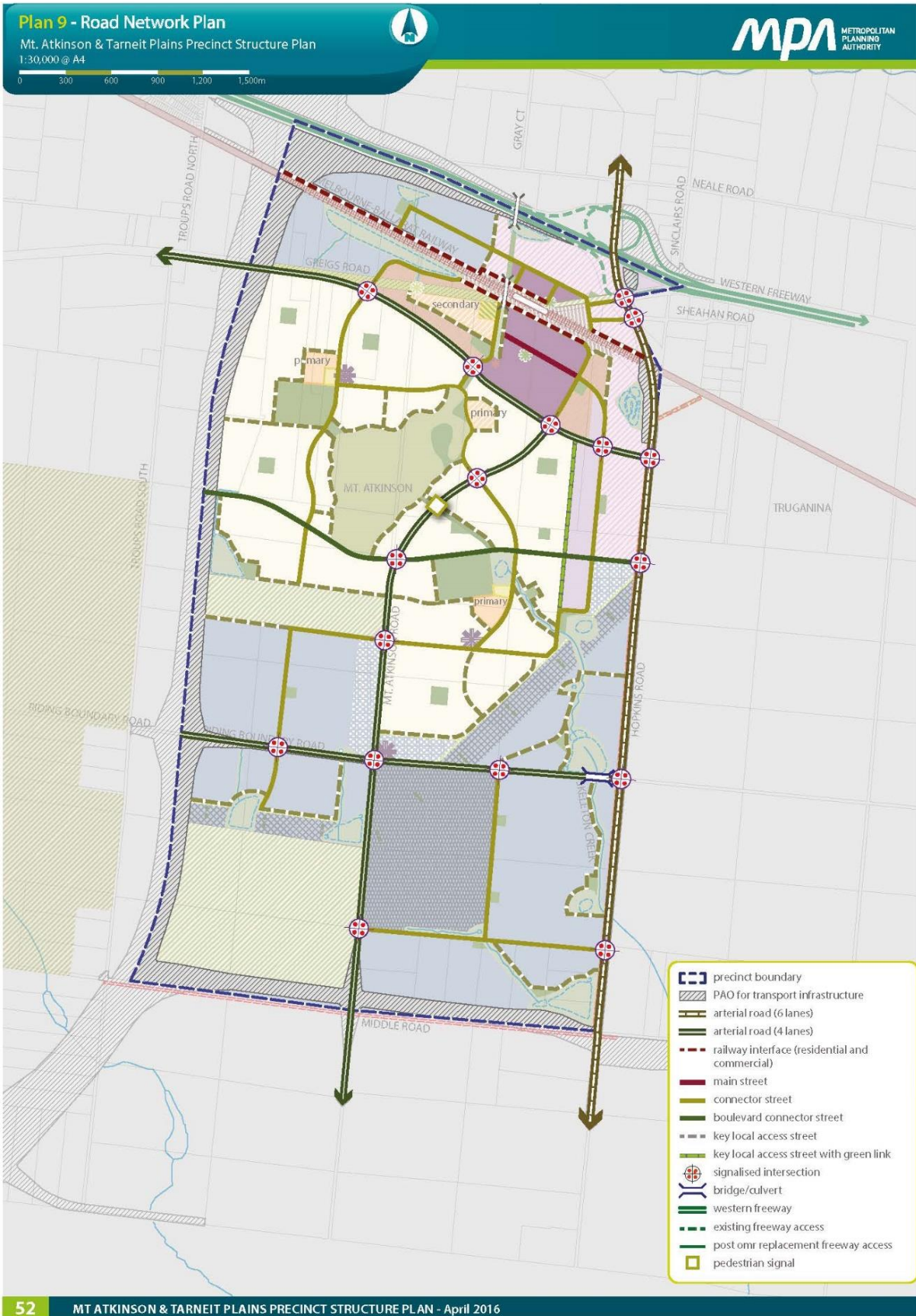


**Figure 9: Council-Preferred Cross Section Secondary Arterial Road**

---

### 3.2.3 RELEVANT MATTERS FOR CONSIDERATION

1. Cyclist and pedestrian use of pathways on primary and secondary roads is expected to be high – consistent with the intent of the Design Principles in the PSP – particularly Principle 5 (under the topic ‘Connecting the Region’) which describes an objective to “Design the town centre to prioritise pedestrian and cyclist access and movement to and within the town centre”. In support of this objective, the PSP highlights the need to provide strong connections and continuous paths of travel to, from and within the town centre to promote walking and cycling, including to Greigs Road, the Mt Atkinson volcanic cone, conservation reserves, and the Kororoit Precinct.
2. The PSP guidelines define 7 key elements to inform the preparation of a design for a precinct, one of which – Element Six involves ‘Transport and Movement’. There are 15 standards identified for Element Six – the most relevant for this context is standard S9: *“Marked bicycle lanes are provided on all collector streets. On all arterial roads, provide a shared bicycle/footpath (segregated where possible) and on road bicycle lanes wherever possible”*.
3. The Mt Atkinson & Tarneit Plains PSP includes a road hierarchy with cross-sectional details provided at Appendix D. The PSP hierarchy of roads (in order of decreasing importance) is ‘Primary Arterial’, ‘Secondary Arterial’, ‘Connector’ and ‘Local Access Street’. The cross sections shown in Appendix D for primary arterials and connectors both feature dedicated off road bike paths. However, the various secondary arterial cross sections feature on road bike lanes. This represents an inconsistency in the treatment of cyclists with an undesirable practical consequence. Specifically, it would force a user moving ‘up the hierarchy’ of roads to cross between off- and on-road facilities. This means that cyclists would experience a reduction in the level of protection when travelling from a fully separated off-road bike facility on a connector street to a more exposed on-road facility on a secondary arterial road and finally back to full protection in the off-road bike path context found on the primary arterial roads. The hierarchy of roads is reproduced in Figure 10.
4. The VicRoads working document “Guidance for Planning Road Networks in Growth Areas” recommends that on Primary Arterials there should be separate footpath and two-way off road bicycle paths on both sides of the road. On Secondary Arterials the document recommends separate footpath and two-way off road bicycle paths to be provided on both sides of the road.
5. Austroads’ Guide to Road Design Part 6A: Pedestrian and Cyclist Paths outlines appropriate conditions applicable to the adoption of ‘shared’ or ‘separated’ bicycle facilities. Shared paths are ‘recommended’ when pedestrian and cyclist volumes during peak periods on a typical day are low. (Low demand is defined as ‘Infrequent use of path’ – less than 10 users per hour). Shared paths are not ‘recommended’ when demand is (in both directions of travel) more than 50 users per hour. Furthermore, a separated path may be appropriate where there is a significant volume of both cyclists and pedestrians such that shared use would lead to safety and operational problems. These situations typically arise in areas that attract high pedestrian and cyclist recreational or commuting movements – which is the logical and desired outcome for the proposed cyclist and pedestrian facilities on the primary and secondary arterials in the Mt Atkinson & Tarneit Plains PSP.
6. Austroads’ Research Report “AP-R287/06 Pedestrian-Cyclist Conflict Minimisation on Shared Paths and Footpaths” identifies that pedestrian-cyclist conflict is common on shared paths with significant volume of cyclists and pedestrians or a mix of recreational pedestrians and commuting cyclists. It also identifies that shared paths are only appropriate with modest numbers of pedestrians and cyclists.



**Figure 10: Proposed Road Network Plan**  
(extract from Mt Atkinson & Tarneit Plains Precinct Structure Plan – Plan 9, page 52)

---

### 3.2.4 CONCLUSION

The adoption of cross sections for Primary Arterial roads as currently proposed in the PSP (where two-way bike path and pedestrian path are joined) is inconsistent with good design guidance for facilities that are expected to be well utilised. Similarly, the provision of on road bike lanes on Secondary Arterial roads is inconsistent with published design guidance.

The Council-preferred separation of the two-way bike path and pedestrian path on the opposite side to the 'Local Frontage Road' on the Primary Arterial cross section (as shown indicatively in Figure 8) is consistent with the desired design outcome to achieve separation of cyclist and pedestrian facilities – as envisaged by relevant VPA, VicRoads and Austroads guidelines. In addition, the provision of two-way off road bicycle paths to be provided on both sides of Secondary Arterial roads (as shown indicatively in Figure 9) is consistent with the desired design outcome of providing cyclists full separation from motorised vehicles – as envisaged by the same set of guidelines.

## 3.3. INTERSECTION IT05 – IDENTIFICATION OF A PREFERABLE LOCATION

---

### 3.3.1 STATUS – INTERSECTION IT05

Intersection IT05 is located at the junction of road segments RD01 and RD02 with a new North-South Connector Road, as shown in Figure 11 (functional concept) and Figure 12 (broader context). This location is along a large radius horizontal curve. The PSP currently proposes to locate intersection IT05 on land at 263 Greigs Road.

RD01 is the realigned Greigs Road between the Outer Metropolitan Ring Road (OMR) and the proposed western-most North-South connector street. RD02 is the realigned Greigs Road between the western-most North-South connector street and the intersection with another North-South Connector Road (IT06) that provides access into the 'specialised town centre'.

The identification of a preferable location for IT05, from a traffic engineering perspective, needs to take into consideration geometric design standards.

---

### 3.3.2 COUNCIL'S POSITION

I am instructed that Council wishes to move IT05 towards the north-west to maintain road segment RD01 within the existing 60m Greigs Rd road reserve (minimising land purchase requirements for this road segment). Moving IT05 towards the north-west would result in it being located on land at 289 Greigs Road. This change also allows the proposed western-most North-South connector street to be straightened (made more perpendicular) and to improve access to allow earlier commencement of development. The shift towards the north-west also removes the undevelopable triangle of land (shown in yellow in Figure 11).

---

### 3.3.3 RELEVANT MATTERS FOR CONSIDERATION

1. The position of IT05 near the centre of a large radius curve provides the necessary pre-conditions to achieve reasonable intersection sight distance outcomes (assuming relatively flat terrain).
2. A relocation of IT05 towards the north-west is likely to improve sight distance outcomes by virtue of moving the junction closer to the midpoint of the curve segment.



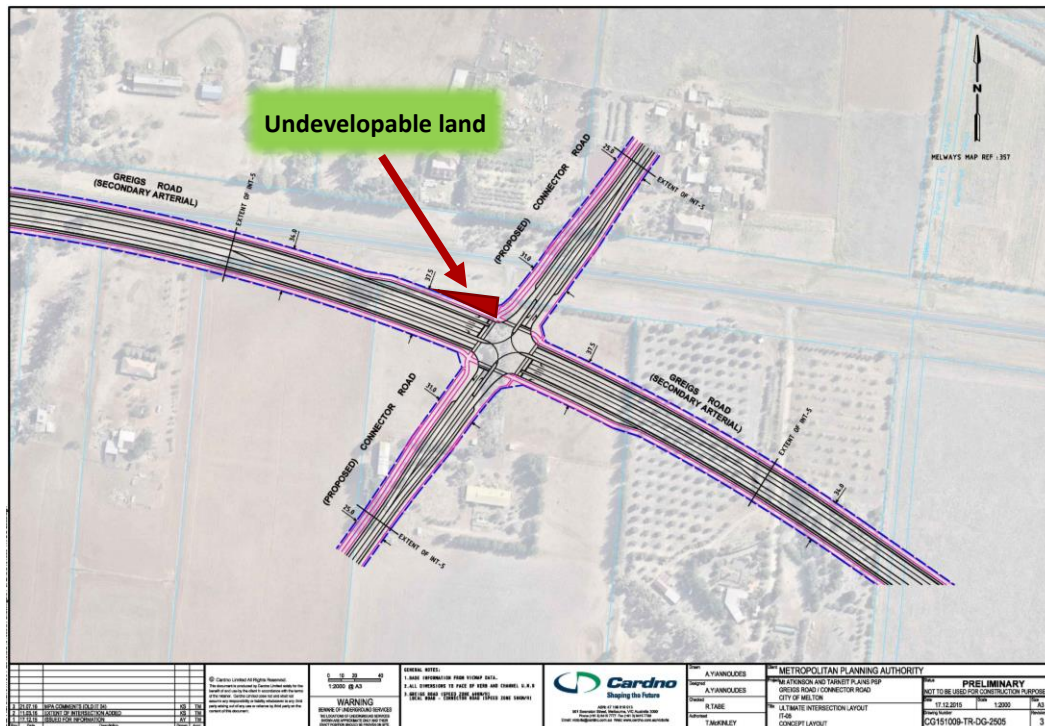


Figure 11: IT05 Indicative intersection layout (Cardno 'preliminary drawing' CG 151009-TR-DG-2505)



Figure 12: Conceptual location of IT05 along horizontal curve (arc on Greigs Rd)  
(extract from Mt Atkinson & Tarneit Plains Precinct Structure Plan – Plan 13, page 68)

### 3.3.4 CONCLUSION

The indicative proposed location for IT05, as identified in the PSP, is reasonable on traffic engineering grounds. However, a shift of IT05 towards the north-west offers an improved traffic engineering solution by moving the intersection closer to the optimal location for sight distance considerations (the midpoint of the circular arc on Greigs Road) as well as allowing the cross roads to be aligned on a more perpendicular alignment. The shift towards the north-west offers the greater net community benefit in terms of safer intersection design and utilisation of land.

## 4. MY OPINION

It is my opinion that there are a number of traffic matters that are not appropriately addressed in the Mt Atkinson and Tarneit Plains PSP. Having reviewed all relevant documentation, I have formed the views outlined below:

### 4.1. INTERSECTIONS IT01 & IT02 – DESIGN ADEQUACY

There has been insufficient modelling undertaken to confidently predict interim intersection requirements (2026) for IT01 and IT02. The absence of 2026 traffic modelling creates uncertainty with respect to the ability of the proposed road network of accommodating future traffic. Additional modelling is required to demonstrate what intersection layouts will be required to accommodate the forecast traffic. This modelling should appropriately incorporate interaction between the two closely spaced intersections (IT01 and IT02) as well as reflect the interaction between Hopkins Road and the nearby Melbourne to Ballarat railway line.

### 4.2. ROAD CROSS SECTIONS FOR PRIMARY AND SECONDARY ARTERIALS

The Primary Arterial cross section should achieve separation of cyclist and pedestrian facilities – both of which should be off-road. In addition, the Secondary Arterial cross section should provide two-way off road bicycle paths on both sides of roads and there should not be any on-road bicycle lanes.

### 4.3. INTERSECTION IT05 – IDENTIFICATION OF A PREFERABLE LOCATION

The indicative proposed location for IT05, as identified in the PSP, is reasonable on traffic engineering grounds. However, a shift of IT05 towards the north-west offers an improved traffic engineering solution by moving the intersection closer to the optimal location for sight distance considerations (the midpoint of the circular arc on Greigs Road) as well as allowing the cross roads to be aligned on a more perpendicular alignment. The shift towards the north-west offers the greater net community benefit in terms of safer intersection design and utilisation of land.

## 5. DECLARATION

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.

A handwritten signature in black ink, appearing to be 'A. C. D.', written on a light blue background.

Signed

Date: 2 September 2016

## **APPENDIX A – MATTERS RAISED BY PPV GUIDE TO EXPERT EVIDENCE**

In accordance with PPV guidance for the preparation of expert evidence the following details are provided:

**(a) the name and address of the expert;**

Stephen Pelosi, Ground Floor 25 Ross Street, South Melbourne.

**(b) the expert's qualifications and experience;**

I am a director of *movendo Pty Ltd* and I have 30 years of experience in transport planning and traffic engineering in Australia, New Zealand, the Middle East, Asia, Latin America and the US. My full CV is attached as Appendix B. I completed a Bachelor of Engineering (Civil) at RMIT University in 1985. I have held senior executive positions in government and consulting firms and in these roles I have been responsible for the delivery of major transport projects and for the provision of strategic and business advice to governments, infrastructure providers and developers on land use/transport studies, multi-modal transport assessments, masterplanning new communities, detailed transport systems analysis, road safety assessments, transport demand forecasting, route planning, public transport studies and bicycle & pedestrian strategies.

Of particular relevance to the Mt Atkinson and Tarneit Plains PSP, I have been involved with numerous transport and traffic assessments in support of urban design frameworks and structure plans for numerous communities in the Cities of Melton, Maribyrnong, Moonee Valley, Ballarat, Colac Otway, Melbourne, Hume, Shepparton, Glenferrie, Knox, Warrnambool, Kilmore, Surf Coast, Banyule, Mitchell, Nillumbik, Bendigo, Yarra, Mildura, Glen Eira and Bayside. I have also undertaken numerous traffic studies for private clients ranging from detailed facility design to analysis of infrastructure requirements for large development proposals in Australia, China and the Middle East.

**(c) a statement identifying the expert's area of expertise to make the report;**

My training and experience, as highlighted in my CV, including involvement with many major transport infrastructure and masterplanning projects in Victoria, Australia and internationally – qualifies me to comment on the traffic matters outlined in this report.

Through my career, I have had considerable involvement in transport infrastructure planning and design, including various public transport and rail projects (Craigieburn Rail Electrification, South Morang Rail Extension project, City Circle Tram, Box Hill tram extension in Melbourne), several road projects (Peninsula Link, Western Distributor, East West Link, Calder Freeway, Geelong Bypass in Victoria and the Western Sydney Orbital in New South Wales).

I have also appeared, as expert traffic and transport witness, at numerous tribunal and panel hearings, EES/EIS hearings and planning scheme amendment hearings. In particular, I have appeared as witness for the Peninsula Link Freeway and East West Link projects in Melbourne, Bass Gas, Otway Gas, Calder Freeway and Geelong Bypass projects in Victoria and also prepared an Expert Witness Statement for the Victorian Desalination Plant EES.

**(d) a statement identifying any other significant contributors to the report and where necessary outlining their expertise;**

Not Applicable

**(e) all instructions that define the scope of the report (original and supplementary and whether in writing or oral);**

I have been requested by Melton City Council to express my expert opinion as to the traffic implications of various aspects associated with the design of the proposed future road network servicing Mt Atkinson and Tarneit Plains PSP.

**(f) the identity of the person who carried out any tests or experiments upon which the expert has relied on and the qualifications of that person;**

Not Applicable

**(g) the facts, matters and all assumptions upon which the report proceeds;**

My report is based on a review of Amendment C162 to the Melton Planning Scheme, specifically the extent to which various transport network issues have been addressed in the incorporated document titled “Mt Atkinson & Tarneit Plains Precinct Structure Plan”.

**(h) reference to those documents and other materials the expert has been instructed to consider or take into account in preparing his or her report, and the literature or other material used in making the report;**

My report is based on a number of documents and other materials that I have been instructed to consider or take into account in preparing the report, as well as other documents that I have referenced in forming my opinions as outlined in the report.

Mt Atkinson and Tarneit Plains PSP documents

1. Background report – Mt Atkinson and Tarneit Plains PSP; April 2016
2. Mt Atkinson and Tarneit Plains PSP; April 2016

Council submission

3. Council submission on Mt Atkinson and Tarneit Plains PSP; 1 July 2016

Traffic documents

4. Transport Modelling Assessment report for the VPA by Jacobs; 4 July 2016
5. Cardno Consultants Advice Notice – CAN002; Ultimate Traffic Modelling; 16 August 2016
6. Traffix Group Traffic Engineering Assessment Proposed Aurora Business Park; February 2016
7. VicRoads guidance for planning road networks in growth areas (working document); November 2015

Other documents

8. Precinct Structure Planning Guidelines produced by the State Government’s former Growth Areas Authority – Part Two Preparing the Precinct Structure Plan; 2009 (revised in 2013)
9. Austroads – Guide to Road Design Part 6A: Pedestrian and Cyclist Paths
10. Austroads Research Report AP-R287/06 Pedestrian-Cyclist Conflict Minimisation on Shared Paths and Footpaths (2006)
11. Austroads – Guide to Road Design Part 4A: Unsignalised and Signalised Intersections

**(i) a summary of the opinion or opinions of the expert;**

It is my opinion that there are a number of traffic matters that are not appropriately addressed in the Mt Atkinson and Tarneit Plains PSP document. Having reviewed all relevant documentation, I have formed the views outlined below:

**INTERSECTIONS IT01 & IT02 – DESIGN ADEQUACY**

There has been insufficient modelling undertaken to confidently predict interim intersection requirements (2026) for IT01 and IT02. The absence of 2026 traffic modelling creates uncertainty with respect to the ability of the proposed road network of accommodating future traffic. Additional modelling is required to demonstrate what intersection layouts will be required to accommodate the forecast traffic. This modelling should appropriately incorporate interaction between the two closely spaced intersections (IT01 and IT02) as well as reflect the interaction between Hopkins Road and the nearby Melbourne to Ballarat railway line.

**ROAD CROSS SECTIONS FOR PRIMARY AND SECONDARY ARTERIALS**

The Primary Arterial cross section should achieve separation of cyclist and pedestrian facilities – both of which should be off-road. In addition, the Secondary Arterial cross section should provide two-way off road bicycle paths on both sides of roads and there should not be any on-road bicycle lanes.

**INTERSECTION IT05 – IDENTIFICATION OF A PREFERABLE LOCATION**

The indicative proposed location for IT05, as identified in the PSP, is reasonable on traffic engineering grounds. However, a shift of IT05 towards the north-west offers an improved traffic engineering solution by moving the intersection closer to the optimal location for sight distance considerations (the midpoint of the circular arc on Greigs Road) as well as allowing the cross roads to be aligned on a more perpendicular alignment. The shift towards the north-west offers the greater net community benefit in terms of safer intersection design and utilisation of land.

**(j) a statement identifying any provisional opinions that are not been fully researched for any reason (identifying the reason why such opinions have not been or cannot be fully researched);**

Not Applicable

**(k) a statement setting out any questions falling outside the expert's expertise and whether the report is incomplete or inaccurate in any respect.**

In the process of preparing this report, I have not identified any questions outside of my area of expertise in traffic engineering and transport planning. I have visited the site, undertaken observations and reviewed relevant documentation assigned to me. I have also drawn on my 30 years of experience in traffic and transport planning. As a result of my deliberations, I have formed the views outlined in this report with respect to the traffic and transport implications of various aspects associated with Amendment C162.





# STEPHEN Pelosi



## EMPLOYMENT HISTORY

### *Current*

Director, movendo

### *2001 . 2011*

Technical Director, AECOM

### *1997 . 2001*

Senior Associate, Traffic & Transport Leader, Connell Wagner (now Aurecon)

### *1986 . 1996*

Team Leader Traffic Engineering & Transport Planning, City of Melbourne

## CAREER HISTORY

Stephen has 30 years of experience in transport planning and traffic engineering in Australia, the Middle East, Asia, the United States and Latin America. He has held senior executive positions in government and consulting firms and in these roles he has been responsible for the delivery of major transport projects and for the provision of strategic and business advice to governments, infrastructure providers and operators on traffic and parking, patronage, revenue potential, risk assessment and management strategies.

Stephen's extensive project experience in delivering a wide variety of programs and projects in the traffic and transport sector has enabled him to develop excellent leadership capabilities, as well as appreciate the importance of undertaking effective consultation and negotiations with a wide range of community and stakeholder groups. Over nearly 3 decades, Stephen has established a strong reputation as a group facilitator working with communities, technical experts and policy makers to proactively engage communities in decision-making, support policy development and implementation and manage processes of change and conflict. His primary focus has been facilitating an integrated approach to the planning of transport infrastructure and systems – recognising, and having respect for, the cultural and social planning requirements as well as understanding the aspirations of communities; with an eye to delivering more sustainable outcomes for the future.

Stephen's work across the world has included masterplanning projects, detailed transport systems analysis, land use/transport studies, multi-modal transport assessments, road safety plans, asset management studies, formulation and implementation of Intelligent Transport Systems, development of transport models, preparation of sustainable transport strategies, demand forecasting, route planning, public transport schemes and bicycle & pedestrian plans. He has also advised developers and government agencies on transport and infrastructure issues, with emphasis on economically viable, efficient, safe and sustainable transport systems. Stephen has led the transport analysis for, and appeared to provide expert testimony on, several major projects, including East West Link, Peninsula Link Freeway, Geelong Bypass, Calder Freeway, Victorian Desalination Plant, Channel Deepening Project in Port Phillip Bay and Bass Gas/Otway Gas projects.

Stephen has regularly taken the opportunity to share his considerable experience through preparation of technical papers and participation in conferences, including most recently various workshop sessions in 2012 in support of the 2010-2020 National Traffic and Transport Strategy for Kuwait, sponsored by the United Nations Development Programme and the government of Kuwait.

Stephen's technical expertise covers all areas related to the planning of sustainable transport systems and cost effective infrastructure provisions:

*Traffic engineering for road, public transport, bicycle and pedestrian projects*  
*Transport planning*  
*Transport system design for mixed-use developments*  
*Traffic and patronage forecasting*  
*Transport network evaluation*  
*Transport policy analysis*  
*Infrastructure feasibility studies*  
*Transport modeling*  
*Road safety*  
*Logistics*

## QUALIFICATIONS

1985

**RMIT University**  
 Bachelor of Engineering (Civil)

## PROJECT EXPERIENCE

*Traffic and transport studies for the Melbourne CBD*

**client** || City of Melbourne **location** || Melbourne **year** || 1986-2014

Over the past 30 years, Stephen has delivered numerous transport projects for the City of Melbourne covering a wide range of topics. He worked continuously as an employee at the City of Melbourne for over 11 years and has continued providing ongoing advice to Council as an expert consultant since that time.

Noteworthy City of Melbourne projects which Stephen has either participated in or led include:

- **Multiple studies for Queen Victoria Market precinct**
- Traffic engineering assessments for the Swanston Walk project
- Pedestrianisation of little streets and laneways
- Evaluation of 44 laneways for shared zone designation
- 40kph study for the Melbourne CBD (leading to its eventual introduction)
- Traffic signal operational review for the CBD
- Road safety plans
- Parking studies
- Motorcycle strategy
- Pedestrian and bicycle strategies
- Public transport projects, including the establishment of the City Circle tram
- Accident blackspot evaluations
- Local area traffic management schemes, including current schemes for North Melbourne, Kensington, South Yarra, East Melbourne and West Melbourne
- St Kilda Road microsimulation to coordinate traffic signals and promote cycling priority
- Transport system review for City North and Arden Macaulay
- Transport efficiency study for the CBD's north edge
- Sustainable transport strategy for Southbank Structure Plan
- Traffic and parking studies for the Southbank Arts Precinct
- Traffic and parking analyses in support of Council's Urban Forest Strategy
- Represented Council on multiple major projects, including the Formula 1 Grand Prix, special events planning for the sports and entertainment precinct, inaugural White Night traffic engineering and 2006 Commonwealth Games
- Represented Council on the evaluation of impacts of major transport infrastructure and development projects, including CityLink, Crown Casino and initial development of Docklands
- Interim advisory truck route through North and West Melbourne
- Review of the municipal wide road hierarchy
- Microsimulation of King Street
- Major taxi strategy in collaboration with State government and taxi operators
- Worked with VicRoads on the central city emergency plans
- Facilitated implementation of the Night Rider bus services



### *Docklands transport plan and model*

*client* || Places Victoria *location* || Melbourne *year* || 2011-2012

In 2011-2012, Stephen led the preparation of a Transport Plan and Transport Model for Docklands. The Docklands area is located on the western edge of Melbourne's central business district and is an extension of the city's major employment hub. From one of Victoria's first ports to an industrial wasteland in the 1990s, Docklands is being transformed into a modern residential, commercial and visitor destination in the heart of Melbourne. The headquarters of some of the biggest businesses in Australia are now located in Docklands, along with a growing residential community. The study involved an extensive survey program with thousands of online and paper surveys undertaken with workers, residents, visitors and those attending events at Etihad Stadium, to understand travel behaviour of people moving to and from Docklands. The work included development of a Transport Model, which takes into account existing and future development and infrastructure proposals in and around Docklands to provide traffic predictions, forecasts of public transport usage and an analysis of pedestrian and cycling patterns at key stages of Docklands development. The Model forecasts traffic volumes when various assumptions are made regarding land use and development yield, infrastructure configuration and capacity, and travel mode split. The Docklands Transport Model was used as a key tool for testing and ultimately defining the preferred land use, transport infrastructure and travel behaviour outcomes for Docklands. The Transport Plan used Model outputs and other sources to examine the key issues and influences on access and mobility at Docklands, and identify the priority transport projects and initiatives required in Docklands over the next ten years and beyond, to ensure Docklands is well placed to cope with the substantial growth still to occur.

### *Congestion management strategy Kallang Paya Lebar expressway*

*client* || Land Transport Authority *location* || Singapore *year* || 2007-2008

While at AECOM, Stephen project managed this commission from the Singapore Land Transport Authority (LTA) to develop a congestion management strategy for the 8.5 kilometre KPE Tunnel (built at a cost of around US\$1 billion and the longest subterranean road tunnel in southeast Asia and the world's 6th longest underground road project - at its time of construction). The study examined both weekday commuter peak period demands, as well as emergencies and other specific incidents within the tunnel. Central to development of the congestion management strategy was the use of a large-scale VISSIM traffic micro-simulation model. As a result of the approach adopted, critical improvements to the initially proposed road-layout designs were identified in advance of tunnel opening and a number of ITS options were proposed and tested in VISSIM, including the first potential implementation of ramp metering on the island of Singapore. Phase 1 of the KPE, a 3km limited-movement section of tunnel, opened in October 2007 incorporating designs developed directly from the VISSIM modeling. Study recommendations for the fully-open tunnel, incorporating further geometric refinements, were prepared in advance of full scheme opening in 2008.

### *Grand prix feasibility study*

*client* || State of Bahrain *location* || Bahrain *year* || 2001-2002

While at AECOM, Stephen managed a traffic and transport study undertaken for the purposes of assessing Bahrain's transport systems in support of a broader feasibility study for introducing Formula One Grand Prix racing to Bahrain. The study examined the capacity of existing traffic routes, the necessity for road capacity upgrades, parking impacts and requirements, public transport and pedestrian movement both inside and outside the proposed track location and concluded with a set of recommended improvement actions. The key recommendations were ultimately implemented, enabling the successful staging of the inaugural Bahrain Grand Prix.

### *CityScope Analysis with the Massachusetts Institute of Technology*

*client* || MIT *location* || Boston *year* || 2013-current

Stephen, in collaboration with the Changing Places Research Group of the Massachusetts Institute of Technology (MIT) Media Lab, is using CityScope to inform the planning process for a new community of 50,000 people in Queensland. CityScope is a modelling tool developed by MIT scientists to create a tangible, interactive, real-time data observatory and urban intervention simulator. The system consists of physical scale models (built of LEGO bricks), 3D projection mapping (using Rhino, Illustrator and Photoshop) and 3D parametric modelling (using Grasshopper) to prototype the design of communities by quantifying system-level effects of planning decisions on travel behaviour, energy consumption, food production and emissions (greenhouse gases and air pollutants). CityScope is designed to help people understand complex inter-relationships, and to make informed decisions about urban design, public policy, planning and the introduction of new urban systems and technology.

### *Moonee Valley walking and cycling strategy*

*client* || City of Moonee Valley *location* || Melbourne *year* || 2010-2012

Between 2010 and 2012, Stephen led the preparation of a walking and cycling strategy for the inner-city municipality of Moonee Valley in inner Melbourne. Moonee Valley, located a short distance north of the Melbourne CBD, has a population of around 120,000 people. The city's strategic goals include providing smart, sustainable and accessible transport that connects its people and communities to achieve a healthy environment and sustainable future. The project involved walking and cycling audits, safety reviews, evaluation of intersection improvements, network development, as well as the preparation, conduct and analysis of pedestrian and cyclist surveys. The study also involved input from key stakeholders and community groups. The site work and consultative activities, including numerous focus groups, were informed by an extensive literature review of previous studies and best international practices in terms of safety and infrastructure provision for pedestrians and cyclists. The strategy developed a comprehensive set of recommendations for infrastructure improvement actions, policy and planning changes and associated travel behaviour programs.

### *Pedestrian Priority Network (PPN)*

*client* || Victoria Department of Transport (DoT) *location* || Melbourne  
*year* || 2010

While at AECOM, Stephen worked with Tract Consultants on the definition of PPNs for the DoT. PPNs represent a key step in helping to realise Government objectives for a more sustainable transport system. The study team developed a simple yet robust methodology that can be consistently applied to identify PPNs to enable transport practitioners to readily identify areas for action, prioritise investment and maximise walking within activity centres across Victoria.

### *Safer Road Design for Older Pedestrians*

*client* || Victoria Walks *location* || Melbourne  
*year* || 2014-2015

Victoria Walks commissioned movendo to investigate engineering measures to make roads safer for older pedestrians. This study focussed on identifying barriers that prevent older people from walking and formulating infrastructure and operational improvements. A review of worldwide research and engineering literature, crash data and discussions with multidisciplinary experts was undertaken to provide informed views in regard to the issues which affect safety of older pedestrians and the nature of treatments which can be implemented to improve safety.

### *Maribyrnong integrated transport strategy*

*client* || City of Maribyrnong *location* || Melbourne *year* || 2011-2012

Stephen was technical leader in the delivery of an Integrated Transport Strategy for the inner city municipality of Maribyrnong in Melbourne. The study included a review of existing transport development plans and policies and the collection of demographic and transport data for Maribyrnong and surrounding areas. The analysis considered conditions not only in the City of Maribyrnong, but also in surrounding areas in order to understand the influence of other municipal, regional and state transport issues and activities upon Maribyrnong. Significant consultation and engagement with relevant authorities and stakeholders were undertaken. The main outcome of the project was the identification and prioritisation of actions, through an Implementation Plan, with respect to transport access and mobility elements that emphasise sustainable transport solutions and will guide transport planning within Maribyrnong over the next ten years. The transport strategy policies and actions aim to make Maribyrnong a city where it is possible for people to walk and cycle more often, and catch public transport with ease, thus relieving congestion on the road network, and reducing the City of Maribyrnong's contribution to transport related greenhouse gas emissions.

### *2006 Commonwealth Games*

*client* || Department of Infrastructure *location* || Melbourne  
*year* || 2005-2006

While at AECOM, Stephen was responsible for the development of a transport model to obtain estimates of the likely impact of the transport task for the Melbourne Commonwealth Games on the normal base load flows on the transport system. This two-year project included forecasting impacts on and utilisation of all forms of public transport as well as private vehicles on the road network. As part of this study, solutions were developed that involved: intersection analysis and design, traffic signal coordination strategies, traffic operations and staging during events, and special pedestrian management in the vicinity of the Sports Stadia.



## Western Sydney orbital – traffic study

**client** || Road Transport Authority **location** || Sydney **year** || 2003-2004

While at AECOM, Stephen coordinated the preparation of traffic management plans for the Western Sydney Orbital (WSO) – the major circumferential freeway through Sydney's north western suburbs; a 40 km motorway linking three other key motorways and saving motorists significant amounts of time. The project included regional modeling and detailed traffic engineering design for:

-17 interchanges along the motorway to provide access to adjoining communities and improve transport options to these areas.

-38 underpasses and overpasses to maintain local access for pedestrians, cyclists and motorists along the full length of the motorway

-40 km off-road shared cycle / pedestrian pathway traverses the motorway and connects with the Sydney Cycleway network

As a result of the implementation of the WSO, motorists travelling on the road can avoid up to 48 sets of traffic lights on the overall trip. The study also included the use of ITS to provide:

-Intelligent vehicle speed detection and operate at variable speeds up to 100 km/h.

-A cashless, free-flow electronic tollway with no toll booths and no slowing or stopping.

## East West Link Melbourne – Independent Traffic & Transport Assessment and Expert Witness Testimony

**client** || Linking Melbourne Authority **location** || Melbourne

**year** || 2013-2014

Stephen was commissioned to peer-review all Traffic Impact Assessment analyses undertaken for the East West Link project – an 18km cross-city road connection extending across Melbourne from the Eastern Freeway to the Western Ring Road (estimated cost of \$16-\$18 billion). Stephen provided an independent assessment of all traffic/transport planning matters associated with the project and its impact on the surrounding road network, including public transport and sustainable transport modes. Stephen also appeared, as the State Government's expert witness, at the Assessment Committee in early 2014, having reviewed in excess of 1,500 community submissions received – that were related to traffic and transport matters. The Committee considered the merits of the first stage of the East West Link, a 6km section connecting the Eastern Freeway with CityLink – together with a separate connection to the Port of Melbourne area.

## WestLink Planning and Consultation Study

**client** || Linking Melbourne Authority **location** || Melbourne **year** || 2009-2010

While at AECOM, Stephen was one of the principal traffic and transport analysts for this study, which included a review and assessment of a variety of infrastructure options to help inform selection of a preferred design solution. The eventual evaluation of a number of shortlisted options included alignment and arrangements for connections to the Western Ring Road and alignments for connection with Dynon and Footscray Roads taking into account transport modelling forecasts and induced demand factors. The traffic engineering investigations also comprised review of required upgrades to existing roads and intersections with consideration for future road widenings and land acquisition.

## Mitcham Frankston Motorway (now East Link)

**client** || VicRoads **location** || Melbourne

**year** || 2004-2005

Stephen led the development of a dynamic VISSIM traffic microsimulation model of this major highway project (40km highway with a tunnel and around 20 grade separated intersections) and managed the traffic analysis for this study. The project involved creating a corridor model, using VISSIM, suitable for input of traffic forecasts by a metropolitan transport model - CUBE. The application of multiple VISSIM simulation scenarios enabled effective options analysis and resolution of the preferred highway scheme design. All freeway interchanges were included in the VISSIM model and tested with varying traffic loads.

## Peninsula Link Route Selection, Concept Design Development and Expert Traffic & Economics Witness

**client** || Linking Melbourne Authority **location** || Melbourne

**year** || 2007-2009

While at AECOM, Stephen was the technical transport director for a planning feasibility study of a new freeway extending for over 20 kilometers on Melbourne's south-eastern fringe. Originally known as the Frankston Bypass, the roadway is nearing completion and is now known as Peninsula Link. The study, conducted in 2008/09, involved preparation of preliminary road designs (tested with modelling and microsimulation) and also included a full environmental assessment of various road options. In his role as technical transport director, Stephen provided traffic safety and traffic engineering advice to test different road options. He also provided expert witness evidence to a Panel hearing covering all modeling aspects (including the development/validation of a sub area traffic model - extracted from the metropolitan wide model - for the base and future year forecasts).

## SELECTED PUBLICATIONS AND PRESENTATIONS

*March and November  
2012*

'National Traffic and Transport Sector Strategy for Kuwait 2010-2020', Towards Sustainable and Safe Transport for Current and Future Generations  
International Training Workshops, Kuwait

*June 2010*

'Sustainable Transport: Integration of Land Use and Transport' at the 2010 Australasian Centre for the Governance and Management of Urban Transport (GAMUT) Conference on Sustainable Transport:  
Varied Contexts – Common Aims, University of Melbourne, Australia

*June 2010*

'Transporte Sostenible: Integración de Planeación Urbana y Transporte' in REvive Monterrey Fórum 2010:  
Innovative Transportation Solutions, Monterrey, México

*May 2010*

'Sustainable Transport: Integration of Land Use and Transport' in World Metro Rail Summit  
Shanghai, China

*April 2009*

'Singapore Kallang-Paya Lebar Expressway - Developing a Tunnel Congestion Management Strategy Using Micro-Simulation' in Traffic Engineering and Control (TEC) Journal

*August 2008*

'Singapore Kallang-Paya Lebar Expressway - Tunnel Congestion Management Strategy Developed with VISSIM and Accident Incident Management/ Road Safety Plan' at the 8th International Symposium on Transport Simulation  
Surfers Paradise, Queensland, Australia

*2001-2011*

Guest Lecturer in Transport Planning and Traffic Engineering at the University of Melbourne  
Faculty of Architecture, Building and Planning  
Melbourne, Australia