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# **Jane Street and Mulgoa Road Infrastructure Upgrade Review of Environmental Factors**

Appendix D – Traffic/Transport Assessment and  
Economic Analysis Study

**October 2016**



# Jane Street and Mulgoa Road Infrastructure Upgrade

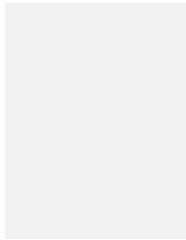
## Traffic and Transport Assessment Report for Review of Environmental Factors (REF)

Incorporating





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# Roads & Maritime Services (Roads and Maritime)

## Jane Street and Mulgoa Road Infrastructure Upgrade

### Traffic and Transport Assessment Report for Review of Environmental Factors (REF)

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## REVISIONS

Revision	Date	Description	Prepared by	Approved by
A	Jan 2016	Draft Report for internal review	KN	
B	28 Jan 2016	Draft Report for client's review	MR	MR
C	14 Oct 2016	Final Report addressing RMS comments	MR	MR



# CONTENTS

<b>1 INTRODUCTION.....</b>	<b>1</b>
1.1 Study purpose .....	1
1.2 Road network.....	1
1.3 Study scopes & objectives .....	2
1.4 Concept design.....	3
1.5 Reference traffic data & modelling.....	5
1.6 Report structure.....	5
<b>2 EXISTING TRAFFIC AND TRANSPORT CONDITIONS.....</b>	<b>6</b>
2.1 Regional & local context.....	6
2.2 Route & speed environment .....	7
2.3 Road hierarchy .....	9
2.4 Freight & heavy vehicles .....	10
2.4.1 4.6 metres height vehicles .....	10
2.4.2 B-double routes .....	11
2.4.3 A-double road train routes .....	11
2.4.4 Daily heavy vehicles.....	12
2.5 Commuter mode shares .....	12
2.6 Historical traffic growth .....	14
2.7 Public transport .....	16
2.7.1 Bus services .....	16
2.7.2 Train services .....	17
2.8 Active transport .....	19
2.9 Crash data.....	20
2.10 Road safety performance .....	22
2.11 Access .....	22
<b>3 EXISTING ROAD NETWORK PERFORMANCE.....</b>	<b>23</b>
3.1 Traffic survey.....	23
3.2 Traffic results.....	25
3.2.1 Weekly traffic profile.....	25
3.2.2 Daily traffic profiles.....	27
3.2.3 Peak hour volumes and midblock capacity.....	28
3.3 Traffic congestion.....	29
<b>4 FUTURE NETWORK PERFORMANCE.....</b>	<b>31</b>
4.1 Future growth .....	31
4.2 Future traffic volumes .....	31



<b>4.3 Consequence of no actions.....</b>	<b>32</b>
<b>4.4 Concept design traffic performance.....</b>	<b>34</b>
4.4.1 Jane Street / Castlereagh Road / Mulgoa Road intersection .....	34
4.4.2 Great Western Highway / Mulgoa Road / High Street intersection.....	36
<b>4.5 Road safety improvements.....</b>	<b>38</b>
<b>4.6 Access strategy .....</b>	<b>38</b>
<b>4.7 Impact to other modes.....</b>	<b>38</b>
<b>4.8 Preliminary construction traffic impacts.....</b>	<b>41</b>
<b>4.9 Management of traffic and transport impacts .....</b>	<b>41</b>
<b>5 SUMMARY OF FINDINGS.....</b>	<b>42</b>
5.1 Overview .....	42
5.2 Existing traffic congestions.....	42
5.3 Future traffic volumes.....	42
5.4 Jane Street and Mulgoa Road infrastructure upgrade .....	43

# 1 INTRODUCTION

## 1.1 Study purpose

The following document is a Traffic and Transport Assessment (hereafter referred to as 'the Study') for the concept design of the Jane Street and Mulgoa Road Infrastructure Upgrade ('the proposal').

Roads and Maritime Services (Roads and Maritime) has investigated options for Jane Street and Mulgoa Road Infrastructure Upgrade to alleviate congestion and improve traffic flows between the Nepean River and the Penrith Central Business District (CBD). Development and selection of a preferred option has been carried out and documented in *Jane Street and Mulgoa Road Infrastructure Upgrade, Preferred Option Report, Roads and Maritime, November 2014* ('the Preferred Option Report').

Arcadis Australia Pacific (Arcadis) has prepared this report to support the Review of Environmental Factors (REF) of the proposal. In the course of preparing this report relevant documents associated with the proposal have been reviewed, and potential traffic impacts on the road network have been assessed. The Study provides recommendations to Roads and Maritime on the potential upgrading works at roads and key intersections required to maximise the traffic performance of the proposal.

Consultation with Roads and Maritime has been carried out during the course of this Study including technical note on the model outcomes and design meetings as required.

This Traffic and Transport Assessment Report has been prepared to support the Review of Environmental Factors (REF) of the proposal.

## 1.2 Road network

Jane Street and Mulgoa Road corridor is a strategic route connecting Penrith CBD to the Blue Mountains and Central West. Jane Street runs east–west within the Penrith CBD, parallel to the Western Railway Line. It connects to Mulgoa Road / Castlereagh Road at a T-intersection. Castlereagh Road / Mulgoa Road is a major arterial road connecting the existing residential areas of Castlereagh, Cranebrook, Jamisontown and Glenmore Park to the Penrith CBD. High Street runs east–west within the study area, connecting to the Great Western Highway at the intersection with Mulgoa Road.

The study area extends along the Mulgoa Road and Castlereagh Road between Museum Drive and Union road and includes intersections at Jane Street and Great Western Highway / High Street.

Figure 1-1 below shows the traffic modelling Study area.



Figure 1-1 Traffic Modelling Study Area

### 1.3 Study scopes & objectives

The scope of the Study is to assess the traffic and transport performance of the proposal. Key objectives of the traffic modelling assessment are to:

- Determine level of service of the proposal taking into account expected traffic growth until 2036
- Identify key network issues that impact the performance of the proposal adjoining roads
- Prepare a Traffic and Transport Assessment Report to inform the Review of Environment Factors of the proposal.

## 1.4 Concept design

Roads and Maritime has prepared a concept design for the proposal. The concept design includes the following key features:

- Widening the existing alignment on the western side of Mulgoa Road - Castlereagh Road between Union Road and a point south of Museum Drive to allow for six lanes of through traffic, a central median strip and auxiliary turning lanes at intersections
- Upgrade and widening of the Jane Street / Mulgoa Road - Castlereagh Road intersection and addition of a bus priority lane ('queue-jump') lane for buses turning right out of Jane Street onto Castlereagh Road
- Widening of the Great Western Highway to allow for four through lanes, a median strip and a longer left and additional right turning lane into Mulgoa Road – Castlereagh Road
- Upgrade and widening of the Mulgoa Road / High Street intersection to allow for an additional eastbound lane and right turn lane out of High Street onto Mulgoa Road
- Replacement of the existing railway bridge over Castlereagh Road with a new 39 m single span concrete bridge using a specialised method known as a 'bridge slide'
- Installation of bridge protection beams on either side of Castlereagh Road as a safety mechanism for over-height vehicles on approach to the railway bridge
- Provision of a 4.5 m wide separated shared pedestrian and cycle pathway along the eastern side of Mulgoa Road - Castlereagh Road and safe crossings at the High Street and Jane Street intersections with Mulgoa Road - Castlereagh Road
- Relocation of underground utilities in the proposal area and improvement of local drainage
- Tree planting and landscaping to match the vision for the whole of the Mulgoa Road corridor
- Temporary establishment of up to three construction compound sites.

Figure 1-2 below shows the concept design of the proposal.





Source: Concept design provided by Roads and Maritime

Figure 1-2 Concept Design of Jane Street and Mulgoa Road Infrastructure Upgrade

## 1.5 Reference traffic data & modelling

The traffic modelling data for this Study has been sourced from a wider traffic model built for the Mulgoa Road / Castlereagh Road from Glenmore Parkway to Andrews Road over a distance of about 6.1 kilometres. It is expected that the future upgrade of Mulgoa Road and Castlereagh Road would be an extension of the Jane Street and Mulgoa Road Infrastructure Upgrade project.

For the purpose of traffic modelling VISSIM micro simulation modelling software was used.

## 1.6 Report structure

The remainder of this report is structured as follows:

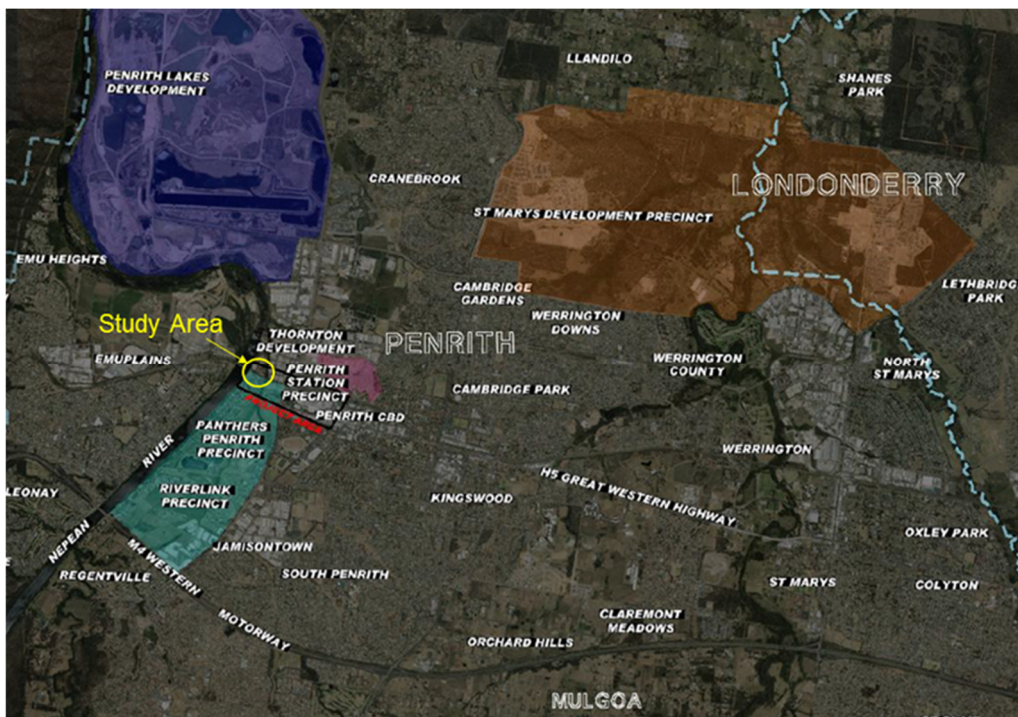
- **Chapter 2:** Existing traffic and transport conditions – Provides the context of existing traffic conditions within the Study area
- **Chapter 3:** Existing road network performance – Establishes the existing network performance within the Study area. Results from traffic surveys are summarised in this section
- **Chapter 4:** Future network performance – Provides an overview of forecast traffic volumes on the Mulgoa Road / Castlereagh Road, consequence of no actions, assessment of the proposal, provide detailed modelling results, impacts to other transport modes, and preliminary construction traffic impacts
- **Chapter 5:** Summary of findings – Provides a summary of key traffic and transportation findings from this Study.

## 2 EXISTING TRAFFIC AND TRANSPORT CONDITIONS

The existing traffic and transport conditions in the Study area are described within this chapter.

### 2.1 Regional & local context

The regional context of the proposal area is presented in Figure 2-1. The proposal Study area is located in the west of Greater Sydney, NSW and falls within the Penrith local government area (LGA) adjacent to the Penrith CBD. Penrith is about 30 kilometres west of Parramatta, and 50 kilometres west of Sydney, and is known as the Gateway to the Blue Mountains. It is about 10 kilometres south of the North West Growth Centre and about 10 kilometres north of the Broader Western Sydney Employment Area.



Source: Roads and Maritime

Figure 2-1 Regional Context of Jane Street and Mulgoa Road Infrastructure Upgrade



## 2.2 Route & speed environment

Jane Street is a four-lane arterial road running east–west within the Penrith CBD, extending about 600 metres between Belmore Street and Castlereagh Road, parallel to the Western Railway Line. It connects to Mulgoa Road / Castlereagh Road at a T-intersection.

Mulgoa Road / Castlereagh Road is a major arterial road with two through lanes in each direction connecting the existing residential areas of Castlereagh, Cranebrook, Jamisontown and Glenmore Park to the Penrith CBD.

Castlereagh Road runs north and Mulgoa Road runs south from the intersection with Jane Street. Castlereagh Road travels under the Western / Blue Mountains Rail Line via an underpass. The Road is a two lane divided carriageway until Waterside Boulevard and turns into a four lane carriageway towards Jane Street. The speed limit for the road is 60 km/h.

Mulgoa Road connects Penrith to Wallacia. The road is a four lane carriageway until Glenmore Parkway and turns in a two lane carriageway towards Wallacia. The speed limit for the road is mostly 60 km/h.

The intersection of Mulgoa Road / High Street / Great Western Highway is about 125 metres south of the intersection with Jane Street and connects Penrith CBD to the Blue Mountains and Central West.

High Street runs east–west through the Study area, connecting to Great Western Highway at the intersection with Mulgoa Road. Although it connects the eastern and western sections of the Great Western Highway, High Street runs through Penrith CBD providing local access to the CBD and is heavily used by pedestrians. The posted speed limit on High Street is 50 km/h.

Through traffic travelling west along the Great Western Highway is re-routed from east of the Penrith CBD along Belmore Street and Jane Street (also part of the Great Western Highway), performing a dog leg back onto the Great Western Highway at the Mulgoa Road intersection with High Street. High Street generally has four lanes (two eastbound and two westbound) within the Study area. This four lane configuration continues onto the Great Western Highway which reduces to two lanes (one in each direction) as it approaches Victoria Bridge to cross the Nepean River.

Figure 2-2 shows posted speed limits in the vicinity of the Study area.



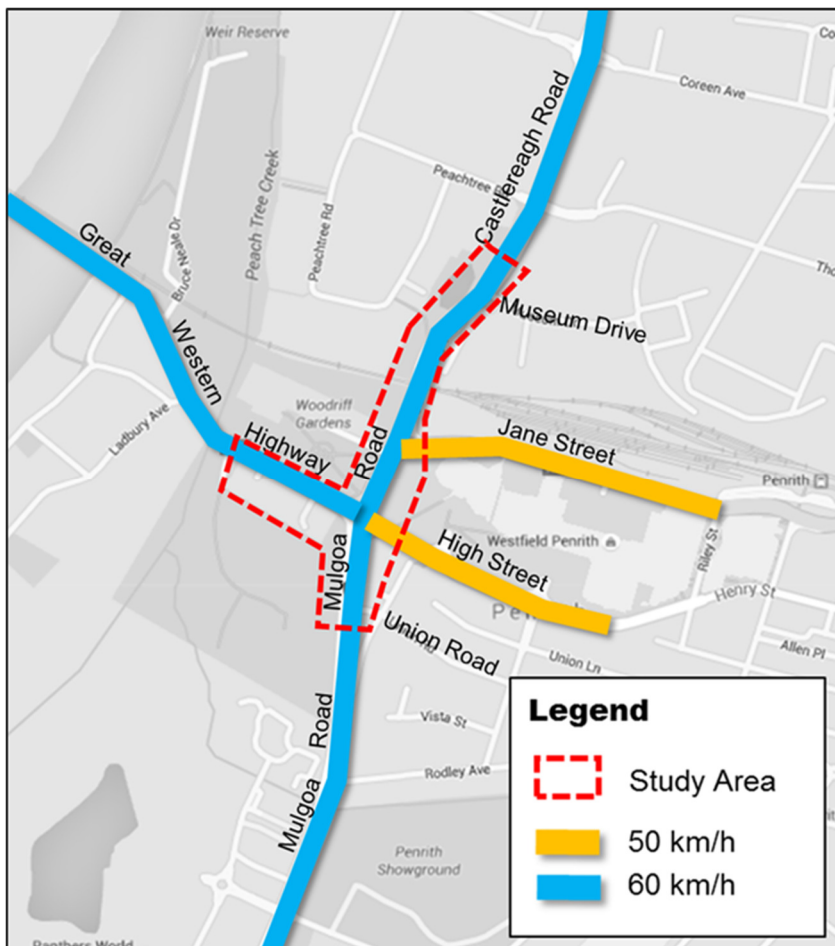


Figure 2-2 Posted Speed Limits of Road Network

## 2.3 Road hierarchy

Figure 2-3 below shows the road hierarchy for the Study area network. Jane Street, Castlereagh Road, Mulgoa Road and Great Western Highway are classified as State Roads. High Street is classified as Local Road.

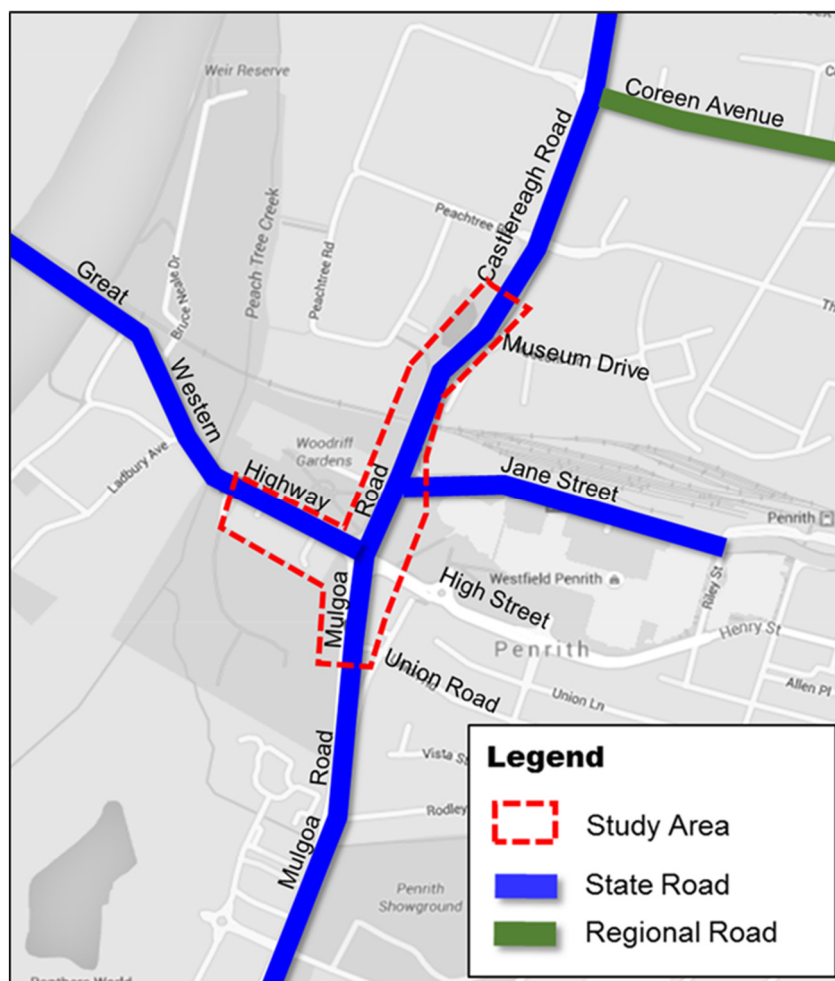


Figure 2-3 Road Hierarchy

## 2.4 Freight & heavy vehicles

A review of the heavy / freight vehicles movements through the Study area indicates the following key routes taken by heavy vehicles:

- Mulgoa Road / Castlereagh Road - As the primary north-south route, the road forms the primary freight route between Penrith, Jamisontown and Glenmore Park. Currently about 15 per cent of total daily traffic on the Mulgoa Road / Castlereagh Road (north of Jane Street) are heavy vehicles
- Jane Street / Great Western Highway – The road provides primary east-west freight movement between Penrith CBD, the Blue Mountains and Central West. Currently about nine per cent of total daily traffic on the Jane Street are heavy vehicles. A similar proportion, about seven per cent of total daily traffic on the Great Western Highway are heavy vehicles.

### 2.4.1 4.6 metres height vehicles

Figure 2-4 below shows approved routes for 4.6 metres high vehicles in the Study area. The predominant route for these vehicles is the east-west movement along Jane Street / Great Western Highway. The high vehicle route also includes the north-south movement on Mulgoa Road south of Jane Street. Within the Study area, the 4.6 metres high vehicles are not allowed on the Castlereagh Road north of Jane Street.

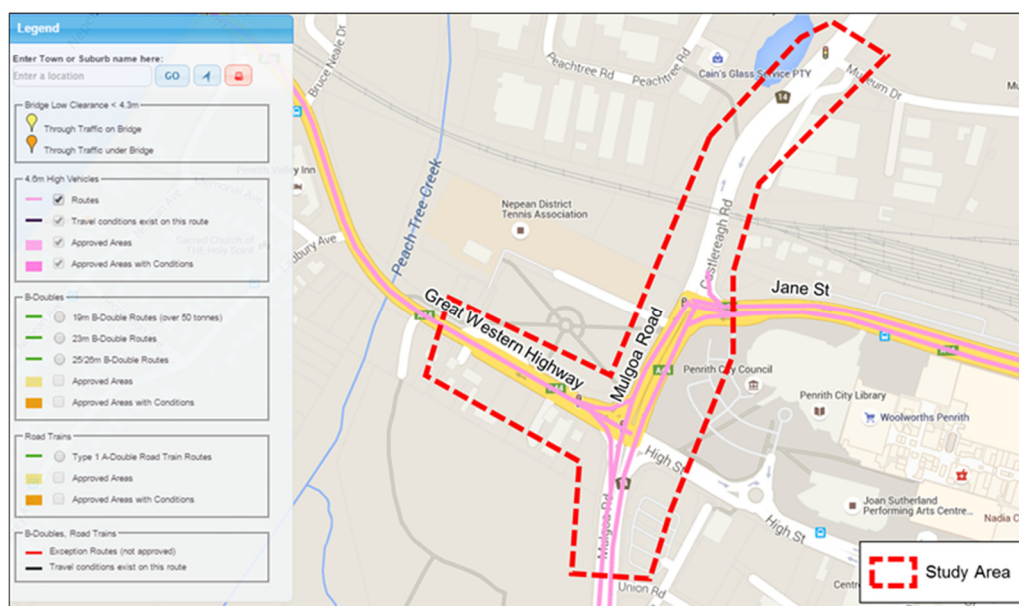
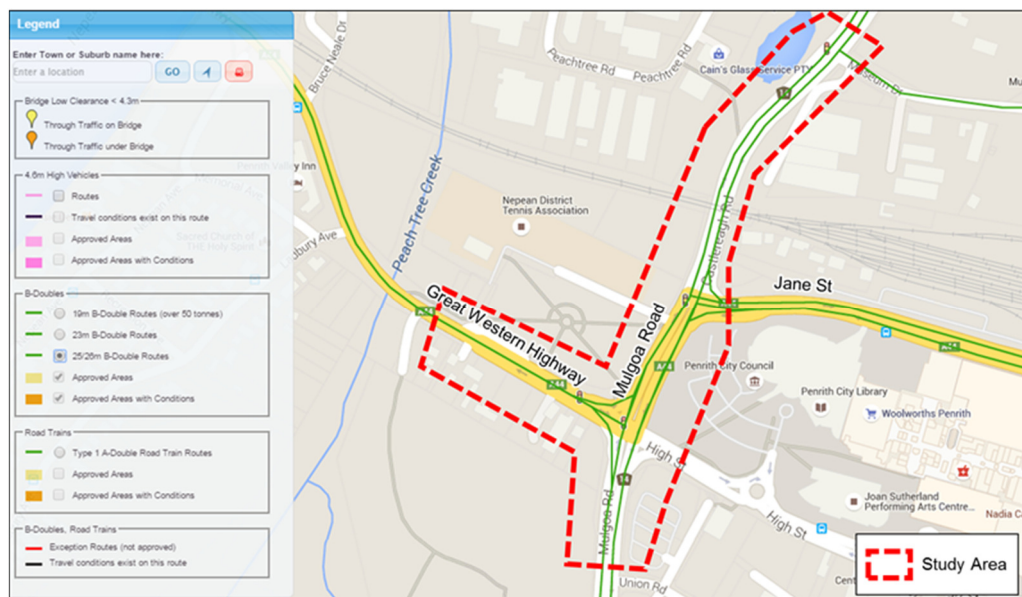


Figure 2-4 Designated 4.6metres High Vehicle Routes in the Study Area

## 2.4.2 B-double routes

Figure 2-5 shows approved routes for 19-26 metre B-double vehicles. 19-26 metre B-double movements are permitted on Jane Street, Castlereagh Road, Mulgoa Road, and the Great Western Highway. Within the Study area, B-double movements are not permitted on High Street east of Mulgoa Road.



Source: Roads and Maritime's Restricted Access Vehicles

Figure 2-5 Designated 19-26 metres B-double Routes in the Study Area

## 2.4.3 A-double road train routes

There are no A-Double routes within the Study area.

## 2.4.4 Daily heavy vehicles

Table 2-1 summarises current heavy vehicles data on a typical weekday based on a survey undertaken in May 2015. Mulgoa Road / Castlereagh between Museum Drive and Jane Street carried about 5,500 heavy vehicles being about 15 per cent of daily traffic volumes. Jane Street, east of Station Road carried about 1,300 heavy vehicles being about nine per cent of daily traffic volumes. Great Western Highway west of Mulgoa Road carried about 2,200 heavy vehicles being about seven per cent of daily traffic volumes.

Table 2-1 Daily Heavy Vehicles

Road/Location	Average Weekday		
	All Vehicles	Heavy Vehicles	% Heavy Vehicles
Mulgoa Road / Castlereagh Road – between Museum Drive and Jane Street	36,025	5,523	15%
Jane Street – east of Station Street	14,599	1,363	9%
Great Western Highway – west of Mulgoa Road	30,918	2,134	7%

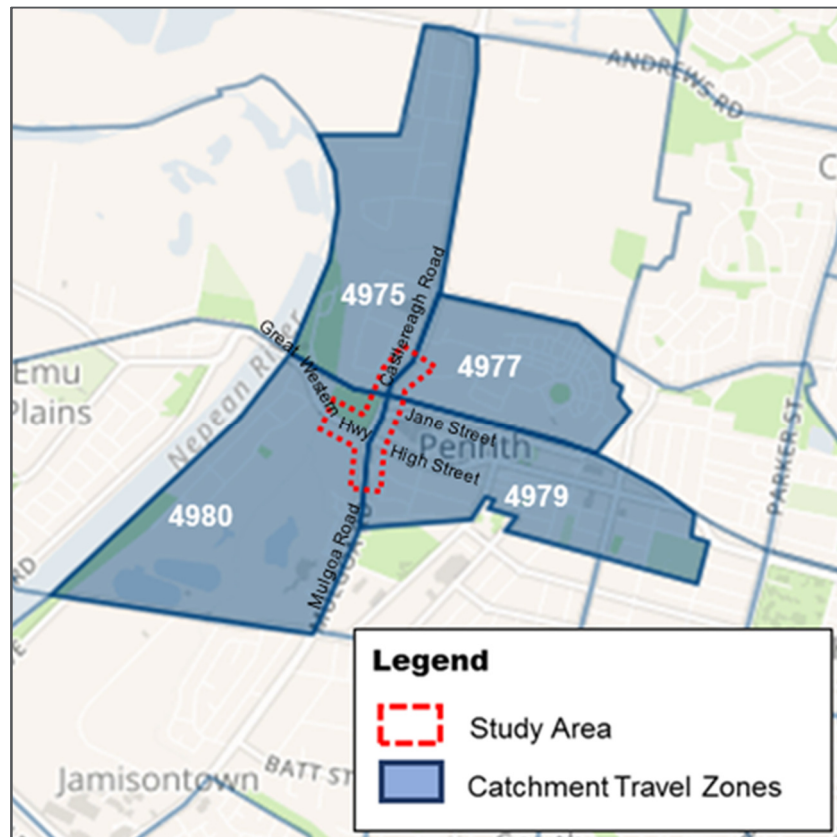
Source: May 2015 Traffic Survey

## 2.5 Commuter mode shares

The Bureau of Transport Statistics (BTS) provides journey to work data for the Sydney Greater Metropolitan Area, comprising of a comprehensive sample of commuter travel, collected during the 2011 Census. Work trip origin and destinations are coded to the 2011 travel zones and showed in Figure 2-6. Table 2-2 summarises the work trips by mode of travel reported for the Study area.

In 2011, about 759 residents travelled from the Study area to work. About 12 per cent of people did not travel to work or worked from home on the census day. The Census data showed that around 51 per cent of work trips from the Study area were made by motorists in a private vehicle, with 6 per cent of those being car passengers. About 21 per cent of workers travelled by public transport (2 per cent by bus and 19 per cent by train), and 7 per cent walked.

About 14,684 employees travelled to the Study area to work. Private vehicles are the dominant mode of transport to work, accounting for about 68 per cent. About 13 per cent of employees travelled by public transport and 1 per cent walked. About 13 per cent did not go to work or worked from home.



Source: JTW 2011, Catchment travel zones: 4975, 4977, 4979 and 4980.

Figure 2-6 Travel Zones in the Study Area

Table 2-2 Daily Work Trips Mode Distributions

Travel Modes	Study Area as Home (Outbound trips)	% Trips as Home	Study Area as Workplace (Inbound trips)	% Trips as Workplace
Car Driver	390	51%	9,985	68%
Car Passenger	47	6%	975	7%
Train	146	19%	840	6%
Bus	15	2%	341	2%
Walked only	54	7%	219	1%
Others (modes not stated)	19	3%	379	3%
Worked from home	88	12%	1,945	13%
<b>Total</b>	<b>759</b>	<b>100%</b>	<b>14,684</b>	<b>100%</b>

Source: JTW 2011, Catchment travel zones: 4975, 4977, 4979 and 4980.

## 2.6 Historical traffic growth

Historical traffic data recorded between 1993 and 2015 on the Mulgoa Road and Castlereagh Road was sourced from Roads and Maritime. Table 2-3 below shows historical daily traffic volumes data (between 1993 and 2015) recorded on the Mulgoa Road / Castlereagh Road north of Great Western Highway (station 86.027).

A regression model was built using historical data from Table 2-3. A best fit line (see Figure 2-7) for regression model was used to calculate linear growth rate and found to be 1.2 per cent per annum.

The historical traffic data on the Mulgoa Road / Castlereagh Road (north of Great Western Highway) suggested a linear traffic growth of 1.2 per cent per annum.

Table 2-3 Historical Traffic Growth on Mulgoa/ Castlereagh Road between 1993 and 2015

Station	Road	Daily Traffic Volumes (AADT/ADT)						
		1993	1996	1999	2002	2005	2009 <sup>(1)</sup>	2015 <sup>(1)</sup>
86.027	Mulgoa/ Castlereagh Road	29,401	35,819	34,011	33,081	33,196	35,160	41,200

Source: Roads and Maritime and traffic counts. The traffic counts between 1993 and 2005 represent annual average daily traffic (AADT). (1) The 2009 and 2015 data represents average daily traffic for one week period (ADT).



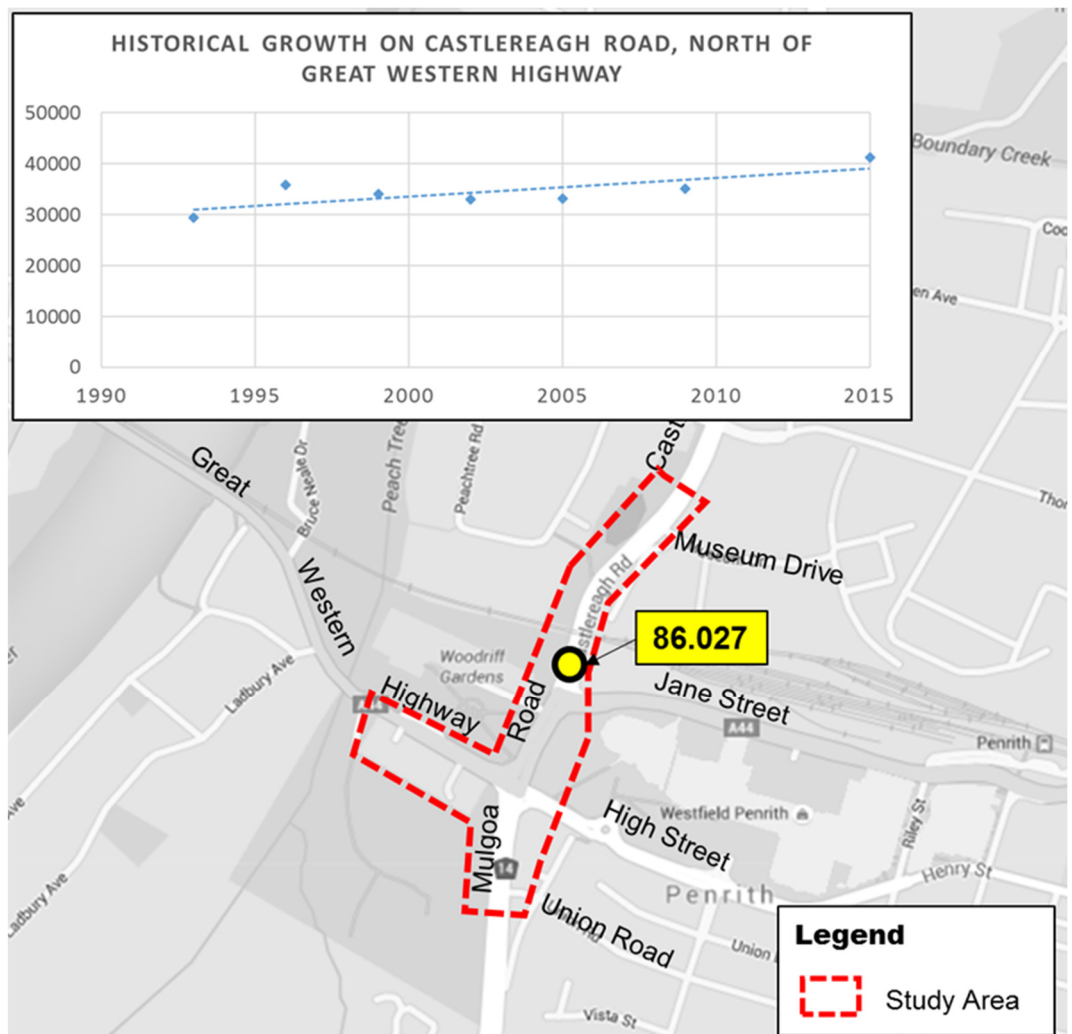


Figure 2-7 Historical Traffic Growth



## 2.7 Public transport

### 2.7.1 Bus services

Currently eight bus services operate within the Study area. The service frequency for buses varies during the morning and afternoon peak period being 30 minutes to 90 minutes depending on the route. Table 2-4 summarises bus routes and service frequency during morning (6am to 9 am) and afternoon peak (3pm to 6pm) period.

Table 2-4 Bus Services in the Study Area

Section	Bus Route	Service	AM Peak services (3-hours, 6 am to 9 am)	PM Peak services (3-hours, 3 pm to 6 pm)
North of Jane Street	673	Between Penrith and Windsor (via Cranebrook and Llandilo)	6 (every 30-60 mins)	3 (every 90 mins)
	783	Jordan Springs to Penrith Loop	6 (every 30 mins)	6 (every 30 mins)
	784	Cranebrook to Penrith Loop	4 (every 30 mins)	4 (every 30 mins)
	<b>Combined services for routes 673, 783, 784</b>		<b>16</b>	<b>13</b>
Loop via Mulgoa Road (between Jamison and High Street)	688	Emu Heights to Penrith Loop	2 (every 30 mins)	7 (every 60 mins)
	689	Leonay to Penrith Loop	5 (every 30 mins)	4 (every 30-60 mins)
	1688	Leonay to Penrith Loop (via Emu Heights)	No service	2 (every 60 mins)
Great Western Highway - Mulgoa Road - M4	690P	Between Penrith and Springwood (via Glenbrook, Blaxland, Warrimoo and Valley Heights)	No service	3 (every 60 mins)
	691	Between Blaxland and Penrith	3 (every 30 mins)	1
	<b>Combined services for routes 688, 689, 1688, 690P, 691</b>		<b>10</b>	<b>17</b>

Source: TfNSW (<http://www.transportnsw.info/>)

The bus services data in Table 2-4 indicate that:

- Bus services along the Mulgoa Road / Castlereagh Road north of Jane Street are operated by Busways for routes 673, 783, 784. During the am peak period (6 am to 9 am) about 16 services operate on these routes. Similarly during the pm peak period (3 pm to 6 pm) about 13 services operate on these routes.
- The Blue Mountains Bus Company provides services for routes including 688, 689, 690P, 691 and 1688. Routes 688, 689 and 1688 travel from the Great Western Highway to High Street (at Transport Interchange), before looping back to the Great Western Highway via Ransley Street, Jamison Road and Mulgoa Road. Route 690P and 691 travel from Great Western Highway to High Street (at Transport

Interchange), then onto the M4 Motorway via Ransley Street and Mulgoa Road. During the am peak period (6 am to 9 am) about 10 services operate on these routes. Similarly during the pm peak period (3 pm to 6 pm) about 17 services operate on these routes. Figure 2-8 below shows current bus services within the study area.

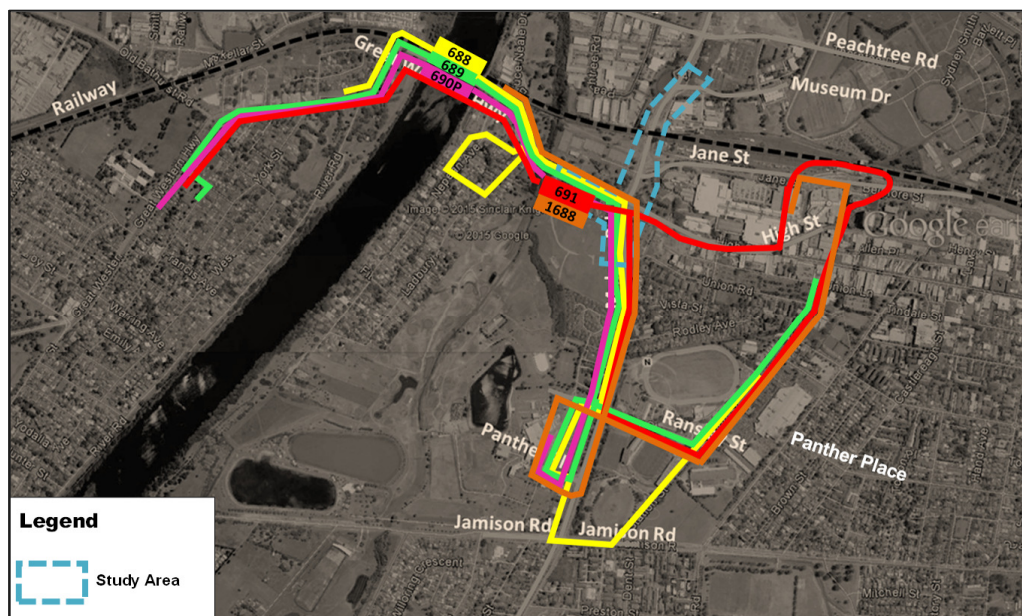


Figure 2-8 Existing Bus Routes on Mulgoa Road between Jane Street and Jamison Road

## 2.7.2 Train services

The Penrith City Centre is a strategic transport hub for the Sydney transport network. It connects the Western Subregion with the Sydney CBD, Parramatta and Blacktown to the east and Blue Mountains to the west. Penrith Station (see Figure 2-9) is located on Jane Street about 800 metres from the Jane Street / Mulgoa Road intersection.

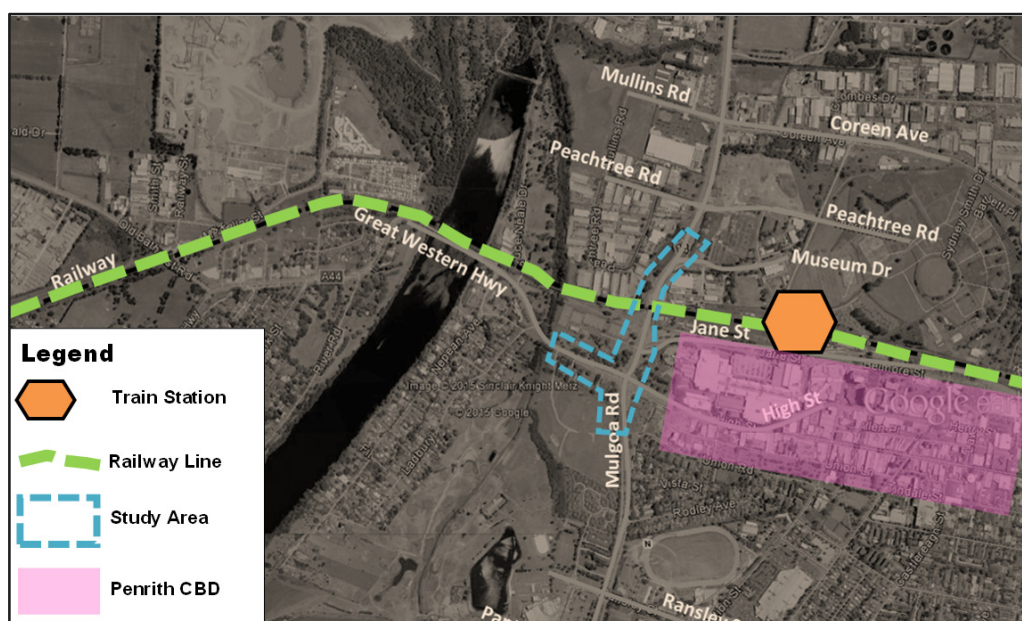


Figure 2-9 Location of Penrith Station

Penrith Station is serviced by the following two train lines:

- The T1 Western Line: Connects Penrith to the West (Blacktown, Parramatta) and towards the Sydney CBD
- The Blue Mountains line: Provides services between suburbs west of Penrith up to Blue Mountains, and provides an express service between Penrith and the Sydney CBD.

Table 2-5 below shows the frequency of trains to the Penrith Station, indicating a high frequency of services.

Table 2-5 Existing Train Services in Penrith

Route description	Significant destinations on route	Service frequency
<b>Suburban Service</b>		
T1-Western Line	Penrith, Richmond, Blacktown, Parramatta, Granville, Strathfield, Redfern, Central, Town Hall, North Sydney, Chatswood	4-11 mins (peak) 15 mins (off-peak)
<b>Intercity Service</b>		
Blue Mountains Line	Bathurst, Katoomba, Glenbrook, Emu Plains, Penrith, Blacktown, Parramatta, Strathfield, Redfern, Central	15 mins (morning peak) 30 mins (evening peak) 1 Hour (off-peak)

Source: TfNSW (<http://www.transportnsw.info/>)

The high rail service frequency highlights the importance of Penrith as a transport hub. The train station is accessible for commuters and includes the provision of the following services:

- Stairs and lifts
- Station car parking and bike rack and lockers
- Kiss and ride zones and taxi ranks close by
- Hearing loop, tactile tiles
- Wheelchair accessible toilets
- Wheelchair accessible car spaces.

## 2.8 Active transport

The Study area comprises a range of land uses including residential, office, recreational parks and retail. Walking and cycling are important as they reduce the amounts of vehicles on the road and decrease congestion. Provision of safe and effective pedestrian and cycling infrastructure along the road network is therefore important.

Within the Study area, there is a footpath running along the westbound carriageway of the Great Western Highway / High Street, and along the eastbound carriageway, east of Bruce Neale Drive. This footpath accesses Woodriff Gardens. Both Castlereagh Road / Mulgoa Road and Jane Street currently have footpaths along both sides of the road. The footpaths within the Study area are of variable widths and are intersected by a number of access points along the roads. Footpaths running east–west within the Study area generally connect the recreational areas associated with the Nepean River and Woodriff Gardens with the Penrith CBD.

Within the Study area off-road separated cycle paths are provided along Mulgoa Road / Castlereagh Road southbound between Museum Drive and Union Road, Mulgoa Road / Castlereagh Road northbound between Great Western Highway and Museum Drive, Great Western Highway westbound, and High Street eastbound.

Figure 2-10 below shows cycling network in the study area.

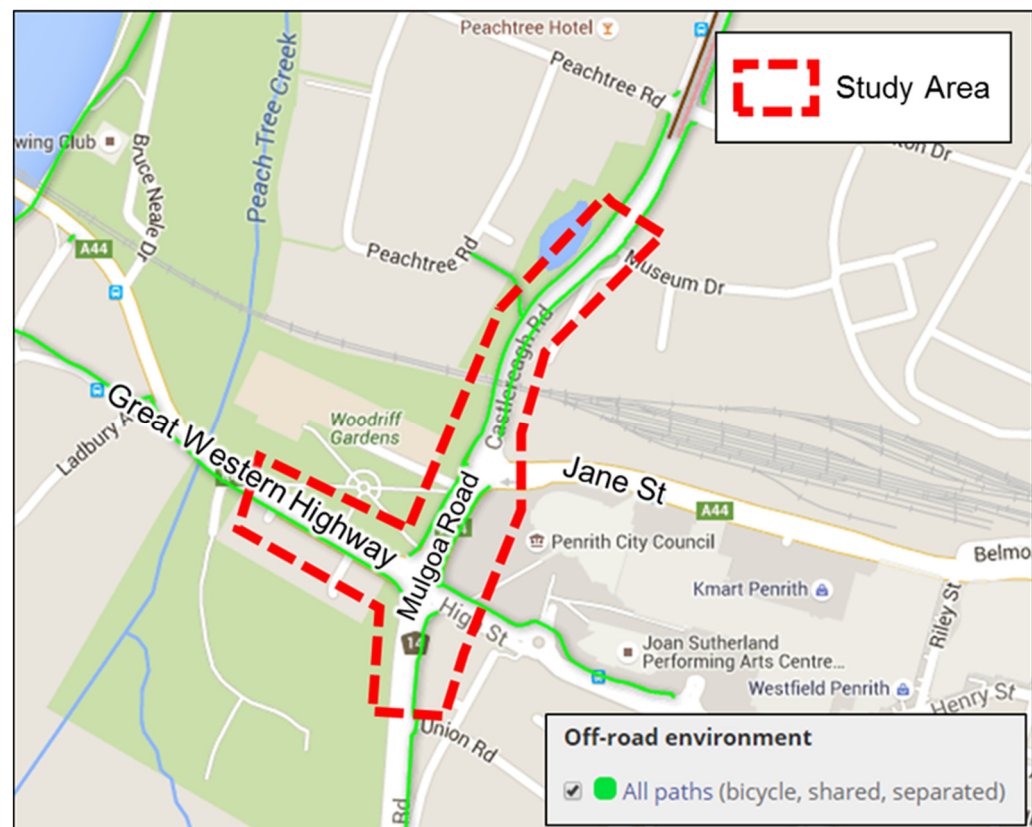


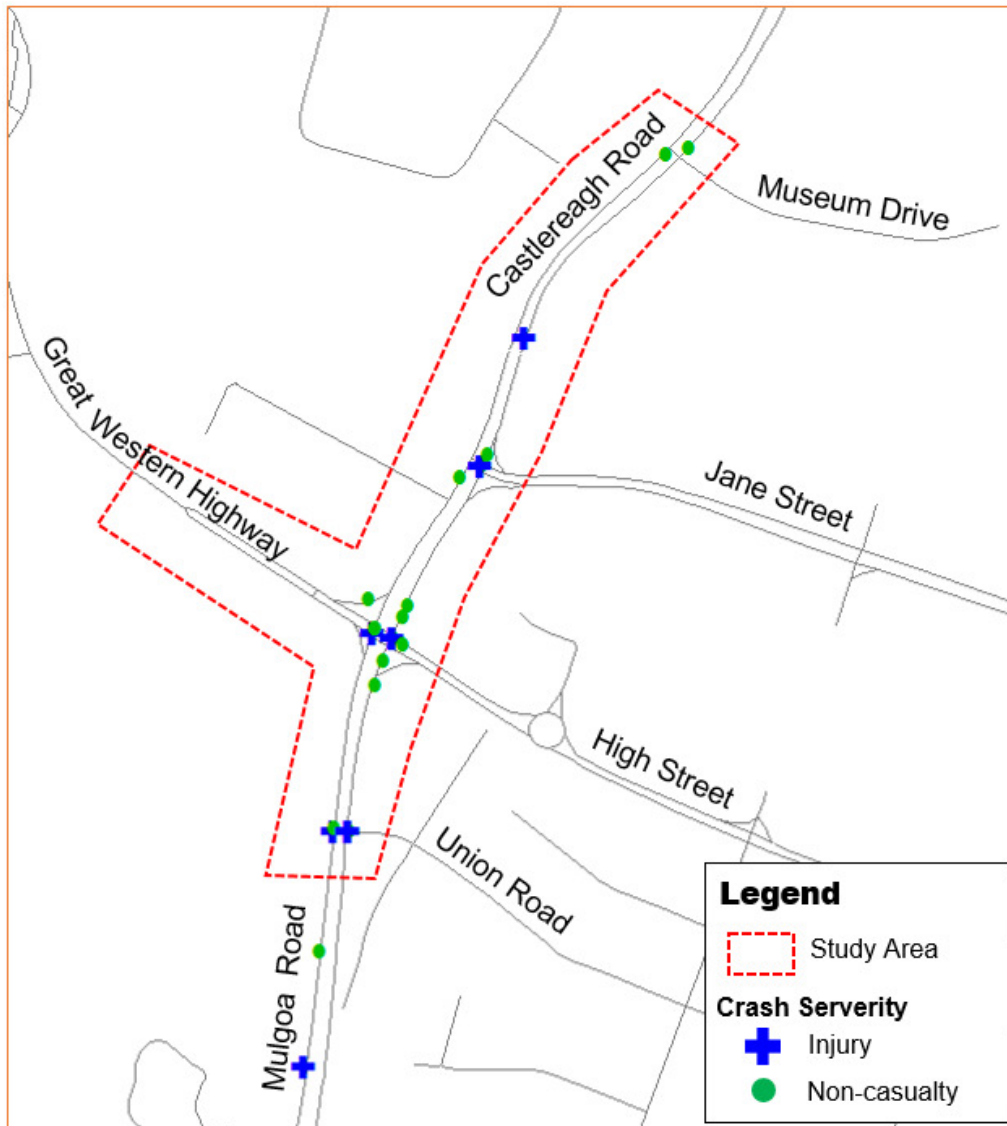
Figure 2-10 Existing Cycle Network in the Study Area



## 2.9 Crash data

This assessment is based on the crash data supplied by Roads and Maritime for the five-year period from January 2011 to December 2015 inclusive. The crash data includes fatal, injury and non-casualty. The crash analysis has been carried out for the Castlereagh Road and Mulgoa Road between Museum Drive and Union Road.

Figure 2-11 below shows crash locations reported between January 2011 and December 2015.



Source: Roads and Maritime

Figure 2-11 Crashes by Location and Severity in the Study Area

Table 2-6 summarises crash statistics classified by severity (fatal, injury and non-casualty). There were 26 crashes recorded between 2011 and 2015 on Castlereagh Road and Mulgoa Road between Museum Drive and Union Road. Of the recorded crashes, none were found to be fatal. About 8 (24 per cent) crashes were found to be injury and 18 (76 per cent) were non-casualty crashes.

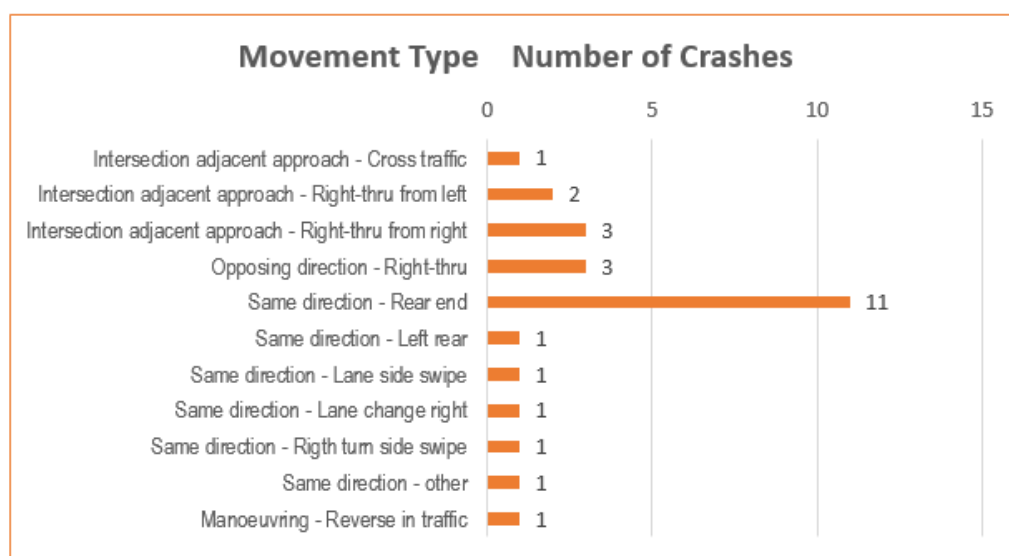
Table 2-6 Severity of Crashes in the Study Area between 2011 and 2015

Crash Severity	Number of Crashes	Per cent
Fatal	0	0%
Injury	8	24%
Non-casualty	18	76%
<b>Total</b>	<b>26</b>	<b>100.0%</b>

Source: Roads and Maritime

Figure 2-12 below shows the crash statistics for five years period by type. The highest crash type recorded was rear end crashes, accounting for 11 crashes (42 per cent). About 19 (73 per cent) crashes occurred at intersections.

It is likely that safety will deteriorate along the Mulgoa Road / Castlereagh Road and associated intersections in their current configuration for all road users as traffic levels and congestion increase. This is of on-going and substantial concern to the Roads and Maritime and the local community.



Source: Roads and Maritime

Figure 2-12 Number of Crashes per Movement Type

## 2.10 Road safety performance

The crash data has been further analysed to estimate the crash rates and casualty rates for the study area (section of Jane Street /Mulgoa Road). Both crash and casualty rates are expressed as 100 million-vehicle kilometres travelled (MVKT) being a measure of crash exposure. The following three inputs are used in estimating crash and casualty rates including:

- Number of crashes
- Traffic volumes
- Segment lengths

Table 2-7 summarises crash and casualty rates for the study area. The crash rate for the section of Jane Street /Mulgoa Road is found to be 65 crashes per 100 million vehicle kilometres travelled (MVKT). The casualty rate for the same section is found to be 20 per 100 million vehicle kilometres travelled (MVKT).

Table 2-7 also includes a comparison of crash and casualty rates for a relevant section of Mulgoa Road /Castlereagh Road between Museum Drive and Andrews Road.

Table 2-7 Crash Rates and Casualty Rates for the Study Area

Parameters	Jane Street /Mulgoa Road (this project)	Castlereagh Road between Museum Drive and Andrews Road
Crashes per 100 million-vehicle kilometres travelled (MVKT).	65	45
Casualties per 100 million-vehicle kilometres travelled (MVKT)	20	22

## 2.11 Access

- The Penrith CBD is a high-density urban environment. The following roads provide access to key areas surrounding the Study area:
- Jane Street and High Street provide access to the heart of Penrith CBD, including Westfield Penrith, Penrith Station via Station Street and commuter car parks along Jane Street
- Great Western Highway provides access to some residential driveways and a number of community services including Central District Ambulance Station, speech pathology clinic, disability support centre and community section resources/training centre
- High Street provides access to Penrith Council Chambers car parks, Westfield Penrith and Union Road car park.

## 3 EXISTING ROAD NETWORK PERFORMANCE

This chapter establishes existing transport network performance in the Study area.

### 3.1 Traffic survey

Four types of surveys were carried out by Matrix (previously known as TracSIS/Skyhigh) to satisfy the needs and purpose of the project as follows:

- Intersection turning movement counts for critical peak periods
- Daily automatic traffic counts on midblock locations for one week period
- Queue length surveys at critical intersections
- Travel speed survey.

The surveys were carried out between 11 May and 20 May 2015 as follows:

- Midblock tube counts were carried out between 11 May and 20 May 2015
- Intersection turning movement counts and queue length surveys were carried out on 19 May 2015 (Tuesday)
- Travel time surveys were carried out on 19 May 2015 (Tuesday) and 11th June 2015 (Thursday).

Table 3-1 below shows traffic survey locations. Figure 3-1 to Figure 3-3 shows the survey location for midblock counts, intersection counts, queue length surveys and travel time surveys.

Table 3-1 Traffic Survey Locations

Survey Type	Locations
Midblock Tube Counts	<ul style="list-style-type: none"><li>• Mulgoa Road / Castlereagh Road - between Museum Drive and Jane Street</li><li>• Jane Street - east of Station Street</li><li>• Great Western Highway – west of Mulgoa Road</li></ul>
Intersection Turning Movement Counts and Queue Length Surveys	<ul style="list-style-type: none"><li>• Mulgoa Road / Castlereagh Road / Jane Street</li><li>• Mulgoa Road / Great Western Highway / High Street</li><li>• Mulgoa Road / Union Road</li></ul>
Travel Time Surveys	<ul style="list-style-type: none"><li>• Mulgoa Road / Castlereagh Road between Museum Drive and Union Road (bi-direction)</li></ul>





Figure 3-1 Intersection Counts and Queue Lengths Survey Locations

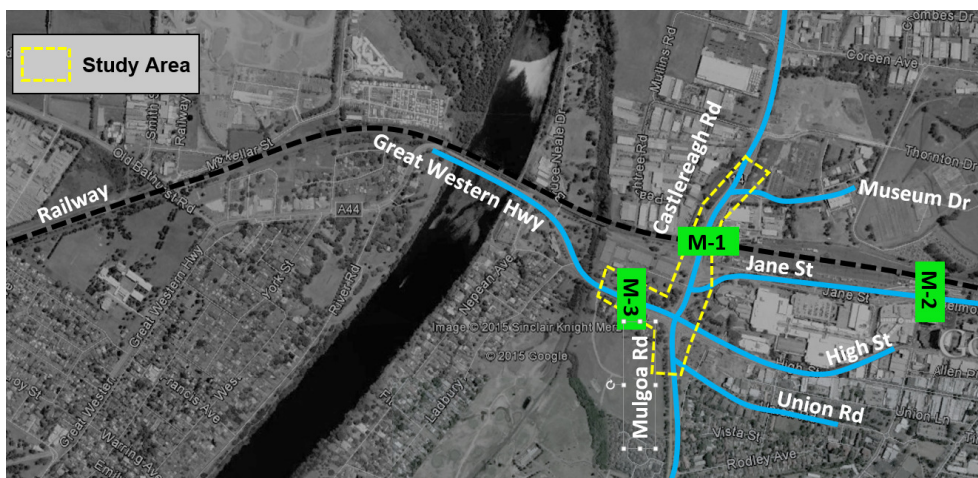


Figure 3-2 Midblock Tube Count (ATC) Locations

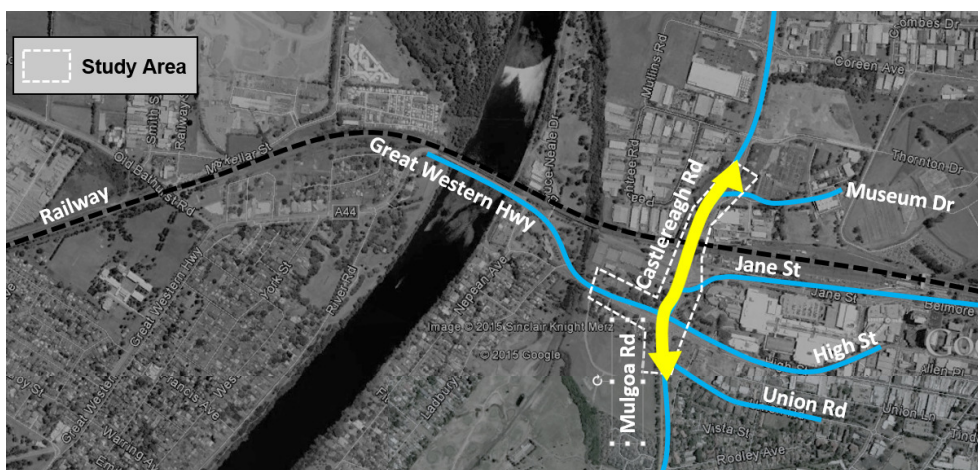


Figure 3-3 Travel Time Survey Route

## 3.2 Traffic results

This section reports daily and peak hour traffic flows at key roads and intersections within the Study area. The intersection turning movement data was used to estimate current capacity problems at key intersections. The traffic data provides a basis to consider likely traffic changes that would result from future growth. The results are based on a new survey undertaken in 2015.

### 3.2.1 Weekly traffic profile

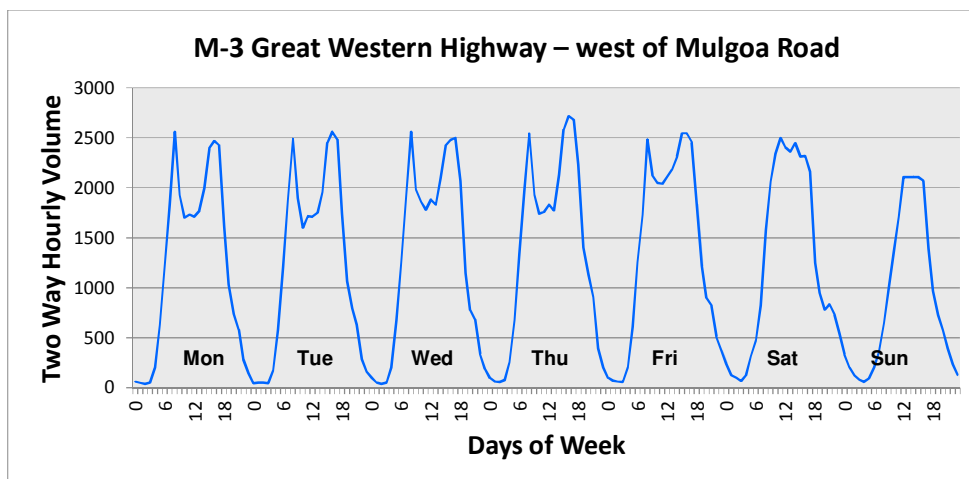
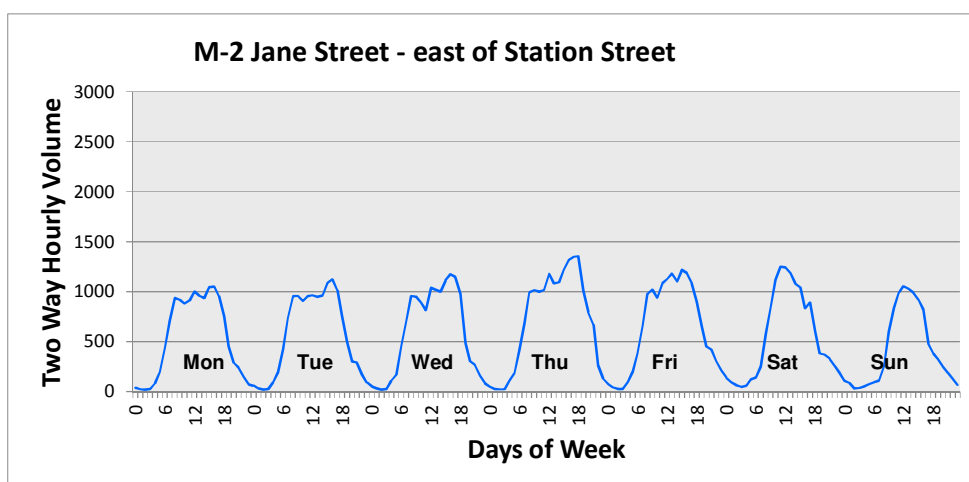
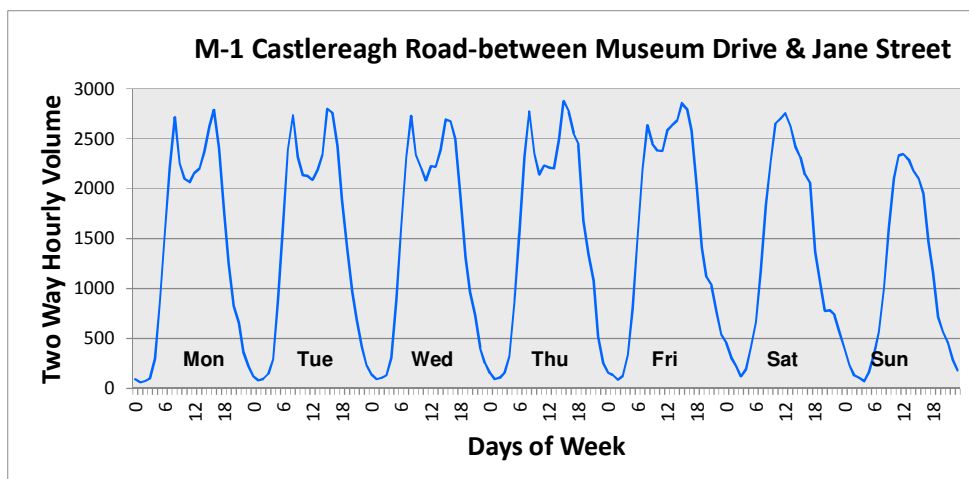
Table 3-2 shows the average daily traffic (ADT) volumes in the Study area for weekdays and the weekend. Average weekly two-way traffic volume profiles are shown in Figure 3-4. The results indicate that:

- Mulgoa Road / Castlereagh Road between Museum Drive and Jane Street carries about 36,000 vehicles on an average weekday
- Jane Street east of Station Street carries about 14,600 vehicles on an average weekday
- Great Western Highway west of Mulgoa Road carries about 31,000 vehicles on an average weekday.
- On an average weekend day, traffic volumes on in the Study area are about 18 to 21 per cent lower than an average weekday.

Table 3-2 Average Daily Weekday and Weekend Traffic Volumes

Site ID	Road Sections	Average 7-days	Average Weekday	Average Weekend	Critical day	%Traffic Change	
						Critical day vs Weekday	Weekend vs Weekday
M-1	Mulgoa Road/Castlereagh Road-between Museum Drive and Jane Street	33,935	36,025	28,710	38,196	6%	-20%
M-2	Jane Street - east of Station Street	13,715	14,599	11,506	17,000	16%	-21%
M-3	Great Western Highway – west of Mulgoa Road	29,367	30,918	25,490	32,608	5%	-18%

Source: May 2015 Traffic Survey



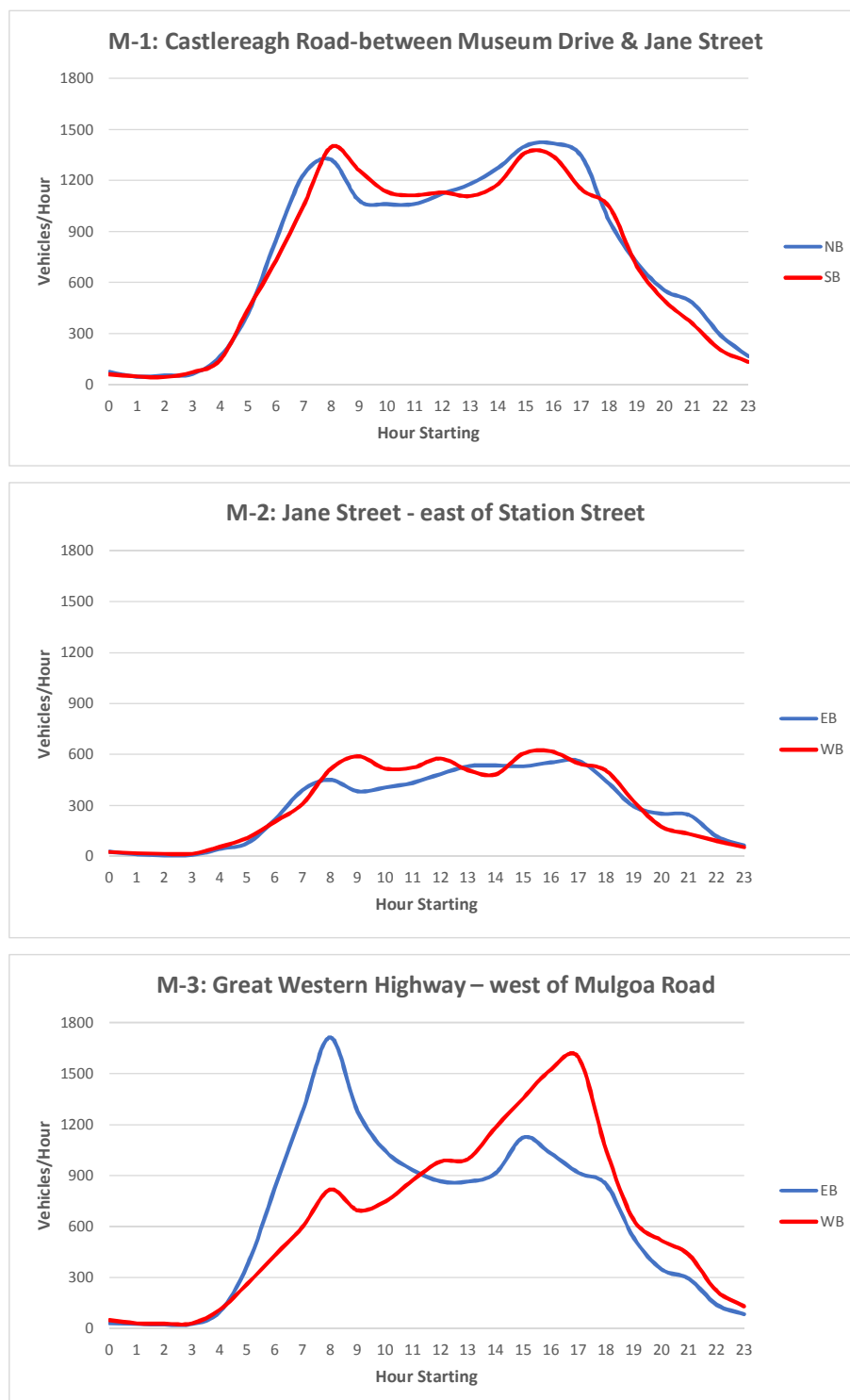
Source: May 2015 Traffic Survey

Figure 3-4 Average Weekly Two Way Traffic Volumes

### 3.2.2 Daily traffic profiles

Daily traffic volume profiles for the five surveyed sites on the Jane Street and Mulgoa Road are shown in Figure 3-5.

The traffic profiles suggest morning and afternoon peak hour durations are being morning (AM) peak between 7:00 and 9:00 AM and afternoon (PM) peak between 4:00 and 6:00 PM.



Source: May 2015 Traffic Survey. NB=Northbound, SB=Southbound, EB=Eastbound, WB=Westbound

Figure 3-5 Daily Traffic Profiles

### 3.2.3 Peak hour volumes and midblock capacity

Table 3-3 summarises morning and afternoon peak hour traffic volumes on Mulgoa Road / Castlereagh Road between Museum Drive and Union Road. Traffic data indicates the northbound is the peak direction in the morning peak, and southbound is the peak direction in the afternoon peak.

In the morning peak, Mulgoa Road / Castlereagh Road carried about 1,800 vehicles per hour in the northbound direction and about 1,500 in the southbound direction. In the afternoon peak, traffic volumes between 1,500 and 1,600 vehicles per hour were recorded in both the northbound and southbound directions.

In estimating volume capacity ratios for midblock sections, the analysis assumed a notional capacity of 900-1000 vehicles per lane for Mulgoa Road / Castlereagh Road depending on the proximity of adjacent intersections. Based on morning and afternoon peak traffic flows, volume to capacity ratios (VCRs) have been estimated for various sections of Mulgoa Road / Castlereagh Road. The VCRs values can be interpreted as follows:

- No capacity problems (VCRs <0.60)
- Acceptable capacity (VCRs >0.60 but <0.85)
- Near capacity (VCRs >0.85 but <1.0)
- Over capacity (VCRs >1.0).

The analysis shows that Mulgoa Road / Castlereagh Road between Museum Drive and Union Road is operating near or over its capacity, indicating a need for improving the traffic capacity of this section of Mulgoa Road / Castlereagh Road.

Table 3-3 Peak Hour Traffic Volumes in 2015

Road Section	AM Peak 1 Hour				PM Peak 1 Hour			
	Northbound		Southbound		Northbound		Southbound	
	Flow	VCR	Flow	VCR	Flow	VCR	Flow	VCR
Mulgoa Road/ Castlereagh Road, between Museum Drive and Union Road	1,824	1.01	1,523	0.85	1,559	0.87	1,589	0.88
	Over capacity		Near capacity		Near capacity		Near capacity	

Note: Notional capacity of 900 vehicle/lane is assumed for the analysis section. VCR is volume to capacity ratio.

### 3.3 Traffic congestion

Figure 3-6 below shows the observed traffic congestions within the Study area road network in the morning and afternoon peak periods. The following notations are used to report current traffic congestions:

- Blue arrows represent peak traffic direction based on the 2015 traffic count
- Red turning arrows represent major turning movements at key intersection where the turning volume is more than 300 vehicles per hour.

Mulgoa Road and Castlereagh Road carry north-south through traffic movements. Between Museum Drive and Union Road, substantial turning movement volumes were observed at the intersections with Jane Street, Great Western Highway, High Street and Union Road. These substantial turning movements together with north-south through traffic movements contribute to capacity problems.

The congestion analysis indicates that Mulgoa Road / Castlereagh Road between Museum Drive and Union Road currently experiences traffic congestion and delays during weekday peak traffic periods. This congestion is predicted to intensify as a result of continuing population and employment growth due to developments in Penrith CBD, Penrith Panthers and Penrith Lakes Development.

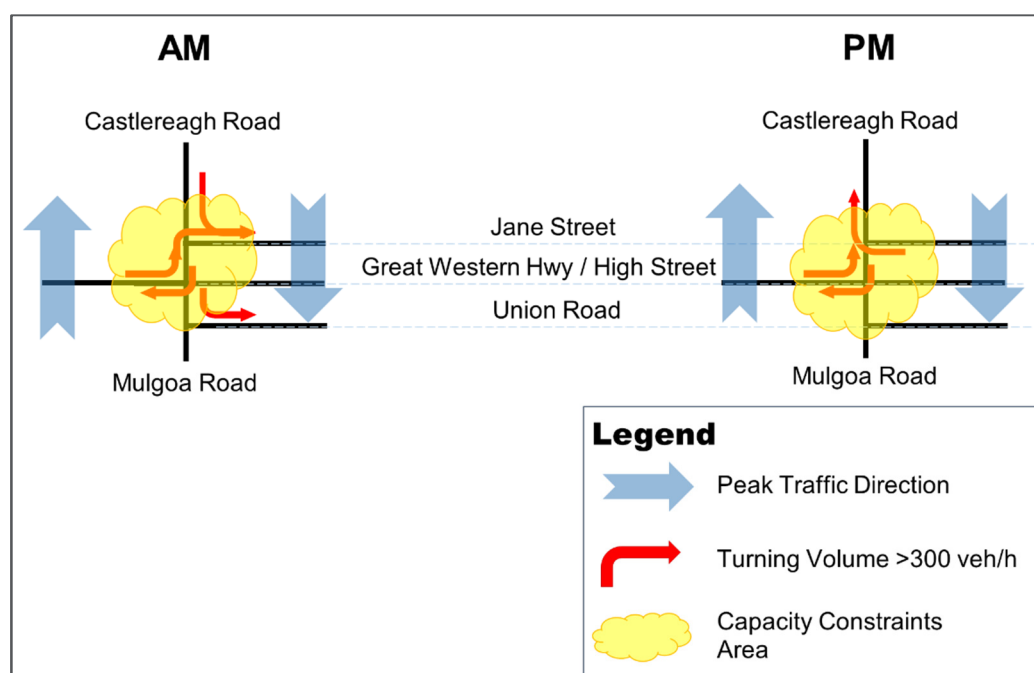


Figure 3-6 Current Traffic Congestion in Study Area

Table 3-4 shows 2015 surveyed travel speed on Mulgoa Road / Castlereagh Road. The survey data shows that average travel speed on the Mulgoa Road / Castlereagh Road between Museum Drive and Union Road during the weekday peak period travelled was about 13 to 16 kilometres per hour, substantially lower than the posted speed of 60 kilometres per hour.

Table 3-4 Existing Average Travel Speeds in the Study Area for 2015

Road Section	Average Travel Speed (km/h)			
	AM Peak		PM Peak	
	NB	SB	NB	SB
Mulgoa Road/Castlereagh Road, between Museum Drive and Union Road	15	13	16	13

Source: May 2015 Traffic Survey. NB=Northbound, SB=Southbound



## 4 FUTURE NETWORK PERFORMANCE

### 4.1 Future growth

Future traffic volumes on the Mulgoa Road / Castlereagh Road between Museum Drive and Union Road will be influenced by the combination of passing (through) and local traffic growth. Future traffic growth within the Study area was sourced from Roads and Maritime's Strategic Traffic Forecasting Model (STFM). The STFM model used land use data (households, employment) from BTS 2014 V2 (being latest at the time of undertaking the assessment). The BTS data contained planned residential and employment growth within Penrith CBD and Penrith LGA including Penrith Panthers, Penrith Lakes and Thornton.

Table 4-1 summarises BTS's land use assumptions for the study area.

Table 4-1 BTS Land Use Assumption

Area	Household			Employment		
	2016	2026	2036	2016	2026	2036
Penrith Lakes	802	1,500	22,88	246	249	263
Thornton	398	1,177	1,673	828	895	973
Panthers	361	404	499	2,385	2,496	2,665
Entire Corridor	10,519	13,229	15,937	30,647	33,521	36,533

Source: Roads and Maritime

### 4.2 Future traffic volumes

Future traffic volumes on the Mulgoa Road / Castlereagh Road between Museum Drive and Union Road were estimated using traffic data from STFM model. Based on the land use assumption, traffic growth between 2015 and 2036 (21 years) was estimated for the Study area.

Traffic forecasts on the Mulgoa Road / Castlereagh Road were prepared for 2026 and 2036 (ultimate). The future volumes took into account passing and local traffic, due to in-fill and greenfield developments (described in Section 4.1 above).

Table 4-2 shows forecast average daily traffic on the Mulgoa Road / Castlereagh Road between Museum Drive and Union Road for 2026 and 2036. The current 2015 traffic counts have been included for comparison.

Based on the Bureau of Transport Statistics (BTS) growth projection, the SFTM model predicted traffic volume on the Mulgoa Road / Castlereagh Road between Museum Drive and Union Road would grow by about 2.9 per cent per annum over the next 21 years (to 2036).

Table 4-2 Future Traffic Volumes on Mulgoa Road and Growth Rates

Daily Volumes			Growth Rate (per annum)		
2015 counts	2026	2036	2015-2026 (11 years)	2026-2036 (10 years)	2015-2036 (21 years)
43,700	61,000	70,000	3.6%	1.5%	2.9%

Source: Roads and Maritime's SFTM Model (uses EMME software)



### 4.3 Consequence of no actions

The level of service was estimated for two relevant intersections including Jane Street / Castlereagh Road / Mulgoa Road and Great Western Highway / High Street / Mulgoa Road. Level of service (LoS) was reported in accordance with the Roads and Maritime's guideline *Guide to Traffic Generating Developments Issue 2.2* (Roads and Maritime, October 2002).

Roads and Maritime guideline recommends that for priority intersections, such as a roundabout and sign controlled intersections, the LoS value is determined by the critical movement with the highest delay. For a signalised intersection, LoS criteria should be related to the average intersection delay measured in seconds per vehicle.

The performance of an intersection is measured by the intersection average delay per vehicle, which indicates the "level of service" measure for the intersection.

These measures are:

- Level of Service A – Average delay per vehicle is less than 14 seconds. Good operation
- Level of Service B – Average delay per vehicle is between 15 and 28 seconds. Good operation with acceptable delays and spare capacity
- Level of Service C – Average delay per vehicle is between 29 and 42 seconds. Satisfactory operation
- Level of Service D – Average delay per vehicle is between 43 and 56 seconds. Operating near capacity
- Level of Service E – Average delay per vehicle is between 57 and 70 seconds. Operating at capacity; incidents at signals will cause excessive delays
- Level of Service F – Average delay per vehicle is more than 70 seconds. Extra capacity required.

Table 4-3 shows forecast level of service results for 2020, 2026 and 2036 for base case ('Do nothing') traffic conditions.

Table 4-3 Forecast Level of Service in 2020, 2026 and 2036 Base Case (Do Nothing)

Intersection	Current Control Type	Forecast Delays in second / Level of service					
		2020		2026		2036	
		Do Nothing		Do Nothing		Do Nothing	
		AM	PM	AM	PM	AM	PM
Jane Street / Castlereagh Road / Mulgoa Road	Signals	48 (D)	91 (F)	50 (D)	101 (F)	52 (D)	108 (F)
Great Western Highway / High Street / Mulgoa Road	Signals	57 (E)	79 (F)	72 (F)	96 (F)	85 (F)	111 (F)

Source: VISSIM models

The future level of service analysis found that if no action is taken to improve the traffic flow for the proposal, the following is likely to occur:

- In 2020, both Jane Street / Castlereagh Road / Mulgoa Road and Great Western Highway / Mulgoa Road / High Street intersections would operate with poor level of service F (over capacity) in the afternoon peak. In the morning peak, these two intersections would operate near or at their capacity with level of service D to E
- In 2036, projected future traffic growth would worsen the operation performance at these intersections resulting in substantial queues and delays
- Consequently, Jane Street and Mulgoa Road would be highly congested and there would be substantially increased delays and queuing along the roads
- Local amenity and access to the Penrith CBD would continue to decline due to increased traffic, as would other road related impacts such as noise and localised air quality
- The efficiency of public transport and freight would decline with reduced travel speed.

The analysis indicates need for improving the operations of the Jane Street and Mulgoa Road proposal.

## 4.4 Concept design traffic performance

The proposal involves widening Mulgoa Road / Castlereagh Road between Museum Drive and Union Road to six through lanes and auxiliary lanes at intersections, upgrading intersections with Jane Street and Great Western Highway / High Street and lengthening of rail bridge to allow for widening of Castlereagh Road.

Previous Section 1.4 details concept design of the proposal. The future traffic performance of the proposal has been determined for post upgrade conditions at two key intersections including Jane Street / Castlereagh Road / Mulgoa Road and Great Western Highway / Mulgoa Road / High Street.

### 4.4.1 Jane Street / Castlereagh Road / Mulgoa Road intersection

#### Upgrade description

Figure 4-1 shows the proposed intersection footprint for the Jane Street / Castlereagh Road / Mulgoa Road intersection

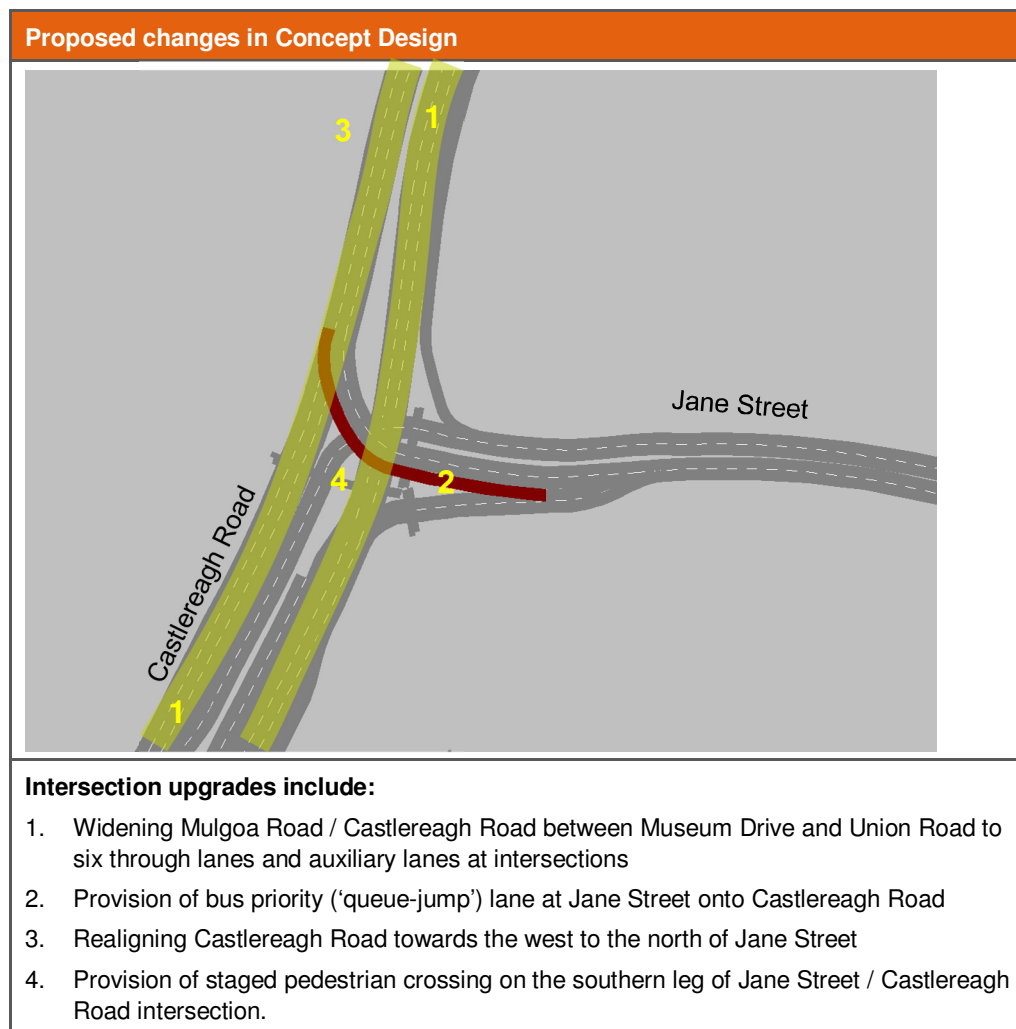


Figure 4-1 Proposed Layout of Jane Street/Castlereagh Road/Mulgoa Road Intersection

## Traffic implication

Future intersection performance at Jane Street / Castlereagh Road / Mulgoa Road for the post upgrade condition was assessed for 2020, 2026 and 2036 for both AM and PM peak periods. The upgrade would improve traffic capacity and LoS at the intersection from LoS D / F in base case (Do Nothing) to LoS B / D with the upgrade in place.

Modelling predicted that upgraded traffic signals would provide LoS B in 2020. In year 2036, the model predicted LoS C in morning peak and LoS D in the afternoon peak. Table 4-4 shows the forecast delays and LoS for upgraded traffic signals at Jane Street / Castlereagh Road / Mulgoa Road intersection in 2020, 2026 and 2036 for AM and PM peak.

Table 4-5 shows predicted queues at Jane Street / Castlereagh Road / Mulgoa Road intersection in 2020, 2026 and 2036 for AM and PM peak.

Table 4-4 Level of Service at Jane Street/Castlereagh Road/Mulgoa Road Intersection

Intersection	Control Type	Delays in seconds / Level of service					
		2020		2026		2036	
		With Proposal		With Proposal		With Proposal	
		AM	PM	AM	PM	AM	PM
Jane Street / Castlereagh Road / Mulgoa Road	Signal Upgrade	23 (B)	27 (B)	24 (B)	31 (C)	32 (C)	49 (D)

Source: VISSIM models

Table 4-5 Queue Length by Approach at Jane Street/Castlereagh Road/Mulgoa Road Intersection

Approaches	Queue Length					
	2020		2026		2036	
	With Proposal		With Proposal		With Proposal	
	AM	PM	AM	PM	AM	PM
Castlereagh Road (N)	215	208	246	252	313	333
Jane Street (E)	48	89	37	175	45	240
Mulgoa Road (S)	109	74	92	81	121	111

Source: VISSIM models. Queue length in metres.

## 4.4.2 Great Western Highway / Mulgoa Road / High Street intersection

### Upgrade description

Figure 4-2 shows the proposed Great Western Highway / Mulgoa Road / High Street intersection upgrade.

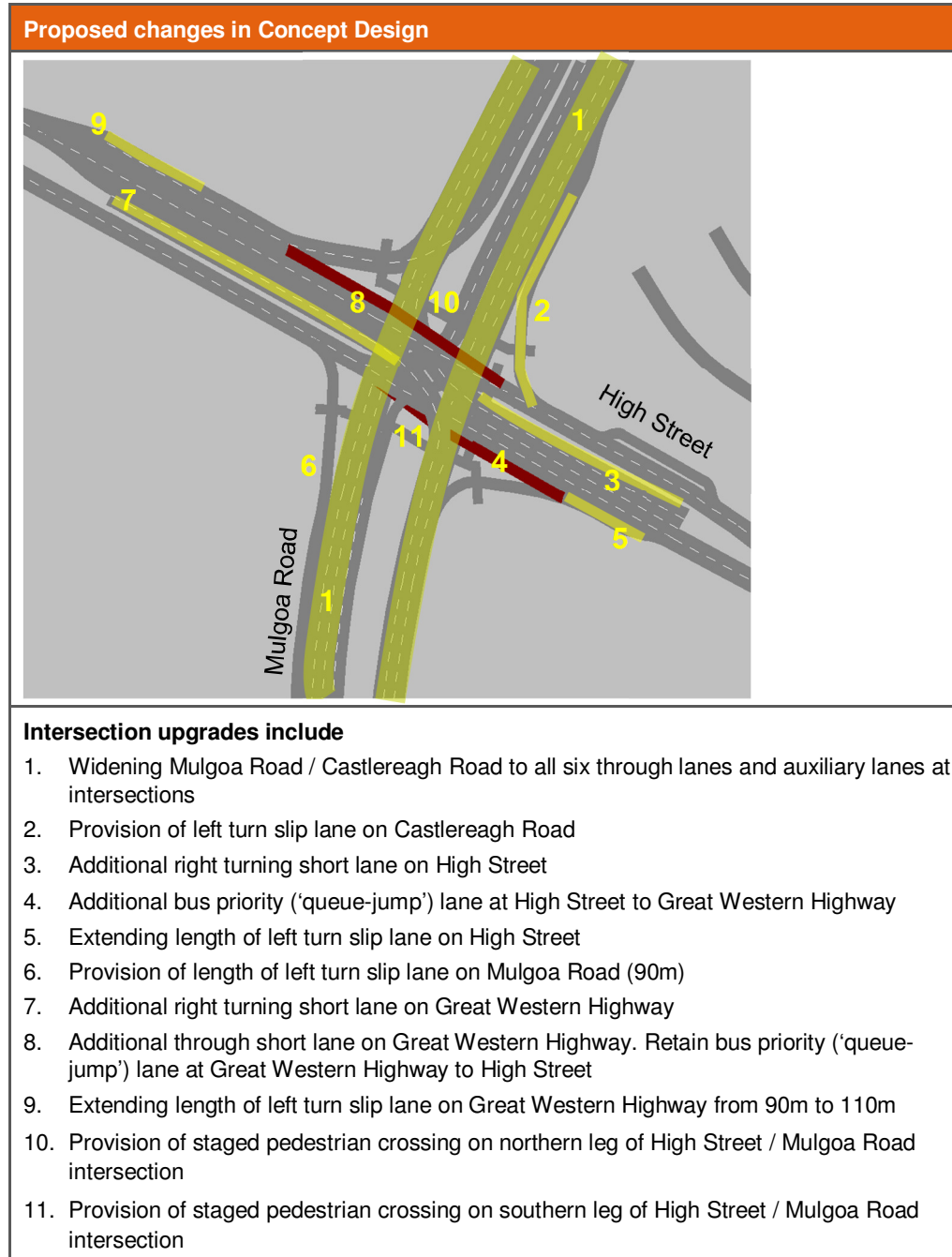


Figure 4-2 Proposed Layout of Great Western Highway/Mulgoa Road/High Street Intersection

## Traffic implication

Future intersection performance at Great Western Highway / Mulgoa Road / High Street for post upgrade conditions was assessed for 2020, 2026 and 2036 for both AM and PM peak periods. The upgrade would improve traffic capacity and LoS at the intersection from LoS E / F in base case (Do Nothing) to LoS C / D with upgrade in place.

Modelling predicted that upgraded traffic signals would provide LoS C / D in 2020. In 2036, the model predicted LoS D in both the morning and afternoon peak. Table 4-6 below shows forecast delays and LoS for upgraded traffic signals at Great Western Highway / Mulgoa Road / High Street Intersection in 2020, 2026 and 2036 for the AM and PM peak.

Table 4-7 shows predicted queues at Jane Street / Castlereagh Road / Mulgoa Road intersection in 2020, 2026 and 2036 for AM and PM peak.

Table 4-6 Level of Service at Great Western Highway/Mulgoa Road/High Street Intersection

Intersection	Control Type	Delays in second / Level of service					
		2020		2026		2036	
		With Proposal		With Proposal		With Proposal	
		AM	PM	AM	PM	AM	PM
Great Western Highway / High Street / Mulgoa Road	Signal Upgrade	42 (C)	50 (D)	42 (C)	47 (D)	49 (D)	47 (D)

Source: VISSIM models

Table 4-7 Queue Length by Approach at Great Western Highway/Mulgoa Road/High Street Intersection

Approaches	Queue Length					
	2020		2026		2036	
	With Proposal		With Proposal		With Proposal	
	AM	PM	AM	PM	AM	PM
Mulgoa Road (N)	147	150	147	155	155	155
High Street (E)	41	209	44	217	42	199
Mulgoa Road (S)	143	106	178	172	202	192
Great Western Highway (W)	223	136	234	171	247	174

Source: VISSIM models. Queue length in metres.

## 4.5 Road safety improvements

The proposal would increase traffic capacity along Mulgoa Road / Castlereagh Road and at intersections with Jane Street and Great Western Highway / High Street.

The analysis suggests that the proposal would improve LoS and delay at the intersections which would potentially lessen 'stop-start' travel conditions and improve road safety to local traffic. The likelihood of intersection crashes would be reduced with the intersection upgrade and provision of deceleration / slip lanes.

## 4.6 Access strategy

The road widening may temporarily affect access during construction. Access would be maintained at all times, and any impacts would be short-term. Construction at intersections of Jane Street and Mulgoa Road and adjoining roads may result in temporary impacts upon access. Traffic management plans would be developed during the detailed design phase to minimise traffic disruption.

With the proposal in place, there would be no impacts to the current access.

## 4.7 Impact to other modes

### Bus services

There would be no impact to the existing bus routes and services as a result of the proposal. All the existing bus services along the Mulgoa Road / Castlereagh Road would be retained.

The proposal includes dedicated bus lanes with bus priority at traffic signals and indented bus bays (queue-jump lanes) to allow buses a head start. This would provide more efficient operation to bus services. New bus priority lanes are proposed at the following locations:

- Jane Street westbound / northbound
- High Street westbound.

Existing bus priority lanes at Great Western Highway would be retained.

Figure 4-3 shows locations of bus priority lanes proposed.



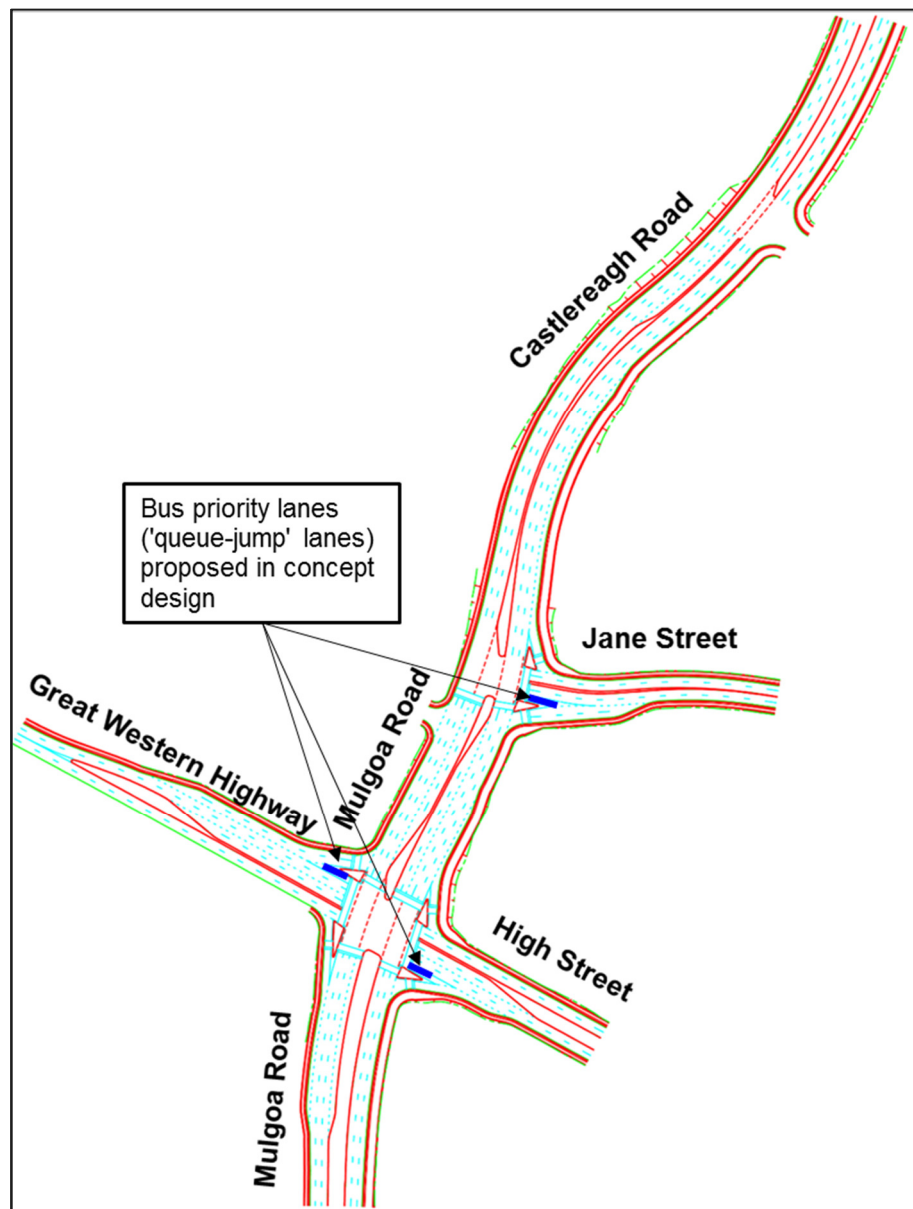


Figure 4-3 Proposed Bus Priority Lanes ('Queue-jump' Lanes)

## Pedestrians and cyclists

The proposed intersection upgrade at Jane Street / Castlereagh Road / Mulgoa Road and Great Western Highway / High Street / Mulgoa Road intersections would retain the existing cyclist and pedestrian crossing facilities. Staged pedestrian crossings are proposed on Mulgoa Road and Castlereagh Road at following locations:

- Staged pedestrian crossing on Mulgoa Road southern approach at Jane Street / Castlereagh Road / Mulgoa Road intersection
- Staged pedestrian crossings on Mulgoa Road northern and southern approach at Western Highway / High Street / Mulgoa Road intersection.

The existing off-road separated cycle paths would be retained along:

- Mulgoa Road / Castlereagh Road southbound between Museum Drive and Union Road
- Mulgoa Road / Castlereagh Road northbound between Great Western Highway
- Museum Drive, Great Western Highway westbound, and High Street eastbound would be retained.

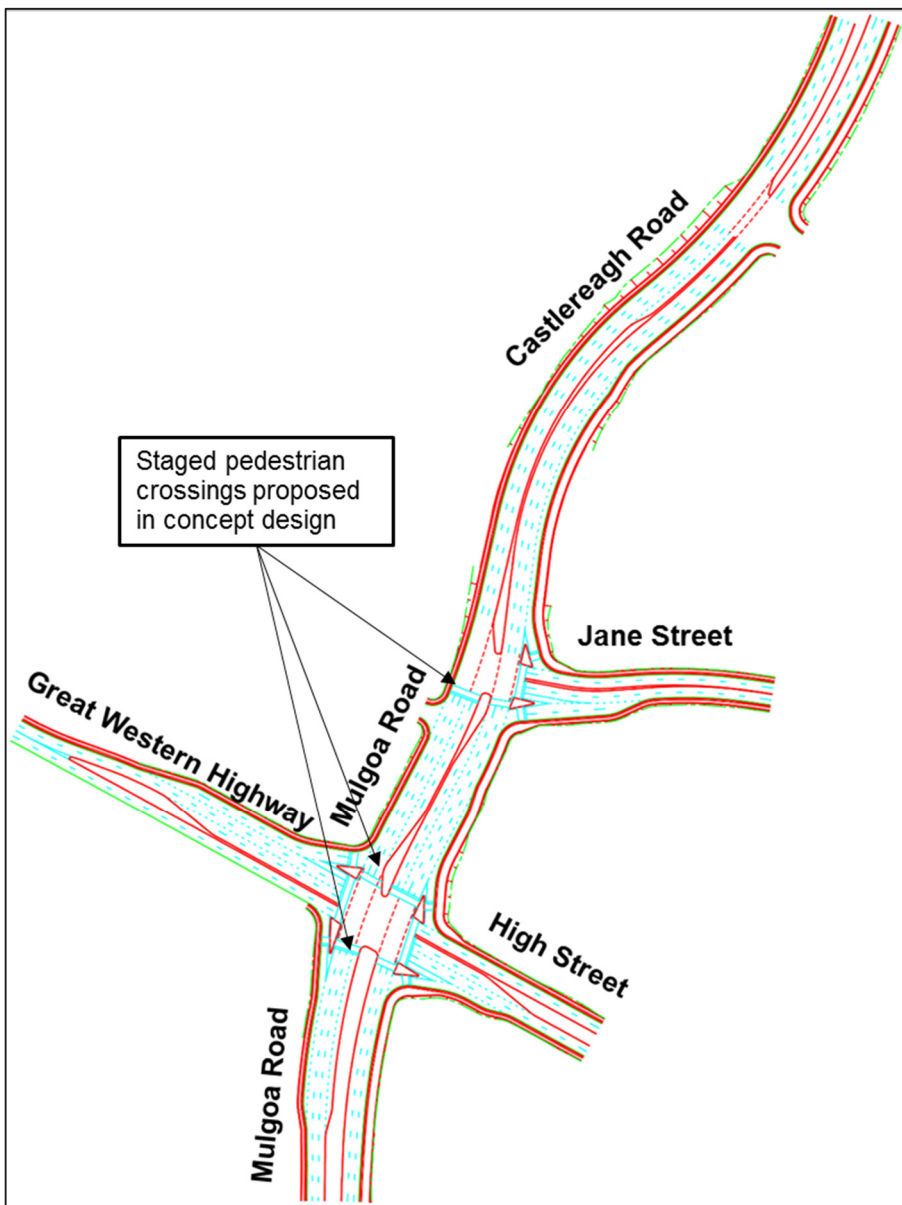


Figure 4-4 Proposed Staged Pedestrian Crossings

## 4.8 Preliminary construction traffic impacts

Impacts on traffic during construction of the proposal would be temporary in nature. Traffic impacts would occur as a result of the movement of construction and service vehicles along access roads, for the haulage of construction materials. General use of Jane Street, Mulgoa Road and adjoined roads and access to existing properties along the road would be maintained throughout the construction phase.

Truck movements during the construction phase are expected to increase. Truck movement numbers will be confirmed at a later stage when construction staging arrangements are defined. Mulgoa Road / Castlereagh Road currently experiences varied heavy vehicle movements along its corridor. Based on traffic data collected in May 2015, there are on average between 5,000 and 6,000 heavy vehicle movements on an average weekday. The additional truck movements during construction are unlikely to have a substantial effect along Jane Street and Mulgoa Road, but may have locally concentrated impacts at construction accesses.

Potential impacts caused by construction vehicle traffic may include:

- Increased travel times due to reduced speed limit around construction sites
- Increased travel times due to increased truck and construction machinery movements
- Temporary partial or complete closure of roads and altered property accesses during construction.

The concept design should seek to minimise the restriction to traffic flow where feasible. It is recommended that Roads and Maritime carry out a detailed construction traffic impact assessment when construction details are known.

## 4.9 Management of traffic and transport impacts

A detailed traffic management plan (TMP) should be prepared as part of the construction environmental management plan (CEMP) during the detailed design phase. The TMP should include the guidelines, general requirements and procedures to be used when activities or areas of work have a potential impact on existing traffic arrangements.

Traffic monitoring is recommended to verify traffic volumes and levels of service after the opening of the project.

## 5 SUMMARY OF FINDINGS

### 5.1 Overview

Jane Street and Mulgoa Road corridor is a strategic route connecting Penrith CBD to the Blue Mountains and Central West. Jane Street runs east–west within the Penrith CBD, parallel to the Western Railway Line. It connects to Mulgoa Road / Castlereagh Road at a T-intersection. Castlereagh Road / Mulgoa Road is a major arterial road connecting the existing residential areas of Castlereagh, Cranebrook, Jamisontown and Glenmore Park to the Penrith CBD. High Street runs east–west through the Study area, connecting to the Great Western Highway at the intersection with Mulgoa Road.

The proposal involves upgrading and widening about 640 metres of Castlereagh Road and Mulgoa Road from Museum Drive to Union Road, widening the existing rail underpass, providing additional eastbound capacity on the Great Western Highway at the intersection with Mulgoa Road and auxiliary lanes at the intersections with Jane Street and High Street.

This Traffic and Transport Assessment Report has been prepared to support the Review of Environmental Factors (REF) of the proposal.

### 5.2 Existing traffic congestions

In 2015, Mulgoa Road / Castlereagh Road north of Jane Street carried about 36,000 vehicles on an average weekday. This included 5,000 to 6,000 heavy vehicles; equivalent to 15 per cent of total daily traffic. In the morning peak, Mulgoa Road / Castlereagh Road carried about 1,800 vehicles per hour in the northbound peak direction and about 1,500 in the southbound direction. In the afternoon peak, about 1,500 to 1,600 vehicles per hour were recorded in both northbound and southbound directions. The traffic capacity analysis found that Mulgoa Road / Castlereagh Road between Museum Drive and Union Road is operating near, or over its capacity, indicating the need for improving the traffic capacity of this section of Mulgoa Road / Castlereagh Road.

Congestion analysis showed a substantial portion of peak hour traffic on Mulgoa Road / Castlereagh Road comprises north-south through traffic movements carrying outbound trips within the Penrith LGA. Between Museum Drive and Union Road, substantial turning movement volumes were observed at the intersections with Jane Street, Great Western Highway, High Street and Union Road. These substantial turning movements, together with north-south through traffic movements, contributed to the capacity problems. The analysis indicated that Mulgoa Road / Castlereagh Road, between Museum Drive and Union Road, currently experiences traffic congestion and delays during weekday peak traffic periods. This congestion is predicted to intensify as a result of population and employment growth, due to developments in Penrith CBD, Penrith Panthers and Penrith Lakes Development.

### 5.3 Future traffic volumes

Future traffic volumes on Mulgoa Road / Castlereagh Road have taken into account passing and local traffic growth due to land use projected by Bureau of Transport Statistics (BTS) and developments in Penrith Lakes, Thornton and Penrith Panthers. The analysis indicated that traffic volume on the Mulgoa Road / Castlereagh Road between Museum Drive and Union Road would grow by about 2.9 per cent per annum over the next 21 years (until 2036). In 2026, traffic is forecast to grow in the order of 61,000 vehicles per day. In 2036, traffic on Mulgoa Road / Castlereagh Road is forecast to be about 71,000 vehicles per day, almost double than today's traffic.

The future level of service analysis found that for “do nothing” condition traffic at Jane Street / Castlereagh Road / Mulgoa Road and Great Western Highway / Mulgoa Road / High Street intersections would operate with a poor level of service F (over capacity) in the afternoon peak in 2020. The projected future traffic growth would result in poorer

performance at both intersections; resulting in substantial queues and delays at intersections. Mulgoa Road / Castlereagh Road would be highly congested and there would be substantially increased delays and queuing to both intersections.

## 5.4 Jane Street and Mulgoa Road infrastructure upgrade

The proposal would improve capacity for north-south movements along Mulgoa Road / Castlereagh Road by:

- Widening of Mulgoa Road / Castlereagh Road between Museum Drive and Union Road to allow for six through lanes and auxiliary lanes at intersections
- Upgrading intersections with Jane Street and Great Western Highway / High Street
- Lengthening of the rail bridge to allow for widening of Castlereagh Road.

The concept design proposes dedicated bus lanes with bus priority at traffic signals and indented bus bays (queue-jump lanes) to allow buses a head start. This would provide more efficient operation of bus services. New bus priority lanes are proposed at the following locations:

- Jane Street westbound / northbound
- High Street westbound.

Staged pedestrian crossings are proposed on Mulgoa Road and Castlereagh Road at the following locations:

- Mulgoa Road southern approach at Jane Street / Castlereagh Road / Mulgoa Road intersection
- Mulgoa Road northern and southern approach at Western Highway / High Street / Mulgoa Road intersection.

The modelling analysis suggested that upgrades at Jane Street / Castlereagh Road / Mulgoa Road and Great Western Highway / Mulgoa Road / High Street would improve traffic capacity and performance at intersections. The upgraded traffic signals would perform level of service D or better in year 2036 and therefore provide adequate capacity and operational efficiency in the longer term.



[www.rms.nsw.gov.au/JaneStreetMulgoaRoad](http://www.rms.nsw.gov.au/JaneStreetMulgoaRoad)



1800 733 084



Jane Street and Mulgoa Road Upgrade  
Roads and Maritime Services  
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RMS 16.529