

# **Pacific Highway Upgrade through Wyong town centre**

## **Traffic and Transport Assessment Report**

*WTC-TR-04A-REP-03*

Prepared for: Roads and Maritime Services  
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## GLOSSARY

AADT	Annual average daily traffic
EMME	Strategic traffic modelling software package.
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
IDM	See <i>intersection diagnostic monitor</i>
Intersection diagnostic monitor	A software feature of SCATS that records (on demand) all of the key operating characteristics of a signalised site for a given time period. Data recorded includes individual and average cycle times, individual and average phase times, number of times a phase runs.
LGA	Local Government Area
LX File	The data file that feeds into the region computer for each signalised intersection. It contains the data necessary for communications, signal timings, intergreen intervals, pedestrian walk and clearance timings, coordination values, flexilink data and variation routines.
Paramics	Micro-simulation traffic modelling software package
REF	Review of Environmental Factors
SCATS	<i>Sydney coordinated adaptive traffic system</i> . An intelligent transportation system developed in Sydney, Australia by former constituents of the Roads and Maritime Services in the 1970. SCATS primarily manages the dynamic (on-line, real-time) timing of signal phases at traffic signals, meaning that it tries to find the best phasing (i.e. cycle times, phase splits and offsets) for the current traffic situation (for individual intersections as well as for the whole network). This is based on the automatic plan selection from a library in response to the data derived from loop detectors or other road traffic sensors.
SMEC	SMEC Australia Pty Ltd
VHT	Vehicle hours travelled
VKT	Vehicle kilometres travelled

# 1. INTRODUCTION

## 1.1 Background

Roads and Maritime Services (Roads and Maritime) has undertaken a planning study to provide a basis for the future development of Wyong and to assist Wyong Shire Council with its planning framework. As part of this, Roads and Maritime has appointed SMEC Australia Pty Ltd (SMEC) to undertake the concept design of the Pacific Highway Upgrade through the Wyong town centre (referred to as the Wyong town centre Upgrade herein). The concept design works apply to a 2.4 kilometre section of the Pacific Highway from Johnson Road to just north of Cutler Drive, with a proposal to upgrade the current single lane in each direction to a divided carriageway, with two lanes in each direction separated by a central median. This is expected to improve traffic flow and increase safety for road users, including cyclists and pedestrians.

The proposal would generally involve the following:

- Widening of the Pacific Highway between Johnson Road, Wyong to about 150 metres north of Cutler Drive, Wyong to a two lane carriageway in each direction
- Provision of a central median (separation of the northbound and southbound carriageways) between Johnson Road and just north of Cutler Drive
- Replacement of the existing Pacific Highway road bridge over the Wyong River with two new road bridges over the Wyong River, one for northbound traffic, pedestrians and cyclists and one for southbound traffic, pedestrians and cyclists
- Provision of a shared cyclist / pedestrian path along the Pacific Highway between Johnson Road and Cutler Drive
- Provision of northbound and southbound on-road cycle lanes between Johnson Road and just north of Cutler Drive
- Reconfiguration of car parking provisions throughout the proposal area including provision of a dedicated rail commuter car park east of Wyong Station
- Provision of a pedestrian refuge to assist crossing of the Pacific Highway, and the partial closure of Bakers Lane to vehicles at the highway
- Provision of a new pedestrian bridge connecting the new shared path on the eastern side of the Pacific Highway to the existing Wyong Station pedestrian overbridge, providing a new western entrance to the station
- Upgrade of Pacific Highway intersections with McPherson Road, Church Street, Rose Street, Anzac Avenue, North Road and Cutler Drive
- Intersection adjustments at River Road, Alison Road, Apex Park and Robley Lane
- Replacement of the Rose Street bridge over the rail line with a new bridge that is longer and wider
- Upgrade of Howarth Street intersections at Rose Street and Warner Avenue

- Dedicated bus stops along the Pacific Highway in both directions and relocation of bus layover facilities to the east of Wyong Station
- Provision of improved disabled parking and taxi services east of Wyong Station located close to station access lifts and stairs
- Provision of a dedicated rail commuter parking facility east of Wyong Station
- Improvements to River Road, Panonia Road and South Tacoma Road that include pedestrian footpaths
- Demolition and removal of the locally heritage listed former Station Master's Cottage and Warner Shops
- Urban design improvements and landscaping throughout the proposal area, including relocation of existing palm trees along the Pacific Highway where feasible
- Retaining walls of various heights and locations
- Property acquisition and adjustments.

## 1.2 Report purpose

Roads and Maritime is undertaking an assessment under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the proposal. Part 5, Section 111 of the EP&A Act requires the environmental impact assessment to be documented in a review of environmental factors (REF) for the proposal.

SMEC was commissioned by Roads and Maritime to prepare a Traffic and Transport Assessment report to support the REF for the proposal and meet Roads and Maritime's obligations under the EP&A Act. The objectives of the Traffic and Transport Assessment report are to:

- Examine and assess the traffic and transport patterns (including pedestrians, cyclists, public transport and parking) and conditions for the existing corridor and connections
- Review the previous traffic and transport studies and investigations commissioned by Roads and Maritime in relation to the proposal
- Review historic traffic volume and crash data for the proposal corridor
- Develop, calibrate and validate a base year traffic model for the existing road configuration
- Conduct modelling to assess the current and future years' road network performance for the existing road configuration ('do nothing') and Roads and Maritime's preferred option
- Assess the bus service performance for the current and future years' road network performance for the current road configuration ('do nothing') and Roads and Maritime's preferred option
- Determine the impacts of the proposal during the construction and operation phases for all road users, including property and local access, public transport, pedestrians,

cyclists and vehicular traffic

- Develop mitigation and management measures to minimise the impacts identified.

### 1.3 Report structure

The remainder of this report is structured as follows:

- **Section 2 Existing transport conditions:** Describes the existing corridor, its surrounding land uses, current modes of travel along the corridor, traffic volumes and patterns, operational assessment and historical crash analysis
- **Section 3 Traffic modelling:** Presents the previous modelling results, specifies the modelling purpose and scenarios, describes the modelling approach and assumptions, details the network modelled and provides the results of the future base case assessment
- **Section 4 The proposal:** Provides an overview of the proposal, specifies the design criteria and summarises the staging of works associated with the proposal
- **Section 5 Transport appraisal:** Assesses the impacts of the proposal on public transport, walking and cycling, freight transport and road safety
- **Section 6 Traffic assessment:** Presents the results of the traffic modelling and impact assessment, including the consequence of the 'do nothing' scenario, preliminary construction impacts identified and impacts during operation of the proposal
- **Section 7 Mitigation and management measures:** Provides a package of mitigation and management measures developed to minimise the impacts identified with consideration of all road users during the construction and operation phases
- **Section 8 Summary and recommendations:** Summarises the findings from the Traffic and Transport Assessment and provides the recommendations for minimising the impacts of the proposal
- **Appendix A Commuter parking survey data:** Summarises the findings of the commuter parking survey carried out to inform the impacts on commuter parking provisions around Wyong station

## 2. EXISTING TRANSPORT CONDITIONS

### 2.1 Corridor description

#### 2.1.1 Route environment

The Pacific Highway is a major north-south corridor along the central east coast of Australia with the majority of the corridor forming part of Australia's national route 1. The proposal comprises a 2.4 kilometre section of the Pacific Highway from Johnson Road in the south to about 150 metres north of Cutler Drive in the north. Figure 2-1 illustrates the proposal location.

Within the proposal area, the Pacific Highway is generally an undivided two-lane road, with on-street parking for the majority of its length. There is localised widening at key intersections for turning and acceleration lane provisions.



Source: UBD Australian City Streets, version 3.0

Figure 2-1: Pacific Highway proposal location



## 2.1.2 Major intersections along the corridor

Figure 2-2 summarises the existing intersections along the Pacific Highway corridor, through Wyong town centre.

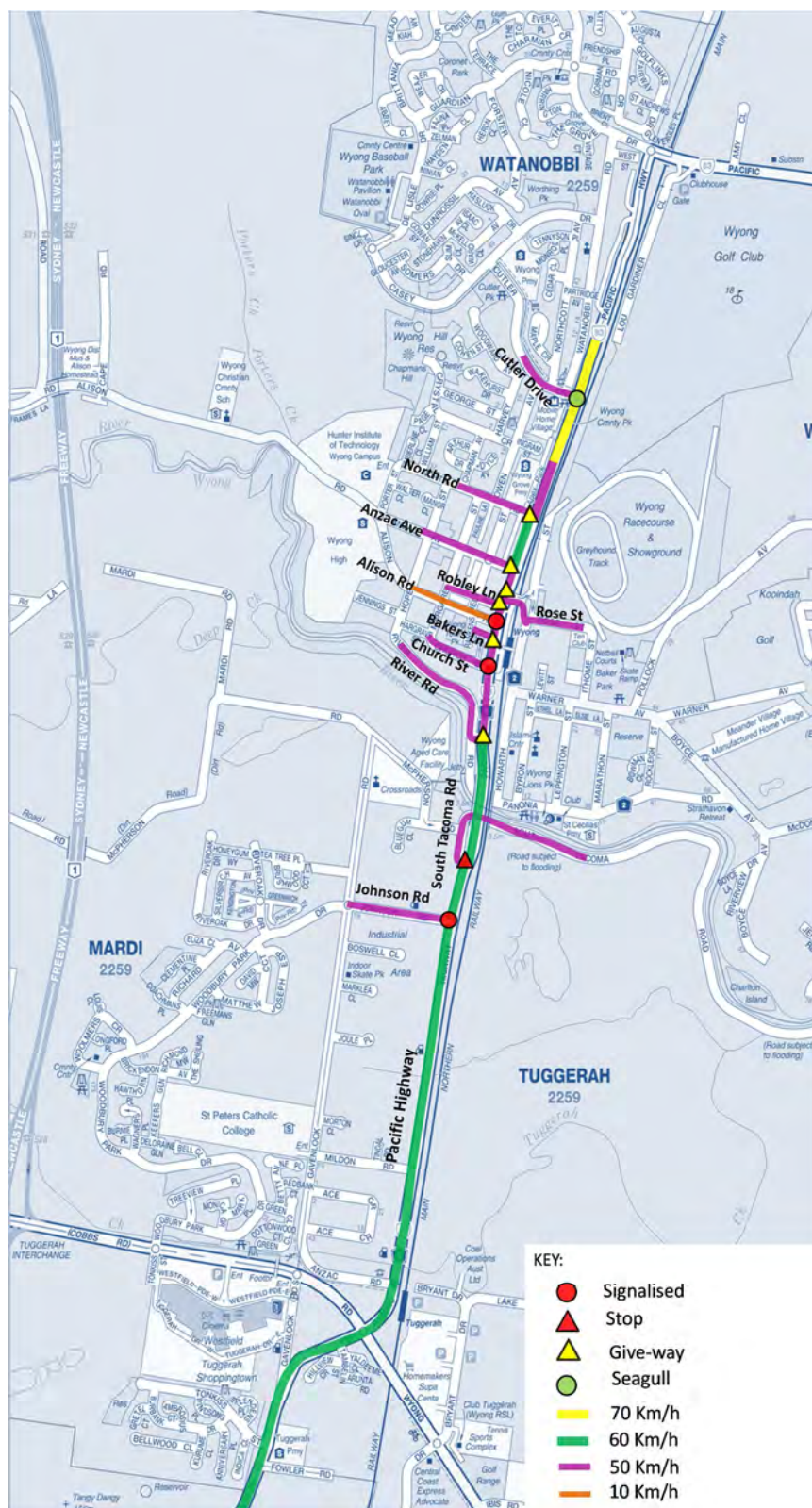


Figure 2-2: Speed limits and major intersections along the Pacific Highway

### 2.1.3 Existing key features of the corridor

The key features of the existing Pacific Highway corridor include:

- A railway corridor runs parallel to the Pacific Highway along its eastern side for the length of the proposal corridor
- Bus priority (bus phase with about 50 metres bus only lane on intersection approaches) at the signalised intersection of Pacific Highway and Johnson Road (both northbound and southbound)
- South Tacoma Road underpass of the Pacific Highway, south of the Wyong River
- Bridge over the Wyong River, adjacent to a railway bridge on the eastern side of the road carriageway
- Panonia Road underpass of the Pacific Highway, north of the Wyong River
- Wyong Station and transport interchange located on the eastern side of the Pacific Highway between Church Street and Robley Lane
- Southbound bus lane on the Pacific Highway between Robley Lane and around 200 metres north of North Road
- Railway overpass on Rose Street, around 40 metres east of the Pacific Highway
- Ambulance emergency services access located on the western side of the Pacific Highway opposite the Rose Street intersection.

There are a number of accesses located along the proposal corridor, including:

- Two accesses on the western side of the Pacific Highway for the takeaway food outlets (including drive-through service) and service station north of Johnson Road
- Rail corridor access about 120 metres north of River Road Link on the eastern side of the Pacific Highway
- Wyong Skin Care Centre off-street parking access on the western side of the Pacific Highway, about 140 metres south of Church Street
- Access to off-street parking for the liquor store, karate centre, real estate agents and account agencies on the western side of the Pacific Highway, about 120 metres south of Church Street
- Access to private property on the eastern side of the Pacific Highway, about 75 metres south of Church Street
- Access to hairdresser and massage therapy clinic on the eastern side of the Pacific Highway, about 50 metres south of Church Street
- Royal Hotel and drive-through liquor store access on the western side of the Pacific Highway, about 50 metres south of the Church Street intersection
- Access to the Warner shops business parking and short-term commuter pick-up and set-down parking on the eastern side of the Pacific Highway at its intersection with

#### Church Street

- Commuter car park accesses to the Wyong Station transport interchange, located at Church Street, about 50 metres north of Church Street and at Robley Lane
- Ambulance emergency services access on the western side of the Pacific Highway, opposite Rose Street
- Real estate agent property access north of the ambulance emergency services access
- Two accesses to the car dealership on the western side of the Pacific Highway, about 50 and 25 metres south of Anzac Avenue
- Access to the former rail maintenance yard on the eastern side of the Pacific Highway, about 60 metres north of Rose Street
- Former service station access on the western side of the Pacific Highway, north of Anzac Avenue
- Two accesses to the off-street parking for 142 Highway Plaza on the western side of the Pacific Highway, about 45 and 75 metres north of Anzac Avenue
- Two accesses to the tyre retailer on the western side of the Pacific Highway, about 90 and 110 metres north of Anzac Avenue.

#### **2.1.4 Speed environment**

The posted speed limits on the key roads within the study area are shown in Figure 2-2.

Surveys conducted for one week commencing 12 February 2014 recorded the speed at key locations. Table 2-1 summarises the average travel speed from the surveys. The AM and PM peak periods are between 7am and 9am and 4pm and 6pm, respectively. These values represent the average speed over the entire two hour peak period and it should be noted that at certain times during the peak periods, the average speeds are much lower than the posted speed limit through the Wyong town centre.



**Table 2-1: Average speed survey results**

Location and posted speed limit	Period	Northbound	Southbound
Pacific Highway north of Mildon Road (posted speed limit 60 km/h)	Daily average	56.1 km/h	56.0 km/h
	AM peak	56.0 km/h	54.5 km/h
	PM peak	55.2 km/h	55.5 km/h
Pacific Highway south of Church Street (posted speed limit 50 km/h)	Daily average	42.7 km/h	50.5 km/h
	AM peak	41.6 km/h	49.5 km/h
	PM peak	33.2 km/h	49.1 km/h
Alison Road west of Anzac Avenue (posted speed limit 50 km/h)	Daily average	55.2 km/h (eastbound)	55.4 (westbound)
	AM peak	49.8 km/h (eastbound)	53.2 (westbound)
	PM peak	55.6 km/h (eastbound)	55.4 (westbound)
Pacific Highway south of Cutler Drive (posted speed limit 70 km/h)	Daily average	60.4 km/h	56.1 km/h
	AM peak	59.2 km/h	46.3 km/h
	PM peak	58.1 km/h	56.3 km/h
Pacific Highway north of Cutler Drive (posted speed limit 70 km/h)	Daily average	60.4 km/h	56.1 km/h
	AM peak	59.2 km/h	46.3 km/h
	PM peak	58.1 km/h	56.3 km/h

The speed survey indicates the average speed at the survey sites located within the proposal corridor is generally below the posted speed limit. The worst average speed in each direction for each of the survey sites within the proposal corridor are:

- Pacific Highway, north of Mildon Road:
  - + 50.6 kilometres per hour, northbound
  - + 51.5 kilometres per hour, southbound
- Pacific Highway, south of Church Street:
  - + 26.7 kilometres per hour, northbound (entering the Wyong town centre)
  - + 43.4 kilometres per hour, southbound
- Alison Road, west of Anzac Avenue:
  - + 49.2 kilometres per hour, westbound
  - + 44.1 kilometres per hour, eastbound
- Pacific Highway, south of Cutler Drive:
  - + 56.9 kilometres per hour, northbound

- + 34.8 kilometres per hour, southbound
- Pacific Highway, north of Cutler Drive:
  - + 60.6 kilometres per hour, northbound
  - + 45.1 kilometres per hour, southbound (entering the Wyong town centre).

The two sites located close to the boundaries of the proposal corridor (south of Church Street and north of Cutler Drive) indicate that vehicles travelling towards the Wyong town centre are travelling much slower than the posted speed limit, which is likely to be a result of congestion within the town centre impacting on its approaches.

### **2.1.5 Freight and access routes**

The Pacific Highway corridor through Wyong town centre is a dedicated B-double route (up to 25 metres) and 4.6 metre high vehicle route. B-double travel through Wyong town centre is restricted to before 7am and after 5:30pm. The following B-double routes connect with the Pacific Highway and are within the study area:

- Wyong Road
- Gavenlock Road
- Mildon Road
- Johnson Road.

There is a low clearance restriction (3.4 to 3.5 metres) on South Tacoma Road where it crosses under the Pacific Highway on the southern side of the Wyong River and a low clearance restriction (3.5 metres) on Panonia Road where it crosses under the Pacific Highway on the northern side of Wyong River. Figure 2-3 illustrates the existing freight and access routes within the study area.

Based on the traffic surveys conducted on the Pacific Highway corridor in February 2014, the existing average daily traffic volumes are about 26,000 vehicles per weekday with a heavy vehicle proportion of about 6.6 per cent.

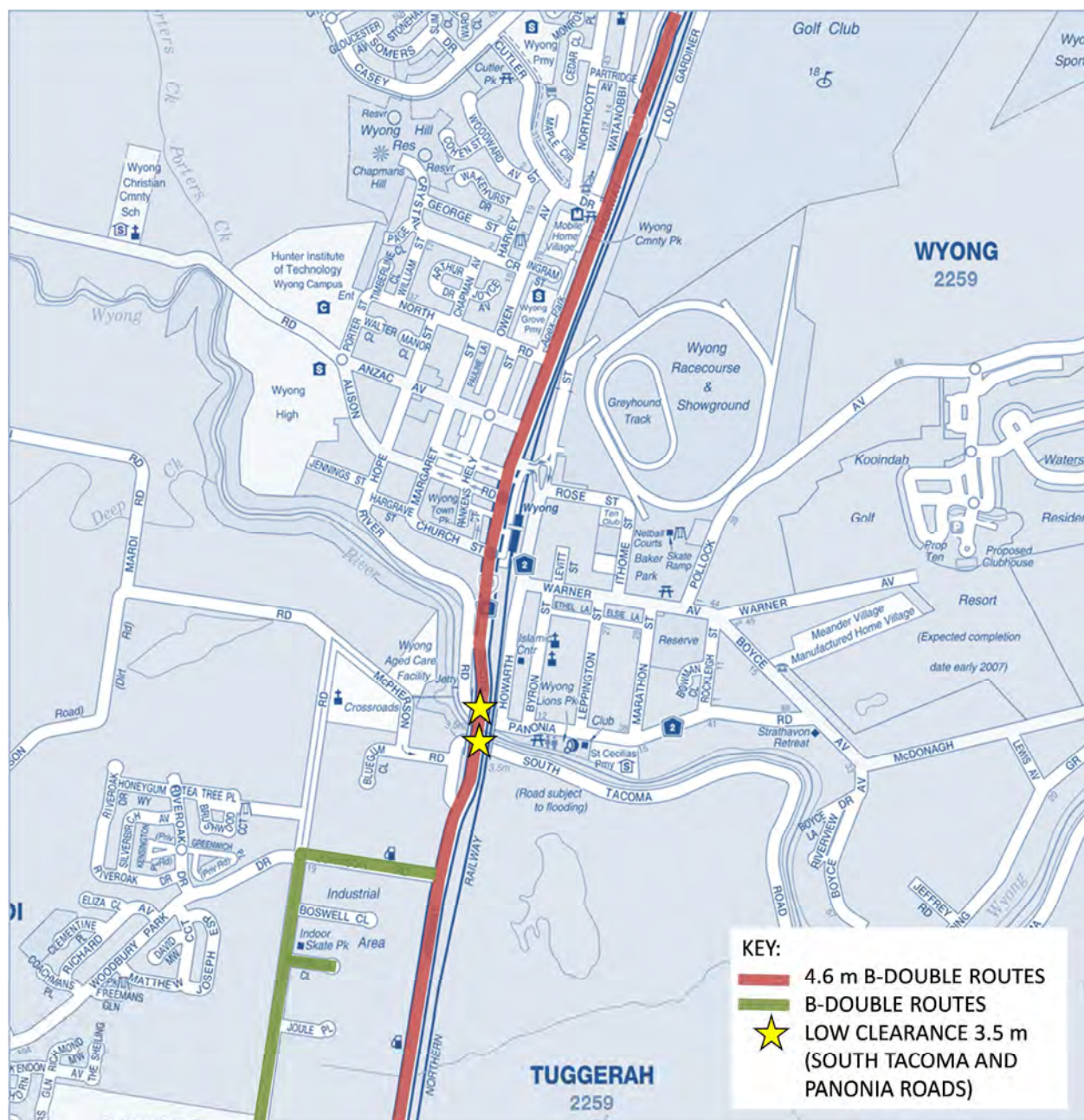


Figure 2-3: Freight and access routes

## 2.1.6 Parking

### Commuter parking

There are commuter car parking provisions within the proposal corridor servicing Wyong station. A survey of the commuter parking provisions was carried out on Tuesday 2 September 2014 to determine the number of spaces provided and the number of spaces occupied. Table 2-2 summarises the findings from the commuter car parking survey. Appendix C includes a map and the parking survey data collected on Tuesday 2 September 2014.

**Table 2-2: Commuter parking provisions**

Location	Number of spaces	Occupancy observation
Howarth Street, southern overflow parking, 90-degree angle	<ul style="list-style-type: none"> <li>44 spaces, unrestricted</li> </ul>	<ul style="list-style-type: none"> <li>50% occupied</li> </ul>
Wyong station / Pacific Highway, short term parking, pick-up and set-down	<ul style="list-style-type: none"> <li>12 spaces, 30 minute limit</li> <li>6 spaces, 5 minute limit</li> <li>3 taxi spaces</li> <li>10 disabled spaces</li> </ul>	<ul style="list-style-type: none"> <li>100% occupied</li> </ul>
Wyong Station / Pacific Highway, long term commuter parking	<ul style="list-style-type: none"> <li>116 spaces</li> </ul>	<ul style="list-style-type: none"> <li>100% occupied</li> </ul>
Pacific Highway, town centre off-street parking	<ul style="list-style-type: none"> <li>21 spaces, 2 hour limit</li> </ul>	<ul style="list-style-type: none"> <li>100% occupied</li> </ul>
Wyong Station / Howarth Street, long term parking	<ul style="list-style-type: none"> <li>200 spaces</li> <li>12 disabled spaces</li> </ul>	<ul style="list-style-type: none"> <li>116% occupied</li> </ul>
Wyong Station / Rose Street, long term parking	<ul style="list-style-type: none"> <li>211 spaces</li> </ul>	<ul style="list-style-type: none"> <li>2% occupied</li> </ul>

During a site investigation on Tuesday 10 March 2015, it was observed that about 30 cars were parked in unauthorised spaces within the commuter car park on the eastern side of the rail line.

Unrestricted on-street parking is available around Wyong station in the following locations:

- Western side of Howarth Street, south of Warner Avenue (seven cars observed)
- Western side of Howarth Street, between Warner Avenue and Rose Street (34 cars observed)
- Eastern and western sides of Howarth Avenue southbound carriageway at the roundabout adjacent to the railway overpass (15 cars observed)
- Eastern side of Howarth Street, west of the roundabout (four cars observed)
- Informal parking within the shoulder on the western side of Howarth Street, north of the roundabout (nine cars observed)
- Rose Street, both sides between Howarth Street and the access to the Rose Street commuter car park.

## On-street parking

There is restricted on-street public parking provided along the Pacific Highway within the Wyong town centre. Table 2-3 summarises the on-street parking provisions and restrictions along the Pacific Highway within the proposal corridor.

**Table 2-3: On-street parking provisions on the Pacific Highway**

Location	Time limit	Restriction periods
Western side of the Pacific Highway, between Church Street and about 200 metres south of Church Street	1 hour	8:30am to 6pm Monday to Friday, 8:30am to 12pm Saturday
Eastern side of the Pacific Highway, south of Warner Shops	15-minutes	8:30am to 6pm Monday to Friday, 8:30am to 12pm Saturday
Western side of the Pacific Highway, between Church Street and Bakers Lane	15-minutes (2 spaces) 1 hour	8:30am to 6pm Monday to Friday, 8:30am to 12:30pm Saturday
Western side of the Pacific Highway, between Bakers Lane and Alison Road	1 hour	8:30am to 6pm Monday to Friday, 8:30am to 12:30pm Saturday
Eastern side of the Pacific Highway, between Bakers Lane and Alison Road	1 hour	8:30am to 6pm Monday to Friday, 8:30am to 12:30pm Saturday
Western side of the Pacific Highway, between Alison Road and Robley Lane	1 hour	8:30am to 6pm Monday to Friday, 8:30am to 12:30pm Saturday

In addition to the restricted on-street parking summarised in Table 2-3, the following informal parking was observed along the proposal corridor:

- About three cars were observed parking informally within shoulder on the western side of the Pacific Highway about 200 metres south of Church Street
- About three cars observed parking in an informal parking area located between Pacific Highway and River Road
- Informal 45-degree angle parking within the shoulder on the western side of the Pacific Highway, north of Anzac Avenue
- Informal 45-degree angle rear-in parking within the shoulder on the western side of the Pacific Highway, north of North Road.

Parking restrictions located:

- Eastern side of the Pacific Highway, between Alison Road and Robley Lane (no stopping)
- No parking along eastern side of Pacific Highway adjacent to River Road Link.



**Table 2-4: On-street parking provisions on local roads**

Location	Time limit	Restriction periods
Church Street, southern side	2 hours	8:30am to 6pm Monday to Friday, 8:30am to 12:30pm Saturday
Church Street, northern side, north of Peters Lane	½ hour	8:30am to 6pm Monday to Friday, 8:30am to 12:30pm Saturday
Alison Road, northern side, 45-degree angle parking	1 hour	8:30am to 6pm Monday to Friday, 8:30am to 12:30pm Saturday
Alison Road, southern side, parallel parking	1 hour	8:30am to 6pm Monday to Friday, 8:30am to 12:30pm Saturday
Rankens Circuit, south of Alison Road, 90-degree angle parking both sides	1 hour	8:30am to 6pm Monday to Friday, 8:30am to 12:30pm Saturday
Alison Road, northern side, west of Wyong shopping centre access, 45-degree angle parking	1 hour	8:30am to 6pm Monday to Friday, 8:30am to 12:30pm Saturday
Alison Road, southern side, west of Wyong shopping centre Access, parallel parking	1 hour	8:30am to 6pm Monday to Friday, 8:30am to 12:30pm Saturday
Howarth Street, eastern side, south of Rose Street	2 hours	8:30am to 6pm Monday to Friday, 8:30am to 12:30pm Saturday
Anzac Avenue, both sides	1 hour	8:30am to 6pm Monday to Friday, 8:30am to 12pm Saturday

Unrestricted parking available on-street at the following locations:

- Informal parking along the shoulder on both sides of South Tacoma Road between intersection with the Pacific Highway and McPherson Road and south of the intersection with the Pacific Highway
- Informal parking area located between Pacific Highway and River Road (about three cars observed parking in this area)
- Unrestricted parking along both sides of Panonia Road, adjacent to picnic tables
- Unrestricted parking along both sides of Rose Street
- Unrestricted on-street parking along both sides of Cutler Drive
- Unrestricted on-street parking along both sides of Watanobbi Road.

## 2.2 Surrounding land uses

### 2.2.1 Land uses

Section 6.1.2 and Section 6.6.1 of the REF detail the existing land uses surrounding the proposal corridor.

### 2.2.2 Population and employment

The State Government has predicted that by 2031 the Central Coast will have an additional

100,000 residents and this will require around 45,000 more jobs (as outlined in the Central Coast Regional Strategy (Department of Planning, 2008)). A new town centre at Warnervale, to the north of Wyong, and another at Tuggerah, to the south of Wyong, have been identified in the Strategy. Table 2-5 and Table 2-6 summarise the expected population and employment growth, respectively for the local government areas (LGAs) surrounding the proposal corridor from 2011 to 2046. The population and employment growth in the region would increase the need for the Pacific Highway corridor upgrade, since it is likely to result in more people driving on the road network.

**Table 2-5: Population growth forecast 2011 to 2046**

LGA	2011	2016	2026	2036	2046
Wyong	155,270	167,519	186,788	205,314	224,872
Gosford	171,072	175,802	182,189	189,379	197,335
Cessnock	51,918	55,323	62,633	66,477	70,167
Lake Macquarie	199,208	204,579	212,601	220,583	227,956
Hawkesbury	66,086	69,290	74,268	80,850	89,804
Newcastle	157,169	163,057	167,539	171,839	175,699

Source: Bureau of Transport Statistics, Census, 2011.

**Table 2-6: Employment growth forecast 2011 to 2046**

LGA	2011	2016	2026	2036	2046
Wyong	47,597	51,545	58,956	66,122	72,790
Gosford	65,264	70,102	77,203	83,635	90,613
Cessnock	17,319	19,394	23,042	26,888	29,492
Lake Macquarie	62,810	66,985	71,491	74,699	79,372
Hawkesbury	27,045	28,304	30,463	32,539	35,015
Newcastle	104,060	113,159	126,405	134,235	142,681

Source: Bureau of Transport Statistics, Census, 2011.

## 2.3 Modes of travel

### 2.3.1 Private transport

Private vehicles are the dominant mode of transport within the Central Coast region of NSW. Table 2-7 summarises the mode share during the average weekday of travel in the LGAs surrounding the proposal corridor and Newcastle. This data was extracted from the 2011 Journey to Work data published by the Bureau of Transport Statistics (BTS). The mode share indicates that over 80 per cent of total trips on an average weekday in the Wyong, Gosford, Cessnock, Lake Macquarie, Hawkesbury and Newcastle LGAs are made by private vehicle.

Table 2-7: Travel to work mode share 2011

LGA	Vehicle driver	Vehicle passenger	Train	Bus	Walk only	Other modes
Wyang	82%	7%	5%	2%	2%	3%
Gosford	74%	6%	13%	2%	3%	3%
Cessnock	85%	8%	0%	1%	3%	3%
Lake Macquarie	86%	6%	1%	2%	2%	3%
Hawkesbury	83%	5%	5%	1%	3%	3%
Newcastle	80%	7%	1%	3%	5%	5%

Source: Bureau of Transport Statistics, Census, 2011.

### 2.3.2 Public transport, including networks and services

There are a number of bus routes servicing the Pacific Highway corridor by operators Busways, Red Bus Services and Coastal Liner. Table 2-8 summarises the bus services and frequencies along the proposal corridor. Figure 2-4 illustrates the bus routes. Figure 2-5 illustrates the location of the existing bus stops along the proposal corridor.

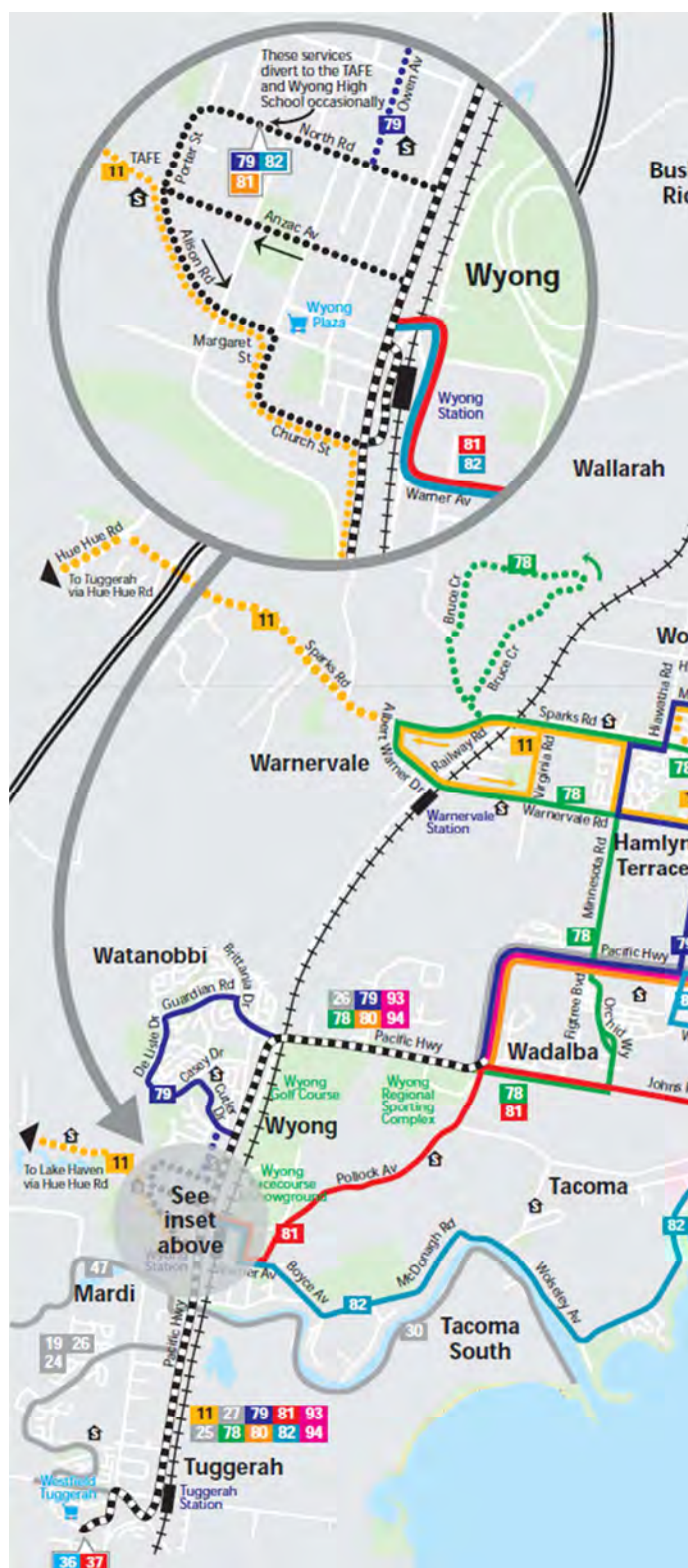
Table 2-8: Existing bus services and frequencies

Route	Description	Frequency (minutes)			
		Peak hours	Off-peak	Saturday	Sunday
10	Wyee to Tuggerah via Wyong	Infrequent	Infrequent	NA	NA
11	Lake Haven to Tuggerah, via Wyong Station	Infrequent	Infrequent	NA	NA
12	Dickson Road to Tuggerah, via Wyong	Infrequent	Infrequent	NA	NA
13	Dooralong to Tuggerah, via Wyong	Infrequent	Infrequent	NA	NA
15	The Entrance to Wyong	Infrequent	NA	NA	NA
16		Infrequent	NA	NA	NA
19	Gosford to Wyong	Infrequent	60	60	60
24	The Entrance to Wyong	Infrequent	20-25 (night only)	Infrequent	Infrequent
25		25	60	60	60



Route	Description	Frequency (minutes)			
		Peak hours	Off-peak	Saturday	Sunday
26		Infrequent	60	60	60
27	Chittaway Point to Wyong	NA	Infrequent	NA	NA
30	Tacoma South to Wyong Loop	Infrequent	Infrequent	NA	NA
47	Bateau Bay Square to Wyong	Infrequent	Infrequent	NA	NA
78	Lake Haven to Wyong and Tuggerah	Infrequent	60	60	120
79		Infrequent	60	60	60
80		30	60	60	Infrequent
81		30	60	60	60
82	Budgwoi or Noraville to Wyong and Tuggerah	Infrequent	120	120	120
93		Infrequent	NA	NA	NA
94		Infrequent	NA	NA	NA

Sources: Busways timetables, effective from 30 November 2014, Red Bus Services timetables, effective July 2014 and Coastal Liner timetables 1 April 2015.



Source: Busways, 8 November 2010

Figure 2-4: Existing bus routes

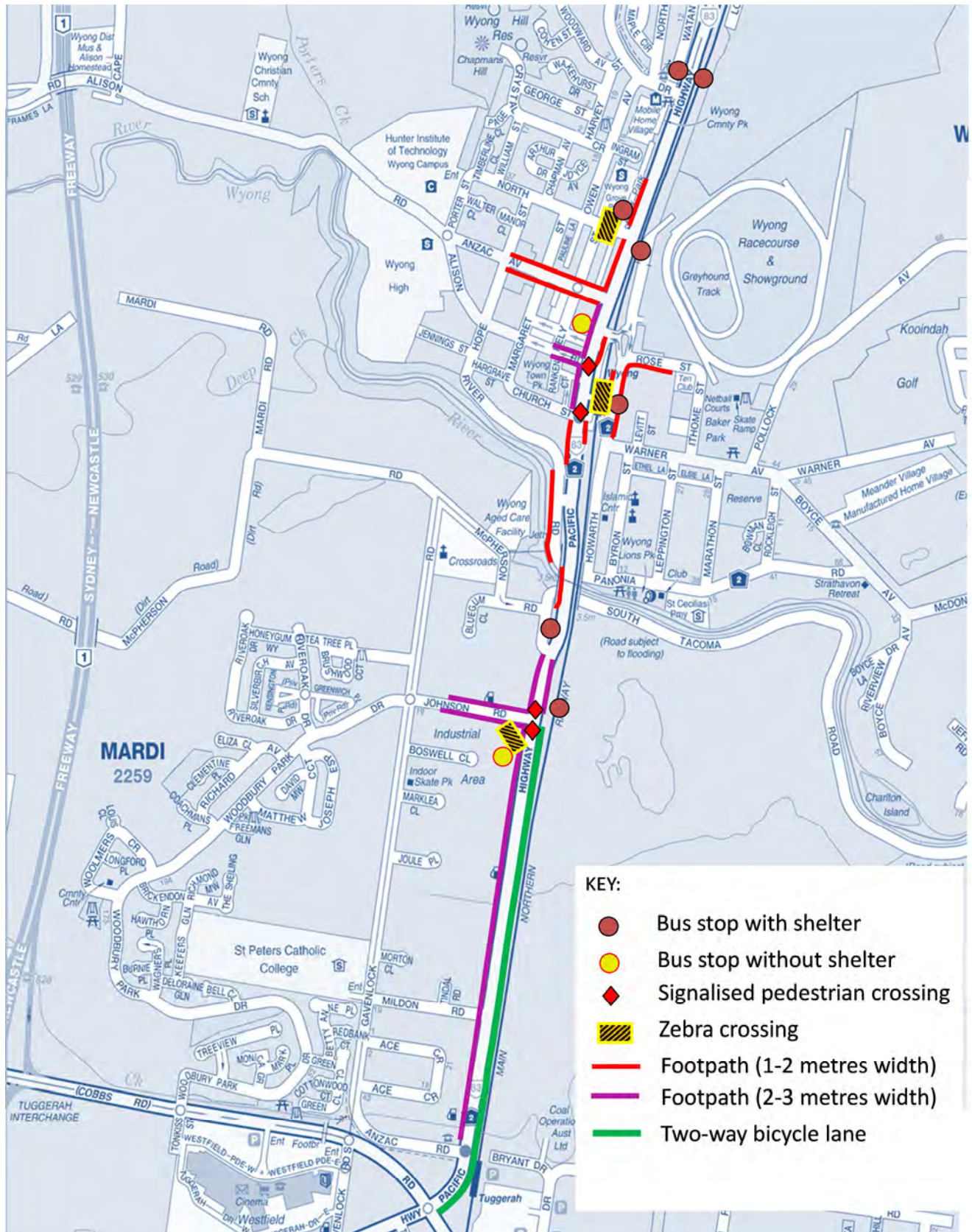


Figure 2-5: Existing bus stop locations and pedestrian and cyclist facilities



### 2.3.3 *Walking and cycling, including networks and facilities*

Figure 2-5 illustrates the existing pedestrian and cyclist provisions along the proposal corridor.

A detailed site investigation was conducted and the following pedestrian and cyclist connectivity issues and pedestrian behaviours were identified:

- Pedestrian connectivity is poor on either side underneath the bridge over the Wyong River and pedestrians were observed using the shoulder of the Pacific Highway and an informal path in the verge
- No footpath is provided along the Pacific Highway north of the River Road Link and pedestrians were observed walking on the grassed area and road shoulder
- The narrow concrete footpath on the eastern side of the Pacific Highway across the intersection with Alison Road is in poor condition and is obstructed by signal posts and trees
- The path along the eastern side of the Pacific Highway south of Rose Street is in poor condition
- There is no pedestrian access along Howarth Street between Panonia Road and the existing commuter car park access at Wyong Station. As such, there is no formal pedestrian provisions between the existing on-street commuter parking and the station access
- There is poor connectivity to pedestrian facilities outside the Rose Street commuter car park
- Pedestrian access provided by zebra markings and delineation through the Wyong station commuter car park on the eastern side of the railway line leading to the Rose Street commuter car park. The route is in good condition and easy to follow but it is circuitous
- The footpath on the western side of the Pacific Highway, between Anzac Avenue and North Road is in poor condition
- No formal pedestrian access to bus stops on the Pacific Highway north of Cutler Drive and pedestrians would be required to use the grassed area to access the bus stops.

## 2.4 **Traffic volumes and patterns**

### 2.4.1 *Mid-block traffic counts*

Road midblock surveys were conducted in the week of Wednesday 12 February 2014 to Tuesday 18 February 2014. The counts are reported for both directions in one-hour intervals, and are classified according to the Austroads Vehicle Classification System. Speed surveys were conducted concurrently, and are reported in 10 km/h bins. An additional midblock traffic survey was conducted from 13 to 19 October 2014 on Howarth Street, south of Rose Street. Figure 2-6 illustrates the data collection sites for the modelling of this proposal.

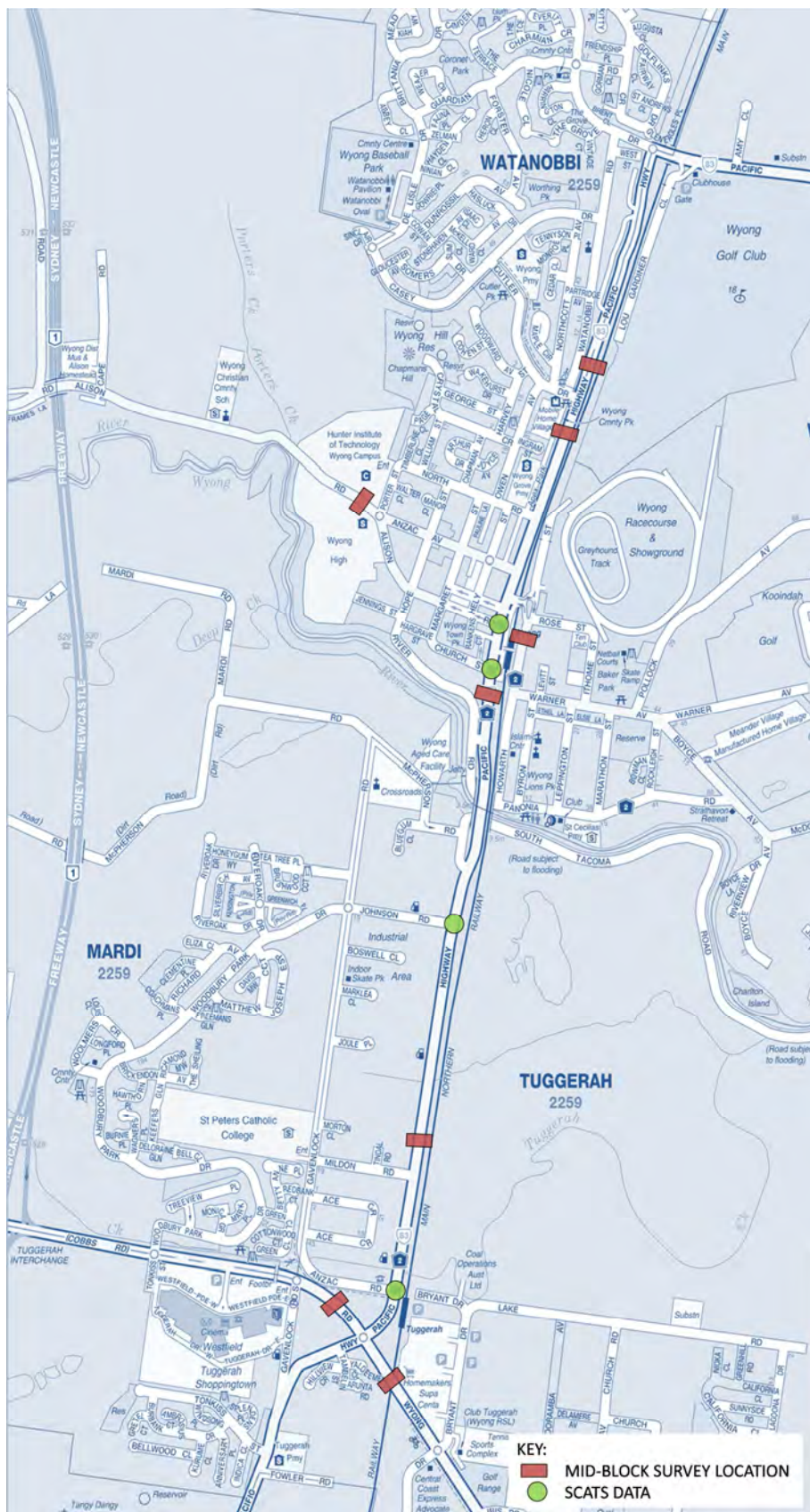


Figure 2-6: Data collection sites

## 2.4.2 Roads and Maritime SCATS data

Roads and Maritime SCATS data details the volumes passing over detectors at signalised intersections. This data was provided for the purpose of this Traffic and Transport Assessment report for the days between 5 March 2014 and 11 March 2014. Data was provided for the following locations:

- Pacific Highway / Alison Road, site number 1784
- Pacific Highway / Church Street, site number 2171
- Pacific Highway / Johnson Road, site number 4051
- Pacific Highway / Anzac Road Tuggerah, site number 1381.

The data provided is in the form of total vehicles per detector per 15 minutes for the entire week. No vehicle classification information is available through the detector technology.

The SCATS data was used to calibrate the base year model, using two one-hour peak volumes for each turning movement. To calculate the 'observed' hourly turning movement, the sum of the four 15-minute volumes was taken for the signal detector that corresponds with the required turning movement. Where there is a shared lane and the turn designation cannot be explicitly measured from the detector data. Therefore, manual turning movement surveys carried out for the purpose of this study were used for calibration purposes. Figure 2-6 illustrates the data collection sites for the modelling of this proposal.

## 2.5 Operational assessment

### 2.5.1 Mid-block capacity

The volume / capacity ratio is a measure that reflects the mobility and quality of travel of a section of road. It compares the demand with the road capacity. For example, a volume / capacity ratio of 1.0 indicates that a road corridor is operating at its capacity. Table 2-9 summarises the flow conditions for volume / capacity ratio ranges.

**Table 2-9: Volume / capacity ratio operational condition descriptions**

Volume / capacity	Flow description
0.0 to 0.6	Free flow conditions with unimpeded manoeuvrability.
0.61 to 0.7	Reasonably unimpeded flow conditions with slightly restricted manoeuvrability.
0.71 to 0.8	Stable flow conditions with somewhat more restrictions in making mid-block lane changes.
0.81 to 0.9	Approaching unstable flow conditions where small increases in volume produce substantial increases in delay and decreases in speed.
0.91 to 1.0	Flow conditions with substantial intersection approach delays and low average speed.
Greater than 1.0	Flow conditions with extremely low speeds, caused by intersection congestion, high delay and adverse signal progression.

Table 2-10 outlines the volume and volume / capacity ratio on the Pacific Highway corridor at three key locations under the existing conditions. The AM and PM peak traffic volumes represent two-hour peak periods.

**Table 2-10: Existing volume / capacity ratio assessment**

Location	Direction	AM		PM	
		Volume (veh)	Volume capacity ratio	Volume (veh)	Volume capacity ratio
Pacific Highway, south of Church Street	Northbound	1602	0.67	1881	0.78
	Southbound	2259	0.94	2005	0.84
Pacific Highway, south of Cutler Drive	Northbound	1417	0.59	2166	0.90
	Southbound	1715	0.71	1526	0.64
Pacific Highway, north of Cutler Drive	Northbound	1306	0.54	1991	0.83
	Southbound	1924	0.80	1413	0.59

### 2.5.2 Intersection performance

Counts of turning movements at the following intersections were conducted manually on Thursday 13 February 2014 and Saturday 15 February 2014. This data provides 15-minute interval traffic counts, separated into light, heavy and cyclist vehicle classifications.

Table 2-11 summarises the level of service criteria adopted for this assessment. It is based on the Roads and Maritime delay method. A level of service of D or better is generally an acceptable level of operation.

**Table 2-11: Intersection level of service criteria (Roads and Maritime method of delay)**

Level of service	Average delay per vehicle (seconds)	Traffic signals, roundabout	Give-way and stop signs
A	<14.5	Good operation	Good operation
B	14.5 to 28.5	Good operation with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	28.5 to 42.5	Satisfactory	Satisfactory, however a crash study is recommended
D	42.5 to 56.5	Operating near capacity	Operating near capacity and a crash study is required

Level of service	Average delay per vehicle (seconds)	Traffic signals, roundabout	Give-way and stop signs
E	56.5 to 70.5	At capacity and is likely to cause excessive delays at signals. Consider implementing alternative control method to roundabouts.	At capacity and requires alternative control method
F	70.5<	At capacity and small increases in traffic volumes are likely to cause disproportionately greater increases in delay.	At capacity and small increases in traffic volumes are likely to cause disproportionately greater increases in delay

The key intersections were modelled using SIDRA Intersection, version 6.0. The level of service has been calculated based on the Roads and Maritime method of delay. Tables 2-12, 2-13 and 2-14 provide a summary of each intersection's overall performance during the AM, PM and weekend peak hours, respectively. For signalised intersections the delay is a measure of the average delay across all of the movements, and the level of service is based on the average delay. For unsignalised intersections including roundabouts, the delay and level of service represent the delay and level of service for the worst movement through the intersection. The intersections operating at level of service E or worse or with queue lengths exceeding 210 metres are indicated with red shading, which indicate the intersections are at or close to capacity. Intersections with long queues are likely to impact the operation of adjacent intersections, which was observed when analysed in the micro-simulation modelling for this project. Figures 2-7, 2-8 and 2-9 illustrate the existing operation of the road network in the AM, PM and weekend peaks, respectively.

**Table 2-12: Existing intersection operation, 2014 AM peak hour**

Intersection	Average delay (seconds)	Level of service	Degree of saturation	95% back of queue length (m)
Pacific Highway – Johnson Road	15	B	0.62	172
Pacific Highway – South Tacoma Road	174	F	0.79	133
Pacific Highway – Church Street	52	D	1.09	550
Pacific Highway – Alison Road	15	B	0.90	354
Pacific Highway – Rose Street	37	C	0.80	45
Pacific Highway – Anzac Avenue	18	B	0.45	7



Intersection	Average delay (seconds)	Level of service	Degree of saturation	95% back of queue length (m)
Pacific Highway – North Road	16	B	0.63	28
Pacific Highway – Cutler Drive	10	A	0.50	7
Pacific Highway – Britannia Drive	12	A	0.59	25

Table 2-13: Existing intersection operation, 2014 PM peak hour

Intersection	Average delay (seconds)	Level of service	Degree of saturation	95% back of queue length (m)
Pacific Highway – Johnson Road	14	A	0.68	200
Pacific Highway – South Tacoma Road	163	F	0.82	14
Pacific Highway – Church Street	31	C	0.88	344
Pacific Highway – Alison Road	19	B	0.90	363
Pacific Highway – Rose Street	42	C	0.71	27
Pacific Highway – Anzac Avenue	27	B	0.50	13
Pacific Highway – North Road	37	C	0.93	53
Pacific Highway – Cutler Drive	14	A	0.64	8
Pacific Highway – Britannia Drive	14	A	0.57	36

Table 2-14: Existing intersection operation, 2014 weekend peak hour

Intersection	Average delay (seconds)	Level of service	Degree of saturation	95% back of queue length (m)
Pacific Highway – Johnson Road	12	A	0.64	178
Pacific Highway – South Tacoma Road	118	F	0.78	113
Pacific Highway – Church Street	37	C	0.93	376
Pacific Highway – Alison Road	21	B	0.89	300
Pacific Highway – Rose Street	42	C	0.65	25

Intersection	Average delay (seconds)	Level of service	Degree of saturation	95% back of queue length (m)
Pacific Highway – Anzac Avenue	21	B	0.47	8
Pacific Highway – North Road	15	A	0.51	11
Pacific Highway – Cutler Drive	12	A	0.55	7
Pacific Highway – Britannia Drive	14	A	0.51	30

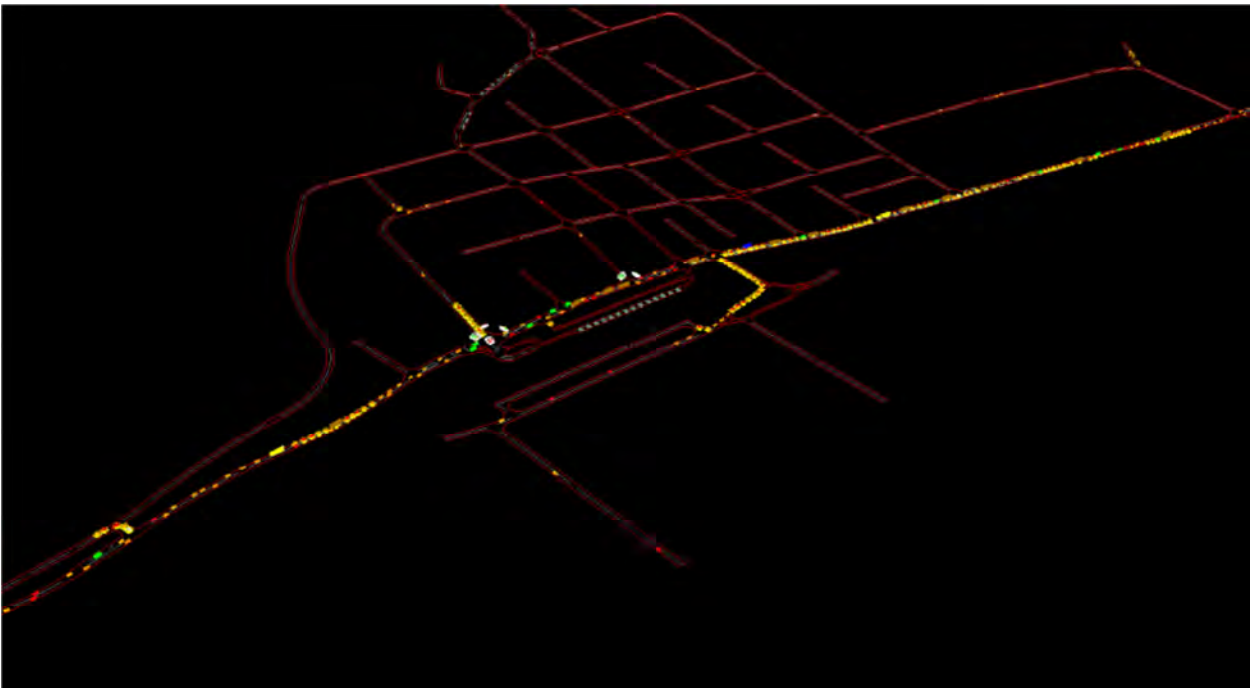


Figure 2-7: Existing AM peak snapshot, 2014

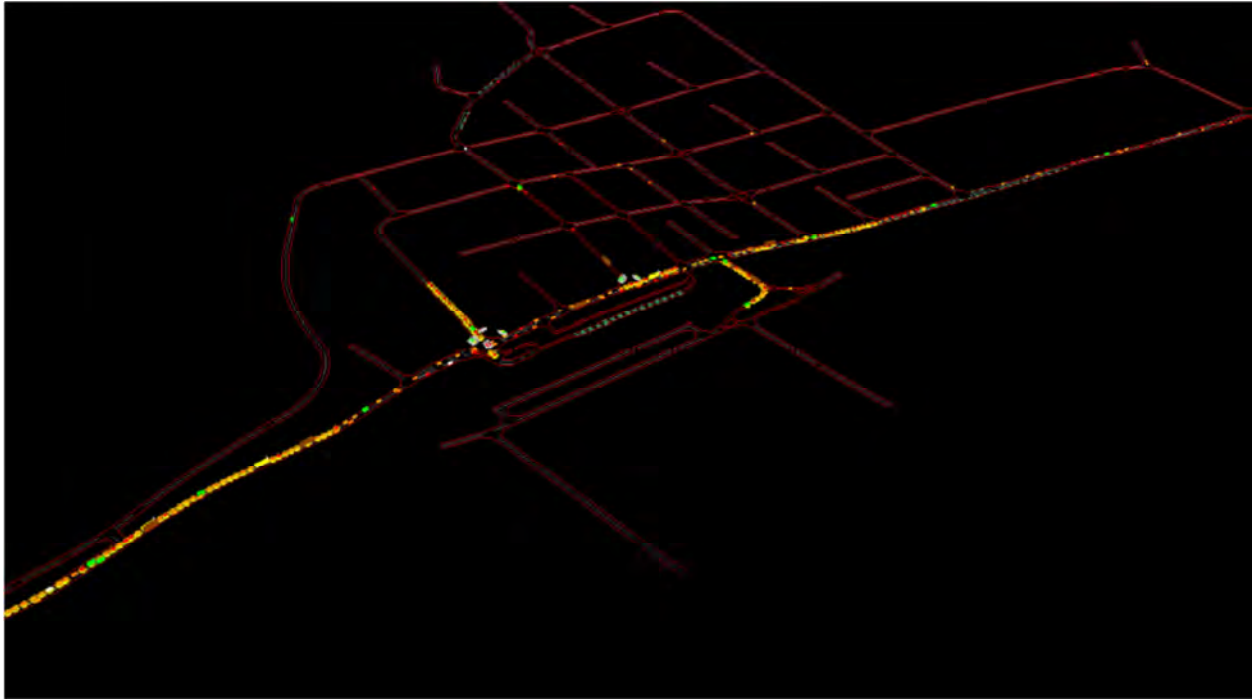


Figure 2-8: Existing PM peak snapshot, 2014

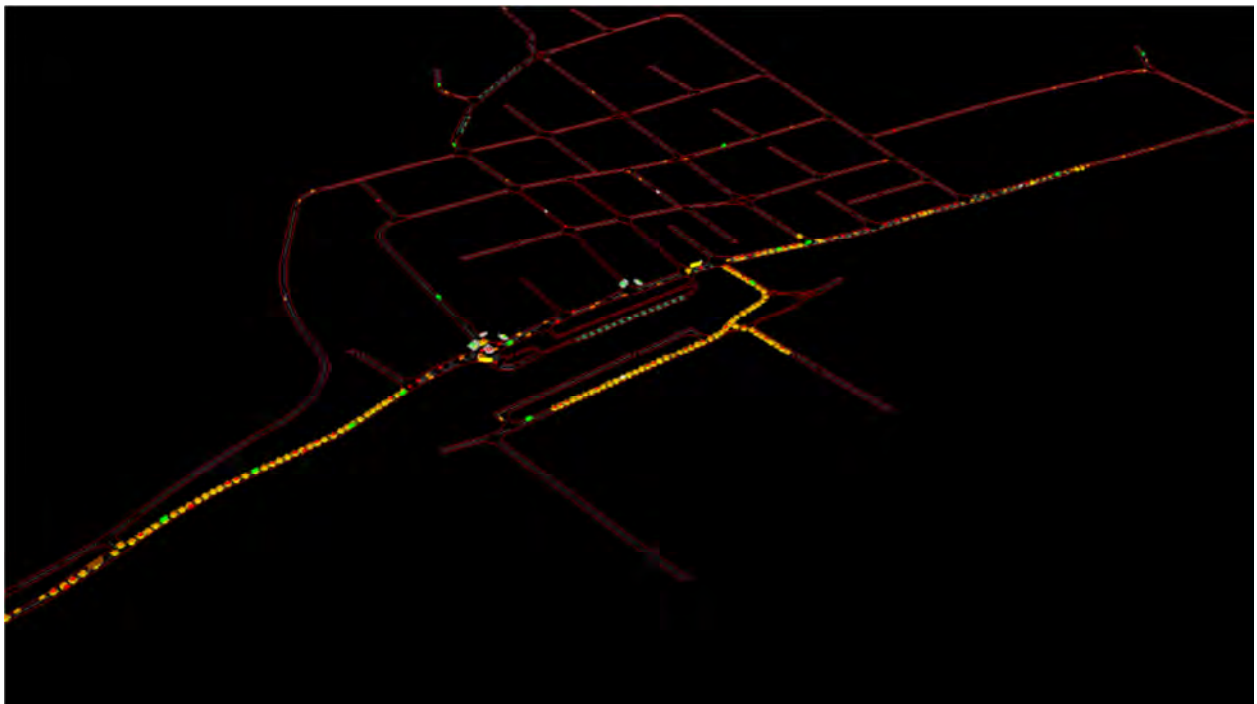


Figure 2-9: Existing weekend peak snapshot, 2014

### 2.5.3 *Travel time analysis*

Travel time surveys were conducted along the section of Pacific Highway between Wyong Road and Britannia Drive in 15 minute intervals for the AM and PM peak periods (6am-10am and 3:20pm-7pm respectively on Thursday 13 February 2014) and the weekend (7am-2pm on Saturday 15 February 2014). The number of survey runs conducted in each direction across the three peak periods is as follows:

- AM peak, northbound: 14 runs

- AM peak, southbound: 14 runs
- PM peak, northbound: 11 runs
- PM peak, southbound: 12 runs
- Saturday peak, northbound: 19 runs
- Saturday peak, southbound: 19 runs.

For the purpose of the modelling exercise the results that were recorded during the one hour peak in each period were used.

The results of the survey are summarised in Table 2-15. The trip variance is provided in the summary of survey results, which demonstrates that the travel times along the corridor are inconsistent, which indicates congestion within the corridor during survey periods.

**Table 2-15: Travel time survey result summary (mm:ss)**

Direction	Peak	Minimum time (whole survey period)	Maximum time (whole survey period)	Trip time variance (max. time – min. time)	Average time (two-hour peak)
Northbound	AM peak	04:34	16:51	12:17	08:26
	PM peak	06:07	19:25	13:18	08:17
	Saturday peak	04:58	08:12	3:14	06:49
Southbound	AM peak	05:20	14:34	9:14	09:20
	PM peak	05:15	11:40	6:25	07:14
	Saturday peak	04:44	10:56	6:12	09:10

Note: Travel time is measured from Wyong Road, Tuggerah to Britannia Drive, Wyong. These results include all travel time results measured within the peak periods. These differ from the modelled peak travel times presented in Section 6.3.5 Travel speeds and time, where outlying results were excluded from the model calibration. Refer to Section 6.3.5 for further information.

## 2.6 Crash analysis

### 2.6.1 Historical crash data

Analysis of the historical crash data has been conducted based on the crash data provided by Roads and Maritime for a five year period from 1 January 2009 to 31 December 2013, between Johnson Road, Tuggerah and 300 metres north of Cutler Drive, Wyong.

During this period, a total of 118 crashes were recorded on the Pacific Highway, between Johnson Road and north of Cutler Drive, including 47 crashes that resulted in injury. There were no fatal crashes recorded on the proposal corridor during this period.

Table 2-16 summarises the crashes recorded along the proposal corridor. Table 2-17 provides

the number of crashes by year and number of casualties.

**Table 2-16: Recorded crashes for the proposal corridor, 2009 to 2013**

Section	Section length (km)	Total crashes	Fatal crashes	Injury crashes	Non-injury crashes
Johnson Road to 300 m north of Cutler Drive	2.4 km	118	0	47	71

**Table 2-17: Crashes by year and number of casualties**

	2009	2010	2011	2012	2013
Crashes	23	19	24	19	20
Casualties	18	7	16	11	8

Analysis of the historical timeline for crashes indicates:

- The number of crashes recorded increased by about 26 per cent from 2010 to 2011
- The number of crashes recorded decreased by about 17 per cent from 2009 to 2010 and 20 per cent from 2011 to 2012
- The number of crashes recorded from 2012 to 2013 is relatively consistent.

Analysis of the crash types recorded indicates:

- The majority of crashes (74.6 per cent) occurred at intersections
- Rear-end crashes represented the most dominant crash type along the proposal corridor with 51.7 per cent of crashes
- Crashes involving vehicles on adjacent approaches at intersections accounted for 23.7 per cent of crashes
- Crashes involving opposing vehicles turning accounted for 5.9 per cent of crashes recorded
- Crashes involving vehicles hitting pedestrians represented 5.9 per cent of crashes recorded
- Vehicles leaving the carriageway on a straight and hitting an object accounted for 5.1 per cent of crashes recorded.

The predominant crash types at specific intersections with higher crashes recorded include:

- Johnson Road, crashes mainly involved rear end collisions with some crashes attributed to right turning vehicles conflicting with through traffic
- South Tacoma Road, crashes involved rear end collisions and rear right collisions

between vehicles travelling the same direction

- Church Street, the majority of crashes involved rear end collisions
- Cutler Drive, crashes involved vehicles turning right out of Cutler Drive and conflicting through traffic approaching from the right.

## 3. TRAFFIC MODELLING

### 3.1 Modelling purpose and scenarios

The purpose of the traffic modelling exercise is to create a tool that can be used to assess the operational characteristics of the proposed upgrade to the Pacific Highway corridor and identify the preferred alignment and intersection arrangement options for the upgrade. The future year traffic models are based on a calibrated base year model as detailed in the model calibration and validation report for the proposal. The future year models provide a good platform to assess overall network performance, travel times on the corridor, travel times of the public transport facilities and other more detailed measures. There are three future years that have been assessed:

- 2021 (opening year)
- 2031 (ten years after opening)
- 2041 (20 years after opening).

The Warnervale Link Road is a proposed connection from the Pacific Highway, Warnervale to Sparks Road, Warnervale that would facilitate access between the Wyong town centre and the Warnervale Growth Area. A sensitivity test was carried out for the preferred option in 2021, to include the Warnervale Link Road, connecting to the Pacific Highway at a two-lane roundabout intersection.

For each future year, three peak periods have been assessed. The following peak periods were chosen based on the traffic surveys, as discussed in the Model Calibration and Validation Report in Appendix A:

- AM peak 7am to 9am
- PM peak 4pm to 6pm
- Weekend peak 10:45pm to 12:45pm.

Two network scenarios have been modelled for each future year and peak period:

- The 'Do nothing' scenario, includes:
  - + Road network as per February 2014 with no modifications
  - + Forecast increases to traffic demand, based on the future do nothing strategic modelling, using Roads and Maritime's EMME forecasts and growth rates agreed with Roads and Maritime (16 April 2014)
  - + Existing bus services, based on current bus timetable information (November 2014)
  - + Modified traffic signal timings to accommodate the increase in traffic demand
- The 'proposed upgrade' scenario, includes:
  - + Proposed road network upgrades as per the 80 per cent concept design dated 23

March 2015

- + Wyong Road / Enterprise Drive intersection is to be signalised in 2015

It is widely accepted in traffic engineering that predicting traffic turning movements for more than 10 to 15 years in advance is highly unreliable. Therefore, the preferred options for the proposed concept design have been determined based on 2031 traffic forecasts and checked against 2041 traffic forecasts.

## 3.2 Modelling approach

The modelling framework adopted for this assessment is as follows:

- The key modelling tasks include:
  - + Analysing and assessing the existing traffic performance of the Pacific Highway and key intersections along the corridor
  - + Identifying existing and future road network deficiencies
  - + Evaluating the proposed Pacific Highway upgrade scheme and identifying further improvements if required, by evaluating the traffic performance under future traffic scenarios
  - + Assessing the overall traffic and economic benefits of the proposed Pacific Highway upgrade
- The modelling tools and techniques applied include:
  - + Micro-simulation – Paramics
  - + Analytical – SIDRA Intersection
  - + Strategic – EMME/3.

The core of the modelling task is micro-simulation analysis of the Pacific Highway corridor. Micro-simulation is a technique in which the path of every trip through the corridor is simulated. The congestion that results from all trips in the corridor and the impact of the congestion on each individual trip is then measured for each road network scenario, including the base case/do nothing and upgrade options. The performance of each road network upgrade scenario was compared to identify the best option and its value.

The models represent the weekday morning, weekday afternoon and weekend midday peak periods, which are generally the most congested periods. Current traffic conditions were surveyed in order to identify the peak periods and for comparison to the model's outputs in the process of calibrating the model to present day traffic.

### Road network and driver behaviour

The micro-simulation model was developed using the Paramics suite of purpose-built traffic simulation software (version 6.9.3). The model uses driver behaviour measures, such as their response times to traffic conditions and the sizes of gaps in traffic that they are prepared to accept, as well as performance measures of vehicles, including size and acceleration ability.



The Paramics model network is shown in orange and the core area (Wyang town centre) is shown in blue in Figure 3-1.

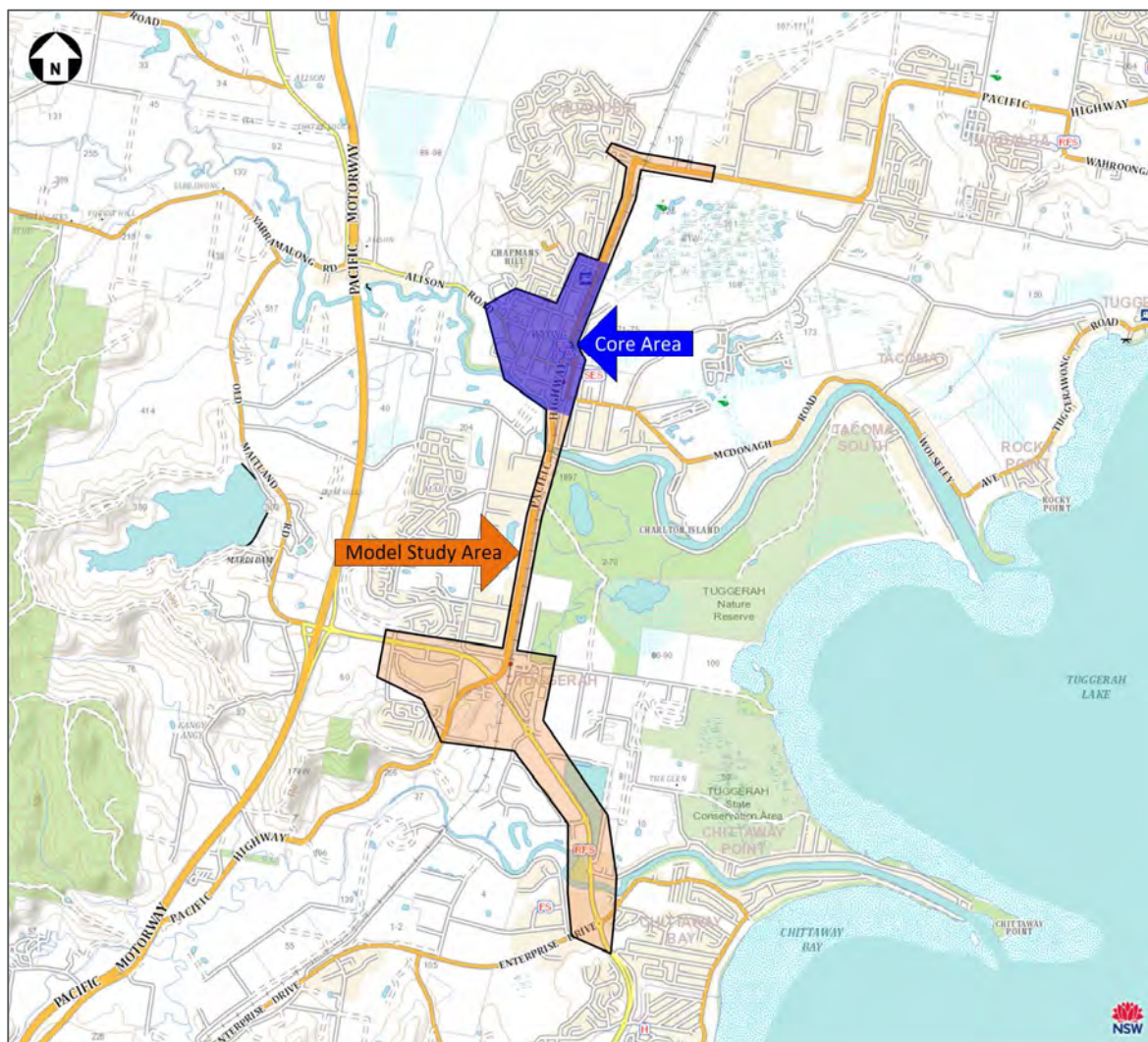


Figure 3-1: Model study area (source: SIX)

### Trip generation

Central to the model are trip matrices, which describe the number of vehicle trips that travel between each origin and destination zone. As an initial estimate of this trip matrix, SMEC used a trip matrix for each peak period from Roads and Maritime's EMME strategic transport model that models the transport networks of the entire Greater Sydney Metropolitan Area, which includes Wyong. These matrices represent a sub-area containing trips that travel into, out of and through the Pacific Highway corridor shown in Figure 3-1 during the morning, afternoon and weekend peak periods.

The matrices are for two-hour peak periods. The morning peak matrix represents trips made in the period from 7am to 9am plus 30-minute warm-up and cool down periods, the afternoon peak matrix represents trips in the period from 4pm to 6pm plus 30-minute warm-up and cool down periods and the weekend peak matrix represents trips in the period from 10:45am to 12:45pm plus 30-minute warm-up and cool down periods.

The Strategic Traffic Forecasting Model (STFM), which is maintained in EMME, does not

include all road links in the study area. Strategic transport models such as the STFM are usually designed for regional transport planning, and thus focus on the major road links throughout the metropolitan area.

### Traffic demand development

The traffic demand for the road network was estimated as a zone to zone trip matrix for each of the peak periods. For each of the peak periods, a pattern matrix from the EMME model was used as a basis for the estimation of each final 2014 traffic demand matrix. The pattern matrices were then iteratively modified using Paramics Estimator to match the observed traffic counts.

The pattern matrix for each peak hour was obtained from the STFM. The matrices are for peak three-hour periods. The morning matrix represents trips made in the period 7am to 9am and the afternoon matrix represents trips in the period from 4pm to 6pm. To generate the weekend daytime peak pattern matrix, the weekday morning and afternoon matrices were averaged. The Saturday matrix represents trips in the period 11:15am to 1:15pm.

### Calibration

Once the 2014 trip matrices were finalised, each of the models (morning, afternoon and weekend peak periods) were calibrated. This process involves adjusting the parameters available in Paramics so that the model reproduces turning movements at intersections, traffic flow on road links and observed travel times. A detailed account of the calibration procedures and results are provided in the model calibration and validation report for the project.

### Forecasting

To assess the impact of the proposal, forecasts of traffic for a do nothing case and the proposal case were produced for years 2021, 2031 and 2041. The expected road networks in the corridor for each of the forecast horizons were coded into the model and the forecast trip matrices were used to generate the traffic for each tested option. Trip matrices were forecast by using the 2014 estimated trip matrix for each peak hour and using origin and destination factors to grow the matrices to the future years.

### Vehicle types

SMEC's estimates of vehicular composition are based on the classified counts carried out at the traffic survey sites on the road network on Thursday 13 February 2014 and Saturday 15 February 2014. The counts were classified into the following vehicle types:

- Light vehicles (cars and light commercial vehicles)
- Heavy vehicles.

Origin-destination (OD) survey data was not available for the study area. Instead, for each of the peak periods, a sub-area pattern matrix from the EMME model was used as the basis for generating separate 2014 traffic demand matrices for light and heavy vehicles. The pattern matrices were then modified using Paramics Estimator to match the observed traffic counts for both light and heavy vehicles.

### 3.3 Modelling assumptions

#### 3.3.1 Future base case

The future base case, do nothing scenario is based on the calibrated base 2014 model. It contains the same road network and the same traffic signals. Traffic signal timing changes have been included to maximise the capacity of the road network in the future.

#### 3.3.2 Road network

The proposed road network has been coded into the model based on the Pacific Highway upgrade through Wyong town centre, 80 per cent concept design dated 23 March 2015.

#### 3.3.3 Traffic growth

The engine of growth in model traffic is growth in the trip matrices. Growth forecasts were calculated based on EMME matrices and advice provided by Roads and Maritime. The review of the EMME growth rates revealed a high growth rate of between 2.4 and 3.0 per cent, which is considered too high for the region. On 16 April 2014, it was agreed with Roads and Maritime's Project Manager that the following uniform growth rates would be applied to all movements for the traffic modelling:

- 1.5 per cent per annum for the first 10 years (2014 to 2024)
- One per cent per annum thereafter (2024 to 2041).

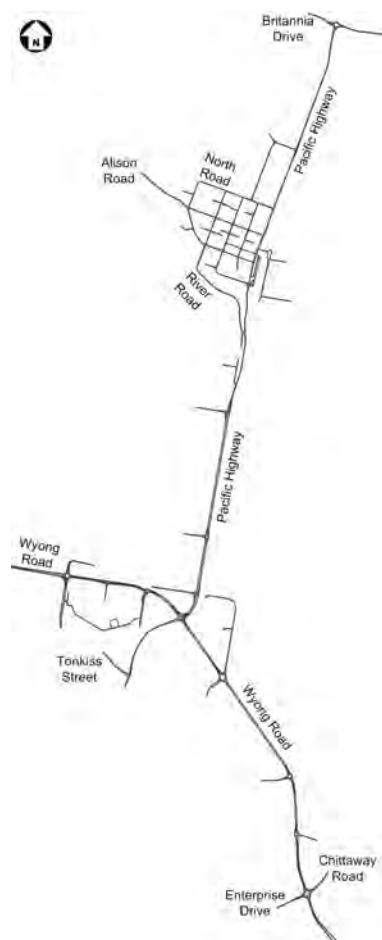
The Warnervale Link Road traffic is not included in the concept design development. However, additional micro-simulation and intersection modelling of the concept design with the Link Road in place has been undertaken to ensure that its construction does not cause the proposed upgrade to have additional capacity issues. The demand development for the Link Road modelling assumes that the traffic carried by the Link Road is additional to that generated by the growth assumptions stated above.

#### 3.3.4 Public transport

Buses were coded into the model based on existing 2014 published bus timetable information.

### 3.4 Network description

The base model network is shown in Figure 3-2.



**Figure 3-2: Base model network**

### **3.4.1 Signalised intersections**

There are four signalised intersections included in the Paramics model. These are:

- Pacific Highway / Alison Road, site number 1784
- Pacific Highway / Church Street, site number 2171
- Pacific Highway / Johnson Road, site number 4051
- Pacific Highway / Anzac Road Tuggerah, site number 1381.

### **SCATS data**

Roads and Maritime provided traffic signal data to inform the configuration of the traffic signals within the model. The following traffic signal data was sourced and supplied by Roads and Maritime:

- Intersection Diagnostic Monitor (IDM) files
- LX files
- Traffic signal layouts.

The IDM data is used to record traffic signal operation statistics at each site on a cycle by

cycle basis. The IDM data is then filtered and reported at 15-minute intervals. The IDM records what split plan and link plan is selected during each 15-minute interval. The IDM also records which traffic signal phases run, their duration, the average cycle time and which pedestrian movements operated within each 15-minute interval. Overall, the IDM provides a comprehensive snapshot of how the traffic signals operate at each site.

The traffic signal layouts were supplied for each site. The signal plans were used to confirm the signal hardware on-site, which was then used to confirm the traffic signal phasing inputs in the model.

The signals are not coordinated in any of the three peak periods modelled, however in the future year models adjacent signals have the same cycle time. This was observed on site to be part of the cause of traffic congestion within the Wyong town centre, particularly at the intersection of Alison Road, where the signalised pedestrian crossing is not coordinated with adjacent signalised intersections.

## 3.5 Future base case modelling results

### 3.5.1 Network performance

Table 3-1 to Table 3-3 show the network performance measures for the future do nothing model scenarios in the AM, PM and weekend peaks. This represents a base case for comparison with the upgraded network presented in Section 6.3 Operational impacts. The results show an increasing number of vehicles (flow) in the future years and corresponding total vehicle kilometres travelled (VKT). The increase in total vehicle hours travelled (VHT) increases at a higher rate in future years, which results from the substantial increase in delay.

Observation of the models shows that severe congestion occurs throughout the model from 2021 for the weekend peak period (refer to Figure 3-3) and from 2031 for the AM and PM peak periods (refer to Figures 3-4 and 3-5, respectively). Congestion appears to be a result of the substantial volume of traffic at the southern end of the model, where the Pacific Highway and Wyong Road intersection is approaching capacity and traffic accessing Tuggerah Westfield on Saturdays causing long queues towards the north into the Wyong town centre.

The 'vehicles waiting to enter' statistic represents the total number of vehicles that did not make it into the model network at the end of the peak period. This is due to queuing that occurs into the edges of the model, which means that the full traffic demand is not able to be released into the model.

**Table 3-1: Do nothing, AM peak network performance**

Measure	2014	2021	2031	2041
VKT (km)	46,409	51,169	56,367	62,205
VHT (hr)	1076	1510	1911	2634
Network travel speed (km/h)	43	34	30	24
Vehicles waiting to enter	0	0	54	530
Total stops	43,735	61,345	79,761	107,092



Table 3-2: Do nothing, PM peak network performance

Measure	2014	2021	2031	2041
VKT (km)	52,223	58,823	65,042	71,097
VHT (hr)	1184	2387	4018	4944
Network travel speed (km/h)	44	25	16	14
Vehicles waiting to enter	0	0	162	2,421
Total stops	49,090	98,973	163,690	191,747

Table 3-3: Do nothing, weekend peak network performance

Measure	2014	2021	2031	2041
VKT (km)	50,102	56,277	62,268	67,541
VHT (hr)	1230	2512	3153	5193
Network travel speed (km/h)	41	22	20	13
Vehicles waiting to enter	0	354	792	11,400
Total stops	41,220	84,162	105,780	135,204

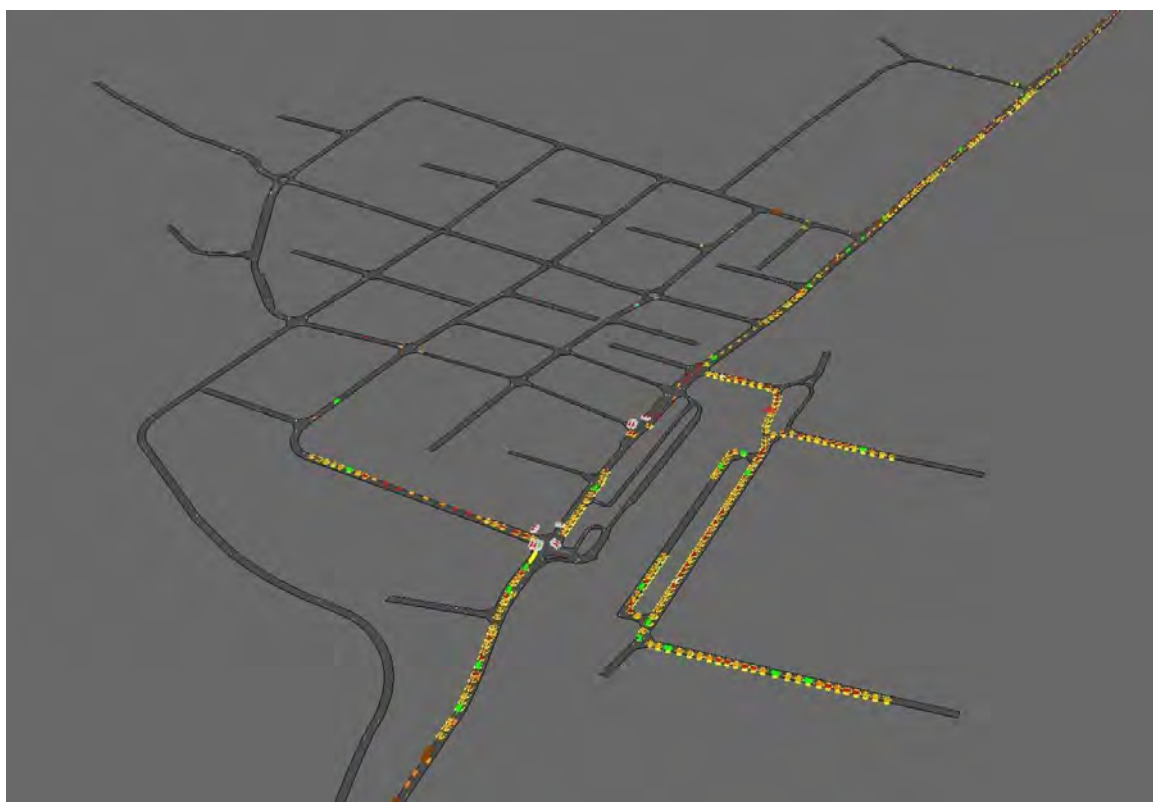


Figure 3-3: Weekend peak congestion, 2021 (do nothing)



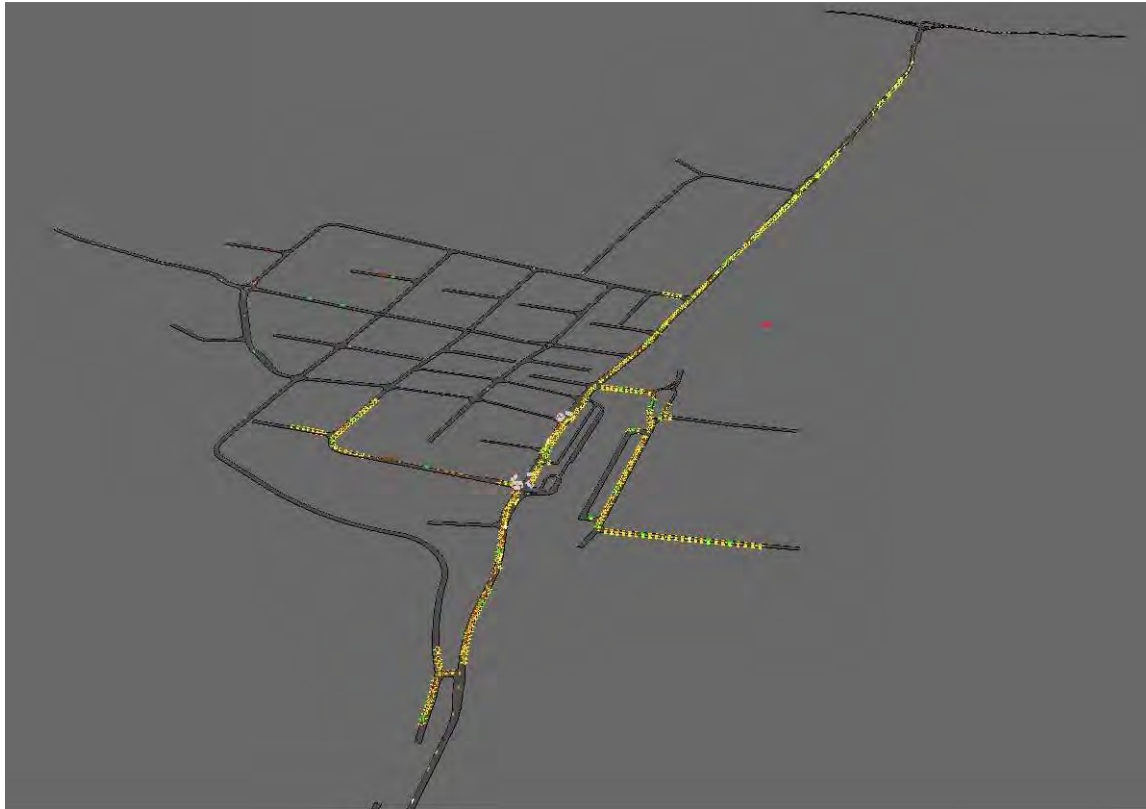


Figure 3-4: AM peak congestion, 2031 (do nothing)

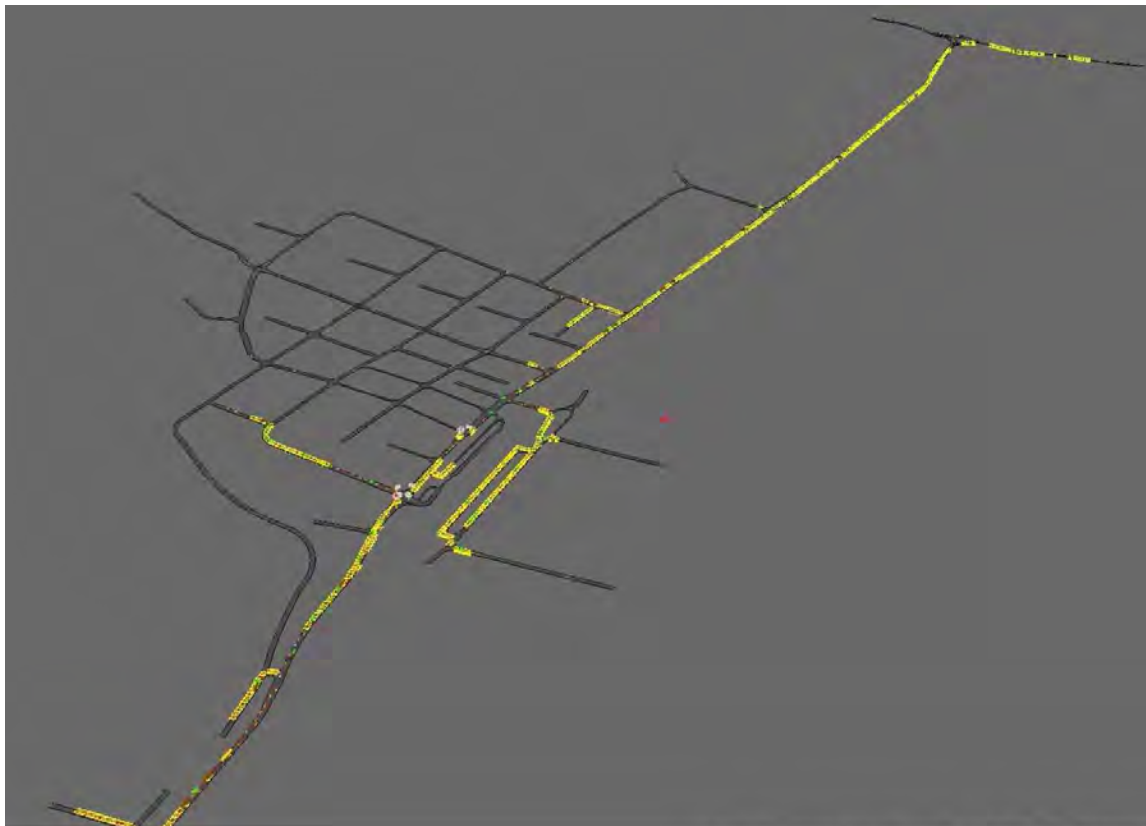


Figure 3-5: PM peak congestion 2031 (do nothing)

### 3.5.2 Intersection performance

SIDRA Intersection was used to assess the operation of the intersections along the Pacific Highway corridor without the proposed upgrade. Table 3-4 to Table 3-9 summarise the intersection performance for forecast years, for the do nothing scenario. The intersections operating at level of service E or worse or have queue lengths exceeding 210 metres are indicated with red shading.

**Table 3-4: Future intersection operation, do nothing, AM peak**

Intersection	Year	Average delay (seconds)	Level of service	Degree of saturation	95% back of queue length (m)
Pacific Highway / Johnson Road	2014	15	B	0.62	172
	2021	18	B	0.75	244
	2031	18	B	0.84	305
	2041	26	B	0.93	485
Pacific Highway / South Tacoma Road	2014	174	F	0.79	133
	2021	>1,000	F	1.49	980
	2031	>1,000	F	6.35	>1000
	2041	>1,000	F	6.35	>1000
Pacific Highway / Church Street	2014	52	D	1.09	550
	2021	74	F	1.07	986
	2031	175	F	1.24	>1000
	2041	237	F	1.38	>1000
Pacific Highway / Alison Road	2014	15	B	0.90	354
	2021	42	C	0.99	689
	2031	106	F	1.11	>1000
	2041	151	F	1.15	>1000
Pacific Highway / Rose Street	2014	37	C	0.80	45
	2021	844	F	1.87	>1000
	2031	>1,000	F	2.14	>1000
	2041	>1,000	F	5.24	>1000
Pacific Highway / Anzac Avenue	2014	18	B	0.45	7

Intersection	Year	Average delay (seconds)	Level of service	Degree of saturation	95% back of queue length (m)
	2021	36	C	0.59	11
	2031	52	D	0.71	24
	2041	250	F	1.11	121
Pacific Highway / North Road	2014	16	B	0.63	28
	2021	34	C	0.77	45
	2031	37	C	0.81	75
	2041	90	F	0.96	146
Pacific Highway / Cutler Drive	2014	10	A	0.50	7
	2021	13	A	0.61	6
	2031	17	B	0.65	10
	2041	22	B	0.75	12
Pacific Highway / Britannia Drive	2014	12	A	0.59	25
	2021	15	B	0.66	41
	2031	17	B	0.68	54
	2041	27	B	0.80	71

Table 3-5: Future intersection operation, do nothing, PM peak

Intersection	Year	Average delay (seconds)	Level of service	Degree of saturation	95% back of queue length (m)
Pacific Highway / Johnson Road	2014	14	A	0.68	200
	2021	15	B	0.79	268
	2031	22	B	0.91	425
	2041	32	C	0.98	675
Pacific Highway / South Tacoma Road	2014	163	F	0.82	14
	2021	>1,000	F	3.32	>1000
	2031	>1,000	F	18.95	734
	2041	>1,000	F	15.09	>1000
Pacific Highway / Church Street	2014	31	C	0.88	344

Intersection	Year	Average delay (seconds)	Level of service	Degree of saturation	95% back of queue length (m)
	2021	89	F	1.07	799
	2031	162	F	1.16	>1000
	2041	278	F	1.29	>1000
Pacific Highway / Alison Road	2014	19	B	0.90	363
	2021	44	D	1.00	686
	2031	98	F	1.12	>1000
	2041	171	F	1.23	>1000
Pacific Highway / Rose Street	2014	42	C	0.71	27
	2021	67	E	0.91	56
	2031	635	F	1.62	617
	2041	734	F	1.72	711
Pacific Highway / Anzac Avenue	2014	27	B	0.50	13
	2021	36	C	0.63	20
	2031	74	F	0.86	34
	2041	260	F	1.22	197
Pacific Highway / North Road	2014	37	C	0.93	53
	2021	23	B	0.67	23
	2031	48	D	0.92	52
	2041	425	F	1.43	476
Pacific Highway / Cutler Drive	2014	14	A	0.64	8
	2021	19	B	0.69	12
	2031	21	B	0.74	13
	2041	64	E	0.89	34
Pacific Highway / Britannia Drive	2014	14	A	0.57	36
	2021	14	A	0.57	36
	2031	16	B	0.64	48
	2041	25	B	0.78	76

Table 3-6: Future intersection operation, do nothing, weekend peak

Intersection	Year	Average delay (seconds)	Level of service	Degree of saturation	95% back of queue length (m)
Pacific Highway / Johnson Road	2014	12	A	0.64	178
	2021	12	A	0.66	183
	2031	15	B	0.76	248
	2041	14	A	0.82	297
Pacific Highway / South Tacoma Road	2014	118	F	0.78	113
	2021	493	F	1.26	203
	2031	>1,000	F	3.56	997
	2041	>1,000	F	8.58	>1000
Pacific Highway / Church Street	2014	37	C	0.93	376
	2021	60	E	1.010.9	697
	2031	141	F	1.17	>1000
	2041	204	F	1.27	>1000
Pacific Highway / Alison Road	2014	21	B	0.89	300
	2021	51	D	0.99	509
	2031	101	F	1.10	884
	2041	178	F	1.21	>1000
Pacific Highway / Rose Street	2014	42	C	0.65	25
	2021	106	F	1.01	126
	2031	809	F	1.81	889
	2041	>1000	F	2.08	>1000
Pacific Highway / Anzac Avenue	2014	21	B	0.47	8
	2021	23	B	0.5	7
	2031	38	C	0.61	12
	2041	49	D	0.65	13
Pacific Highway / North Road	2014	15	A	0.51	11
	2021	17	B	0.58	15

Intersection	Year	Average delay (seconds)	Level of service	Degree of saturation	95% back of queue length (m)
	2031	24	B	0.69	22
	2041	34	C	0.72	22
Pacific Highway / Cutler Drive	2014	12	A	0.55	7
	2021	11	A	0.5	5
	2031	12	A	0.24	6
	2041	15	B	0.61	7
Pacific Highway / Britannia Drive	2014		A	0.51	30
	2021	14	A	0.6	33
	2031	14	A	0.61	33
	2041	15	B	0.66	41

In summary, without the proposed upgrade, the following intersections are likely to approach or exceed capacity under forecast traffic volumes:

- Johnson Road
- South Tacoma Road
- Church Street
- Alison Road
- Rose Street
- Anzac Avenue
- North Road.



## 4. THE PROPOSAL

### 4.1 Overview of the proposal

The key features of the Pacific Highway upgrade, through the Wyong town centre from south to north are:

- Two lanes in each direction with a central median between the Pacific Highway and Johnson Road intersection the proposed roundabout intersection of the Pacific Highway and McPherson Road
- A new service lane on the western side of the Pacific Highway between chainage 200 and the proposed roundabout intersection of the Pacific Highway and McPherson Road
- Realignment of McPherson and South Tacoma roads to accommodate the proposed roundabout intersection of the Pacific Highway and McPherson Road
- Two lanes in each direction with a central median between the proposed roundabout intersection of the Pacific Highway and McPherson Road and about 150 metres north of Cutler Drive
- New twin bridges over the Wyong River, replacing the existing road bridge
- Replacement of the Rose Street rail overbridge with a longer and wider bridge structure
- Construction of a northbound left-in / left-out access to Apex Park with an auxiliary left turn lane, about 200 metres north of North Road
- Upgrades to the following intersections:
  - + Construction of a new roundabout intersection at the intersection of the Pacific Highway and McPherson Road, replacing the existing priority intersection at the Pacific Highway and South Tacoma Road
  - + Construction of a northbound left-in / left-out into the River Road Link with a new left turn auxiliary lane
  - + Construction of a new roundabout at the intersection of River Road Link, River Road and Panonia Road
  - + Realignment of the intersection of Panonia Road and Howarth Street to suit the new alignment of Panonia Road. The intersection would be a basic right (BAR) arrangement
  - + Construction of a new roundabout at the intersection of Howarth Street and Warner Avenue, with the introduction of a fourth approach on the western side of the intersection to provide access to the proposed bus layover area, disabled parking and taxi stand
  - + Removal of the existing entry and exit into the Wyong station car park at the Pacific Highway and Church Street intersection
  - + Closure of the Pacific Highway and Bakers Lane intersection, with access to

Bakers Lane maintained via Alison Road and Rankers Crescent

- + Removal of the existing signalised intersection at the Pacific Highway and Alison Road intersection and introduction of left in only at this intersection
- + Maintain vehicular access to Robley Lane with the construction of a driveway layback and a 10 km/h shared zone starting at the entry of Robley Lane
- + Construction of traffic signals at the intersection of the Pacific Highway and Rose Street, with northbound right turn and southbound left turn auxiliary lanes on the Pacific Highway. Signalised pedestrian crossings would be provided at the southern approach of the Pacific Highway and across Rose Street
- + Realignment of the roundabout at the intersection of Howarth and Rose streets to suit the new alignment of the Rose Street railway overpass
- + Construction of traffic signals at the intersection of the Pacific Highway and Anzac Avenue, with left and right turn auxiliary lanes on the Pacific Highway approaches and signalised pedestrian crossings on all approaches
- + Construction of traffic signals at the intersection of the Pacific Highway and North Road with left and right turn auxiliary lanes on the Pacific Highway approaches and signalised pedestrian crossings on all approaches
- + Construction of traffic signals at the intersection of the Pacific Highway and Cutler Drive with left and right turn auxiliary lanes on the Pacific Highway approaches and signalised pedestrian crossings on all approaches
- Provision of new pedestrian and cyclist facilities at the following locations:
  - + Bicycle lanes on the northbound and southbound carriageways of the Pacific Highway between Johnson Road and about 300 metres north of Cutler Drive
  - + Footpath along the western side of the Pacific Highway between Johnson Road and the proposed roundabout at McPherson Road, with continuation of the footpath along the southern side of McPherson Road and the northern side of South Tacoma Road
  - + Shared user path along the eastern side of the Pacific Highway between Johnson Road to just north of North Road
  - + Footpath along the western side of the Pacific Highway between the proposed roundabout at McPherson Road and River Road Link, with continuation of footpath along the eastern side of Panonia Road about 80 metres south of the intersection and along the eastern side of River Road about 20 metres north of the intersection
  - + Stairs linking the footpaths on the western side of the Pacific Highway and eastern side of Panonia Road
  - + Shared user path along the western side of Panonia Road and River Road from just east of the Wyong River twin bridges to about 100 metres north of the intersection of Panonia Road, River Road and River Road Link
  - + Footpath along the western side of the Pacific Highway between River Road Link and Church Street

- + Pedestrian refuge within the median just south of Bakers Lane
- + Shared zone along the western side of the Pacific Highway at the existing Bakers Lane intersection
- + Raised pedestrian crossing on Howarth Street, south of Rose Street
- + Raised pedestrian crossing on Rose Street, east of Howarth Street
- + Footpath along the western side of Howarth Street running parallel to the Howarth Street service lane to the Rose Street intersection
- + Shared user path along the western side of the Pacific Highway from North Road to about 300 metres north of Cutler Drive
- + Footpath on the eastern side of the Pacific Highway, from north of Cutler Drive to the proposed southbound bus stop south of Cutler Drive
- Provision of new bus stops at the following locations:
  - + Northbound and southbound bus stops on the Pacific Highway, about 80 metres south of Church Street
  - + Provision of new bus layover area on the eastern side of Wyong station, on the western side of Howarth Street, north of Warner Avenue
  - + Removal of the existing bus interchange at Wyong station and replacement with northbound and southbound bus bays on the Pacific Highway between Alison Road and Robley Lane (space for three buses per bay)
  - + Northbound bus stop indented on the Pacific Highway, about 50 metres south of North Road
  - + Southbound bus stop indented on the Pacific Highway, about 50 metres south of Cutler Drive
- Reconstruction of the following bus stops:
  - + Southbound bus stop, north of Johnson Road, reconstructed with indented bay and to accommodate the proposed shared user path
  - + Southbound bus stop, south of North Road, reconstructed with indented bay and to accommodate the proposed shared user path
  - + Northbound bus stop, north of Cutler Drive, reconstructed with indented bay and to accommodate the proposed shared user path
- Removal of the northbound bus stop, north of South Tacoma Road after consultation with the local bus operators
- New parking provisions at the following locations:
  - + Indented long term parallel parking bays along the western side of the Pacific Highway, between Johnson Road and the existing South Tacoma Road intersection, maintaining access to the takeaway food outlets and service station

located north of Johnson Road (18 spaces)

- + Indented long term parallel parking bays along the western side of South Tacoma Road between chainages 20 and 100 (13 spaces)
- + Indented long term parallel parking bays along the western side of Panonia Road between chainages 200 and 290 (14 spaces)
- + Short term parking bays along the western side of the Pacific Highway between the River Road Link intersection and Church Street (21 spaces)
- + Short term parking bays along the western side of the Pacific Highway between the River Road Link intersection and Church Street (21 spaces)
- + Short term 45-degree angle parking (rear-in) on the western side of the Pacific Highway between Church Street and Bakers Lane (13 spaces)
- + Short term parallel parking on the eastern side of the Pacific Highway, north of Church Street (seven spaces)
- + Short term parallel parking on the western side of Howarth Street, north of Warner Avenue (18 spaces)
- + Short term 45-degree angle parking (rear-in) on the western side of the Pacific Highway between Bakers Lane and Alison Road (seven spaces)
- + Kiss and ride parking on the western side of Howarth Street, south of Rose Street (eight spaces)
- + Short term parallel parking on the eastern side of the Pacific Highway between Bakers Lane and Alison Road (four spaces)
- + Kiss and ride parking on the eastern side of the Pacific Highway between Bakers Lane and Alison Road (two spaces)
- + Disabled 90-degree angle parking on the Howarth Street service lane, south of Rose Street (23 spaces)
- + Additional commuter car parking spaces to be provided in the Rose Street commuter car park to increase the total number of spaces to 488, by constructing a new level of parking on top of the existing Rose Street commuter car park
- Removal of existing commuter car parking provisions on the western side of the railway line.

## 4.2 Design criteria

### 4.2.1 Design speed

Figure 4-1 illustrates the proposed design and posted speed limits.

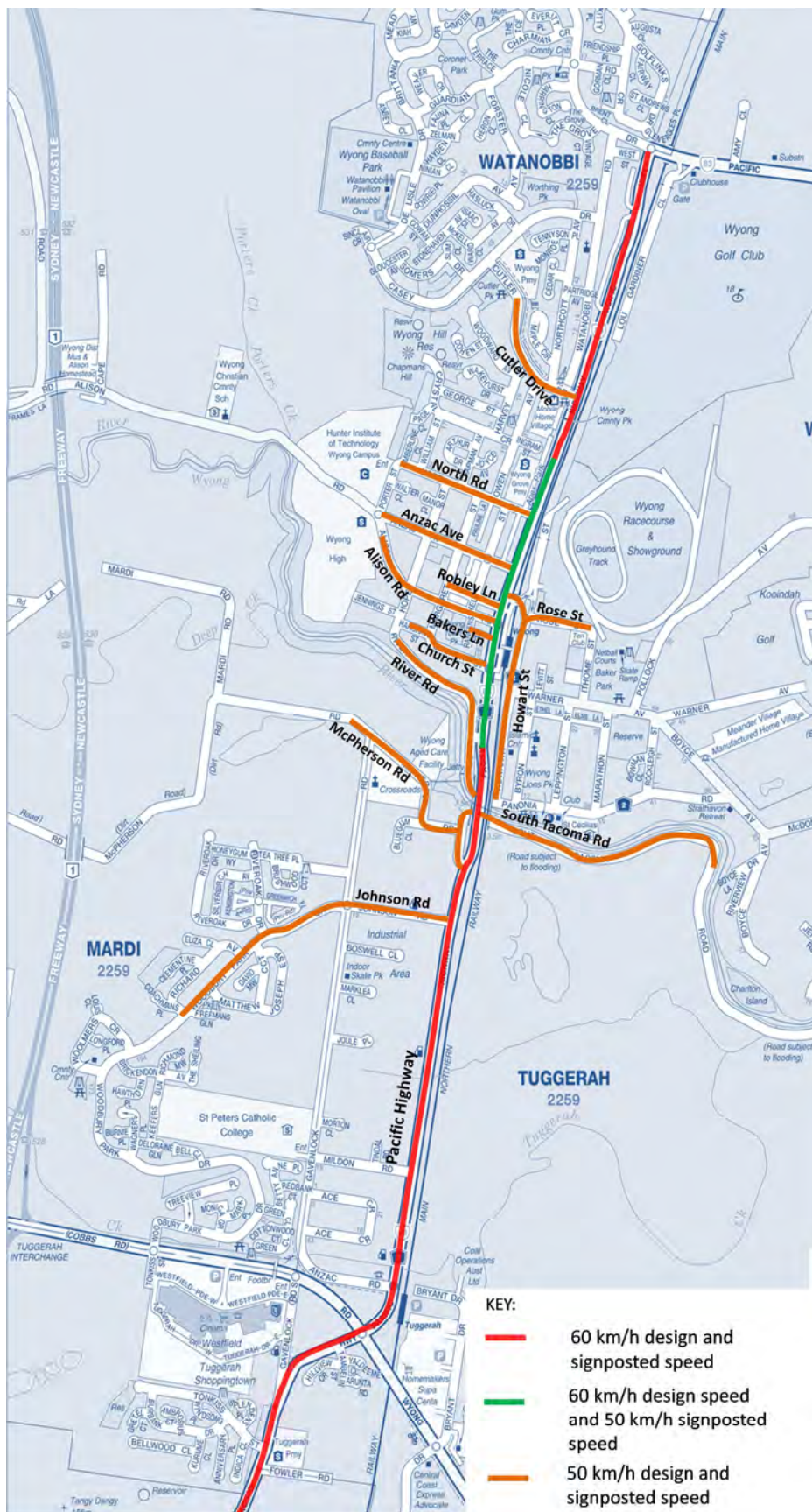


Figure 4-1: Design speeds



### 4.2.2 Cross section

The typical cross section of the proposal corridor comprises four lanes (3.3 metres wide) with a bicycle lane in both directions (1.5 metres wide).

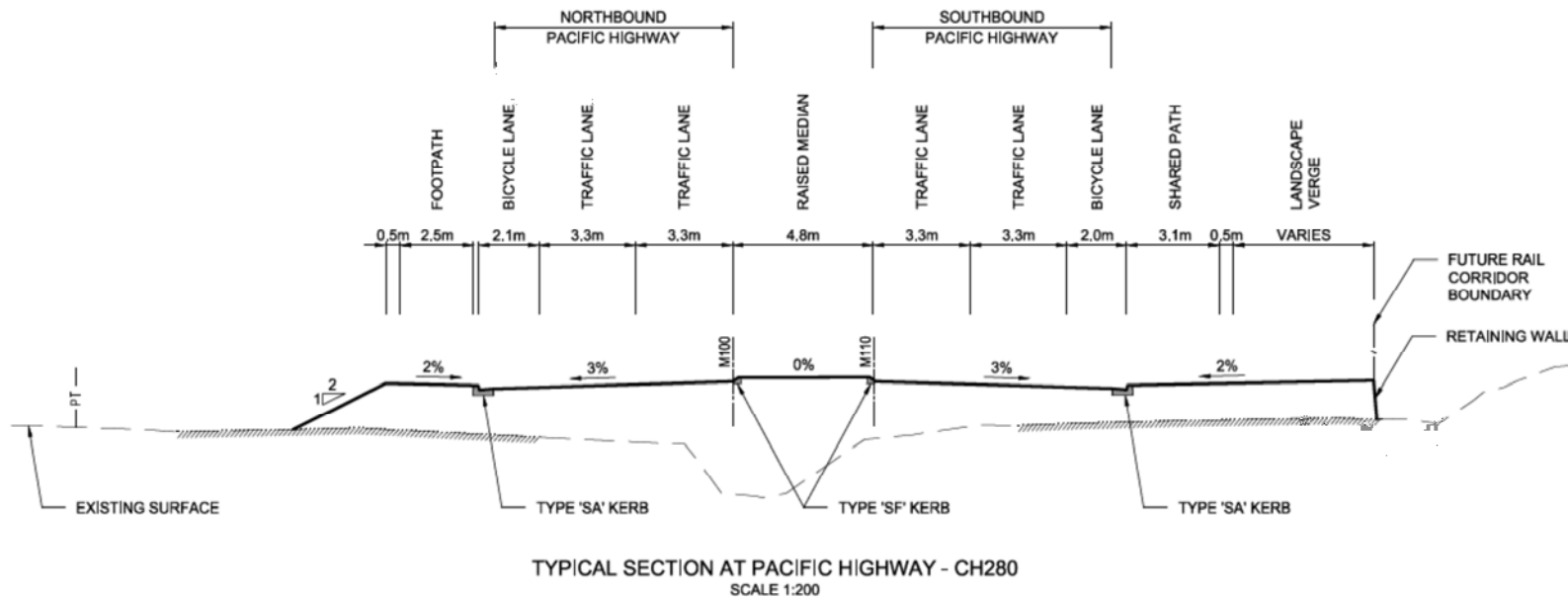


Figure 4-2: Typical section

### 4.3 Staging of works

Section 3.4 of the REF summarises the preliminary construction staging strategy was developed by SMEC. Under this proposed construction staging arrangement, the road network within the proposal corridor would be open to traffic at all times.



## 5. TRANSPORT APPRAISAL

### 5.1 Public transport

The proposed upgrade includes additional bus stops and changes to the road corridor which impact bus travel patterns. Figure 5-1 illustrates the proposed public transport facilities.

The proposed bus stop locations provide the Pacific Highway corridor with additional bus stops. The bus stops proposed for relocation are within reasonable walking distances from the existing bus stops, resulting in minimal impacts for passengers currently using the existing bus stops. The bus layover facility east of Wyong Station may also be used for terminating and town service buses for the convenience of routes that access Wyong town centre or Baker Park.

There are no bus priority measures such as dedicated bus lanes and bus jump starts at intersections proposed as part of this proposed upgrade. Therefore, bus travel times would be reflective of the overall travel times for all vehicles along the Pacific Highway corridor. As discussed in Section 6.3.5 Travel speeds and time, the travel time decreases and the travel speeds increase substantially in the PM and weekend peak periods and travel time decreases and the travel speeds increase slightly in the AM peak.

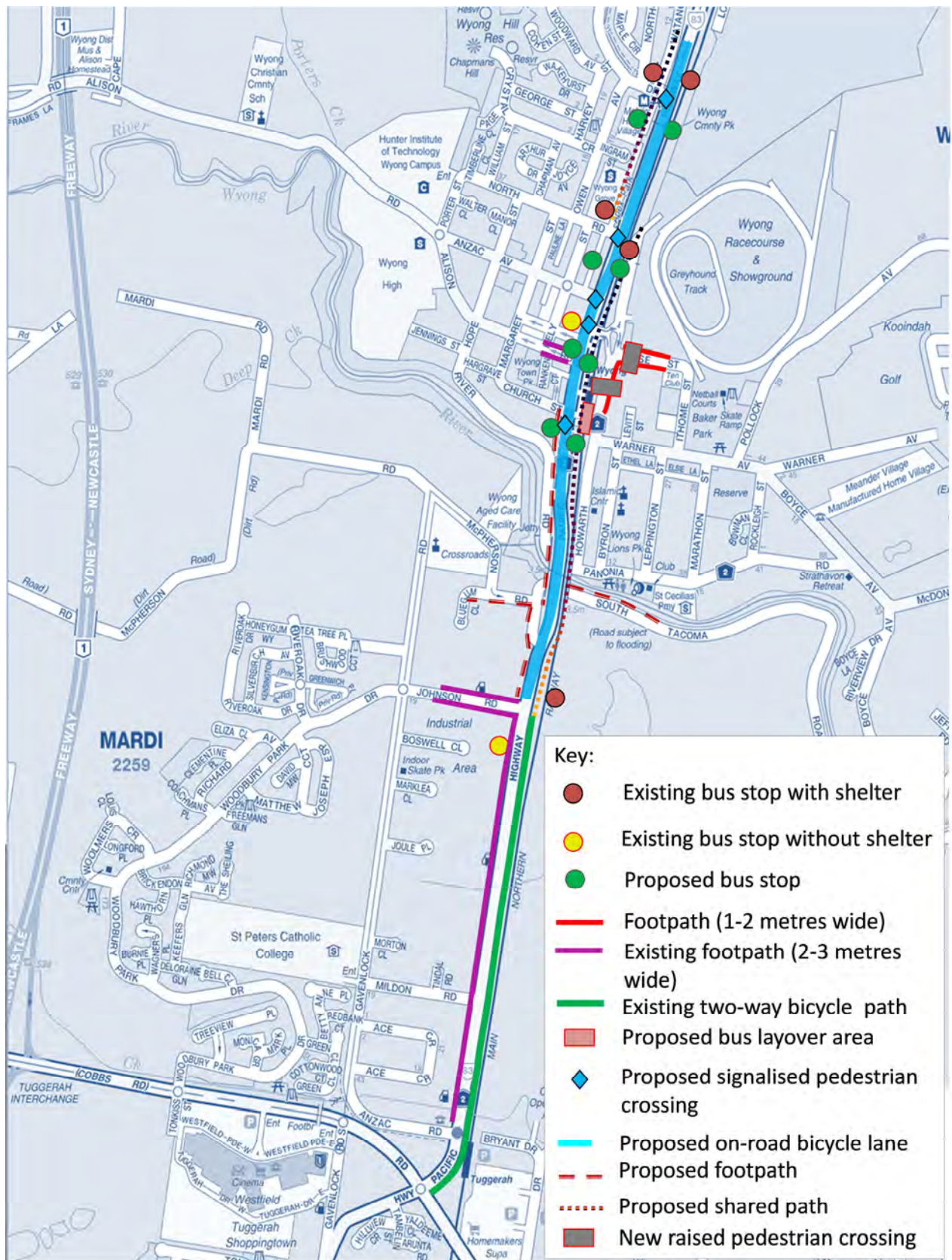


Figure 5-1: Proposed public transport and pedestrian and cyclist facilities

## 5.2 Walking and cycling

Figure 5-1 illustrates the existing pedestrian and cyclist facilities that would be maintained and proposed pedestrian and cyclist facilities under the proposal. The proposal includes the following improvements for pedestrians and cyclists:

- The provision of new signalised crossings provides additional safe crossing opportunities for pedestrians compared with the existing provisions
- The proposed bicycle lanes on the Pacific Highway in both directions is an improvement to the existing arrangement, which has no bicycle lanes
- The proposed footpath continues along the western side of the Pacific Highway to Johnson Road. This is an improvement on the existing arrangement, which has limited formal pedestrian facilities along the western side of the Pacific Highway south of Church Street.
- Stairs are proposed to link the footpaths on the western side of the Pacific Highway and eastern side of Panonia Road, which provides pedestrian connectivity with the Pacific Highway and the recreational area along the Wyong River.
- A pedestrian refuge is proposed within the median just south of Bakers Lane, which would improve the safety of pedestrians crossing the Pacific Highway corridor compared with existing conditions, which does not provide any pedestrian refuges within the town centre
- Bakers Lane would be closed at its intersection with the Pacific Highway under the proposal reducing the potential for pedestrian and vehicular conflicts at this location
- The existing pedestrian refuge on Howarth Street, south of Rose Street is proposed to be upgraded to a raised pedestrian crossing and an additional raised pedestrian crossing is proposed on Rose Street, east of Howarth Street, improving pedestrian access from Wyong station to the proposed extension of the Rose Street commuter car park.

The existing Rose Street commuter car park has poor pedestrian connectivity, provided by a narrow path with obstacles such as power poles and limited passive surveillance outside business hours and is poorly sign posted. Additionally, the shortest walking distance to the existing Rose Street commuter car park is about 360 metres and the longest walking distance is about 420 metres. Under the proposed commuter car park arrangement, the shortest walking distance to the Rose Street commuter car park is about 210 metres (150 metres less than existing) and the longest walking distance is about 380 metres (40 metres less than existing).

The distance to the proposed Rose Street commuter car park access is substantially shorter than the furthest overflow parking space located on the western side of Howarth Street, south of Warner Avenue, which is about 400 metres in length and is therefore, considered to be an acceptable distance for commuters to walk. The Howarth Street overflow parking area would be maintained in the proposed upgrade.

The distance for pedestrians walking between the existing eastern and western commuter car parking areas is increased in the proposed upgrade. However, pedestrian facilities would be upgraded to facilitate pedestrian access and improve connectivity to the Rose Street

commuter car park.

The lighting along the footpaths between Wyong station and the proposed Rose Street commuter car park upgrade is proposed to be upgraded to improve the safety of pedestrians in the area.

The proposed pedestrian crossing locations and network of shared user paths and footpaths provide improved connectivity and safety to existing and proposed public transport services (including bus stops), new car parking provisions and surrounding land uses and community facilities.

### 5.3 Freight transport

There are no anticipated impacts to the existing B-double and 4.6 metre high vehicle route network surrounding the Pacific Highway corridor. The proposal is likely to improve safety and travel times along the Pacific Highway corridor due to the additional lane in each direction, which provides opportunities for vehicles to pass slower moving heavy vehicles on the corridor.

### 5.4 Road safety

The road safety of the Pacific Highway corridor is likely to improve at each of the following locations:

- The introduction of a roundabout at the intersection of the Pacific Highway and McPherson Road intersection is likely to reduce the number of crashes that occurred at the existing South Tacoma Road intersection. Many of the existing incidents involved rear end collisions and rear right collisions between vehicles travelling the same direction. The roundabout would control movements involving vehicles turning into the minor approach and is likely to reduce the approach speed of through traffic reducing the potential for conflict between vehicles travelling in the same direction
- The introduction of traffic signals at Cutler Drive is likely to reduce the number of crashes involving vehicles turning right out of Cutler Drive and conflicting through traffic approaching from the right, by controlling all movements at this intersection
- The provision of pedestrian and cyclist facilities along the length of the proposal corridor will improve pedestrian safety, particularly in locations where in the existing arrangement, pedestrians were observed walking within the shoulder of the Pacific Highway because of the absence of formal pedestrian provisions
- The provision of additional signalised pedestrian crossings of the Pacific Highway at Rose Street, Anzac Avenue, North Road and Cutler Drive will increase the number of safe crossing opportunities within the proposal corridor compared with the existing arrangement
- The closure of Bakers Lane and removal of right turns into Alison Road and Robley Lane will reduce the potential for collisions between right turning vehicles and through traffic on the Pacific Highway
- The introduction of traffic signals at the intersection of the Pacific Highway and Rose Street will potentially reduce the occurrence of drivers becoming impatient and turning



into the through traffic within insufficient gaps

- The addition of a central median would reduce the potential risk of head on crashes along the length of the proposed upgrade.

An overall reduction of five injury crashes per year would be expected in the first year of opening which equates to an injury crash reduction of 50 per cent. By 2041, the predicted overall crash rates for the concept design upgrade (26 crashes per year) would be lower when compared with the do-nothing case (33 crashes per year).

## 6. TRAFFIC ASSESSMENT

### 6.1 Consequence of do nothing

The volume capacity ratios presented in Section 2.5.1 Mid-block capacity, indicate that the Pacific Highway corridor is approaching capacity under existing conditions. The results of the do nothing scenario summarised in Section 3.5.1 Network performance show that an increasing number of vehicles on the network into future years would result in a substantial increase in the delay experienced on the network. Observation of the models shows that severe congestion occurs throughout the model from 2021 for the weekend peak period and from 2031 for the AM and PM peak periods.

The results of the do nothing scenario provided in Section 3.5.2 Intersection performance, indicate that a number of intersections operate at an unacceptable level of service of E or worse with long queues from 2021.

### 6.2 Preliminary construction impacts

#### 6.2.1 Construction methodology

Section 3.4 of the REF summarises the construction staging strategy and methodology, which would be developed in more detail during the detailed design phase.

#### 6.2.2 Construction hours

Section 3.4.2 of the REF details the construction hours for the proposed upgrade.

#### 6.2.3 Plant and equipment

Section 3.4.3 of the REF provides a summary of the plant and equipment likely to be required for the proposed construction activities.

The period of construction is anticipated to be about three to four years. Truck movements during the construction phase are likely to increase by an average of 40 and up to 80 truck movements per day during peak construction periods. The heavy and light vehicle movements associated with the construction phase would be confirmed during the detailed design and construction planning stages of the proposal. Based on the traffic surveys conducted on the Pacific Highway corridor in February 2014, the existing average daily traffic volumes are about 26,000 vehicles per weekday with a heavy vehicle proportion of about 6.6 per cent. Therefore, the additional peak heavy vehicle movements associated with construction would be between 6.7 and 6.9 per cent, which is considered very small proportionally and would not have a substantial impact on existing heavy vehicle volumes.

#### 6.2.4 Worksite access, compound and stockpile locations

Section 3.5 of the REF describes the proposed site compound and stockpile locations.

Direct access at each of the site compound and stockpile locations would be provided with adequate sight distances relating to the posted road speed. This would allow vehicles on the main road to see vehicles emerging from the ancillary facilities and would allow ample room to slow down and stop if necessary. Similarly, it would allow vehicles waiting to emerge from the site access, adequate sight distance to see approaching vehicles and determine acceptable



gaps for them to enter the main road traffic.

Left-in / left-out only access would be provided at the entry and exit points to site compound and stockpile locations. Sufficient turning provisions would be provided within each site to allow construction vehicles to enter and exit the access in the forward direction. Each site compound and stockpile location would generally employ a traffic controller at the access to manage vehicular traffic into and out of each site and guide pedestrians crossing the site accesses.

Construction vehicles would generally use the Pacific Highway to haul material for short distances. Haulage on local roads would be required on some local roads, namely:

- South Tacoma Road
- Panonia Road
- Howarth and Rose streets for the reconstruction of the commuter car parks and Rose Street overbridge.

### **6.2.5 Property and local access**

Under the construction staging strategy developed by SMEC, access to existing properties along the Pacific Highway corridor and local access to areas surrounding the corridor would be maintained during all stages of construction. The Rose Street overbridge would be open to traffic during all stages of construction, to ensure emergency access to the eastern side of the railway line is maintained. This is an essential part of the construction staging strategy since Rose Street overbridge provides the only flood free access and the most direct route to the eastern side of the railway line.

The key access arrangements for the construction staging strategy are detailed as follows:

- During the enabling work stage, the following access arrangements would be implemented:
  - + Partial closure of McPherson Road would be required to enable the construction of the roundabout. An alternative route would be implemented via Johnson Road
  - + South Tacoma Road would be restricted to one way under the Pacific Highway bridge over the Wyong River
- During stage 1, the following access arrangements would be implemented:
  - + Access from McPherson Road to South Tacoma Road would be closed, with an alternative route via Johnson Road and Gavenlock Road to maintain access to businesses along McPherson and South Tacoma roads
  - + Access to businesses along South Tacoma Road south of its intersection with the Pacific Highway would be maintained during operating hours and work associated with the proposed upgrade carried out outside operating hours where possible
  - + Access from the Pacific Highway to South Tacoma Road would be closed to allow for the construction of the proposed roundabout and its approaches south of bridges, with alternative access provided via Johnson and Gavenlock roads
  - + South Tacoma Road would be restricted to one lane under the bridge over Wyong

River with traffic signals provided at each approach

- + Temporary removal of on-street parking along the Pacific Highway through the town centre. People would be required to use the short term parking spaces within the proposed upgraded Rose Street car park or alternative on-street parking provisions along Alison Road and Rankens Circuit
- + Work at the Cutler Drive intersection would be staged or carried out at night to ensure it remains open to traffic at all times
- During stage 1c, the following access arrangements would be implemented:
  - + Howarth Street would be closed to northbound traffic, with vehicles required to use the new bus layover area on Howarth Street or Panonia and River roads
- During stage 2, the following access arrangements would be implemented:
  - + Traffic would be switched onto the completed northbound bridge over Wyong River to allow for demolition of the existing bridge over Wyong River
  - + South Tacoma Road would be restricted to one way under the bridge over the Wyong River
  - + Closure of Panonia and River roads to allow the demolition of the existing road bridge over the Wyong River and road work on both roads, with alternative routes provided via Rose Street and Church Street, respectively
  - + Construction works at the intersections of the Pacific Highway and local roads (Church Street, Bakers Lane, Alison Road, Robley Lane and Anzac Avenue) would be staged to ensure that no more than one road closure occurs at a time and that viable alternative routes are identified and implemented
- During stage 3, the following access arrangements would be implemented:
  - + The southbound bridge over the Wyong River would be constructed and traffic would continue to use the completed northbound bridge
  - + Traffic between Johnson Road and the Wyong River would be reduced from four to two lanes to direct two-way traffic across the northbound bridge over Wyong River
  - + Between Panonia and River roads and north of Anzac Avenue, two lanes of traffic would be increased to four lanes through the Wyong town centre along the completed carriageways
  - + North of Anzac Avenue, the traffic would be reduced to two lanes on the completed northbound carriageway to allow the construction of the southbound carriageway from north of Anzac Avenue to the northern limit of the proposal corridor.

### **6.2.6 Bus services**

A number of changes to bus operations and bus stops are likely to be required during construction, including:

- The existing northbound bus stop north of South Tacoma Road would be permanently

removed in stage 2 of the construction strategy

- Temporary relocations of bus stops along the proposal corridor would be required to accommodate the construction staging. Appropriate temporary bus stop arrangements would be identified during the detail design phase
- For stage 1 of the construction staging strategy, the existing bus layover area at Wyong station would not be operational and a temporary bus zone would be established
- The proposed eastern station commuter car park and bus layover area on the eastern side of railway would be complete in stage 1a of the construction staging strategy and the existing commuter facilities on the western side of the station decommissioned. The new eastern car park and layover area would be opened for use by commuters and bus operators in stage 1b of the construction staging strategy
- The southbound bus lane on the Pacific Highway would be removed north of the town centre (just south of North Road) in stage 1 of the construction strategy.

The new bus stops would be operational in the following stages of the construction strategy:

- North of Johnson Road, the northbound bus stop would be operational from stage 2 and the southbound bus stop would be operational from stage 3 of the construction strategy
- Between Alison Road and Robley Lane the southbound bus stop would be operational from stage 2 and the northbound bus stop would be operational from stage 3 of the construction strategy
- North of North Road, the northbound bus stop would be operational from stage 3 of the construction strategy
- North of Cutler Drive, the northbound bus stop would be operational from stage 2 of the construction strategy.

### **6.2.7 Pedestrians and cyclists**

The following key pedestrian provisions would be made for the proposed construction staging arrangements:

- During all stages of construction, designated paths for pedestrians between the town centre and Wyong station would be maintained at all times
- During stage 1 of the construction staging strategy, pedestrian access to the station would be via the signalised intersection at Church Street
- During stage 1a of the construction staging strategy, a temporary pedestrian crossing would be provided on Howarth Street about 100 metres south of Rose Street to maintain existing pedestrian access to Wyong station until new access routes are constructed
- During stages 2 and 3 of the construction staging strategy, construction of footpaths would be staged to maintain pedestrian access to retail precinct at all times.

During all stages of construction, cyclists would be required to share traffic lanes or use available road shoulders as per the existing arrangement.

### **6.2.8 Commuter parking**

The existing commuter car park would be relocated during the early works, minimising the impact on commuters throughout the proposed construction period. During construction the following changes would be made for commuter car park arrangements and access:

- Commuters would be required to park on the eastern side of the railway line and the upgraded Rose Street car park from stage 1 of the construction staging strategy, with the closure of the existing commuter car park on the western side of the railway line
- Northbound traffic on Howarth Street would not have access to Rose Street in stage 1c of the construction staging strategy. Northbound traffic on Howarth Street accessing the upgraded Rose Street commuter car park would be detoured via Warner Avenue and Ithome Street.

During construction on street parking along the Pacific Highway through the Wyong town centre would be temporarily removed for various stages of work. Alternative on street parking is available in the retail precinct along Alison Road, Rankens Circuit and Hely Street. These on street parking provisions were observed to have available capacity to accommodate the additional vehicles currently parking along the Pacific Highway.

### **6.2.9 Traffic management**

The design of the proposal and associated construction staging would be developed to maintain existing road capacity throughout the construction phase, minimising the restrictions to existing traffic movements where possible. The number of traffic switches would be minimised to reduce the impacts and disruption to general traffic.

## **6.3 Operational impacts**

### **6.3.1 Mid-block volume capacity**

The volume-capacity ratio is a transport planning concept used for the strategic analysis of the required number of lanes of mid-block road sections. The capacity is an assumed parameter, adjusted down to account for capacity reduction at intersections. It is to be noted that the traffic capacity of the Pacific Highway is determined by intersections rather than mid-block sections.

Table 6-1 summarises the volume and volume-capacity ratio on the Pacific Highway at three key locations. The traffic volumes in Table 6-1 represent two hour traffic volumes. The volume-capacity assessment for the site north of Cutler Drive was carried out outside the limit of the proposed upgrade.

Analysis of the mid-block volume capacity shows that the proposed upgrade would be required by 2021 to address the capacity issues identified along the Pacific Highway corridor through the Wyong town centre.

Table 6-1: Forecast mid-block capacity

Location	Direction	AM peak				PM peak			
		Traffic volume (veh)	Volume capacity ratio	Traffic volume (veh)	Volume capacity ratio	Traffic volume (veh)	Volume capacity ratio	Traffic volume (veh)	Volume capacity ratio
		2021 – do nothing		2021 - upgrade		2021 – do nothing		2021 - upgrade	
Pacific Highway, south of Church Street	Northbound	1810	0.75	1950	0.41	2100	0.88	2210	0.46
	Southbound	2490	1.04	2790	0.58	2490	1.04	2750	0.57
Pacific Highway, south of Cutler Drive	Northbound	1510	0.63	1440	0.30	2290	0.95	2220	0.46
	Southbound	1970	0.82	1940	0.40	1760	0.73	1790	0.37
Pacific Highway, north of Cutler Drive	Northbound	1420	0.59	1310	0.55	2200	0.92	2050	0.85
	Southbound	2090	0.87	2040	0.85	1730	0.72	1800	0.75
Pacific Highway, south of Church Street		2031 – do nothing		2031 - upgrade		2031 – do nothing		2031 - upgrade	
	Northbound	1900	0.79	2120	0.44	2360	0.98	2390	0.50
	Southbound	2740	1.14	3140	0.65	2890	1.20	3020	0.63
Pacific Highway, south of Cutler Drive	Northbound	1580	0.66	1660	0.35	2500	1.04	2490	0.52
	Southbound	2110	0.88	2170	0.45	2060	0.86	1970	0.41
Pacific Highway, north of Cutler Drive	Northbound	1460	0.61	1550	0.65	2330	0.97	2320	0.97
	Southbound	2200	0.92	2240	0.93	2000	0.83	1970	0.82

Location	Direction	AM peak				PM peak			
		Traffic volume (veh)	Volume capacity ratio	Traffic volume (veh)	Volume capacity ratio	Traffic volume (veh)	Volume capacity ratio	Traffic volume (veh)	Volume capacity ratio
Pacific Highway, south of Church Street		2041 – do nothing		2041 - upgrade		2041 – do nothing		2041 - upgrade	
	Northbound	2160	0.90	2320	0.48	2640	1.10	2600	0.54
	Southbound	2940	1.23	3530	0.74	3340	1.39	3390	0.71
Pacific Highway, south of Cutler Drive	Northbound	1760	0.73	1750	0.36	2770	1.15	2680	0.56
	Southbound	2170	0.90	2370	0.49	2270	0.95	2250	0.47
Pacific Highway, north of Cutler Drive	Northbound	1610	0.67	1590	0.66	2610	1.09	2540	1.06
	Southbound	2290	0.95	2510	1.05	2170	0.90	2180	0.91



### 6.3.2 Intersection performance

#### Intersection options assessment

SMEC carried out an assessment of options identified for the upgrade of the intersections within the proposal corridor. This options assessment was conducted for forecast traffic volumes for the future years for AM, PM and weekend peak periods. The following scenarios were modelled for the options assessment:

- Do nothing
- Concept design options
- Preferred concept design options with Warnervale Link Road.

It is to be noted that predicting traffic volumes beyond 10 to 15 years is considered highly unreliable. Therefore, the preferred options were selected based on the operation in 2031 and checked against the forecast 2041 traffic volumes. The methodology and results from this options assessment is provided in a separate Options Assessment Report.

In addition to the options assessment report, a supplementary sensitivity test was carried out for the intersection of the Pacific Highway and Rose Street under 2041 traffic volumes to determine whether the intersection operates under the three options identified, assuming that the upgraded Rose Street commuter car park is at capacity with all vehicles exiting the car park during the PM peak. Peak bus services were also included in this sensitivity test.

The purpose of this sensitivity test was to ensure that the intersection operates at an acceptable level of service and that queue lengths on Rose Street did not extend across the overbridge to Howarth Street and determine the amount of spare capacity available under 2041 traffic volumes.

The following three potential options for the intersection of Pacific Highway and Rose Street were used for the sensitivity test:

- Option A: four lane bridge, two lanes turning left, one lane turning right
- Option B: four lane bridge, one lane turning left, two lanes turning right
- Option C: three lane bridge, one lane turning left, one lane turning right.

Table 6-2 summarises the results of the sensitivity test. The options operating at level of service E or worse or queue lengths longer than 210 metres are indicated with red shading.

**Table 6-2: Pacific Highway and Rose Street intersection operation, 2041**

Intersection option	Peak	Average delay (seconds)	Level of service	Degree of saturation	95% back of queue length (m)
Option A	AM	30	C	0.72	201
	PM	27	B	0.59	150
	WE	26	B	0.59	155

Intersection option	Peak	Average delay (seconds)	Level of service	Degree of saturation	95% back of queue length (m)
Option B	AM	37	C	0.85	255
	PM	29	B	0.63	160
	WE	32	C	0.73	189
Option C	AM	42	C	0.89	279
	PM	30	C	0.65	165
	WE	33	C	0.77	196

The results of the Pacific Highway and Rose Street sensitivity test show that options B and C both approach capacity in the 2041 AM peak period with a degree of saturation over 0.80 and queue lengths exceeding 210 metres. All three options operate at an acceptable level of service in the PM and weekend peaks. Therefore, option A was selected at the preferred intersection arrangement for the intersection of the Pacific Highway and Rose Street.

The analysis of option A and the additional sensitivity test showed that queueing on the Rose Street approach does not exceed available storage length (about 50 metres) on the bridge under 2041 traffic volumes during AM, PM and weekend peak periods. Therefore, queuing is unlikely to encroach on the circulating lanes of the roundabout on Howarth Street.

Figure 6-1 illustrates the preferred intersection arrangement for the Rose Street intersection.

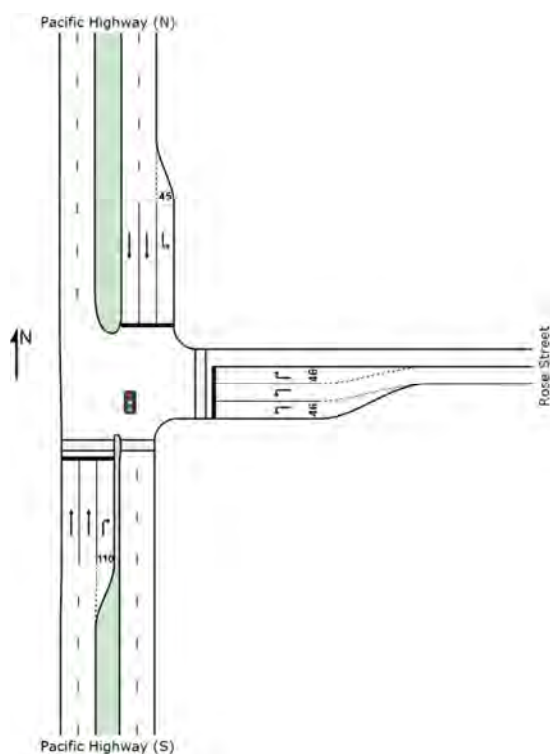


Figure 6-1: Option A – Pacific Highway and Rose Street

### Preferred upgrade option intersection performance

SIDRA Intersection was used to assess the intersection performance along the proposal corridor with the preferred upgrade options. Tables 6-3 to 6-5 summarise the results of the intersection performance assessment. The intersections operating at level of service E or worse are indicated with red shading. The results indicate that all intersections operate at a level of service of D or better for all future years.

At the intersections of Pacific Highway with North Road and Cutler Drive, there is a slight reduction in average delay between 2021 and 2031 in the AM peak. While the traffic increases overall, the average delay reduces due to a larger increase in traffic on Pacific Highway, which has lower delays.

At the intersections of Pacific Highway with Johnson Road, North Road and Cutler Drive, there is a slight reduction in average delay between 2021 and 2031 in the PM peak. While the traffic increases overall, the average delay reduces due to a larger increase in traffic on Pacific Highway, which has lower delays.

At the intersections of Pacific Highway with North Road and Cutler Drive, there is a slight reduction in average delay between 2021 and 2031 in the weekend peak. While the traffic increases overall, the average delay reduces due to a larger increase in traffic on Pacific Highway, which has lower delays.

The preferred intersection upgrade options were also modelled for all future years with the traffic volumes forecast for the construction of the proposed Warnervale Link Road, to confirm that the proposed intersection upgrades within the proposal corridor operate at an acceptable level with the introduction of the Warnervale Link Road, north of the proposal corridor and identify potential capacity issues resulting from the construction of the Link Road.

Table 6-3: Future intersection operation with preferred upgrade option, AM peak

Intersection	Year	Average delay (seconds)	Level of service	Degree of saturation	95% back of queue length (m)	Level of Service with Warnervale Link Road
Pacific Highway / Johnson Road	2021	16	B	0.55	141	B
	2031	18	B	0.65	185	B
	2041	21	B	0.82	277	D
Pacific Highway / McPherson Road	2021	12	A	0.51	32	A
	2031	13	A	0.57	41	B
	2041	14	A	0.64	53	B
Pacific Highway / Church Street	2021	19	B	0.62	174	B
	2031	22	B	0.73	230	B
	2041	26	B	0.82	287	D
Pacific Highway / Rose Street	2021	23	B	0.60	156	B
	2031	24	B	0.62	164	B
	2041	25	B	0.72	201	D
Pacific Highway / Anzac Avenue	2021	21	B	0.49	124	B
	2031	22	B	0.53	135	C
	2041	24	B	0.59	157	C
Pacific Highway / North Road	2021	14	B	0.44	106	B
	2031	14	B	0.45	108	B
	2041	14	B	0.53	136	B
Pacific Highway / Cutler Drive	2021	19	B	0.53	138	B
	2031	18	B	0.56	146	B
	2041	19	B	0.67	195	C

Table 6-4: Future intersection operation with preferred upgrade option, PM peak

Intersection	Year	Average delay (seconds)	Level of service	Degree of saturation	95% back of queue length (m)	Level of Service with Warnervale Link Road
Pacific Highway / Johnson Road	2021	18	B	0.69	205	B
	2031	17	B	0.78	266	B
	2041	23	B	0.87	353	F
Pacific Highway / McPherson Road	2021	13	A	0.57	31	B
	2031	13	A	0.56	33	B
	2041	15	B	0.68	47	C
Pacific Highway / Church Street	2021	22	B	0.56	149	B
	2031	23	B	0.61	165	B
	2041	26	B	0.68	191	B
Pacific Highway / Rose Street	2021	21	B	0.49	113	B
	2031	21	B	0.50	121	B
	2041	21	B	0.57	141	B
Pacific Highway / Anzac Avenue	2021	22.8	B	0.5	135	C
	2031	25	B	0.57	145	C
	2041	26	B	0.62	163	E
Pacific Highway / North Road	2021	17	B	0.51	125	B
	2031	17	B	0.51	129	B
	2041	17	B	0.56	146	B
Pacific Highway / Cutler Drive	2021	12	A	0.57	142	A
	2031	12	A	0.57	145	A
	2041	11	A	0.6	153	B

Table 6-5: Future intersection operation with preferred upgrade option, weekend peak

Intersection	Year	Average delay (seconds)	Level of service	Degree of saturation	95% back of queue length (m)	Level of Service with Warnervale Link Road
Pacific Highway / Johnson Road	2021	17	B	0.59	160	B
	2031	15	B	0.65	182	B
	2041	16	B	0.67	191	C
Pacific Highway / McPherson Road	2021	11	A	0.47	25	A
	2031	13	A	0.56	33	B
	2041	13	A	0.58	39	B
Pacific Highway / Church Street	2021	21	B	0.55	142	B
	2031	22	B	0.64	180	B
	2041	23	B	0.70	209	B
Pacific Highway / Rose Street	2021	20	B	0.42	97	B
	2031	21	B	0.50	120	B
	2041	22	B	0.55	140	B
Pacific Highway / Anzac Avenue	2021	18	B	0.42	99	B
	2031	18	B	0.48	117	B
	2041	24	B	0.62	168	C
Pacific Highway / North Road	2021	12	A	0.39	86	A
	2031	11	A	0.42	92	B
	2041	12	A	0.48	112	B
Pacific Highway / Cutler Drive	2021	17	B	0.53	133	B
	2031	15	B	0.54	138	B
	2041	16	B	0.56	147	B

The intersections of the Pacific Highway with Anzac Avenue and Johnson Road would be likely to experience unacceptable delays in the PM peak in 2041 with the introduction of the Warnervale Link Road. It is to be noted that forecasting traffic volumes more than 10 to 15 years in advance is considered highly unreliable and this assessment for 2041 was done as a check only. The operation of these intersections would need to be investigated in the design process for the Watanoobi Link Road.

The turn bays at the signalised intersections on the Pacific Highway were assessed under



2041 traffic volumes to determine whether they are adequate for accommodating the 95<sup>th</sup> percentile back of queue lengths for the left and right turning movements from the Pacific Highway. Table 6-6 summarises the results.

**Table 6-6: Turn bay lengths and 95<sup>th</sup> percentile back of queue lengths, 2041**

Intersection	Approach, movement	Turn bay length (m)	95 <sup>th</sup> percentile back of queue length (m)		
			AM peak	PM peak	Weekend
Pacific Highway / Johnson Road	Southbound, right	110	110	94	65
Church Street	Northbound, left	50	13	7	13
	Southbound, right	60	29	16	17
Rose Street	Northbound, right	110	104	54	55
	Southbound, left	50	28	21	12
Anzac Avenue	Northbound, left	30	21	14	18
	Southbound, right	140	41	57	52
North Road	Northbound, left	60	11	4	7
	Southbound, right	120	72	61	41
Cutler Drive	Northbound, left	80	23	9	7
	Southbound, right	80	71	15	49

### 6.3.3 Local access

#### Retail and commercial access

The proposed upgrade results in reduced access to the following three local roads due to proposed local road closures and the construction of a central median without breaks:

- River Road Link, right turn in, right turn out not available, with the intersection converted to left-in, left-out only
- Alison Road, right turn in not available, with the intersection converted to left in only
- Bakers Lane, full closure from the Pacific Highway
- Robley Lane, right turn in not available, with the construction of a central median.

Local traffic movement changes resulting from these turn closures are described in Table 6-7.

**Table 6-7: Local traffic movement changes**

Intersection	Movement removed	Alternative access routes	Detour distance (km)
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Intersection	Movement removed	Alternative access routes	Detour distance (km)
Pacific Highway at River Road / Panonia Road	Right turn in coming from north on the Pacific Highway	Via Church Street, Alison Road and Hope Street	1.4
		Via Anzac Avenue and Hope Street	1.5
		Via Rose Street, Howarth Street and Panonia Road	1.1
Pacific Highway at River Road / Panonia Road	Right turn out to head south on the Pacific Highway	Via Church Street	1.5
		Via Panonia Road, Howarth Street and Rose Street bridge	1.7
Pacific Highway at Alison Road	Right turn in coming from north on the Pacific Highway	Via Anzac Avenue and Hely Street	0.4
		Via Church Street and Margaret Street	0.6
		Via North Road and Hely Street	0.6
		Left-turn in via U-turn at proposed Pacific Highway / McPherson Road roundabout	1.6
Pacific Highway at Bakers Lane	All vehicle entry from the Pacific Highway	Via Alison Road and Rankens Circuit	0.3
Pacific Highway at Robley Lane	Right turn in coming from north on the Pacific Highway	Via Anzac Avenue, Church Street and Margaret Street	0.6
		Left turn in via U-turn at proposed Pacific Highway / McPherson Road roundabout	0.7

Commercial and retail properties that have existing driveway access directly onto the Pacific Highway would be restricted to left-in / left-out access only under the proposed upgrade, due to the introduction of a central median.

The impacts on retail and commercial access resulting from the proposal would be offset by the improved travel times and speeds along the Pacific Highway corridor through the Wyong town centre.

### Residential access

Access to residential properties would not be impacted as a result of the proposed upgrade and could potentially be improved by reduced travel times resulting from the additional capacity provided by the proposal.

### Parking

The proposal includes substantial changes to the commuter car parking arrangements around Wyong station. The existing long term commuter car park provisions, on the western and eastern sides of the railway line amount to about 338 formal spaces, including 22 disabled spaces. These car parks were observed to be over capacity with about 364 vehicles parked on Tuesday 2 September 2014 and Tuesday 10 March 2015. The existing Rose Street commuter car park was substantially underutilised with only about four cars parked.

The proposal includes the extension of the Rose Street commuter car park to accommodate around 488 spaces. This parking allocation exceeds the number of vehicles currently observed to be using the existing off-street parking provisions around Wyong station.

The distance to the furthest parking spaces in the existing commuter car park on the eastern side of the railway is about 210 metres from the station stairway access. The distance to the furthest spaces in the proposed upgraded Rose Street commuter car park is about 380 metres. Therefore, a portion of the passengers currently parked in the existing commuter car parks on the eastern and western sides of the railway line would be required to walk an additional distance (up to 160 metres) to the upgraded Rose Street car park. However, the distance to the furthest spaces in the proposed upgraded Rose Street commuter car park is shorter than the furthest space of the Howarth Street overflow car park south of Warner Avenue (about 400 metres), which was observed to be at 100 per cent occupancy on 10 March 2015.

The existing arrangement includes about 143 short term on-street parking spaces along both sides of the Pacific Highway between Johnson Road and Rose Street. The proposal allows for about 120 short term on-street parking spaces, which presents a reduction of 23 on-street parking spaces within the Wyong town centre. Between Church Street and Alison Road, the short term on-street parking provisions include 45-degree rear-in angle parking. Sufficient turning space is proposed to facilitate the safe entry and exit of vehicles accessing these spaces.

#### 6.3.4 Network performance

Table 6-8 to Table 6-10 show the network performance measures for the future do nothing and proposed upgrade model scenarios in the AM, PM and weekend peaks. For the purpose of assessing the benefits of the proposal, the network performance measures presented in Table 6-7 to Table 6-9 are for the section of the model between south of Mildon Road and south of

Britannia Drive, excluding Wyong Road, which experiences substantial congestion in future years. VKT and VHT were adjusted to take into account unreleased vehicles.

The results indicate that the upgrade reduces delay and increases travel speed for all future years and all peak periods. The number of unreleased vehicles is reduced to zero vehicles in the following peaks and future years:

- 2021 in the AM, PM and weekend peaks
- 2031 in the PM and weekend peaks.

In 2041 the number of unreleased vehicles is substantially reduced as a result of the proposed upgrade.

**Table 6-8: Network performance, AM peak**

Measure	Do nothing	Upgrade
<b>2021</b>		
VKT (km)	52,783	52,289
VHT (hr)	1581	1382
Network travel speed (km/h)	33	38
Vehicles waiting to enter	368	0
Total Stops	63,217	52,123
<b>2031</b>		
VKT (km)	58,303	58,134
VHT (hr)	2084	1797
Network travel speed (km/h)	28	32
Vehicles waiting to enter	608	311
Total Stops	88,294	74,208
<b>2041</b>		
VKT (km)	64,418	63,873
VHT (hr)	2948	2385
Network travel speed (km/h)	22	27
Vehicles waiting to enter	1936	360
Total Stops	120,084	101,799

Table 6-9: Network performance, PM peak

Measure	Do nothing	Upgrade
<b>2021</b>		
VKT (km)	58,823	59,299
VHT (hr)	2387	1474
Network travel speed (km/h)	25	40
Vehicles waiting to enter	209	0
Total Stops	98,973	60,713
<b>2031</b>		
VKT (km)	65,042	66,412
VHT (hr)	4018	1992
Network travel speed (km/h)	16	33
Vehicles waiting to enter	1023	0
Total Stops	163,690	88,984
<b>2041</b>		
VKT (km)	71,097	72,939
VHT (hr)	4944	3735
Network travel speed (km/h)	14	20
Vehicles waiting to enter	2365	921
Total Stops	191,747	126,545

Table 6-10: Network performance, weekend peak

Measure	Do nothing	Upgrade
<b>2021</b>		
VKT (km)	56,277	57,272
VHT (hr)	2512	1400
Network travel speed (km/h)	22	41
Vehicles waiting to enter	549	0
Total Stops	84,162	54,407
<b>2031</b>		
VKT (km)	62,268	63,852
VHT (hr)	3153	2055
Network travel speed (km/h)	20	31
Vehicles waiting to enter	1118	0
Total Stops	105,780	87,042
<b>2041</b>		
VKT (km)	67,541	69,718
VHT (hr)	5193	3188
Network travel speed (km/h)	13	22
Vehicles waiting to enter	6092	990
Total Stops	135,204	139,655 <sup>1</sup>

Note:

1. The total number of stops increases between the do nothing and upgrade scenarios for the weekend peak due to the higher number of vehicles able to enter the modelled network in the upgrade scenario.

### 6.3.5 Travel speeds and time

Table 6-11 summarises the modelled travel time and speed on the Pacific Highway corridor between Wyong Road and Britannia Drive comparing the future do nothing and upgrade scenarios. The largest travel time savings are highlighted in green. The results show that the proposal provides travel time savings of between 40 seconds and 11 minutes and 40 seconds in the northbound direction and between 30 seconds and 14 minutes and 50 seconds in the southbound direction. During the AM peak period there is no congestion experienced in the northbound direction. Therefore, there is no noticeable improvement to the travel time in the northbound direction in the AM peak resulting from the upgrade.

**Table 6-11: Forecast peak travel time and speeds on the Pacific Highway**

Direction	Measure	AM peak		PM peak		Weekend peak	
		Do nothing	Upgrade	Do nothing	Upgrade	Do nothing	Upgrade
2021							
Northbound	Travel time (min)	7:00	7:00	14:30	7:30	11:20	7:30
	Speed (km/h)	41	41	20	38	25	38
Southbound	Travel time (min)	9:00	8:30	15:10	7:30	17:10	7:40
	Speed (km/h)	32	34	19	38	17	37
2031							
Northbound	Travel time (min)	8:00	7:20	19:10	7:30	10:10	7:20
	Speed (km/h)	36	39	15	38	28	39
Southbound	Travel time (min)	13:20	10:10	23:20	8:40	21:00	9:40
	Speed (km/h)	21	28	12	33	14	30
2041							
Northbound	Travel time (min)	11:00	7:30	14:10	7:50	15:10	7:20
	Speed (km/h)	26	38	20	37	19	39
Southbound	Travel time (min)	14:20	14:30	28:40	13:50	29:00	20:00
	Speed (km/h)	20	20	10	21	10	14

### 6.3.6 Induced traffic assessment

The impact of induced traffic is built into the process used for forecasting trip-making in the Pacific Highway corridor.

Induced traffic represents the increased traffic volumes that are observed after a new highway is opened or a previously congested highway is widened. Induced traffic is often used to support the argument that highway upgrades do not solve congestion problems because any increases in highway capacities are filled with additional traffic.



In metropolitan areas, new or widened highways attract trips that previously took other routes or travelled at other times. Improved congestion may also attract trips from public transport and trips may also be distributed to different, more distant destinations. In some cases, a new transport facility may affect the number of trips made, because trips are shortened and become easier to make.

Because SMEC used Roads and Maritime's strategic transport model as the basis for the trip matrices in the micro-simulation modelling, changes in route choice and mode choice are accounted for and the number of trips in the matrices for base case and upgrade case reflect changes in route choice and mode choice. The number of trips resulting from mode choice is likely to remain primarily unchanged, since public transport provisions in the study area are unlikely to change significantly.

## 7. MITIGATION AND MANAGEMENT MEASURES

### 7.1 Construction phase

#### 7.1.1 Property and local access

When developing a Traffic Management Plan, it is desirable to maintain pedestrian and vehicle access to adjoining properties throughout the duration of the work.

Properties impacted during construction (accesses or temporary local road closures) would be notified prior to the commencement of construction and advised to use alternative routes during the construction period (for local road closures) and consulted regarding temporary access arrangements to their properties.

#### 7.1.2 Bus services

In the case that bus stops require temporary relocation during construction, a suitable location would be identified by the contractor. Consultation with affected bus operators would be undertaken in conjunction with any temporary bus stop relocations.

#### 7.1.3 Pedestrians and cyclists

Appropriate signage and way finding facilities relating to changes to pedestrian and cyclist access during construction would be developed and implemented.

Pedestrians and cyclists are to be kept clear of work sites at all times. Construction areas would be defined by plastic pedestrian fencing or more substantial fencing in urban or shopping areas.

Temporary footpaths would be adequately signposted to indicate the direction of the footpath, be of all-weather standard, and have an unobstructed width at local constrictions no less than one metre (elsewhere at least two metres).

Crossing facilities and associated signs are to be maintained where possible. If access to an existing crossing cannot be provided, alternative facilities as close as possible to established crossing are to be provided. Crossings where traffic is flowing temporarily in the opposite direction from normal, medians, refuges or other physical devices separate lanes of traffic flowing in the same direction are to be avoided.

Safe pedestrian access to the Rose Street commuter car park would be provided for all stages of construction that involve work on the eastern side of the railway line.

Cyclists would be considered when implementing temporary traffic arrangements. For example, lanes widths and provision of shoulder width would be adequate to minimise potential conflicts between cyclists and vehicles.

Cyclists would be considered when providing lighting at night. Roadworks signs would be positioned above the head height of cyclists. Barrier boards should not be placed so that they direct cyclists away from allocated cycle paths. Adjacent to the work site, pavement surfaces would be maintained in a clean smooth state to ensure cyclist comfort and safety. The edges of temporary surfaces would be 'feathered' to remove any hazardous edges.

### 7.1.4 Traffic management

A range of mitigation and management measures would be needed to manage the impacts to traffic and transport during construction. These are:

- A construction traffic management plan would be prepared and implemented in accordance with the Traffic Control and Worksites, version 4.0 (Roads and Maritime, June 2010). The construction traffic management plan would enable the safe management of traffic, provide for the safety of construction personnel and minimise impacts on the local community. The plan would include as a minimum:
  - + Hours of haulage, which do not impose on peak periods and school drop-off and pick-up times
  - + Haulage routes, including the source locations and their access points for the site
  - + Design and construction of access points to the ancillary sites in accordance with Roads and Maritime and Council requirements
  - + Links to a community consultation plan that provides for local residents to be informed prior to and during construction activities. This could include a dedicated telephone contact line for community issues to be registered and addressed. The consultation plan would also include emergency services, bus operators, local business and other major stakeholders to inform them on changes in traffic management during construction
  - + The design of temporary works required to accommodate the heavy vehicle movements along the short sections of local roads required for access to ancillary sites
  - + Designated areas within the proposal area for heavy vehicle turning movements, parking, loading and unloading
  - + On-site parking arrangements for construction, supervisory and management personnel
  - + Sequence for implementing traffic works and traffic management devices
  - + Safety principles for construction activities, such as speed limits around the site and procedures for specific activities
  - + Induction requirements for construction, supervisory and management personnel
  - + Procedures for inspections and record keeping for maintaining traffic control measures
- For each stage of construction, detailed Traffic Control Plans would be prepared and implemented in accordance with the Traffic Control and Worksites, version 4.0 (Roads and Maritime, June 2010) by suitably qualified personnel
- Dilapidation surveys of roads around the proposal area would be undertaken prior to their use for construction as well as after construction is complete. Any damage to roads would be repaired
- Direct access at each of the ancillary facilities frontages would be provided with

adequate sight distances relating to the posted road speed. This would allow vehicles on the main road to see vehicles emerging from the ancillary facilities and would allow ample room to slow down and stop if necessary. Similarly, it would allow vehicles waiting to emerge from the site access, adequate sight distance to see approaching vehicles and determine acceptable gaps for them to enter the main road traffic

- Construction sites and ancillary facilities would generally have traffic control at the site access to manage the vehicular traffic into and out of each site and to manage pedestrian movement across the access
- All vehicles accessing a construction site or ancillary facility for the purpose of material delivery and construction works would be fitted with safety flashing lights located on the top of the vehicle and functioning reverse beepers. All operators would be licensed for the particular item of plant / equipment, and would demonstrate competence in the use of the plant / equipment as part of the site management and safety plan
- Only left-in / left-out movements would be provided at ancillary site accesses located on through-roads
- Routes used for access and haulage during construction would be developed in consultation with relevant stakeholders upon confirmation of material source and disposal locations
- Reduced temporary construction speed limits associated with traffic switches and temporary lane or road closures would be preferentially scheduled outside peak periods to reduce impacts on traffic on the road network
- A temporary parking area at designated ancillary facilities would be provided for use by construction staff
- Appropriate construction speed limits would be implemented in consultation with Roads and Maritime to facilitate safety of road users and construction personnel during construction
- Traffic management plans would specifically address night works safety issues to protect motorists and construction personnel
- Temporary accesses, ancillary site entrances and exits, road works and other traffic management measures would be designed and operated to conform with relevant road safety and Roads and Maritime requirements and would not impact upon the safety of the users of the existing road network.

## 7.2 Operational phase

### 7.2.1 Property and local access

The following mitigation and management measures would be implemented to minimise the impacts to properties and local access:

- The alternative access routes imposed by the proposal for Alison Road, Bakers Lane and Robley Lane would be communicated to the community and retail owners impacted by the changes in access arrangements

- Properties along the proposal corridor (including the Pacific Highway and local roads impacted by the proposed upgrade) would be provided with new formal access to the road network and developed in the detail design phase
- A signage strategy will be developed to guide road users to the new commuter car parking facilities and transport interchange.

### **7.2.2 *Bus services***

Changes to bus operations imposed by the proposed upgrade, including changes to the bus interchange arrangements and access to the new facility, additional and relocated bus stops and removal of the southbound bus lane on the Pacific Highway would be undertaken in consultation with the relevant bus operators.

### **7.2.3 *Pedestrians and cyclists***

The impacts on pedestrians and cyclists during operation are positive improvements to the pedestrian and cyclist network under the proposal.

### **7.2.4 *Traffic management***

The impacts on traffic management during operation are positive improvements to the network under the proposal. All traffic devices would be designed and implemented in accordance with current standards, Roads and Maritime and Council requirements.

## 8. SUMMARY OF IMPACTS AND RECOMMENDATIONS

The proposal would primarily involve the upgrade of the Pacific Highway corridor from an undivided two lane road to a divided four lane road between Johnson Road and 300 metres north of Cutler Drive.

### 8.1 Mid-block performance and impacts

Analysis of the mid-block volume capacity ratio on the Pacific Highway within the proposal corridor shows that:

- The Pacific Highway is approaching or over capacity for the majority of the do nothing future years and peaks
- The proposed upgrade of the Pacific Highway substantially reduces the volume-capacity ratio for all future years and peaks
- North of Cutler Drive, outside the proposed upgrade corridor, the Pacific Highway is approaching capacity in 2021 and 2031 in the AM and PM peak directions and is over capacity in 2041 in the AM and PM peak directions. This indicates that the section of the Pacific Highway north of Cutler Drive would need to be upgraded to four lanes to accommodate future traffic volumes.

The assessment of the volume capacity ratio show that the proposed upgrade would be required by 2021 to address the capacity issues identified along the Pacific Highway corridor through the Wyong town centre.

### 8.2 Intersection performance and impacts

The analysis of the intersection performance with the proposed upgrade show that all of the intersections within the proposal corridor operate at an acceptable level of service of D or better during the AM, PM and weekend peak periods for all future years.

Based on current growth forecasts, the introduction of the Warnervale Link Road may result in the intersections the Pacific Highway with Anzac Avenue and Johnson Road reaching capacity in the PM peak in 2041.

### 8.3 Other operational impacts

The proposed upgrade results in reduced access to the following three local roads due to proposed local road closures and the construction of a central median without breaks:

- River Road Link, right turn in, right turn out not available, with the intersection converted to left-in, left-out only
- Alison Road, right turn in not available, with the intersection converted to left in only
- Bakers Lane, full closure
- Robley Lane, right turn in not available, with the construction of a central median.

Commercial and retail properties that have existing driveway access directly onto the Pacific Highway would be restricted to left-in / left-out access only under the proposed upgrade, due



to the introduction of a central median.

The impacts on retail and commercial access resulting from the proposal would be offset by the improved travel times and speeds along the Pacific Highway corridor through the Wyong town centre.

The proposal includes substantial changes to the commuter car parking arrangements around Wyong station. The proposal includes the closure of the existing eastern and western car parks at Wyong station and the extension of the Rose Street commuter car park to accommodate around 488 spaces. The parking allocation proposed for the upgrade exceeds the number of vehicles currently observed to be using the existing off-street parking provisions around Wyong station.

The distance for pedestrians walking to commuter car parking areas is increased in the proposed upgrade. However, pedestrian facilities would be upgraded to facilitate pedestrian access and improve connectivity to the Rose Street commuter car park.

## 8.4 Preliminary construction traffic impacts

Truck movements during the construction phase are likely to increase by an average of 40 and up to 80 truck movements per day during peak construction periods. The heavy and light vehicle movements associated with the construction phase would be confirmed during the detailed design and construction planning stages of the proposal. Based on the traffic surveys conducted on the Pacific Highway corridor in February 2014, the existing traffic volumes are about 26,000 vehicles per weekday. Therefore, the additional peak heavy vehicle movements associated with construction would be very small proportionally and would not have a substantial impact on existing heavy vehicle volumes.

Under the construction staging strategy developed by SMEC, access to existing properties along the Pacific Highway corridor and local access to areas surrounding the corridor would be maintained during all stages of construction. The Rose Street overbridge would be open to traffic during all stages of construction, to ensure emergency access to the eastern side of the railway line is maintained. This is an essential part of the construction staging strategy since Rose Street overbridge provides the only flood free access and the most direct route to the eastern side of the railway line.

The construction staging requires changes to access arrangements for various stages of construction. Where road closures are required, particularly for the demolition and construction of the bridge over Wyong River, appropriate alternative routes have been identified. For partial road closures, appropriate traffic management schemes would be implemented to allow safe access.

A number of changes to bus operations and bus stops are likely to be required during construction, including temporary bus stop relocations for various stages of construction. All temporary bus stop locations would be within acceptable walking distance of the existing bus stop locations.

During all stages of construction, designated paths for pedestrians between the town centre and Wyong station and pedestrian access to the retail precinct would be maintained at all times.

During all stages of construction, cyclists would be required to share traffic lanes or use available road shoulders as per the existing arrangement.

## 8.5 Recommended mitigation and management measures

In summary, the proposed mitigation and management measures are presented in Table 8-1.

**Table 8-1: Summary of mitigation and management measures**

Mitigation and management measure	Detailed design	Pre-construction	Construction	Operation
Develop a detailed Construction Traffic Management Plan		✓		
Consult with property owners impacted by access arrangement alterations	✓			✓
Design and implement a signage strategy to guide commuters to the new car parking provisions and transport interchange access	✓		✓	✓
Consultation with bus operators for relocated or removed bus stops and changed interchange and access arrangements	✓			✓
Pedestrian and cyclist access (including crossing facilities) to be maintained and separated from works areas at all times			✓	
Safe pedestrian access to the Rose Street commuter car park to be provided for all stages of construction			✓	

## APPENDIX A: COMMUTER PARKING SURVEY DATA

# Pacific Highway Upgrade through Wyong Town Centre

Commuter Parking Survey - Tuesday 2nd September 2014

