

Amendment C158mith & C161mith  
Beveridge North West Precinct  
Structure Plan  
Transport Evidence Report

---

28/04/2022

Ref: Final

**PREPARED FOR:**

Harwood Andrews

**PREPARED BY:**

Reece Humphreys

---

# Contents

<b>1.</b>	<b>Introduction</b>	<b>1</b>
1.1	Background	1
1.2	Expert Witness Details	1
1.3	Relationship to the Applicant	1
1.4	Instructions & Scope of Report	2
1.5	References	2
1.6	Tests, Experiments & Assistance	2
<b>2.</b>	<b>Beveridge North West PSP</b>	<b>3</b>
2.1	Terms of Reference	3
2.2	Beveridge North West PSP	3
2.3	The PSP	4
2.4	Internal Road Network	5
<b>3.</b>	<b>Transport Modelling</b>	<b>7</b>
3.1	Introduction	7
3.2	Model Updates	7
3.3	Inputs and Assumptions	8
<b>4.</b>	<b>Response to Instructions</b>	<b>11</b>
4.1	Is the performance of the road network set out in the PSP acceptable?	11
4.2	Is there a need for an interim delivery of the Eastern Arterial Road (RD-04)?	13
4.3	Western Arterial Road alignment at RD03D	16
<b>5.</b>	<b>Summary of Opinion &amp; Other Statements</b>	<b>19</b>
5.1	Summary of Opinion	19
5.2	Declaration	19

# 1. Introduction

## 1.1 Background

Amendment C158mth to the Mitchell Planning Scheme proposes to implement the Beveridge North West Precinct Structure Plan. The Amendment is being prepared by the Victorian Planning Authority (VPA) to reflect the recommendations of the C106mth Panel Report dated 7<sup>th</sup> October 2020.

That report outlined 17 recommendations with two relevant to this evidence being:

- *Recommendation 1 was to Revise Mitchell Planning Scheme Amendment C106 to explicitly include precinct level planning for resource extraction from Work Authority 1473, and*
- *Recommendation 17 was to Include explicit recognition of the need to plan for Hanna Swamp in the revised Precinct Structure Plan (Document 267) in, for example: a) The land description at 1.4 b) The Vision at 2.1 c) Requirement R1 d) Table 10, Water Infrastructure.*

A draft planning scheme amendment has also been prepared for the supplementary levy Infrastructure Contributions Plan (ICP) was also prepared, known as Amendment C161mth.

I have been instructed by Harwood Andrews Lawyers in April 2022 to review the exhibited amendment background materials and submissions, and to prepare and provide expert evidence in response to the key traffic and transport issues of relevance for Amendment C158mth.

In preparing this report, I have relied upon information prepared by the VPA and previous reports completed by my office. This report is an independent traffic and transport evidence report.

## 1.2 Expert Witness Details

**Name:** Reece Humphreys BE (Civil)

**Position:** Group Leader, Transport Analytic, Stantec

**Address:** L25, 55 Collins Street, Melbourne

**Areas of Expertise:** Traffic Engineering, Transport Modelling & Transport Planning

I have a Bachelor of Engineering degree and almost two decades' experience spanning transport planning, transport modelling, transport engineering, traffic engineering, land use development and strategic assessments. This experience covers a mixture of assignments ranging from traffic and transport modelling on large-scale projects in Melbourne and Sydney to transport planning, engineering analysis, and advice on projects across Australia.

I have completed several projects for the Department of Transport (Vic), VPA, the NSW Roads and Maritime Services (RMS) and a number of local Government agencies that include a series of large regional transport models, strategic corridor planning, congested corridor management and transport corridor planning. I have provided expert evidence for both Government and private clients, as well as on several high-profile transport corridor and growth area panels. I also play an active role in industry organisations; I am the President of the AITPM Victoria Committee and am an inaugural member of the National Council of Transport Modellers Network.

Further details of my experience are provided in Appendix A.

## 1.3 Relationship to the Applicant

I have been retained to provide expert witness services at this hearing for a mutually agreed fee. Stantec (formerly GTA Consultants) have previously provided advice to the VPA for Beveridge North West (BNW) from 2014 and in 2018 prepared the Strategic Transport Modelling Assessment report that informed preparation of the Precinct Structure Plan (PSP). In 2020 I provided expert evidence for Amendment C106mth and have provided on going advice to the VPA in the preparation of this Amendment and other PSP's in the North Growth Corridor.

## 1.4 Instructions & Scope of Report

I have been engaged to prepare and present expert traffic and transport evidence as part of the Panel Hearing to consider the Amendment. Prior to preparing this evidence I was briefed by the VPA and Harwood Andrews via both verbal and written instructions.

In undertaking an assessment of documents and background materials, I have been asked to prepare an expert witness statement which:

1. Reviews the exhibited amendment and background materials (as relevant) and submissions;
2. Outlines my previous involvement in the Beveridge North West PSP including transport modelling completed after exhibition of Amendment C106mth.
3. Determines if the performance of the road network set out in the revised PSP is acceptable.
4. Reviews, acknowledges and provides a response to the traffic and transport submissions to the Amendment that concern the above matters.

As part of my review, Stantec have undertaken additional strategic modelling of the PSP which has been documented within this report.

## 1.5 References

In preparing this evidence, reference has been made to the following:

- The Mitchell Planning Scheme
- Reports prepared by GTA Consultants, for Beveridge North West, including the evidence dated 6th July 2020
- Relevant Government policies and documents
- Various technical data as referenced in this report.

## 1.6 Tests, Experiments & Assistance

In preparing this evidence, I received assistance from the following people:

Renuka Janga	Senior Modeller	BE (M. Tech)
Liz Irvin	Consultant	BE (Chemical)

## 2. Beveridge North West PSP

### 2.1 Terms of Reference

The Panel Report for Amendment C106m1th indicated its support for the PSP documentation prepared by the VPA, however it was not convinced that the PSP considered the Quarry and Burrung Buluk (former Hannah Swamp). An Advisory Committee was appointed by the Minister for Planning with the following terms of reference to advise on whether:

*a. Draft planning scheme amendment c158m1th (Amendment C158) is acceptable and appropriately implements the recommendations of the Amendment C106m1th (Amendment C106) Panel, and any appropriate consequential changes to the Beveridge North West Precinct Structure Plan (PSP) area;*

*b. Draft planning scheme amendment C161m1th (Amendment C161) for the supplementary levy Infrastructure Contributions Plan (ICP) is acceptable; and*

*c. Planning permit PLP268/19 (Permit Application) should be granted to 'use and develop the subject land for stone extraction and the creation of access to a road in a Road Zone Category 1' at the Conundrum Quarry Land under WA1473 having regard to the Mitchell Planning Scheme (as modified by the planning controls proposed by Amendment C158), and if so, the appropriate permit conditions.*

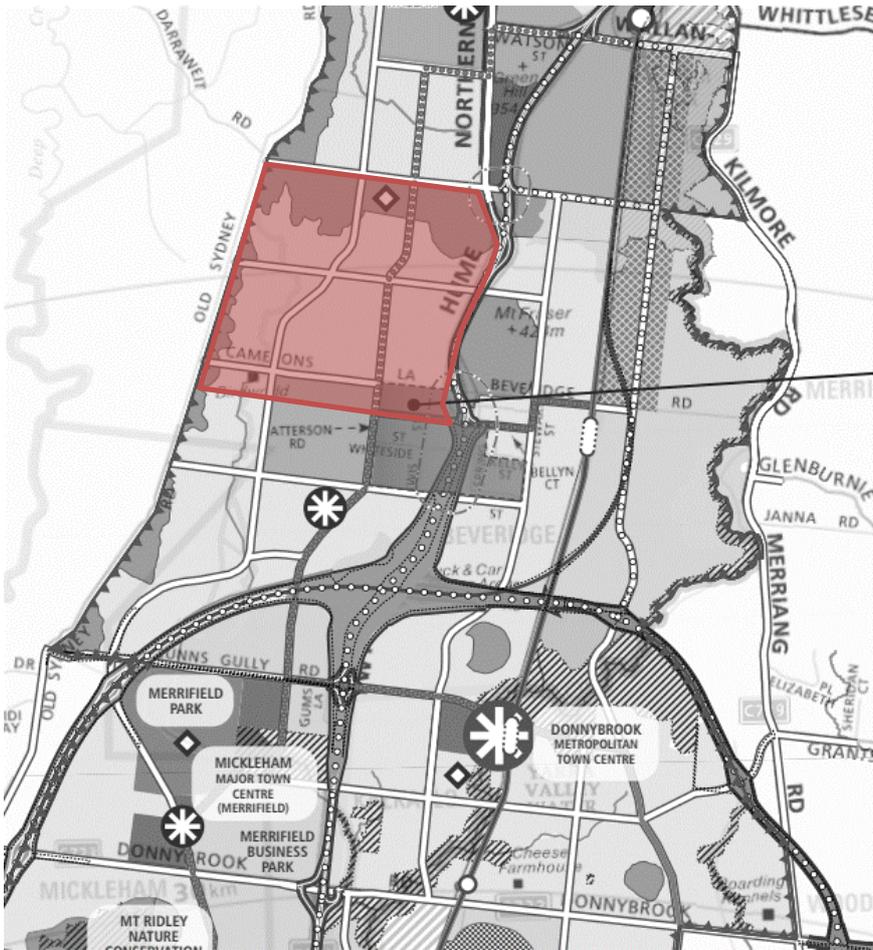
As stated previously, the focus of this report is bullet point 'a' and the changes to the Beveridge North West PSP and its adoption in the Mitchell Planning Scheme. I have also reviewed the draft plans exhibited in the ICP principally in relation to the alignment of the Western Arterial.

### 2.2 Beveridge North West PSP

The Beveridge North West PSP is located within the North Growth Corridor (NGC). The NGC creates new town centres and employment areas that contribute to the ongoing diversification and growth of the northern region's economy. Activity centres and employment areas in the NGC are in alignment with Plan Melbourne's goals of creating 20-minute neighbourhoods for Melburnians.

The Growth Corridor Plans prepared by the VPA (formerly Metropolitan Planning Authority) are carefully thought out integrated land use and transport plans that provide strategic justification for Melbourne's growth corridors. The transport network within the NGC is depicted with two separate north south arterials connecting through the BNW PSP to the broader network.

The NGC was updated to show the impact of logical inclusions and the extension of the road network which was undertaken as part of the Urban Growth Zone (UGZ) extension, notably the Wallan South PSP (currently in planning). A plan showing the regional context of Beveridge North West in the updated NGC has not yet been gazetted, however the regional context plan (Plan 1) of the Beveridge Central PSP does show an updated UGZ which is reproduced in Figure 1.



**Figure 1: BNW (shaded) within the Beveridge Central PSP Context Plan**

Of note, the plan retains the two north south arterial roads through the PSP and includes the Principal Public Transport Network (PPTN) extension along Patterson Road (also known as the Eastern Arterial) to Wallan and Wallan station. The inclusion of these roads in the PSP is also consistent with the Panel recommendations in the C106mth Panel Report which are discussed in the VPA Part A submission and within this report.

## 2.3 The PSP

Beveridge North West (BNW) PSP is located approximately 40km north of the Melbourne CBD and covers an area of 1,279 hectares. The precinct is bounded by the Hume Freeway to the east, Camerons Lane to the south, Old Sydney Road to the west and Hadfield Road to the north.

The Future Urban Structure (FUS) as exhibited in Plan 3 of the PSP documentation is reproduced in Figure 2.



**Figure 2: Beveridge North West PSP Urban Structure**

The PSP is expected to deliver approximately 16,200 dwellings for a population of around 46,000 residents, four local town centres, five primary schools and two secondary schools.

Access to the PSP is provided by five connections (two primary arterials) to Camerons Lane in the south and two primary arterials to Hadfield Road in the north. There are three connectors intersecting with Old Sydney Road to the west and no connections are provided across the Hume Freeway to the east, although the PSP does allow for a 'potential future' connection across the Hume Freeway, it is not included in the ICP.

An updated FUS has been prepared by the VPA in their Part A submission which includes the following changes:

1. School site resized from 3.79 ha to 3.5 ha for school site for proposed government schools Kalkallo Creek P6 and Hilltops P6
2. Amended shape of non-government school on property BN- 15
3. Updated Kalkallo Creek DSS in line with Melbourne Water requirements, including revision of western Town Centre and updated SR-04.
4. Plan updated to be consistent with other changes in the plan set.

Each of these changes do not amend the modelled road network which is discussed in Section 3.

## 2.4 Internal Road Network

The internal road network for BNW is underpinned by a grid network of arterial, connector and connector boulevard road types that provide internal connectivity to local town centres as well as broader connections with the external arterial network. When constructed, the network will include the following:

- A proposed Western Arterial road travelling in a north south direction through the PSP which is generally 1.4 kilometres west of Patterson Road/Eastern Arterial and 1.6 kilometres east of Old Sydney Road.
- Patterson Road/Eastern Arterial which is an arterial road that is located between the Hume Freeway and the Western Arterial road that travels through the PSP between Camerons Lane and Hadfield Road. This road will be a four lane road that will be capable of delivering the planned Principal Public Transport Network (PPTN) through the PSP.

- One new north-south local connector between Old Sydney Road and the Western Arterial road.
- One new north-south local connector between the Western Arterial road and Patterson Road/Eastern Arterial (generally).
- One new north south local connector between Patterson Road/Eastern Arterial and the Hume Freeway.
- A series of three new east-west local connectors located north of Camerons Lane connecting the communities and precincts within BNW.

The network will be supported by a series of local streets that will connect the future residents to the connector and arterial road network.

#### 2.4.1 Changes from C106mth

The key change between the plan exhibited as part of Amendment C106mth and the updated PSP is the alignment of the Western Arterial road at the northern parts of the PSP, which has shifted to the west to avoid Burrung Buluk. The Eastern Arterial road has also shifted 200m to the west to avoid the quarry blast zone, which provides the ability for the implementation of a Special Conditions Overlay (SCO).

Other changes have been adopted to the connector road network for both the east west and north south connections. There have been no changes of note to the location of land use including the location of schools, mixed use areas and local town centres. This means that the movement of traffic through the PSP will be very similar to the previous assessment.

As such, the changes to the road network in the revised PSP are expected have a minor impact to the way traffic moves through the PSP.

## 3. Transport Modelling

### 3.1 Introduction

I have relied upon strategic transport modelling to help understand the traffic and transport characteristics for the North Growth Corridor. Strategic transport modelling uses future population, employment and land use data projections to model the impact of changes to land use and road and public transport networks. The Victorian Integrated Transport Model (VITM) is developed by the Department of Transport (DoT) to assist in the planning of road and public transport infrastructure and contains all major freeways, main arterials and connector roads within the Melbourne Statistical Division.

The model is a link-based traffic model that uses a range of metrics to determine how traffic is assigned to the model (mainly these are cost and time). In assigning traffic to the network, the model uses the capacity and speed of the links to assign the shortest and quickest route for trips based on the link capacities. It is not uncommon in strategic models that the capacity of the route be exceeded, in these cases the travel time for the link becomes so congested that alternate paths (or routes) are calculated and determined.

#### 3.1.1 Limitation of Strategic Transport Modelling

It is important to note the limitations that a strategic transport model has. Principally, it is a tool used to evaluate the performance of a transport network based on the travel decisions that people make on a day to day basis. Travel demand is generated in a strategic model based on demographic information including the households, education, retail and employment-based trips.

They are not generally used to predict exact volumes on roads (or patronage on public transport) rather they are used to analyse the travel demand for a specific scenario (and to compare against). They can be used for corridor studies, wide area impact studies, major road projects, major public transport projects, different land use change scenarios, travel demand change / mode shift assessments and policy settings (i.e. public transport fares, parking charges, toll charges etc.).

This project used the model to determine the impacts of the introduction of the Beveridge North West PSP in the context of the North Growth Corridor.

## 3.2 Model Updates

### 3.2.1 Model used for C106mth

The work completed and presented as part of C016mth was underpinned by the North Growth Corridor (NGC) Model which was developed in 2014 to understand the transport infrastructure requirements for the development of the PSP's within the growth corridor. That modelling was based on the Melbourne Integrated Transport Model (MITM) which covered the Melbourne metropolitan statistical area up to and including Wallan. Input into the development of the NGC model was provided over a number of years from a range of stakeholders including the VPA, Hume City Council, Whittlesea City Council Mitchell Council and VicRoads (now DoT).

The NGC model formed the basis for the modelling undertaken as part of the assessment of BNW in Amendment C106 and my evidence dated 6th July 2020.

### 3.2.2 Model used for C151mth

The Victorian Integrated Transport Model (VITM) was prepared in 2018 by the Department of Transport (DoT) and was also used to inform work completed by Stantec (formerly GTA) for Regional Roads Victoria (RRV, which is a part of DoT) for the Wallan South PSP and the Northern Highway upgrade project (previously referred to as the Northern Highway Model).

A number of the assumptions that underpin both models are aligned, however there are some that differ. In particular, these include broader land use and network changes outside of Beveridge North West that influence travel patterns and behaviour. In consultation with the VPA, it was agreed that the latest version of the Victorian Integrated Transport Model (VITM) should be updated to reflect the latest DoT model and networks for the North Growth Corridor.

This model has been used to inform my decision making for Amendment C151mth. It will also form the basis of future PSP assessments in the NGC including Wallan South (to be completed at a later date). All of the work has been completed for 2051 which assumes a full build out or delivery of the North Growth Corridor and the broader transport network.

### 3.3 Inputs and Assumptions

#### 3.3.1 Land Use Inputs

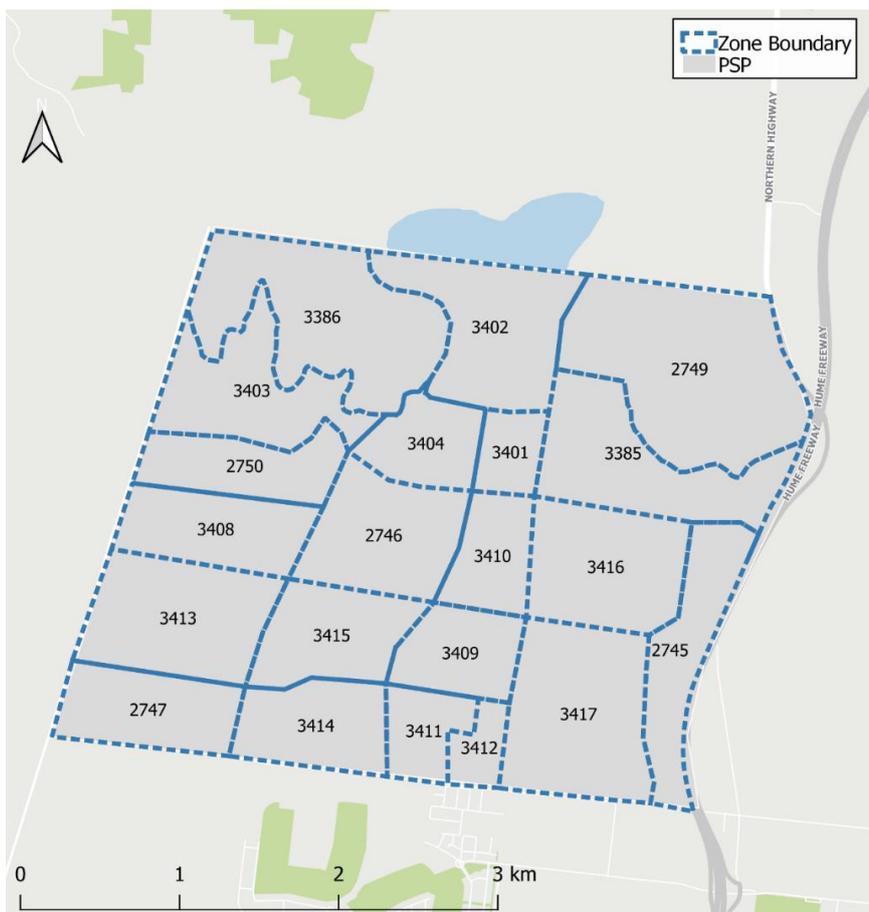
The population, households, employment and enrolments for the Beveridge North West are outlined in Table 1.

**Table 1: Beveridge North West Land Use Inputs**

Model	Population (People)	Household (Dwellings)	Employment (jobs)	Enrolment (no. of Students)
Beveridge North West PSP (updated for C151mith)	49,600	16,000	3,000	5,350
Previous (C106mith)	46,000	16,286	2,005	5,150
<i>Difference</i>	<i>3,600</i>	<i>-286</i>	<i>995</i>	<i>200</i>

The overall population, employment and enrolments for Beveridge North West are marginally higher than the previous assessment which correlates to the land use forecast of the PSP. Whilst the population has increased, the number of households is marginally higher which is due to the housing densities within the PSP.

Traffic zones, which are where traffic is loaded onto the network in the model, have been adjusted to reflect the realigned transport network. The zone structure for the Beveridge North West PSP is shown in Figure 3.



**Figure 3: Beveridge North West PSP Zone Structure**

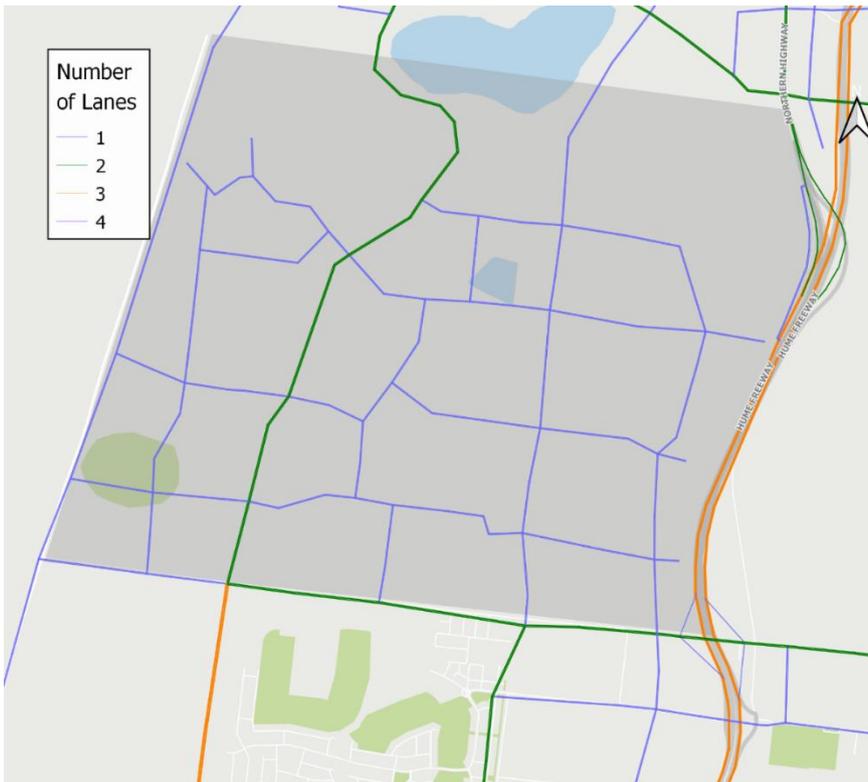
The zones have included the updated land use inputs for Beveridge North West and revised inputs for Wallan South. These have been provided by the VPA.

### 3.3.2 Transport Networks

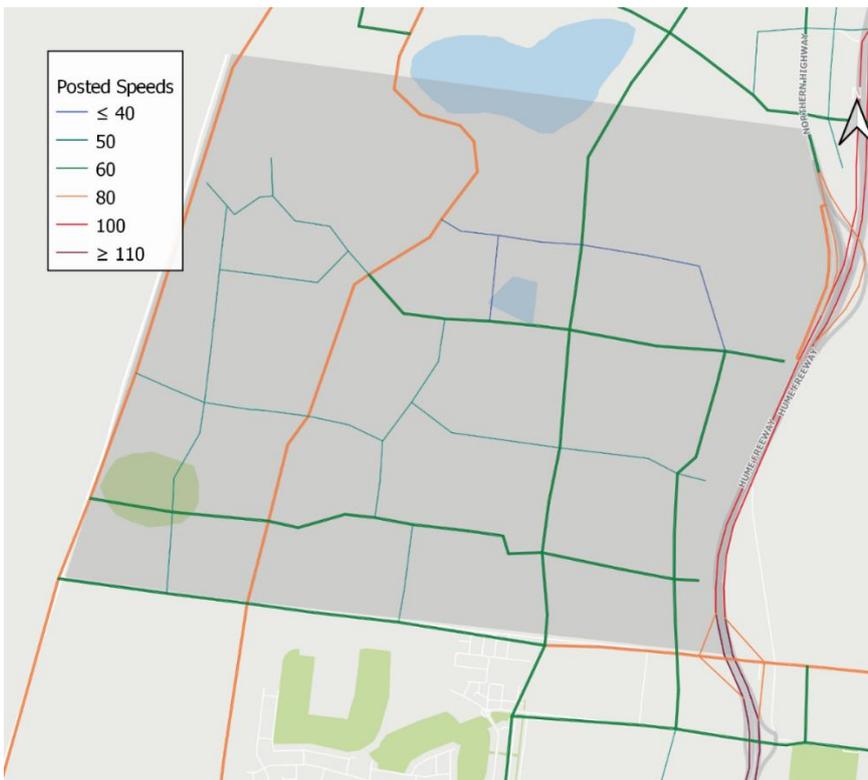
The transport networks within the PSP have been updated to reflect the revised FUS in Beveridge North West. Some of the key features of the network include:

- The Western Arterial road has been modelled as a “Primary Divided Road” comprising of four lanes (two lanes in each direction) and an 80km/hr speed limit. The alignment of the road in the model has been adjusted to reflect the FUS, specifically at the northern end of the PSP which has been realigned due to Burrung Buluk.
- Patterson Road/Eastern Arterial has been modelled as a “Secondary Road” with four lanes (two lanes in each direction) and speeds of 60km/hr through the PSP. This alignment has been shifted approximately 200m to the west to avoid the blast zone of the quarry.
- Old Sydney Road is modelled as a “Rural Unsealed Road” with one lane in each direction. Adjacent to the PSP it has an 80km/hr speed limit which is increased from what was previously assessed as 50km/hr
- The local road network has been updated to depict the FUS alignment. These roads consist of one lane in each direction and speeds of 50km/hr for local roads and 60km/hr for connector roads
- East west connections across the Hume Freeway at Hadfield Road (four lanes) and Camerons Lane (four lanes) are still provided. Camerons Lane west of Patterson Road/Eastern Arterial has been modelled with an 80km/hr speed limit (previously assessed as 60 km/hr)
- Malcom Street at Camerons Lane is grade separated with Camerons Lane which is consistent with the previous assessment,
- Whilst the FUS does include a potential connection across the Hume Freeway, this has not been modelled which is consistent with what was previously assessed, and
- The network north of Hadfield Road reflects the latest draft network of the Wallan South PSP, including a realigned Hadfield Road.

More broadly, the Hume Freeway between the Northern Highway off ramp and Watson Street is three lanes in each direction, which was previously assessed as two lanes in each direction. The networks used for this assessment are shown in Figure 4 and Figure 5.



**Figure 4: Modelled Number of Lanes**



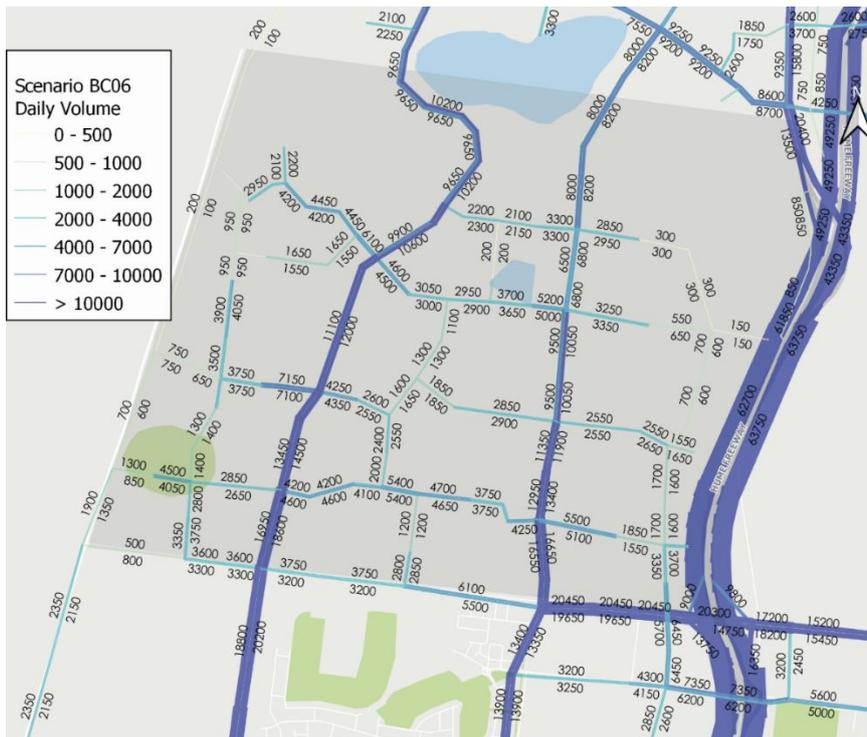
**Figure 5: Modelled Speed**

A summary of the key model outputs relevant to the updated modelling are provided in Section 4 in the discussion and response to instructions.

## 4. Response to Instructions

### 4.1 Is the performance of the road network set out in the PSP acceptable?

There are a number of metrics that the modelling is able to provide however for this evidence I have focused on undertaking a comparison between the previously updated model for the daily volumes and PM peak performance as this is the peak period that generates a higher level of traffic at full development. The daily volumes for the network is provided in Figure 6.



**Figure 6: Beveridge North West PSP Daily Volumes**

I have also reviewed the anticipated daily volumes on the key roads in the strategic modelling report which is summarised in Table 2.

**Table 2: Daily Volume Assessment on Key Roads**

#	Road Name	Proposed Classification and No. lanes	Updated Daily Traffic Volume	Daily Traffic Volumes in 2020 Evidence	Difference (veh)
1	Western Arterial Road (north of Camerons Lane)	Primary Arterial (4 lanes)	35,550	32,720	2,830
2	Patterson Road/Eastern Arterial (north of Camerons Lane)	Secondary Arterial (4 lanes)	33,200	27,640	5,560
3	Camerons Lane (West of Hume Highway)	Primary Arterial (4 lanes)	40,100	28,540	11,560
4	Hadfield Road (West of Northern Highway)	Secondary Arterial (4 lanes)	17,300	29,300	-12,000
5	Western Arterial Road (South of Hadfield Road)	Primary Arterial (4 lanes)	19,850	19,780	70
6	Eastern Arterial Road (South of Hadfield Road)	Secondary Arterial (2 lanes)	16,200	15,170	1,030

The daily volumes generally align with the previous assessments in that the two north south arterial roads through the PSP carry the highest levels of volumes which are between 16,000 and 35,000 vehicles per day. The Western Arterial will carry in the order of 19,850 vehicles per day at the northern extent of the PSP which will increase to 35,550 north of Camerons Lane. Similarly, Patterson Road/Eastern Arterial will carry in the order of 16,200 vehicles per day at the northern extent of the PSP which will increase to 33,150 north of Camerons Lane.

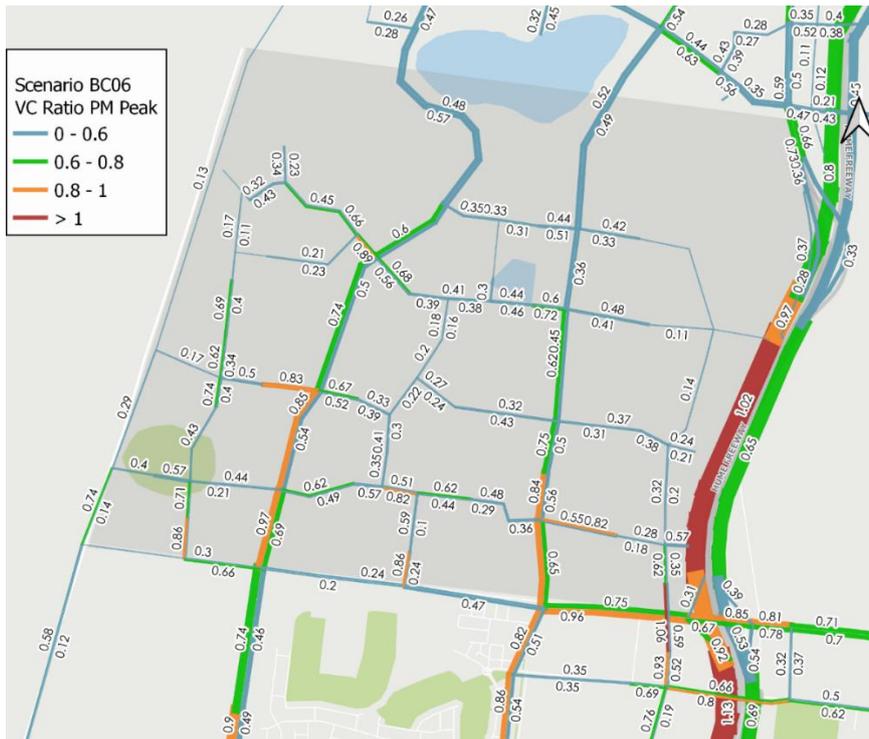
The revised network and higher land use has resulted in an increase in daily traffic volumes on the key roads of traffic through the PSP when compared to the 2020 assessment. Notably these changes include:

1. An increase in land use (population, employment and enrolment) estimates for Beveridge North West as detailed in Table 1.
2. The realignment of Hadfield Road to account for Burrung Buluk and the quarry
3. Increases in the number of lanes on the Hume Freeway capacity north of the Northern Highway
4. Increase in the number of lanes on Camerons Lane west of the Hume Freeway
5. Broader network changes on the eastern side of the Hume Freeway not specifically related to Beveridge North West

Most notably, the two arterial roads at the southern end of the PSP have increased by some 8.6% (on the Western Arterial Road) and 20.1% (on the Eastern Arterial Road). The increase in speed and capacity on Camerons Lane, in addition to a realigned Hadfield Road has also increased volumes on the Camerons Lane and reduced volumes on Hadfield Road.

I have also reviewed the volume to capacity metric (v/c) which is a measure of a links performance. Links that exceed a volume to capacity ratio of greater than 0.9 are approaching their theoretical capacity and is the point where congestion will occur. Links that exceed 1.0 will be over their theoretical capacity and will experience flow breakdown.

Figure 7 has been prepared to show the volume to capacity ratio for the PM peak.



**Figure 7: Beveridge North West PSP Volume to Capacity Ratio (PM Peak)**

The volume to capacity plot for the PM peak has been utilised as this is the more critical of the two peaks as it has higher traffic volumes. The results show a very similar outcome to the analysis presented in C106mth which have all roads within the PSP expecting ratios of less than 1.0. There is, however, higher levels of congestion occurring on the Western and Eastern Arterials that approach 1.0 with ratios of 0.97 and 0.95 respectively. Malcom Street, which will be grade separated with Camerons Lane, will also increase its volumes and is the only link in the PSP with a ratio of greater than 1.0.

These modelling results do highlight the need for a resilient network that is able to respond to change in land use and alignment as infrastructure and land use is delivered. The scope of my instructions is to assess whether or not the performance of the road network set out in the PSP is acceptable, rather than assessing the need for the network as this has been dealt with in the C106mth Panel Report which states:

*Two new arterial roads running north/south through the PSP is justified and will enhance subregional connectivity and resilience.*

The comparison between the previous and updated modelling show that the expected daily volumes on the network will be higher through the PSP when compared to the previous work. The higher volumes will still result with the Beveridge North West transport network performing at acceptable levels with V/C values of less than 1.0 on all roads in the PSP (except for Malcolm Street which travels under Camerons Lane). Based on this assessment I support the changes to the transport network, notably the realignment of the Western and Eastern Arterial roads.

## 4.2 Is there a need for an interim delivery of the Eastern Arterial Road (RD-04)?

The VPA are proposing to include a Special Conditions Overlay (SCO) in the amendment which will allow for the ability for the first carriageway of the Eastern Arterial to be constructed in the period prior to the full development of the PSP and the North Growth Corridor. The position outlined by the VPA in Section 7.1.10 of their Part A submission states:

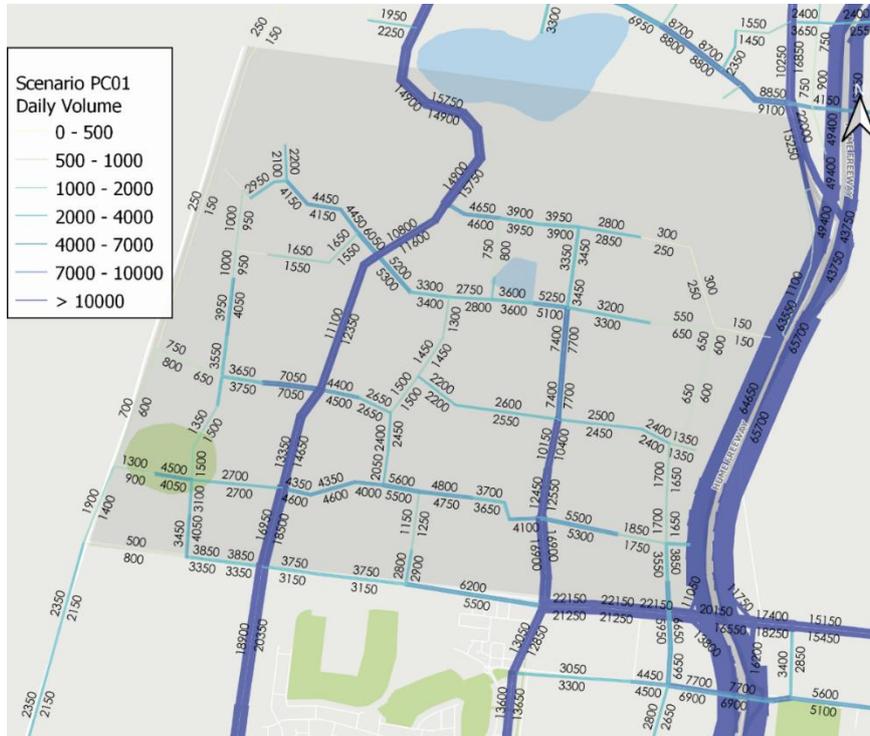
*Whilst the quarry would have a limited timeframe, the VPA acknowledges there could potentially be a need for the delivery of the Eastern Arterial Road RD-04 while the quarry is operational. The VPA is therefore proposing to realign the Eastern Arterial Road RD-04 200m west. Whilst this will bring it closer to the Burrung Buluk area, the road realignment will ensure that should the road need to be delivered before cessation of any quarry, there is an ability to do so. The VPA has commissioned a redesign of the Eastern Arterial Road RD-04 from intersection IN-11 to facilitate a desirable road network connecting Beveridge North West PSP to Wallan South PSP.*

*The VPA also proposes revisions to the SCO incorporated document to minimise conflicts between blast buffers and the road at a date to be agreed by DOT, and traffic management requirements regarding public roads, particularly during blasting.*

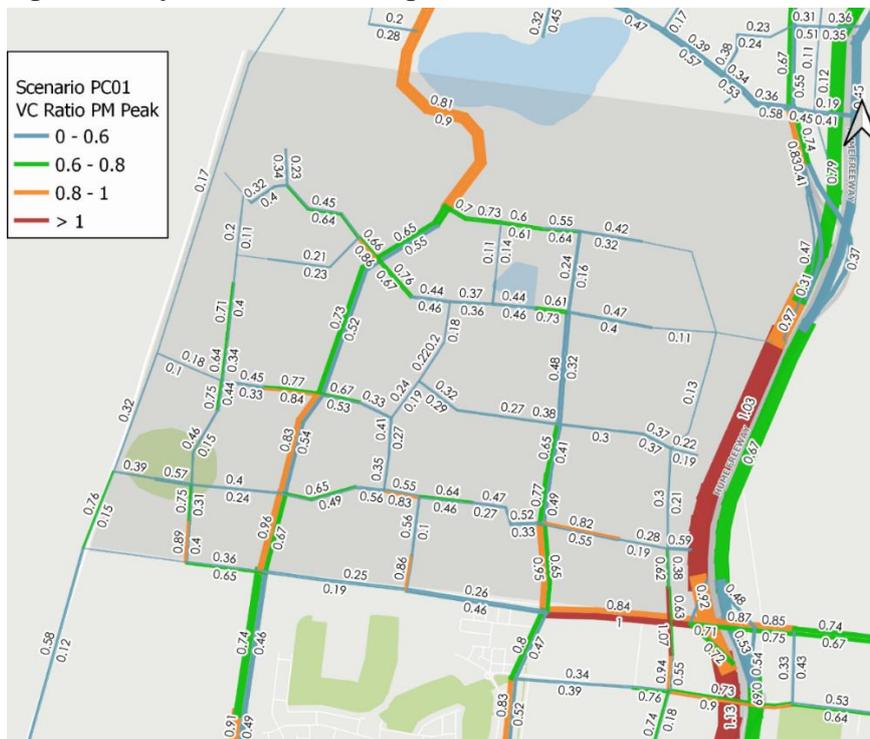
The SCO has been put in place with an end date of 2052 for the quarry. This will broadly align with the modelling assumptions included in this assessment.

In considering the issue on the timing when Patterson Road/Eastern Arterial will be required, I have undertaken an assessment of the implications of the removal of the road through the quarry buffer zone. I note that this assessment has been undertaken at full development of the North Growth Corridor land use and transport infrastructure provisions.

The daily volumes and PM peak hour performance without the Eastern Arterial is shown in Figure 8 and Figure 9.



**Figure 8: Daily Volumes in Beveridge North West without Eastern Arterial**



**Figure 9: Volume to Capacity in Beveridge North West without Eastern Arterial (PM Peak)**

Further interrogation of the performance of the network with the removal of the Eastern Arterial Road is provided in Table 3.

**Table 3: Performance of network with and without the Eastern Arterial Road**

Road Name / Location	Precinct Infrastructure Plan (PIP)			PIP without Eastern Arterial		
	PM Peak Period Volume	Average Speed (PM Peak)	Lowest Speed (PM Peak)	PM Peak Period Volume	Average Speed (PM Peak)	Lowest Speed (PM Peak)
Eastern Arterial Road south of Hadfield Road (two way)	5,150	51.0	21.9	NA	42.2	23.5
Eastern Arterial Road north of Camerons Lane (two way)	8,150	35.9	18.4	8,100	36.2	19.2
Western Arterial Road south of Hadfield Road (two way)	5,500	52.4	40.0	9,150	37.02	32.4
Western Arterial Road north of Camerons Lane (two way)	8,950	54.7	48.9	8,750	46.5	23.5
Camerons Lane west of Hume Freeway (two way)	9,050	37.7	23.1	9,750	35.2	17.6
Camerons Lane west of Hume Freeway (westbound)	5,050	23.1	23.1	5,250	17.6	17.6
Hume Freeway (two way between Camerons Lane and Northern Highway)	27,850	61.0	22.5	28,600	60.8	18.2
Hume Freeway (northbound between Camerons Lane and Northern Highway)	16,350	54.3	22.5	16,650	53.0	19.2
Beveridge North West PSP (all roads)	287,340	34.7	19.0	295,649	33.5	18.6

The modelling shows that the removal of the Eastern Link Road at full development of the PSP will result in added congestion in the PM Peak within Beveridge North West and on the broader network, including:

- increased congestion on the Western Arterial Road with speeds dropping to 33 km/hr at the northern end and 24 km/hr at the southern end of the PSP
- Without a direct connection to Hadfield Road and Camerons Lane there will be increased pressure on the Camerons Lane Interchange with multiple locations experiencing high levels of degree of saturation.
- higher traffic demand and congestion on the Hume Freeway between Camerons Lane and the Northern Highway. The increased freeway trips will likely be short distance between Camerons Lane and the Northern Highway which is not desirable for freeway management.

Overall, it is clear that the network will experience increased congestion resulting in more delays, low speeds and congestion for motorists. Whilst the need for two arterial roads is not part of the terms of reference for this hearing, this assessment has only reinforced my view from the 2020 evidence in that:

4. *There is a clear need for two four-lane north south arterial roads through the PSP based on the road user hierarchy and intended function of the road, network resilience and the anticipated traffic volumes on the network.*

It is important to note that the assessment without the Eastern Arterial in this section has also assumed the full delivery of the North Growth Corridor – it does not assess what may happen in the interim. In determining the timing for the delivery of the road, there are a number of considerations that will need to be evaluated in order for form an opinion, including the:

1. **Rate of development** (land use) within Beveridge North West and the surrounding PSP's. Travel demand is a direct outcome of land use with residents required to travel to access their jobs, schools and shopping requirements. Low housing take up or employment opportunities being delivered will slow travel demand. Conversely higher land use take up will put added pressure on interim infrastructure.
2. Level of **employment opportunities** provided within the North Growth Corridor at locations such as BIFT, Merrifield City Centre and Cloverton City Centre. Beveridge North West will predominantly be a residential community, meaning that the majority of people will need to travel outside of it to access jobs, tertiary education and shopping. The North Growth Corridor Framework Plan has planned for employment opportunities and their timely delivery will be dependent on market demand and policy driven outcomes. These factors are outside of my area of expertise.
3. Timing of the **delivery of the transport network** within Beveridge North West. Prior to the delivery of the ultimate network depicted in the PSP, an interim network will be delivered by the ICP which will provide a single lane on the Western and Eastern Arterial Roads, Camerons Lane and Hadfield Road prior to them being duplicated by the State. The State (DoT) will determine the timing of the upgrades as part of their investment pipeline.
4. Timing and delivery of **connections in the North Growth Corridor** to the broader network. Extending the Western and Eastern Arterial Road networks through Beveridge Central and Beveridge South West will fundamentally change the travel patterns in the corridor.
5. Delivery of **infrastructure by the State** including the Hume Freeway triplication, Interchange upgrades (Camerons Lane, Rankin Street), the Outer Metropolitan Ring Road and Wallan electrification. As stated, these will depend on investment from the State as part of their pipeline.

Making adjustments to these items will likely have consequences on the level of performance of the transport network.

I have not considered an outcome should the Hume Freeway not be triplicated, or if the Western Arterial not be duplicated, or if land take up is slower than expected. Should any of the variables listed not be realised, or change their course, there will clearly be a need for a road to be provided before the full development of the PSP and the North Growth Corridor.

The modelling completed for Beveridge North West and the North Growth Corridor considers the full delivery of land use and infrastructure. It has not considered alternative outcomes or levels of development as understanding the implications of each of these variables would require a significant level of scenario modelling to be undertaken. Importantly, it would only assist in understanding when, not if, the level of investment may be required.

The proposal to include an SCO for the Eastern Arterial Road will allow the DoT or Council an ability to consider the factors listed above when determining the need and requirement of the road as development and network changes occur.

Having regard for the discussion presented in this section, I support the realignment of Patterson Road/Eastern Arterial to allow the inclusion of the SCO that will enable the interim delivery of the network by the DoT.

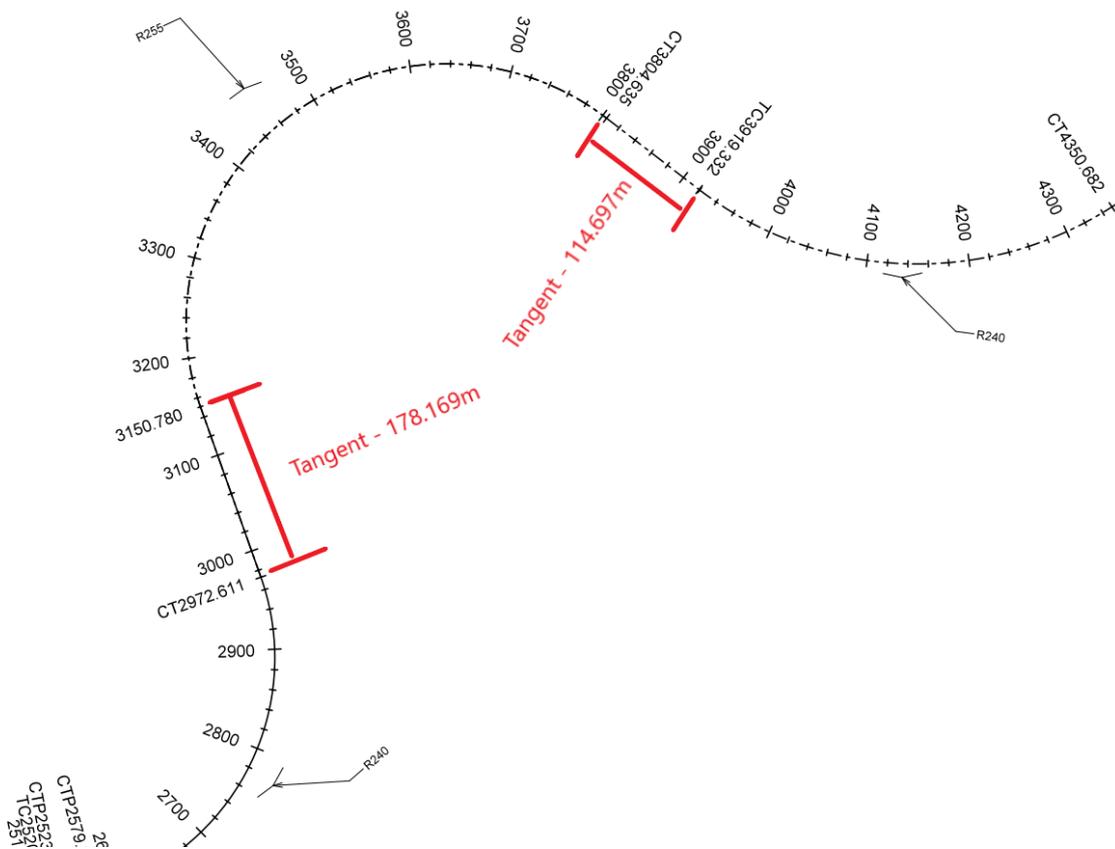
## 4.3 Western Arterial Road alignment at RD03D

I have been asked to review the alignment of the Western Arterial Road at the northern end of the PSP, specifically at the location annotated on Plan 13 of the Precinct Infrastructure Plan (PIP) marked RD03D.

A review of the plans prepared by Cardno<sup>1</sup> indicate that the alignment at the northern extents of the PSP will have two locations with a radii of 240m that both have tangents into a reverse curve with a 255m radii, as shown in Figure 10.

---

<sup>1</sup> [https://vpa-web.s3.amazonaws.com/wp-content/uploads/2021/11/Beveridge-North-West-PSP-Infrastructure-Designs-and-Costings-Cardno-November-2021\\_Part-3\\_Appendix-B\\_Plans\\_1.pdf](https://vpa-web.s3.amazonaws.com/wp-content/uploads/2021/11/Beveridge-North-West-PSP-Infrastructure-Designs-and-Costings-Cardno-November-2021_Part-3_Appendix-B_Plans_1.pdf)



**Figure 10: Western Arterial Road Alignment at R03D**

A reverse curve is where section of road comprises two adjacent curves that are in the opposite direction, as per the design shown in Figure 10. I note that the Austroads Guide to Road Design (AGRD) Part 3 Geometric Design recommends that reverse curves should be avoided “where possible”, however it does go on to state that whilst it is desirable to avoid there may be locations where it is unavoidable, stating:

*...in hilly or mountainous terrain or where physical constraints that influence the alignment are present*

In this instance, the design has been implemented to avoid Burrung Buluk.

Also shown in Figure 10 are “tangents”, these are the distance between the reverse curves. The AGRD provides guidance on the distance of the reverse curves as follows:

*Short tangent lengths should be desirably not less than  $0.6 V m$  where  $V =$  design speed in km/h. A check should be done to ensure there are no surface drainage problems.*

Based on a design speed of 80km/hr a minimum tangent length of 48 meters is required which is exceeded in both locations.

In terms of the radii, the minimum radii of a horizontal curve is also provided in Part 3 of the AGRD which has been reproduced in Table 4.

**Table 4: Minimum radii of horizontal curves based on superelevation and side friction at maximum values (reproduced from Table 7.6 of Part 3 of AGRD)**

Operating speed km/h	Urban roads		Rural roads					
	$e_{max} = 5\%$		$e_{max} = 6\%$		$e_{max} = 7\%$		$e_{max} = 10\%$	
	$f_{max} =$ Des min	$f_{max} =$ Abs min						
40	36	31	35	31	34	30	31	28
50	56	49	55	48	53	47	49	44
60	98	75	94	73	91	71	83	66
70	161	107	154	104	148	102	133	94
80	240	163	229	157	219	153	194	140
90	354	255	336	245	319	236	–	–
100	–	–	437	358	414	342	–	–
110	–	–	529	529	–	–	–	–
120	–	–	667	667	–	–	–	–
130	–	–	783	783	–	–	–	–

Based on a design speed of 80km/hr the minimum radii for an Urban Road is 240m (a rural road is 229m). Having regard for the three radii provided of 240m (twice) and 255m, the design prepared by Cardno exceeds the desirable and absolute minimum requirements and is satisfactory.

## 5. Summary of Opinion & Other Statements

### 5.1 Summary of Opinion

On the basis of the information set out within this report, I note the following:

1. The modelling presented in C106mith in 2020 has been updated to match the most recent version of the Victorian Integrated Transport Model (VITM) and the North Growth Corridor.
2. The modelling shows that the demand on the network is higher in the PSP than what was presented in the 2020 report, which is due to changes in the broader network and an adjusted population forecast.
3. The changes to the transport network, principally the realignment of the Western and Eastern Arterial roads results in an acceptable performance of the network and is supported
4. The inclusion of a SCO which allows the delivery of the Eastern Arterial by the DoT or Council is supported
5. The design of the alignment of the Western Arterial exceeds the desirable and absolute minimum radii requirements for an 80km/hr design speed in the Austroads Guide to Road Design Part 2 and is supported.
6. Overall, I do not see why from a traffic and transport perspective that the changes proposed in C158mith and the Beveridge North West Precinct Structure Plan and ICP should not be adopted and support its inclusion in the Mitchell Planning Scheme.

### 5.2 Declaration

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

**Appendix A Curriculum Vitae**





## Reece Humphreys

Group Leader – Transport Analytics  
Melbourne, Australia

---

### EDUCATION

BE, Civil, Victoria University,  
Victoria, Australia, 2000

---

### MEMBERSHIPS

Member, Institution of  
Engineers Australia  
Fellow, Committee Member,  
Victorian President, Australian  
Institute of Traffic Planning  
and Management  
Incorporated

---

### AWARDS

2012 Young Engineer of the  
Year, Finalist, Engineers  
Australia

---

### PRESENTATIONS

Latest Developments in  
Australian Modelling. *NZ  
Modelling User Group*, 2014.  
Developing a Framework for  
modelling regional Australian  
cities. *AITPM National  
Conference*, 2019.  
Transport Planning or Land  
Use – Who Controls What?.  
*AITPM National Conference*,  
2015.

## PROJECT EXPERIENCE

### TRANSPORTATION

Goulburn Valley Highway – Roads of Strategic Importance | Department of  
Transport (VIC) | Project Director

The Victoria Goulburn Valley Highway section of the corridor has been identified under the Roads of Strategic Importance (ROSI) initiative for strategic investment to improve freight productivity, access, safety, reliability and journey times. To support the investment, the Department of Transport (DoT) is undertaking a detailed assessment of intersection and corridor requirements on the route between Shepparton and Tocumwal. The assessment includes the development of transport modelling that can reflect existing and future travel demands on the network and also consider future transport project delivery. The assessment demonstrated the impact of proposed options / mitigations through traffic modelling that will inform an economic analysis.

Suburban Roads Project | Victoria, Australia | Technical Director (Transport)

The Western Roads Upgrade is a \$1.8 billion project that will deliver a combination of road widening, duplications and intersection upgrades on eight arterial roads in the western suburbs. Stantec is part of the Netflow consortium that was successful in delivering the project. As Technical Director, Reece was responsible for leading the traffic and transport analysis of the eight corridors which comprised 48 intersections and freeway interchanges. The work completed through the bid phase included a range of solutions that resulted in the submission having no departures from the scope requirements, resulting in a successful award for the consortium.

Geelong Growth Areas Transport Infrastructure Strategy | Victoria, Australia

Stantec have been engaged to assist the City of Greater Geelong and the Department of Transport to develop a transport strategy for Geelong to support extensive growth as a result of its three growth areas. The work includes the calibration of the Victorian Integrated Transport Model (VITM) to inform the strategy for all modes of transport in Geelong as a result of the Northern, Western and Armstrong Creek Growth Areas which will double the size of Geelong over the next 30 years. The project is currently in progress.

Gunns Gully Interchange | Victoria, Australia | Project Director and  
Technical Lead

The Gunns Gully Interchange on the Hume Freeway will unlock the development of the Cloverton and Merrifield City Centres in Melbourne's Northern Growth Corridor. The scope of the project includes the preparation of supporting traffic analysis and assessment that informs the design and economic benefit of the project using a bespoke VITM. The project is currently in progress working closely with the DoT, VPA and the Planning Minister in order to release GAIC WIC funding.

### **Calder Highway Traffic Analysis and Economic Assessment | Victoria, Australia | Project Director and Modelling Lead**

The Calder Highway between Maiden Gully and Ironbark in Bendigo is experiencing increased congestion as a result of population growth. Regional Roads Victoria (RRV) developed a range of concept options and solutions for the upgrade of intersections and the corridor as a whole. A transport assessment was undertaken with the use of a multi-layered traffic model that was also used to inform an economic assessment that recommended the preferred option.

### **Northern Highway Economic Assessment | Victoria, Australia**

VicRoads is preparing a business case to upgrade a section of the Northern Highway between the Hume Freeway and Wallan township. As Project Director Reece was responsible for preparing an economic assessment using strategic transport modelling to understand the benefits of the upgrade. The project utilised and updated the Statewide Victorian Integrated Transport Model (S-VITM) and included several workshops with various stakeholders to develop the inputs into two project cases for testing. The economic assessment will form part of a business case that will be submitted to the State Government.

### **Ararat Bypass Study | Victoria, Australia**

Regional Roads Victoria (RRV) are investigating a new bypass of the Western Highway in Ararat. The work involved calibration of the Statewide Victorian Integrated Transport Model (S-VITM) to test the three possible alignments for the bypass. The work was also used to inform the design of the interchanges and fed directly into the Environmental Impact Assessment.

### **Beveridge North West PSP | Victorian Planning Authority | Director**

VicRoads is preparing a business case to upgrade a section of the Northern Highway between the Hume Freeway and Wallan township. As Project Director Reece was responsible for preparing an economic assessment using strategic transport modelling to understand the benefits of the upgrade. The project utilised and updated the Statewide Victorian Integrated Transport Model (S-VITM) and included several workshops with various stakeholders to develop the inputs into two project cases for testing. The economic assessment will form part of a business case that will be submitted to the State Government.

### **Tamworth Strategic Transport Model | Tamworth Regional Council / TfNSW | 2017 - 2021 | Project Director**

The Tamworth Strategic Transport Model (TSTM) was developed in 2011 and has been updated, recalibrated and validated in 2017 and 2021. The model is used to test the performance of the network as a result of forecast growth in Tamworth and to assist in planning for new infrastructure required to be delivered by Government.



Level 25  
55 Collins Street  
Melbourne Vic 3000  
Tel +61 3 9851 9600