![GHD]

Traffic Assessment

Macksville Bridge Rehabilitation

Transport for NSW

14 May 2024

→ **The Power of Commitment**

Project name	REF – Macksville Bridge					
Document title	Traffic Assessment | Macksville Bridge Rehabilitation					
Project number	12608031					
File name	12608031_Traffic Assessment_Macksville Bridge Version 5.docx					
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S4	0	Olivia Lin	C. Steinbach	*Christophe Steinbach*	M. Kiejda	*[signature]*	14/05/24
.							
.							
.							

GHD Pty Ltd | ABN 39 008 488 373

GHD Tower, Level 3, 24 Honeysuckle Drive

Newcastle, NSW, 2300, Australia

T (02) 4979 9999 | **F** +61 2 9475 0725 | **E** ntlmail@ghd.com | **ghd.com**

The Power of Commitment

Contents

Table index

Figure index

Appendices

This report has been prepared by GHD for Transport for NSW and may only be used and relied on by Transport for NSW for the purpose agreed between GHD and Transport for NSW as set out in this report.

GHD otherwise disclaims responsibility to any person other than Transport for NSW arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

1   Introduction

1.1   Background

GHD Pty Ltd (GHD) has been commissioned by Transport for NSW (TfNSW) to assess the impact of single-lane and full (two-lane) bridge closures associated with each stage of Macksville Bridge rehabilitation. The proposed bridge rehabilitation stages (and indicative durations) include:

– Stage 1: Pier strengthening/concrete durability works over a nine month period.
– Stage 2: Steel rehabilitation over an eight week period.
– Stage 3: Bridge painting over a 30 month period.
– Stage 4: Deck repairs.

1.2   Purpose of this report

The purpose of this report is to identify the impacts on traffic flow on the Macksville Bridge (and associated side roads) in proximity to the Macksville Bridge, associated with each stage of bridge rehabilitation, and to identify potential mitigation measures to ensure partial or full bridge closures do not adversely impact traffic circulation on the immediate road network, including within Macksville.

1.3   Site location

The Macksville Bridge on which the rehabilitation work will be carried out is on Giinagay Way, Macksville, about 1.3 kilometres west of the new Macksville Bridge on the Pacific Highway, as shown in Figure 1.1.

Figure 1.1   Macksville Bridge Site Location

Source: Six Maps modified by GHD

1.4　Scope and limitations

The scope of the project is summarised below:

– Traffic surveys include intersection turning count surveys at six intersections located along Giinagay Way (undertaken by sub-consultant NTPE) and traffic volume surveys (provided by TfNSW).
– Review of TfNSW traffic signal (SCATS) data for the intersections of Wallace and Partridge streets along Giinagay Way.
– Review of TfNSW's indicative traffic management plans for managing single-lane closures of the Macksville Bridge.
– Traffic operational modelling includes the development of a "base year" model reflecting existing conditions and a scenario reflecting single-lane (bridge closure) operations.
– Traffic impact assessment includes single lane and full bridge closures of Macksville Bridge, considering the impact on local and intra-regional traffic movements (including light and heavy vehicles and active transport users).
– Where appropriate, identify mitigation measures to minimise the transport impacts associated with the closure of the Macksville Bridge.

This traffic impact assessment is a desktop assessment only (no site visit included) and is based on collected traffic surveys, open-source data (e.g., TfNSW crash database) and plans provided by TfNSW.

1.5　Methodology overview

1.5.1　Traffic surveys

Peak hour turning counts were undertaken at six key intersections near the Macksville Bridge to assess the potential impact of single and full bridge closures (and as an input to traffic modelling and impact assessment).

Further details of surveys collected for the study are detailed in section 3.2 and section 3.3, and also shown in Appendix A (queue length surveys) and Appendix B (intersection counts).

1.5.2　Traffic modelling

Traffic modelling has been undertaken to estimate the potential traffic impacts of single-lane bridge closures.

Noting TfNSW's proposed use of temporary traffic signals on bridge approaches (during single-lane operation) and the proximity of traffic signals at the intersection of Giinagay Way and Wallace Street (within 100 m of the bridge), a microsimulation modelling methodology was developed in which the potential impact of queue spill back from the Wallace Street signals to the temporary signals on the Macksville Bridge could be estimated.

Pending the outcome of the traffic modelling, a revised traffic management approach may be recommended to TfNSW, in which traffic queues can safely clear the bridge and thus minimise road user and worker safety.

The traffic modelling approach (discussed further in Section 4) included the development of an existing year (2023) model reflecting peak hour conditions, before which scenario models were developed to replicate single land operation on the Macksville Bridge. To ensure confidence in the modelling approach, the existing year model was validated.

1.5.3　Traffic Impact Assessment

A traffic impact assessment has subsequently been undertaken to assess the potential traffic impacts of single-lane and full bridge closures associated with each stage of the Macksville Bridge Rehabilitation, including as it relates to each road user group (e.g., local light vehicle traffic, heavy vehicle traffic, bus services and active transport users), as well as for local and intra-regional trips. Further, the potential impact on emergency services' access and access to key community infrastructure (e.g., schools and health services) was also considered.

1.6 Report structure

The traffic assessment is structured as follows:

- Section 1   Introduction
- Section 2   Existing Conditions
- Section 3   Traffic Modelling
- Section 3   Traffic Impact Assessment
- Section 4   Summary and Conclusions.

1.7 Key traffic modelling terminology

A glossary of technical terms for traffic modelling is set out in Table 1.1 to assist in interpreting this document.

Table 1.1   Key traffic modelling terminology

Technical Term	Definition
Assignment	The path that vehicles take through the model network.
Base Traffic Model	A model calibrated and validated with respect to observed traffic data.
Calibration	Modifying model parameter values until model outputs replicate observed data within a specified tolerance level.
Convergence	A condition where no or a negligible number of vehicles can achieve a reduced travel time by choosing an alternate route.
Level of Service	A qualitative measure for ranking operating conditions or service quality based on service measures, such as speed, travel time, delay, density, freedom to manoeuvre, interruptions, comfort, and convenience (Austroads, 2017).
Matrix Estimation	Manual manipulation of a demand matrix to match observed values.
Model Analysis Period	The period that traffic performance is to be analysed over.
Model Seed	A number is utilised in a model package's random number generator to vary model outputs stochastically. This is also referred to as Random Seed.
Modelling Methodology	They are also called Modelling Types. It is the type of analysis a model undertakes: Strategic, Mesoscopic, Hybrid or Microscopic.
Temporal Period	A predefined unit of time.
Traffic Demand	The volume of traffic assigned to a traffic zone rather than completing a journey.
Traffic Distribution	The locations where journeys start and end.
Validation	An evaluation of the model's ability to predict behaviour through comparisons of information not used in the calibration process.
Vehicle Class	The categorisation of a set of vehicles based on a common attribute.
Warm-Up Period	An additional period before the Model Analysis Period to enable the model to be pre-populated with traffic.
Cool-Down Period	An additional period after the Model Analysis Period to enable an assessment of the decay in traffic.

2 Existing conditions

2.1 Existing road network

2.1.1 Road hierarchy

Functional road classification involves the relative balance of mobility and access functions. TfNSW defines four levels in a typical functional road hierarchy, ranking from high mobility and low accessibility to high accessibility and low mobility. These road classes are:

Arterial Roads – generally controlled by TfNSW, typically no limit in flow and designed to carry vehicles long distances between regional centres.

Sub-Arterial Roads – can be managed by either TfNSW or the local council. Typically, their operating capacity ranges between 10,000 and 20,000 vehicles per day, and they aim to carry through traffic between specific areas in a subregion or provide connectivity from arterial road routes (regional links).

Collector Roads – provide connectivity between local roads and the arterial road network and typically carry between 2,000 and 10,000 vehicles daily.

Local Roads – provide direct access to properties and the collector road system and typically carry between 500 and 4,000 vehicles daily.

A summary of the key roads near the proposed subdivision is provided below.

2.1.1.1 Giinagay Way

Giinagay Way (refer to Figure 2.1) is a collector road. A short-left turn lane of 40 m was provided to facilitate the northbound traffic to turn left on River St, and a short right turn lane was provided for southbound traffic to facilitate turning right to Wallace St.

In proximity to the Macksville Bridge, Giinagay Way has the following key features, as outlined in Table 2.1.

Table 2.1   Giinagay Way key features

Feature	Description
Carriageway	An undivided carriageway with a single travel lane in either direction with a double barrier road centre line.
Parking	There is a provision of a few parking spaces on both sides of the road in proximity to the bridge to the southern side; however, it is not provided along the extent of the Giinagay Way Road. There are insufficient parking spaces on the northern side of the bridge.
Speed Limit	50 km/h
Pedestrian Facilities	Provision of pedestrian facilities on the southern side of the bridge. There is a facility for pedestrians only on the western side of the northern part of the bridge.
Bicycle Facilities	No dedicated facilities
Public Transport	The bus stop is 40 m south of the Macksville Bridge for boarding service for the people travelling north. A bus stop is located approximately 300 m south of the bridge for alighting service for people travelling from north to south. There is not any bus stop located in the vicinity to the north of the bridge. This indicates that people must come south of the bridge for boarding and alighting purposes.

Figure 2.1   Giinagay Road looking north towards the bridge

Source: Google Streetview (Sept 2022)

2.1.1.2   River St (West)

River St (West) (refer to Figure 2.2) is a collector road intersecting Giinagay Way Road at a priority-controlled intersection with a left-in and left-out configuration provision.

River St (West) has the following key features, as outlined in Table 2.2.

Table 2.2   River St (West) key features

Feature	Description
Carriageway	An undivided carriageway with a single travel lane in either direction.
Parking	On-street parking is available on both sides of River St (West).
Speed Limit	50 km/h
Pedestrian Facilities	Footpaths are provided on both sides of River St (West).
Bicycle Facilities	No dedicated facilities
Public Transport	There is not any bus stop at River St (West).

Figure 2.2   Giinagay Road looking towards River Street

Source: Google Streetview (Oct 2016)

2.1.1.3 River St (East)

River St (East) (refer to Figure 2.3) is a collector road intersecting Giinagay Way Road at a priority-controlled intersection with a left-in and left-out configuration provision.

River St (East) has the following key features, as outlined in Table 2.3.

Table 2.3   River St (West) key features

Feature	Description
Carriageway	An undivided carriageway with a single travel lane in either direction with a double barrier centre line.
Parking	On-street parking is available on both sides of River St (East).
Speed Limit	50 km/h
Pedestrian Facilities	Footpaths are provided on both sides of River St (West).
Bicycle Facilities	No dedicated facilities
Public Transport	There is not any bus stop at River St (East).

Figure 2.3   Giinagay Road looking towards River Street

Source: Google Streetview (Sept 2022)

2.1.1.4 Wallace Street

Wallace St (refer to Figure 2.4) is a collector road intersecting Giinagay Way Road at a signal-controlled intersection.

Wallace St between Giinagay Way and Princess St has the following key features, as outlined in Table 2.4.

Table 2.4   Wallace Street in between Giinagay Way and Princess Street key features

Feature	Description
Carriageway	An undivided carriageway with a single travel lane in either direction with a double barrier centre line.
Parking	On-street parking is available on both sides of Wallace St.
Speed Limit	40 km/h
Pedestrian Facilities	Footpaths are provided on both sides of River St (West).
Bicycle Facilities	No dedicated facilities
Public Transport	There is not any bus stop in this section.

Figure 2.4   *Wallace Street looking towards Giinagay Way*

Source: Google Streetview (May 2018)

2.1.1.5   Winifred Street

Winifred Street (refer to Figure 2.5) is a collector road intersecting Giinagay Way Road at a priority-controlled intersection.

Winifred Street between Giinagay Way and Princess St has key features, as outlined in Table 2.5.

Table 2.5   *Winifred Street in between Giinagay Way and Princess Street key features*

Feature	Description
Carriageway	An undivided carriageway with a single travel lane in either direction.
Parking	On-street parking is available on both sides of Winifred Street.
Speed Limit	50 km/h
Pedestrian Facilities	Footpaths are provided on both sides of Winifred Street.
Bicycle Facilities	No dedicated facilities
Public Transport	A bus stop is approximately 10 m west of the Giinagay Way Road.

Figure 2.5   *Winifred Street looking towards Giinagay Way*

Source: Google Streetview (Oct 2016)

2.1.1.6 Partridge Street

Partridge Street (refer to Figure 2.6) is a collector road intersecting Giinagay Way Road at a priority-controlled intersection.

Partridge Street has the following key features, as outlined in Table 2.6.

Table 2.6   Partridge Street key features

Feature	Description
Carriageway	An undivided carriageway with a single travel lane in either direction.
Parking	On-street parking is available on both sides of Partridge Street.
Speed Limit	50 km/h
Pedestrian Facilities	No proper footpaths are provided on both sides of Partridge Street.
Bicycle Facilities	No dedicated facilities
Public Transport	There is no bus stop at Partridge Street.

Figure 2.6   Partridge Street looking towards Giinagay Way

Source: Google Streetview (Feb 2010)

2.1.1.7 Ferry Street

Ferry Street (refer to Figure 2.7) is a collector road intersecting Giinagay Way Road at a priority-controlled intersection.

Ferry Street has the following key features, as outlined in Table 2.7.

Table 2.7   Ferry Street's key features

Feature	Description
Carriageway	An undivided carriageway with a single travel lane in either direction with a double barrier centre line in the middle.
Parking	On-street parking is available near the intersection on the southern side of Partridge Street.
Speed Limit	50 km/h
Pedestrian Facilities	No proper footpaths are provided on both sides of Partridge Street.
Bicycle Facilities	No dedicated facilities
Public Transport	There is no bus stop at Ferry Street.

Figure 2.7   Partridge Street looking towards Giinagay Way

Source: Google Streetview (Feb 2010)

2.1.1.8   Bellevue Drive

Bellevue Drive (refer to Figure 2.8) is a local road intersecting Giinagay Way Road at a priority-controlled intersection.

Bellevue Drive has the following key features, as outlined in Table 2.8.

Table 2.8   Bellevue Drive key features

Feature	Description
Carriageway	An undivided carriageway with a single travel lane in either direction.
Parking	On-street parking is unavailable on either side of the Bellevue Drive near the intersection.
Speed Limit	50 km/h
Pedestrian Facilities	No footpaths are provided on both sides of Bellevue Drive.
Bicycle Facilities	No dedicated facilities
Public Transport	There is no bus stop at Bellevue Drive.

Figure 2.8   Bellevue Drive looking towards Giinagay Way

Source: Google Streetview (Sept 2022)

2.2 Public and active transport

Footpaths are provided on both sides of the road to the south of the Macksville Bridge, with a footpath continuing on the western side of Macksville Bridge towards Ferry Street on the northern bank of the Nambucca River. Paths are also located either side and parallel to the Nambucca River (and under the northern and southern abutments of the Macksville Bridge), connecting to the footpath across the Macksville Bridge.

Bus services that travel across the Macksville Bridge are as follows (see Figure 2.9) include:

–   Bus route 358: This bus route connects Macksville with Bellingen via Nambucca Heads. This is a Monday-to-Saturday service.

–   Bus route 356: This bus route connects Macksville with Scotts Head and Grassy Head. This is a Monday-to-Friday service with less frequency.

–   Bus route 360: This bus route connects Coffs Harbour with Macksville via Urunga and Nambucca Heads. The service is provided from Monday to Saturday, with no service on Sunday.

–   Bus routes 351 and 352: This route provides service from Macksville to Bowraville via Rodeo Dr or Wilson Rd. The service is provided for 6 days, from Monday to Saturday.
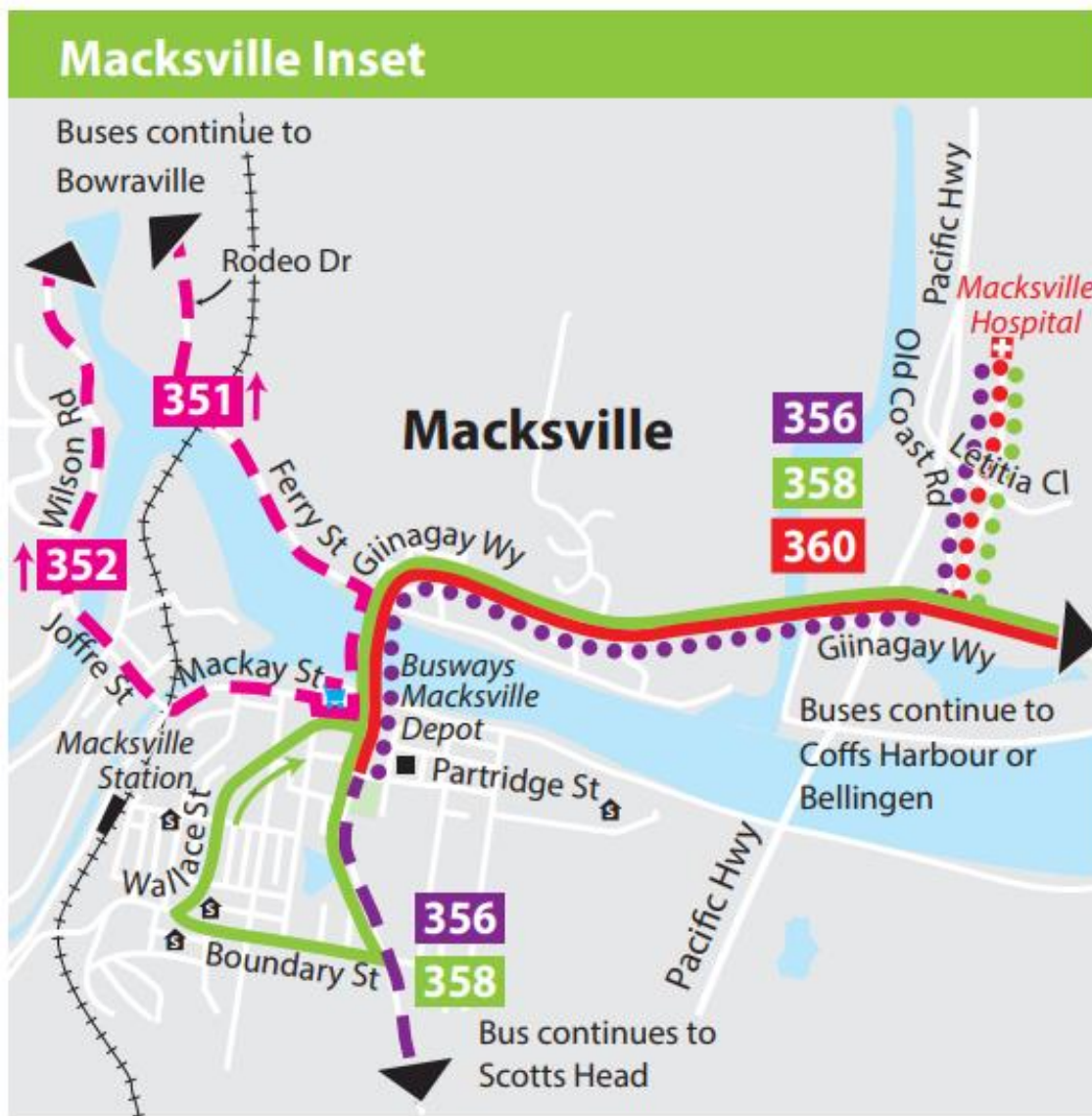
Figure 2.9   Bus routes map on Macksville

2.3   Crash data

A review of crash data provided by the TfNSW Centre for Road Safety website has been undertaken, as shown in Figure 2.10. The review is based on five years (2017-2021) for roads within the vicinity of the bridge, indicates that:

– Two crashes have been reported on Giinagay Way south to the bridge, categorised as casualties. One is at the River St/Giinagay Way intersection, and the other is at the Wallace St/Giinagay Way intersection.

– One crash was reported north of the bridge on Giinagay Way at the bend, categorised as severe injury.

– There has been one crash reported at Wallace St of minor category near the Wallace St/Giinagay Way intersection and one to the east of River St approximately 500 m away from the intersection of the casualty category.

Of five crashes reported near the bridge, apart from one severe injury category, all the others were minor and non-casual.
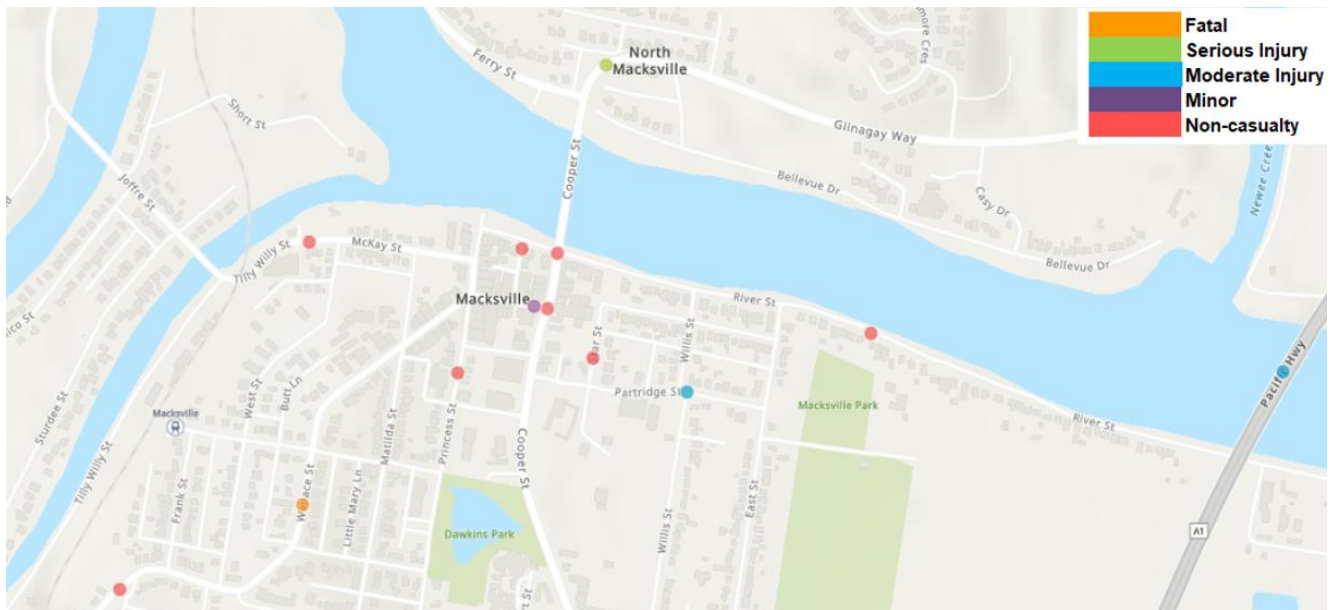
Figure 2.10   Crash Statistics (2017-2021)

Source: NSW Centre for Road Safety

3 Traffic data collection

3.1 Extent of traffic model study area

The extent of the traffic model area is presented in Figure 3.1. TfNSW agreed upon the traffic model area during the project's planning phase.

Figure 3.1   Extent of traffic microsimulation base model area

Source: Metro Map,2023 (modified by GHD)

3.2 Classified traffic counts

To identify the existing traffic volumes near the Macksville Bridge, weekday AM and PM peak period turning movement surveys were undertaken at the six intersections by Northern Transport Planning and Engineering on Wednesday 21 June 2023. A summary of the surveyed intersections is as follows. Locations of the surveyed intersections are shown in Figure 3.1. The detailed survey data can be found in Appendix B.

1. The intersection of Giinagay Way Road and Bellevue Drive (Priority)
2. The intersection of Giinagay Way Road and Ferry Drive (Priority)
3. The intersection of Giinagay Way Road and River Street (Priority)
4. The intersection of Giinagay Way Road and Wallace Street (Signals)
5. The intersection of Giinagay Way Road and Winifred Street (Priority)
6. The intersection of Giinagay Way Road and Partridge Street (Signals)

The traffic counts were undertaken in 15-minute intervals for the following times to coincide with peak periods of activity at the above-listed intersections:

– 7:00 am – 10:00 am
– 3:00 pm – 6:00 pm

3.3 Supplementary traffic data

Additionally, traffic intersection queue length surveys were obtained on 21 Jun 2023 at the following intersections between 3:00 and 4:00 pm. The numbering is aligned with those in Figure 3.1. Detailed queue length data can be found in Appendix A.

1. The intersection of Giinagay Way Road and Bellevue Drive (Priority)
2. The intersection of Giinagay Way Road and Ferry Drive (Priority)
3. The intersection of Giinagay Way Road and River Street (Priority)
4. The intersection of Giinagay Way Road and Wallace Street (Signals)
5. The intersection of Giinagay Way Road and Winifred Street (Priority)
6. The intersection of Giinagay Way Road and Partridge Street (Signals)

The queue length survey findings reveal that no significant queuing has been observed at any intersections that exhibited some degree of queueing: Giinagay Way and River Street, Giinagay Way and Partridge Street.

3.4 Peak hour analysis

Table 3.1 presents the overall traffic counts for the morning peak period, between 7:00 – 10:00 am, and the evening peak period, between 3:00 – 6:00 pm. Notably, the traffic count during the evening peak exceeds that of the morning peak. Therefore, it was decided that only the PM peak would be modelled.

Table 3.1   Total survey traffic counts

Period	AM Total traffic counts	Period	PM Total traffic counts
7:00-8:00 am	2979	3:00-4:00 pm	5250
8:00-9:00 am	4607	4:00-5:00 pm	5066
9:00-10:00 am	4587	5:00-6:00 pm	3580

Figure 3.2 displays the overall vehicle count for both directions, specifically for the southbound direction. The comprehensive traffic data reveals that the highest traffic point during the afternoon occurs between 3:00 pm and 4:00 pm for both directions. However, the peak for the south bound direction specifically is observed between 3:45 pm and 4:45 pm. Considering the potential for queues extending back to the bridge and the anticipated challenges in traffic management by the Traffic Management Plan (TMP), it was chosen to focus on testing the most intense southbound peak hour instead of analysing both directions simultaneously.

Peak Hour Analysis

	3:00-4:00 PM	3:15-4:15 PM	3:30-4:30 PM	3:45-4:45 PM	4:00-5:00 PM	4:15-5:15 PM	4:30-5:30 PM	4:45-5:45 PM	5:00-6:00 PM
Total Traffic Counts (Both Direction)	5250	5248	5192	5191	5066	4797	4423	4066	3580
Total Traffic Counts (SB)	2204	2146	2164	2232	2158	2031	1903	1718	1589
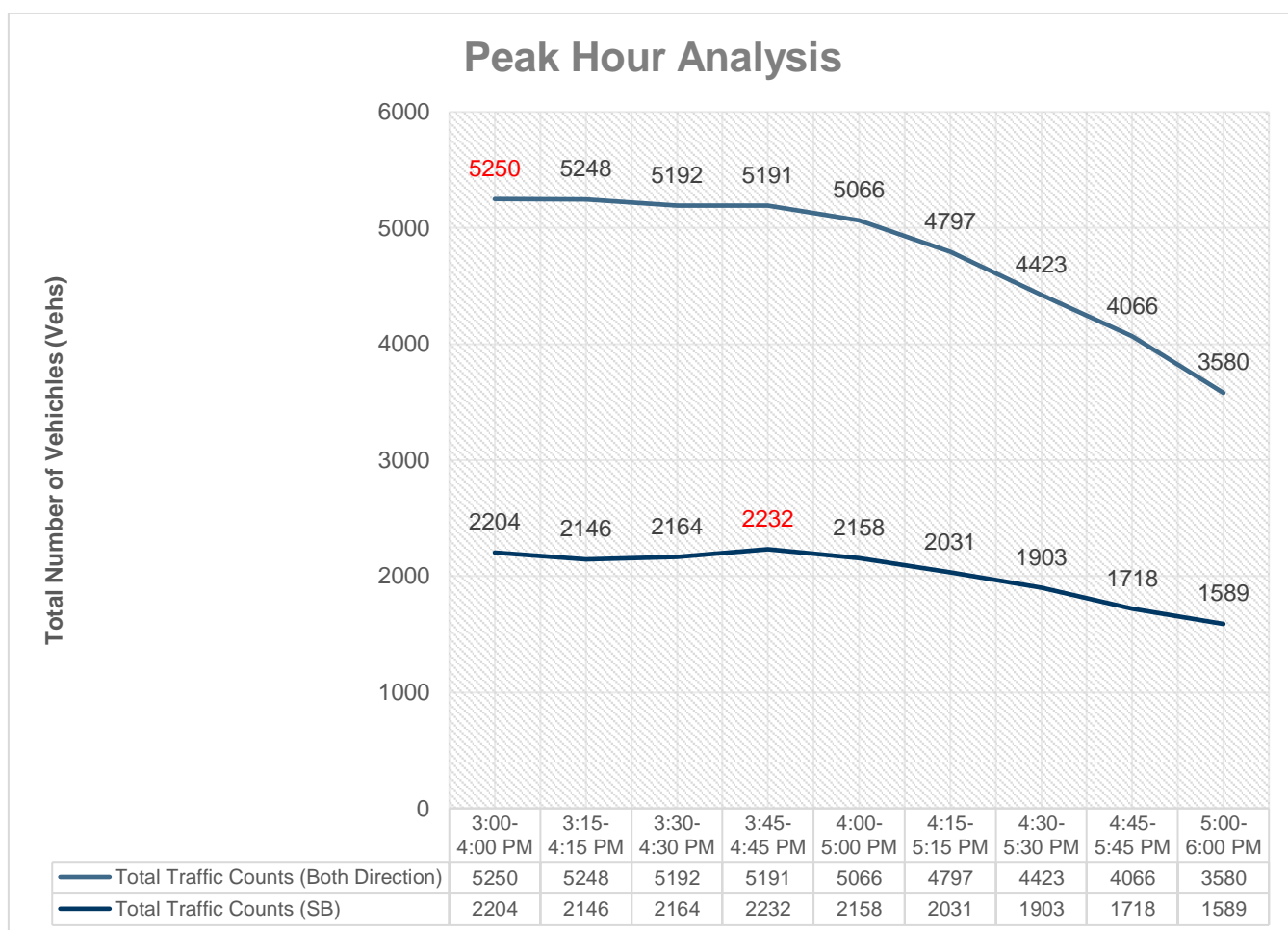
Figure 3.2   Peak Hour Analysis for PM peak

Therefore, the observed traffic network peak hours were identified as the following:

– Afternoon peak: 3:45 pm – 4:45 pm

3.5   Existing traffic movement

The existing PM peak hour traffic movement is displayed in Figure 3.3. The traffic movement has been balanced and used for the calibration process of the base year models.
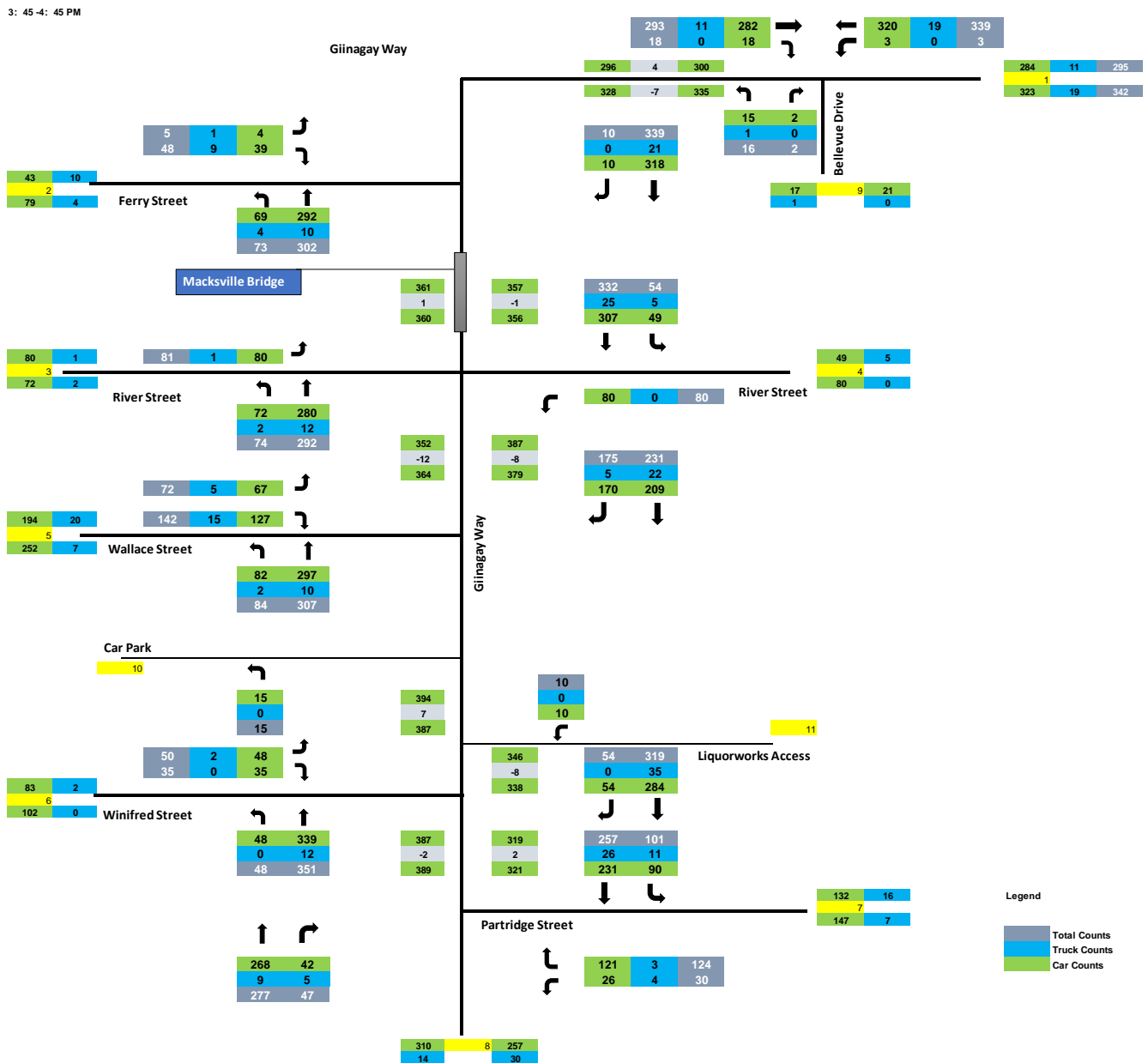
Figure 3.3   *PM peak hour survey traffic volumes*

4 Model methodology

4.1 Introduction

The Macksville Bridge microsimulation model has been developed using VISSIM (version 2022-02), a traffic modelling suite developed by the PTV Group. VISSIM visually represents traffic operations while accounting for route choice variability.

4.2 Base model development methodology

The overall traffic modelling methodology is presented in Figure 4.1, including:

- Network development is detailed in Section 4.3
- Demand development is detailed in Section 4.4
- Model Calibration and Validation in Section 4.5 and Section 4.6
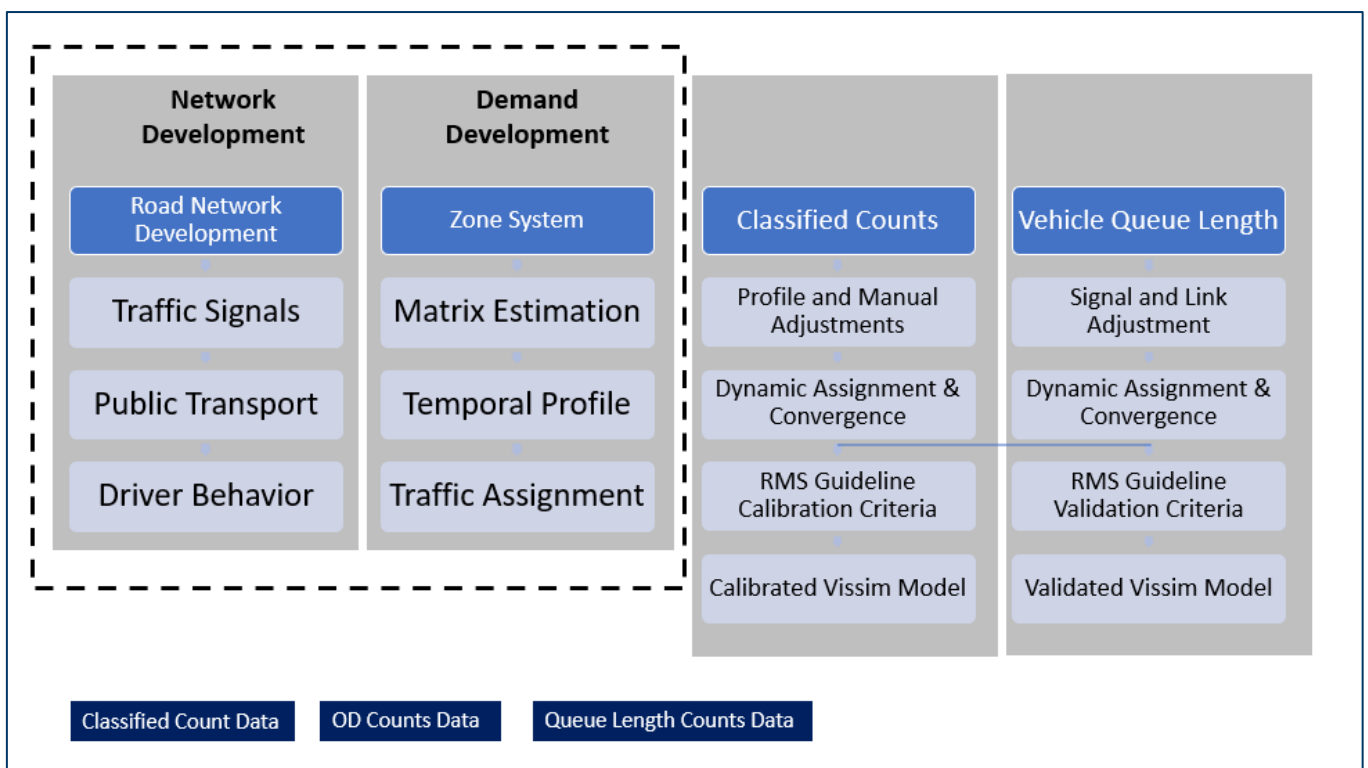
Figure 4.1   Overall Base Model development

4.3 Base year model development

4.3.1 Road network

The model road network was developed utilising a combination of aerial imagery in Metro Map. The road network extent modelled in VISSIM is presented in Figure 4.2.
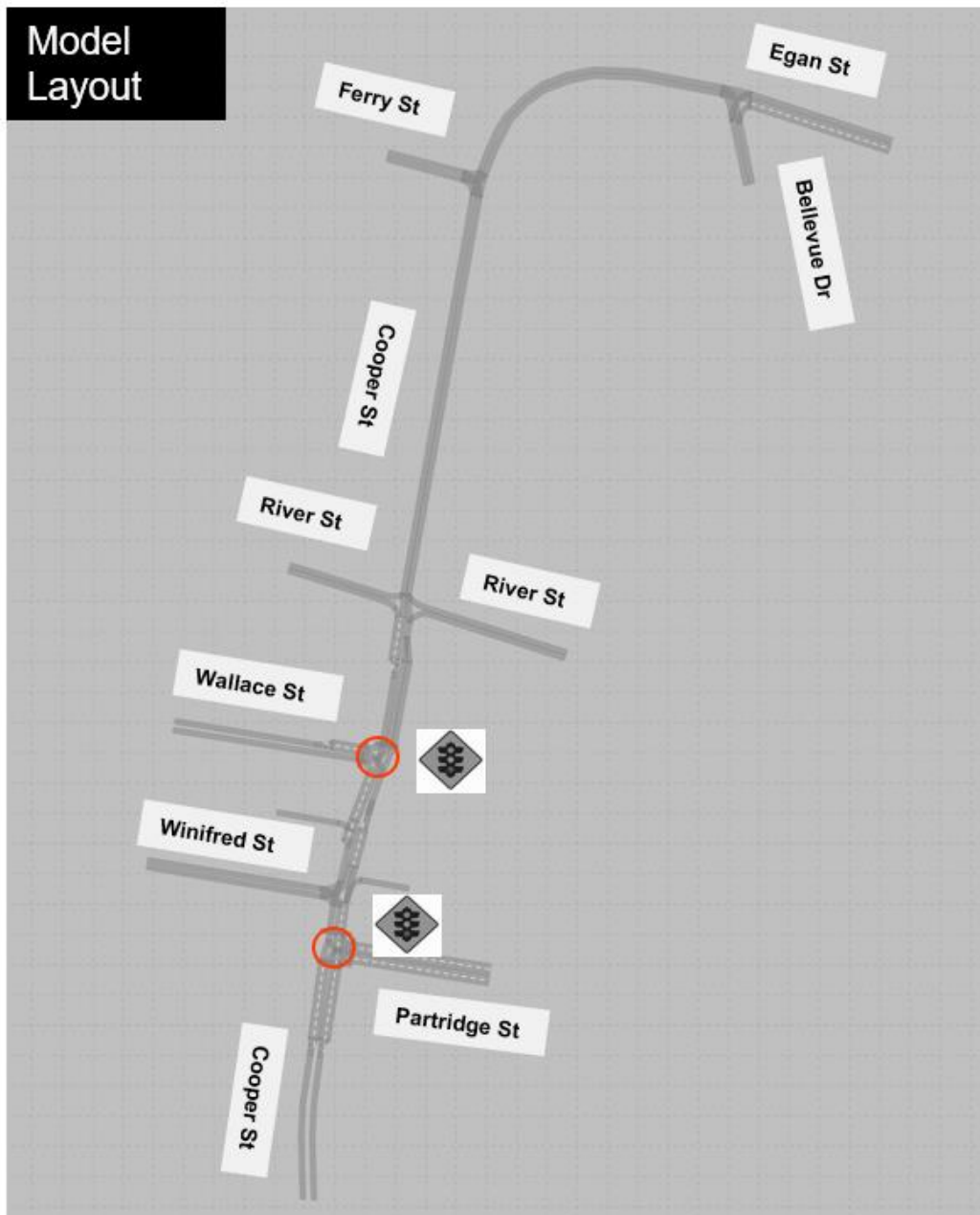
Figure 4.2   *Extent of Base Model*

The base model includes the following road network elements:

–   Number of lanes shown on aerial imagery
–   Lane width measured on aerial imagery
–   The speed limits from Google Maps Street View
–   Lane marking at the intersection from Google Map Street View

4.3.2   Traffic signal operations

The average cycle and phase timings have been calculated and coded according to the Intersection Diagnostic Monitor (IDM) data from SCATS, which TfNSW collates on 21 June 2023.

The following signalised intersections contained in the study area were coded:

Intersection of Giinagay Way Road and Wallace Street (TCS 2563). The signal phasing at the intersection is shown in Figure 4.3.
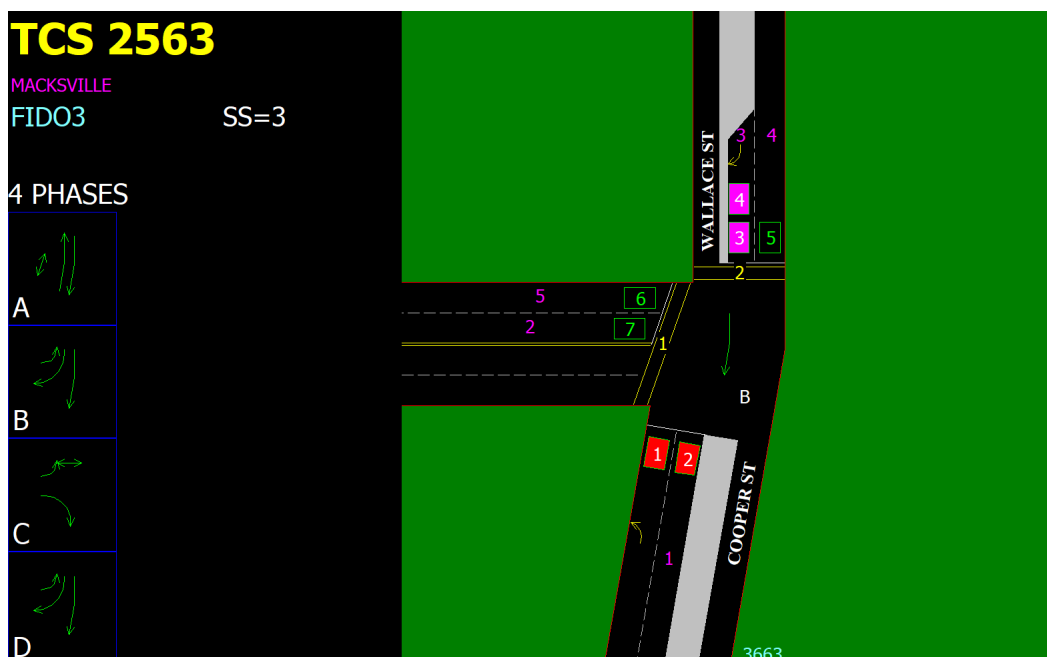
Figure 4.3   *Intersection of Giinagay Way Road and Wallace Street signal phasing*

1. Intersection of Giinagay Way Road and Partridge Street (TCS 3663). The signal phasing at the intersection is shown in Figure 4.4.
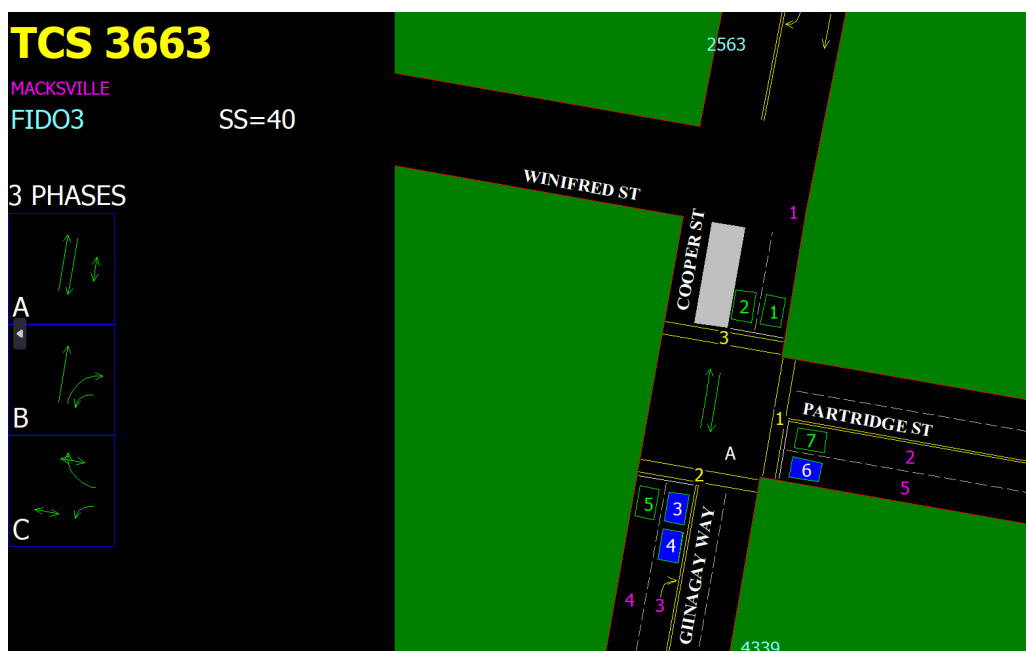
Figure 4.4   *Intersection of Giinagay Way Road and Partridge Street signal phasing*

Table 4.1 shows the following phase sequences and cycle times, identified for the PM peak period and subsequently modelled. The detailed signal timings can be found in Appendix E.

Table 4.1   *Phases and cycle times modelled*

Peak hour	Intersection	Phase sequence	Cycle time (secs)
PM Peak	Giinagay Way Road/ Wallace Street	A, B, C	71
PM Peak	Giinagay Way Road/ Partridge Street	A, B, C	80

4.3.3   Bus routes

Buses generally exhibit reduced speeds compared to general traffic, often operating in a stop-and-go manner. As a result, it is crucial to integrate public transport services into a traffic model to validate traffic congestion across the road network accurately.

The following commuter bus services have been incorporated into the traffic model:

– Bus 351: Macksville to Bowraville via Rodeo
– Bus 352: Macksville to Bowraville via Wilson Rd
– Bus 358: Macksville to Bellingen via Nambucca Heads & Urunga
– Bus 360: Macksville to Coffs Harbour via Nambucca Head & Toormina

4.3.4   Driver behaviour

In the development of the base traffic model, the following driver behaviour components were incorporated:

– Desired speed decisions: This component was applied at initiating road links where the speed limit differed from the upstream link. It aimed to ensure vehicles adhered to the specified speed limit using VISSIM's default distribution profile.
– Reduced speed areas: This feature was implemented on curved links where vehicles needed to slow down to make a turn. Most turning movements were modelled with speeds set at 25 km/h for heavy trucks and 30 km/h for cars within the network.
– Conflict areas and priority rules: Priority and conflict areas were defined to accurately represent road priorities and gap acceptance parameters on the network. These components ensured that modelled vehicles observed the same road priorities as in the real-world network, including situations such as Give Way intersections, and they also prevented vehicles from queuing across intersections.
– VISSIM driving behaviour parameters: It is worth noting that default VISSIM driving behaviour parameters were retained for consistency and standardisation.

4.4   Traffic demand development

4.4.1   Model zone system

A total of 11 traffic zones were included in the base traffic model, covering the entire extent of the study area. Table 4.2 summarises every zone number and its corresponding link to which it is connected.

Table 4.2   Summary of model zoning structure

Zone	Description	Traffic Zone	Description
1	Giinagay Way (North)	7	Partridge Street
2	Ferry Street	8	Cooper Street/Giinagay Way (South)
3	River Street (West of Cooper St)	9	Bellevue Drive
4	River Street (East of Cooper St)	10	Car park 1
5	Wallace Street	11	Car park 2
6	Winifred Street	-	-

The location of traffic zones is shown in Figure 4.5.
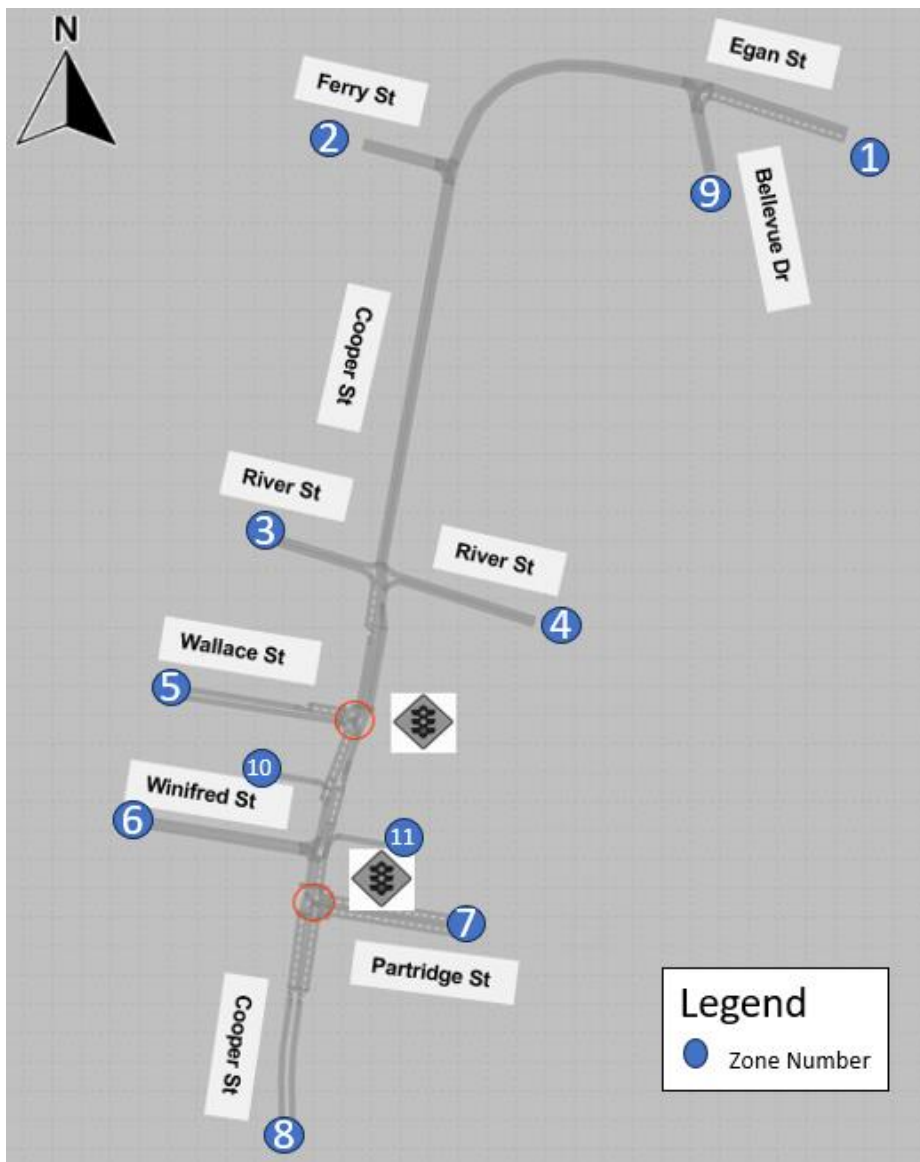
Figure 4.5   Zone Systems

4.4.2   Matrix estimation

Traffic demand development was undertaken by:

– Producing intersection turning movement diagrams using classified intersection count data and attributing intersection volumes and volume differences at road mid-block locations to trip ends for external zones.

– Producing estimated matrices by calculating the percentage of turning movements in each direction at each intersection and then evenly distributing them to each destination (heavy vehicles having their dedicated trip matrices). Additionally, manual adjustments were made to eliminate any unreasonable traffic routes. The resulting matrix has been input into VISSIM for model assessment. It represents the overall network demand, including light and heavy vehicles but excluding public buses.

4.4.3   Temporal profile

Warm-up and cool-down periods allow the road network to load and unload traffic at both the beginning and end of the peak periods. One hour is allocated to each warm-up and cool-down period. Without survey data outside these model periods, 100% has been used to estimate warm-up demand. This factor is applied to the model peak hour demand to determine the warm-up demand. The intersection count data for the down period is available. Therefore, a factor of 78% was used.

4.5 Model calibration and validation

4.5.1 Overview

Traffic model calibration involves the complex task of tailoring a model to mimic specific local circumstances. GHD will calibrate and validate these models according to the TfNSW Traffic Modelling Guidelines (TMG). This ensures the models effectively depict the current (2023) traffic conditions, ensuring their suitability for evaluating proposed bridge rehabilitation scenarios.

The calibration process will entail utilising survey traffic data, while the validation of the model will be confirmed through a comparison between observed and modelled traffic queue lengths.

4.5.2 Model convergence

For calibration of the microsimulation models to be assessed, model convergence is required to ensure the model reflects similar results from run to run, indicative of the model reaching a converged solution.

Within VISSIM, model convergence has been reached per TfNSW Traffic Modelling Guidelines (TMG). The guideline stipulates for:

"The proportion of links in the entire network with flows changing less than five per cent from the previous iteration".

This has been obtained for each seed run within the VISSIM base models, and the output of the convergence files is supplied together with the VISSIM models.

4.5.3 Model stability

The VISSIM microsimulation modelling was undertaken using a dynamic assignment, allowing vehicle movements to be based upon an associated cost calculated from the model. These determined path and cost files are based on the software's 'seed' number.

To illustrate model sensitivity, the 'seed' number is typical within all microsimulation models. The five different "seed" numbers are assessed to mimic the variability representative for a weekday. The five different "seed" values are shown in Table 4.3.

All volumes and model outputs have been based on an average of five different "seed" runs.

Table 4.3   Seed values used to assess model stability

Number	Seed Value
1	86524
2	86624
3	86724
4	86824
5	86924

4.5.4 Model calibration

4.5.4.1 Calibration criteria

After developing the PM base year models in 2023, GHD conducted a calibration process using intersection turning movement data. The PM peak model covers three hours, with one peak hour designated as the evaluation period. To assess the model's accuracy in replicating the observed network behaviour, GHD employed the flowing evaluation measures:

1.   Percentage Root Mean Square Error (RMSE) of total modelled flows compared to observed counts
2.   Scatter plot analysis of modelled flows versus observed counts, along with regression statistics (R^2 values)

3. GEH -statistic, a Chi-S squared statistic, considers relative and absolute differences between modelled flows and observed counts

The formula used to compute the GEH statistic is as follows:

$$GEH = \sqrt{\frac{(F_{mod} - F_{obs})^2}{0.5\,(F_{MOD} + F_{obs})}}$$

Where:

$$F_{mod} = Modelled\ flow$$

$$F_{obs} = Observed\ counts$$

The formula used to compute the RMSE is as follows:

$$\%RMSE = \frac{\sqrt{\dfrac{\sum(F_{mod} - F_{obs})^2}{N - 1}}}{(\dfrac{\sum F_{obs}}{N})} \times 100$$

Where:

$$F_{mod} = Modelled\ flow$$

$$F_{obs} = Observed\ counts$$

$$N = Number\ of\ counts$$

According to the guidelines, the following calibration statistics must be met, as shown in Table 4.4.

Table 4.4   Traffic Model Calibration Criteria

Calibration and Validation Criteria	TfNSW Guidelines/ requirements	PM Results
Calibration Criteria: Weekday PM peak		
Percentage of turn volumes with GEH less than 5	85%	100%
Percentage of link and turn volumes with GEH less than 10	100%	100%
Scatter Plot	Coefficient of determination (R^2) greater than 90%	Over all observations
RMSE	RMSE less than or equal to 30	Over all observations

Source: Traffic Modelling Guidelines, Road and Maritime Service, NSW, 2013

4.5.4.2   Calibration results

The turning movement calibration results for PM peak hours can be found in Appendix C. The results indicate that 100% of 36 turning movements have achieved GHD of less than 5 of base year models, well within the calibration thresholds recommended by TfNSW traffic modelling guidelines.

Additionally, the modelled data versus observed data are plotted graphically, which can be found in Appendix C. The R^2 value of the line of best fit for the model is well above the minimum 0.90 value stipulated in the guideline. This result also confirms that the model is well-calibrated and fit for purpose.

OFFICIAL

4.5.5   Base year model validation

A second measurement is required against another set of observed data independent of the dataset utilised for model calibration to confirm further that the model replicates observed conditions. In this instance, GHD has validated the model by comparing the average queue length between observed traffic data and modelled results displayed in Appendix D. Results indicate that the modelled average queue length is similar to the observed average queue length. This denotes that the base year models are reasonably validated and suitable for the transport assessment.

4.5.6   Base year results

This document mentions that VISSIM modelling has been undertaken for the Macksville area. The results in this section reflect existing operations only, forming the base for forecasted scenarios to be tested. Table 4.5 summarises network results derived from the base year model.

Table 4.5   *Base year network performance*

Indicator	Unit	2023 PM Base
Traffic demand input	No.	1384
Vehicle kilometres travelled (VKT)	km	816
Vehicle hours travelled (VHT)	hr	28
Vehicle delay	sec	31
Vehicle active	No.	28
Vehicle arrived	No.	1308
Latent demand	No.	0
Network speed	Km/h	29

Table 4.6 provides a summary of intersection delays and level of service thresholds. Table 4.7 presents the intersection results derived from the base year model. The detailed intersection LOS can be found in Appendix F.

Table 4.6   *Intersection LOS results and average delay (sec) criteria*

Level of Service (LoS)		
LoS	Minimum Delay (sec)	Maximum Delay (sec)
LoS A	0	14
LoS B	15	28
LoS C	29	42
LoS D	43	56
LoS E	57	70
LoS F	71+	-

Table 4.7   *PM Base model intersection results*

Intersection	Intersection Type	2023 PM Base – Intersection delay (seconds)
Giinagay Way/Bellevue Dr	Priority	3
Giinagay Way/Ferry St	Priority	3
Giinagay Way/River St	Priority	4
Giinagay Way/Wallace St	Signals	29
Giinagay Way/Winifred St	Priority	3
Giinagay Way/ Partridge St	Signals	11

4.5.7   Queue observed on the southern side before Wallace Street

Figure 4.6 illustrates the average and maximum queue length during the base year model. It indicates a notable queue at the Giinagay Way/Wallace Street intersection, with a maximum length of approximately 78 meters southbound toward River Street. Should further demand be added to the network, whether from background traffic growth or additional traffic based on a lane closure, it is likely that the intersection would struggle to operate with the existing geometry.

Overall, the base year modelling concludes adequate intersection and road performance.
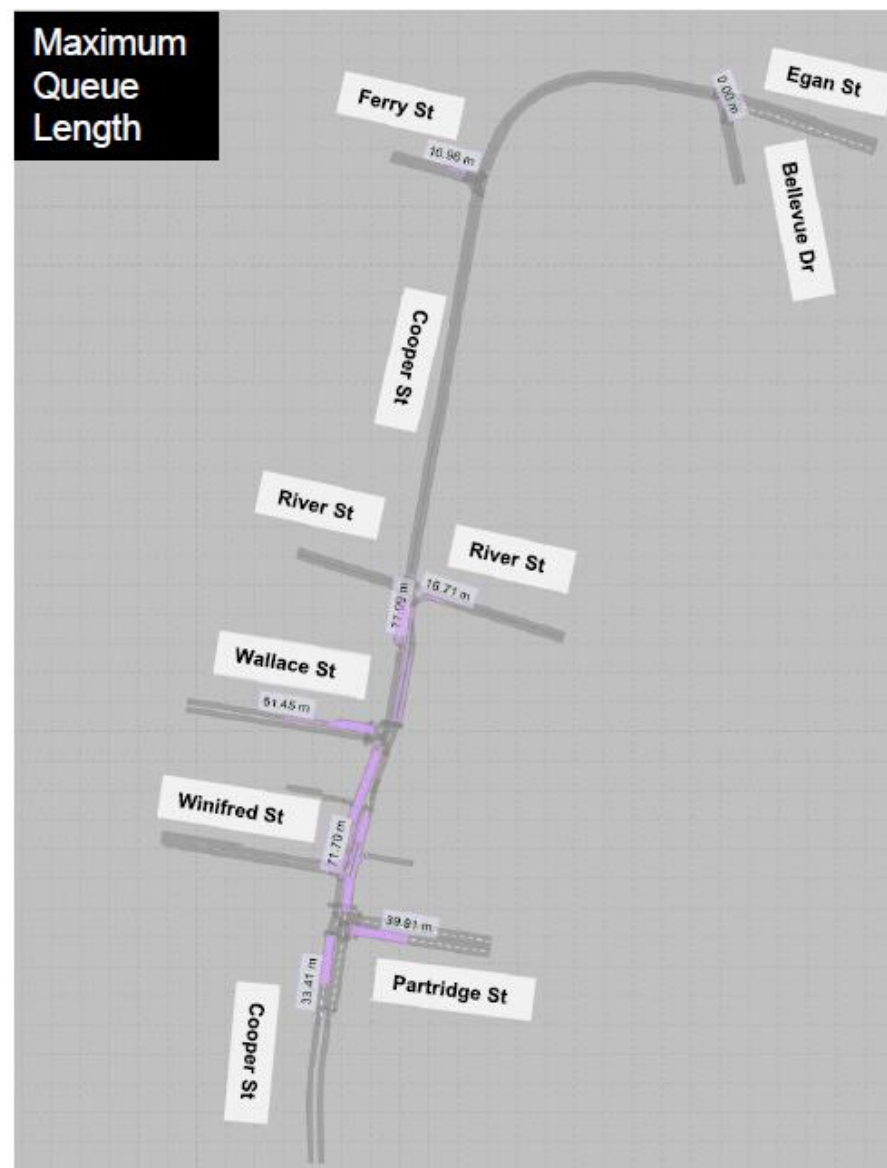
Figure 4.6   Base year model average queue length and maximum queue length

4.6 Lane closure scenarios

Traffic management plans for the Macksville Bridge rehabilitation were completed by Men and Women at Work (MAWAW). These were simplified into two lane closure scenarios (reflecting various work types), subsequently modelled in VISSIM for the PM peak. Figure 4.7 (below) summarises each bridge rehabilitation stage and the two simplified traffic modelling scenarios developed.
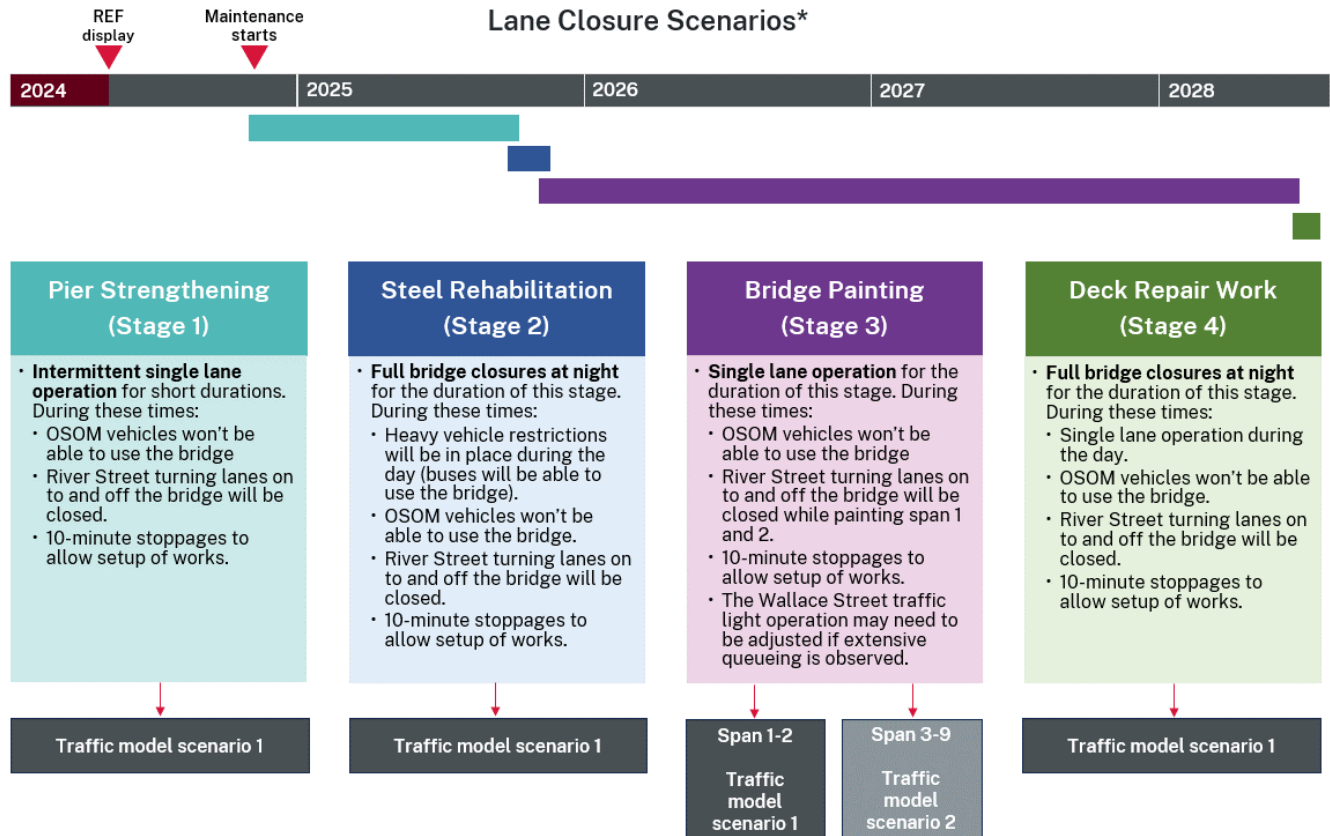
Figure 4.7   List of Scenarios (Top – Project Stages, Bottom – Scenarios modelled)

Consistent with all traffic model scenarios, the operation of single lane contra-flow traffic across the Macksville Bridge to facilitate the rehabilitation works has assumed to be provided through a traffic signal arrangement, with signals located on both the northern and southern approach to the bridge (refer Figure 4.8). An indicative three phase signal was assumed for modelling purposes, with a total signal cycle time of 150 seconds (noting variability to the cycle time will occur should the signals be located close or further from the bridge).
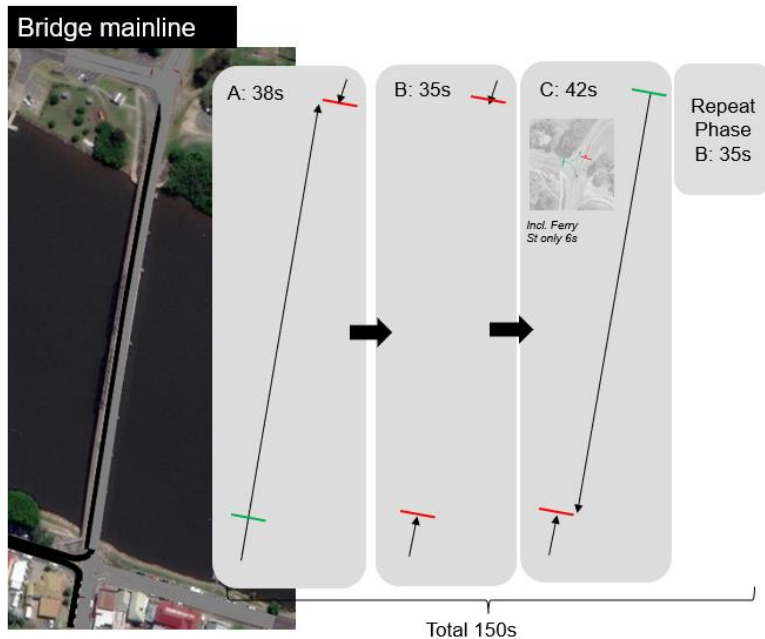
Figure 4.8   Traffic Signal Control on the north and south of the bridge (Closure Lane was highlighted in black)

The estimated green time allocation (for each traffic signal phase), accounting for the closure of one lane on the bridge, was calculated through the following equation.

$$Green\ time\ (for\ one\ lane\ closure) = \frac{Bridge\ Distance}{Posted\ Speed} + 10sec$$

4.6.1   Traffic Model Scenario 1

Scenario 1 depicts the road network during the pier strengthening, steel rehabilitation, deck repairs and painting of bridge spans 1 and 2. The assumed road network changes include:

– Enforcing a 40 km/h reduced speed limit within the work zone
– Assumed traffic growth of 2% annual from 2023 to 2027 (covering the planned activities)
– Closing the left turning lanes onto and off the southern end of the Bridge (Cooper Street) on River Street
– Redirecting traffic from the River Street West closure (left-out) to access Cooper Street via Wallace Street
– Implementing traffic signal control with queue monitoring to the north and south of the bridge (refer to Figure 4.9)

TfNSW's proposed traffic management plans for single lane operation across the bridge under this scenario are shown further in Appendix I (Single lane operation southbound, northbound, Span 1 and Span 2).

22.0 m

3.5 m

WORKZONE

10.7 m

End Terminals (Anchored to Road)
ABSORB-M Plastic Crash Cushion
5.3m long

Concrete Barrier

Type 2 Traffic Light
(Trailer Mounted)

STOP HERE
ON RED
SIGNAL
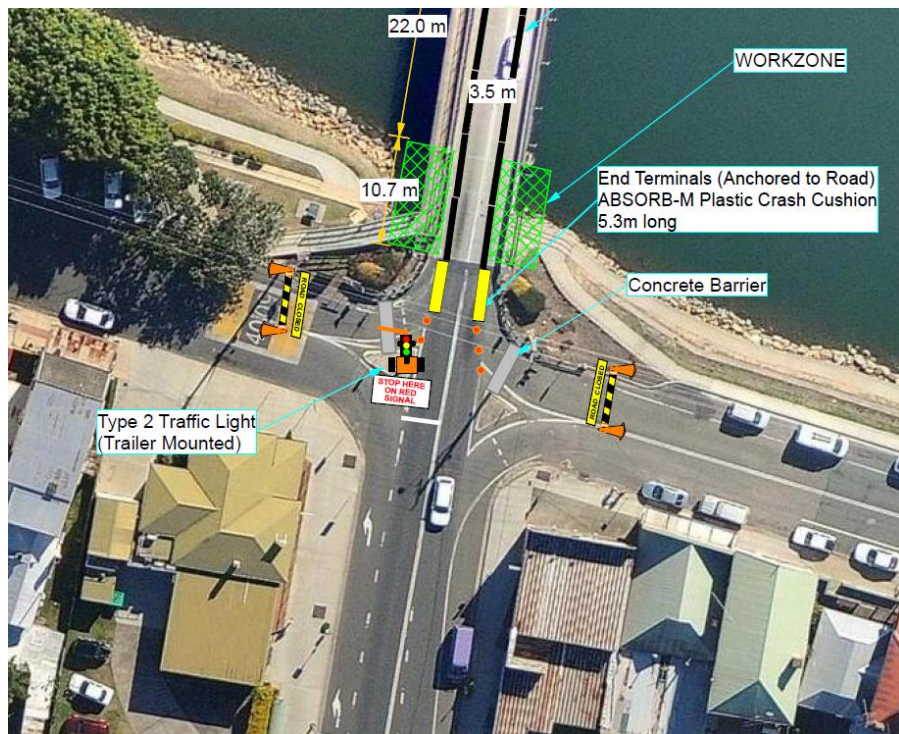
Detour route to Wallace Street (traffic signal)

Ferry St

Egan St

Cooper St

Bellevue Dr

River St

River St

Wallace St

Winifred St

Cooper St

Partridge St

Model Layout

Figure 4.9 *Scenario 1 Network changes*

4.6.2   Traffic Model Scenario 2

Scenario 2 presents the road network for painting bridge spans 3 to 9. This scenario involves the adjustment of traffic signal timings along the corridor to effectively and safely manage projected traffic demands (to 2027). The future network (as per the Traffic Management Plan) is coded in accordance with the "Macksville Centre Lane Span 3-9 painting". The assumed road network changes include:

– Implementing a 40 km/h reduced speed limit within the work zone.

– Full access in/out of River Street East and West is permitted.

– Installing traffic signal control with queue monitoring to the north and south of the bridge (refer to Figure 4.10).

TfNSW's proposed traffic management plans for single lane operation across the bridge under this scenario are shown further in Appendix I (Span 3 and Span 9).

Figure 4.10   Scenario 2 Network Changes
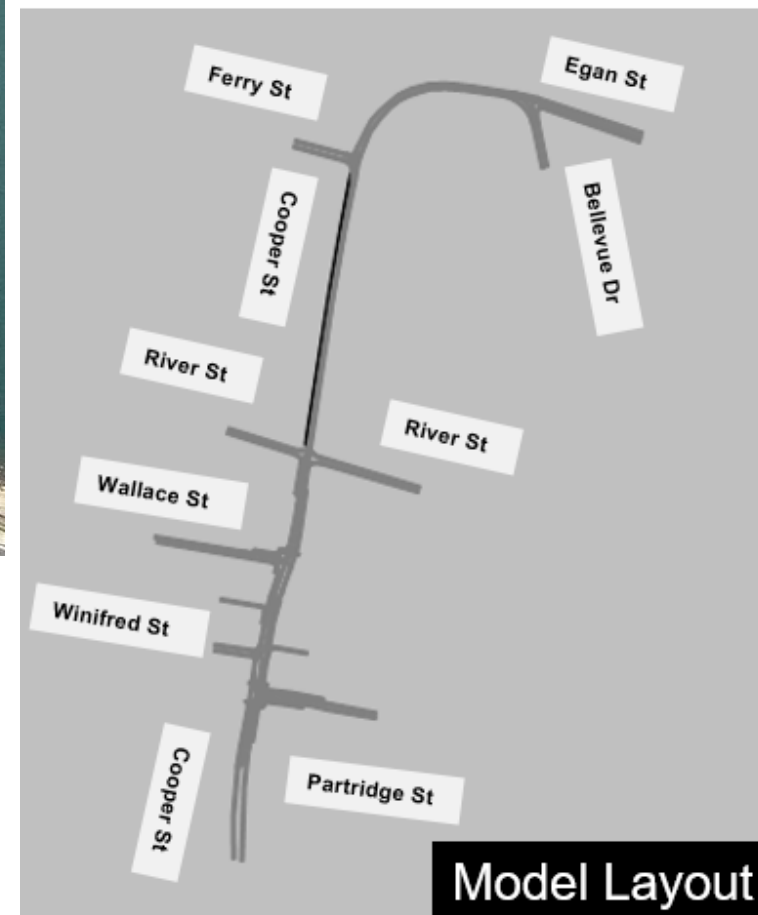
4.6.3   Model results

4.6.3.1   Network level results

The network-level performance indicators for the PM peak are shown in Table 4.8. Updated lane closure scenario results present a deterioration in road network performance compared to the base-year model (2023), mainly due to the single-lane operation required on Macksville Bridge during its proposed rehabilitation (refer to Table 4.8).

– Traffic Volume increase of around 80 vehicles from 2023 to 2026, with Vehicle Hours Travelled (VHT) increase of up to 30 hours (for Scenario 1) and an average network speed of 17 and 18 kilometres per hour for Scenario 1 and Scenario 2, respectively.

– No unrealised (latent) demand was observed under both Scenario 1 and Scenario 2 models, indicating that the proposed traffic management plans are not expected to realise excessive network congestion.

Table 4.8   Summary of network-level indicator results – PM peak

	Base (2023)	Scenario 1 (2026)	Scenario 2 (2027)
Demand Input (no)	1,384	1,469	1,498
VKT (km)	622	869	858
VHT (hrs)	21	52	48
Vehicle Delay (sec)	25	76	67
Vehicle Active (no)	21	54	47
Vehicle Arrived (no)	1,305	1,483	1,508
Latent Demand	0	0	0
Average Network Travel Speed (km/hr)	29	17	18

The related queue length results can be found in Appendix G.

4.6.3.2   Corridor Level: travel time results

The travel time results are summarised in Figure 4.12 for the routes defined in Figure 4.11 (northbound and southbound along Giinagay Way).

Model Layout

Ferry St

Egan St

Cooper St

Bellevue Dr

River St

River St

Wallace St

Winifred St

Partridge St

Cooper St

— — · NB
— — · SB
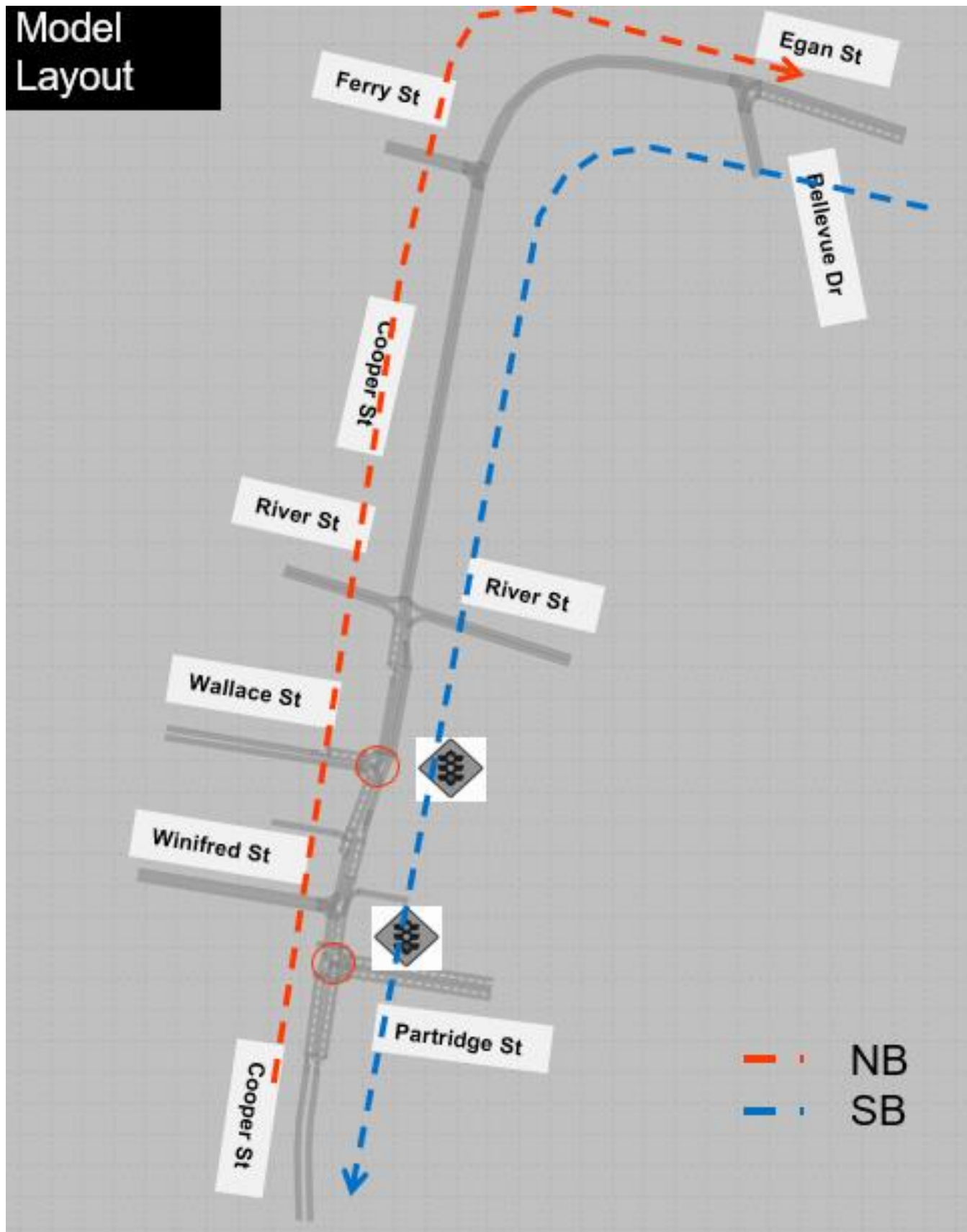
Figure 4.11   Travel Time Routes
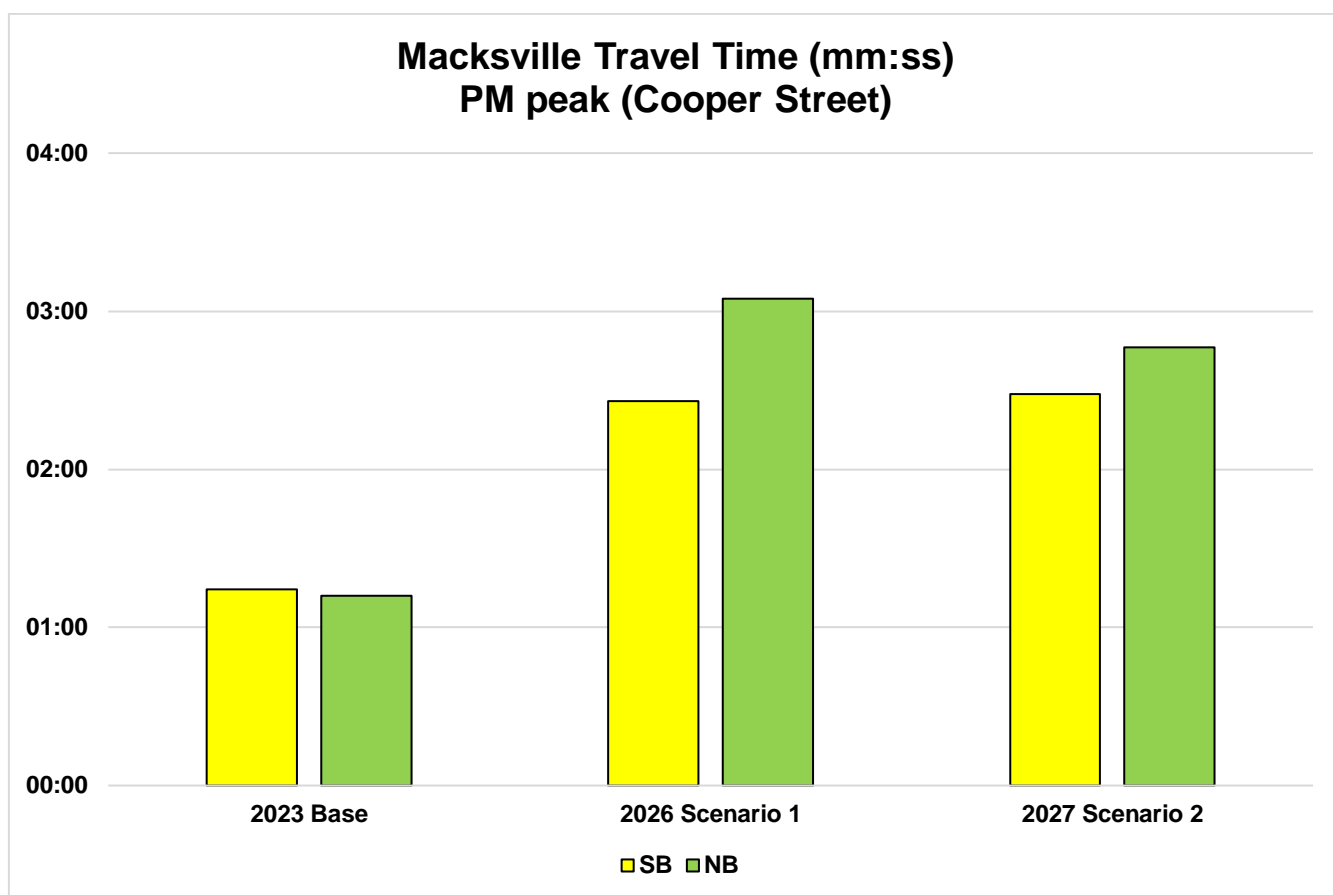
Figure 4.12   *Summary of Travel time results*

The results show that the northbound travel time in Scenario 1 increased by approximately 2 minutes in the PM peak, as compared with the 2023 Base Case.

4.6.3.3   Intersection Level: Level of Service

The Level of Service results for six intersections are summarised in Table 4.10, categorised by the LOS criteria for intersection performance shown in Table 4.9. The results demonstrate that all internal intersections operate acceptably in the 2026 and 2027 horizon years, with Level of Service (LOS) of D or higher.

A visual overview of the Level of Service at each intersection is displayed in Table 4.9.

Table 4.9   *LoS criteria for intersections, Roads and Maritime Service*

Level of Service (LoS)		
LoS	Minimum Delay (sec)	Maximum Delay (sec)
LoS A	0	14
LoS B	15	28
LoS C	29	42
LoS D	43	56
LoS E	57	70
LoS F	71+	-

Source: Roads and Maritime Services, Guide to Traffic Generation Development, 2022

Table 4.10   LoS Results and Delay

Name	Base Model (2023)	Scenario 1 (2026)	Scenario 2 (2027)
Giinagay Way/Bellevue Drive	3	2	1
Giinagay Way/Ferry Street	3	30	30
Giinagay Way/River Street	4	23	50
Giinagay Way/Wallace Street	29	45	25
Giinagay Way/Winifred Street	3	11	2
Giinagay Way/Partridge Street	11	16	7

The intersection modelling results show that all intersections (south of Bellevue Drive) will experience minor increases in delay, under single lane operation of Giinagay Way.

4.7   Additional mitigation

Noting the limitation in the existing traffic models (where there may not be sufficiently robust to model use of local roads as potential detours by residents), the following additional mitigation measures are recommended to be further explored, noting residents are likely to make their own informed decisions to minimising delays during the rehabilitation of Macksville Bridge.

–   Should safety or efficiency concerns arise, TfNSW requires discretion to implement additional changes as it relates to access to Giinagay Way. This may include: Establishing detours using local roads (in consultation with the Nambucca Valley Council) to access Giinagay Way at the Boundary Street intersection (Refer to Figure 4.13), particularly for southbound movements. This would enable prioritisation of the traffic signals at Partridge and Wallace streets for northbound movements. Should traffic conditions deteriorate, this could include a potential ban on all right-turns at the Wallace Street traffic signals or other potential measures.

–   Closing Winifred Street left-out/right-out. Winifred Street could possibly be used as a "rat-run", where it may impact the operation of the Wallace Street signals.

–   Closure of River Street West left-out, under Scenario 2 conditions where this is used as a "rat-run".

–   During the steel rehabilitation (stage 2) extensive repair works are being undertaken to the southern end of the bridge. To enable repairs to the approach of the bridge closure of all turning lanes in/out of River St may be required for short durations to facilitate this work.

–   Noting the variability in work types, and potential need to change access to/along Giinagay Way over the course of the project, TfNSW will continually liaise with impacted businesses and residents.

Figure 4.13   Additional Mitigation

5 Impact assessment

5.1 Project information

The proposed rehabilitation works will be undertaken on Macksville Bridge (bridge B1873), Giinagay Way, which spans the Nambucca River. Work will generally be conducted from:

– Monday to Friday, 7:00 a.m. to 6:00 pm (standard EPA construction hours)

– 7:00 am to 6:00 pm Saturday (note extended working hours)

Extended working hours will be required during certain project stages, including nightworks and Sunday work. Works have been scheduled to minimise traffic impacts for the community.

5.2 Project stages

Rehabilitation works on the Macksville Bridge are planned in four discrete stages, with varying traffic impacts (and preliminary mitigation measures) summarised in Table 5.1. The dates and timeframes given in this table are only a guide and may change depending on a range of factors including weather/ extent of repairs/changes in staging etc. Additional mitigation measures outlined in Section 4.7 may be required if traffic conditions deteriorate during these stages.

Table 5.1   Project Stages

	Duration (Business Days)	Traffic Impacts
Stage 1 (Pier Strengthening/ Concrete Durability)	Approx. 220 days (11 months)	**Single lane operation – approx. 20 days intermittent** – One lane closed, at intermittent times (around twenty days in total). Required during concrete pours to allow for worker access and concrete trucks, line pumps etc to be parked on the bridge. – Mitigation: A single lane will remain open. Small delay time of 2-3 minutes. – Note: some 10-minute traffic stoppages may be required for at times to setup/remove traffic control/ scaffold etc. **OSOM restriction – approx. 20 days intermittent** – OSOM vehicles will not be able to use this route during the intermittent bridge closures. – Mitigation: Detour is the Pacific Hwy (18 minutes worst case). **Closure of turning onto and off bridge at River Street – approx. 20 days intermittent** – The turning lanes on River Street onto and off the end of the bridge will all be closed during the single lane operation of the bridge. This is due to the work zone extending past the end of the bridge (a buffer zone and barriers are required in this location for worker safety). – Mitigation: A single lane of River Street either side will remain open to allow access to businesses.
Stage 2 (Steel Rehabilitation)	Approx. 40 days (8 weeks)	**Full closure – approx. 20 nights** – Full bridge closures at night to enable removal and installation of support beams under the bridge deck. During this time the bridge will be load limited during the day (more info below). – Some 10-minute traffic stoppages may be required for at times to setup/ remove traffic control/scaffold etc. – Mitigation: Full bridge closures to occurring at night. Emergency services light vehicles will be able to use the bridge if sufficient notice is provided through most of these closures. However, there may be short periods of time during jacking of the spans etc that no vehicle can use the bridge due to safety. Emergency services and delivery team to work closely to facilitate access during closures to ensure emergency response times are not effected/minimised.

	Duration (Business Days)	Traffic Impacts
		Heavy vehicle restrictions - load limited single lane operation during daytime – approx. 20 days
		– As we're taking out structural members from the bridge the bridge will need to be load limited during the day. We will allow standard light vehicles, buses and emergency services vehicles across the bridge (utilising single lane operation). No heavy vehicles or OSOM vehicles will be able to use the bridge during this time.
		– Mitigation: A single lane will remain open with light vehicle traffic flowing in an alternating arrangement. Heavy vehicles and trucks to use the highway as a detour (18 minutes worst case). Buses will be allowed across the bridge.
		– Note: some 10-minute traffic stoppages may be required for at times to setup/ remove traffic control/ scaffold etc.
		OSOM restriction – approx. 20 Days
		– OSOM vehicles will not be able to use this route during the 20 days of load restriction/night closures. Detour is the Pacific Hwy (18 minutes worst case).
		Closure of turning onto and off bridge at River Street – 20 Days
		– The turning lanes on River Street onto and off the end of the bridge will all be closed during the single lane operation of the bridge. This is due to the work zone extending past the end of the bridge (a buffer zone and barriers are required in this location for worker safety).
		– Mitigation: A single lane of River Street either side will remain open to allow access to businesses.
Stage 3 (Bridge Painting)	Approx. 625 days (two and a half years)	**Single lane operation – approx. 2.5 years**
		– One lane closed for entirety of the works. Scaffold will be installed either side of the bridge with a single lane down the centre.
		– Mitigation: A single lane 3.5m wide will remain open. This will allow traffic (including heavy vehicles and 4.6 m high vehicles) to flow in an alternating arrangement. Small delay time of 2 minutes.
		– Note: some 10-minute traffic stoppages may be required for at times to setup/remove traffic control/ scaffold etc.
		OSOM restriction – 2.5 year
		– OSOM vehicles will not be able to use this route during the bridge repainting due to scaffold installation required.
		– Mitigation: Detour is the Pacific Hwy (18 minutes worst case).
		Closure of turning onto and off bridge at River Street – approx. 5 months
		– The turning lanes on River Street onto and off the end of the bridge will all be closed during the painting of Span 1 and 2. This is due to the work zone extending past the end of the bridge (a buffer zone and barriers are required in this location for worker safety).
		– Mitigation: A single lane of River Street either side will remain open to allow access to businesses during painting of span 1 and 2. During the rest of the bridge painting the traffic light will be moved up to the end of the bridge so that all lanes can be opened.
Stage 4 (Deck Repairs)	Approx. 10 days (2 weeks)	**Full closure – approx. 5 nights**
		– Full bridge closure for treatment and repair of entire concrete bridge deck.
		– Mitigation: Full bridge closures to occur at night only. Emergency vehicles will be able to use the bridge if sufficient notice is provided. Emergency services and delivery team to work closely to facilitate access during closures to ensure emergency response times are not effected/ minimised.
		Single lane operation – approx. 10 days
		– One lane closed for entirety of the works.

	Duration (Business Days)	Traffic Impacts
		– Mitigation: A single lane will remain open. Small delay time of 2-3 minutes.
		– Note: some 10-minute traffic stoppages may be required for at times to setup/remove traffic control/scaffold etc.
		OSOM restriction – approx. 10 days
		– OSOM Vehicles will not be able to use this route during the 10 days of single-lane operation.
		– Mitigation: The detour is the Pacific Highway (18 minutes, worst case).

5.3   Major detours

Full bridge closures will be required for approximately twenty five nights total during Stage 2 and Stage 4 to complete complex structural repairs on the bridge. During these nighttime closures all vehicles will be required to use a detour route. Exemptions are in place for emergency services only.

During the steel rehabilitation works (Stage 2) heavy vehicles will be required to utilise a detour route as the bridge will be load limited during daytime hours. Buses services will still be able to use the bridge during this time.

Over size over mass (OSOM) vehicles must also undertake detours during all phases of the project due to width restrictions when the bridge is in single lane operation as outlined in Section 5.2.

A summary of detour routes across the Nambucca River using the existing road network is summarised below for each direction of travel (northbound and southbound).

5.3.1   Northbound: Macksville south to Macksville north

Light Vehicles and Heavy Vehicles:

– Travel south to the Bald Hill Road interchange and turn left turn (north) to access the Pacific Highway.
– Travel north on the Pacific Highway from the Bald Hill Road interchange, exiting the Pacific Highway at the Giinagay Way interchange, and undertake a U-turn for southbound travel on the Pacific Highway using the interchange ramps.
– Travel south on the Pacific Highway and exit the Old Coast Road interchange to access Giinagay Way.
– Travel along Giinagay Way to reach Macksville north.

The detour distance is approximately twenty-five kilometres (or approximately 18 minutes travel time) (Refer to Figure 5.1).
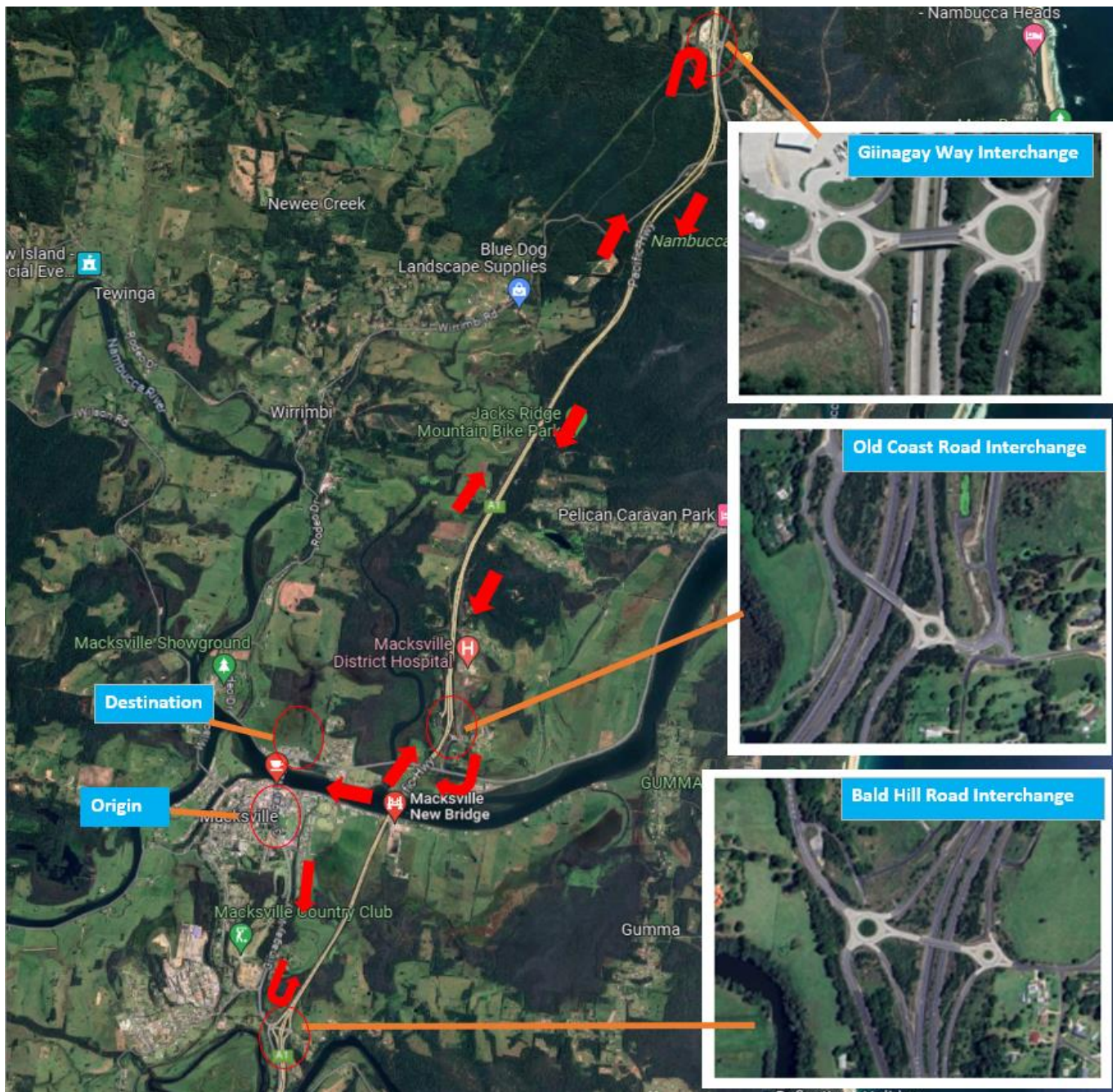
Figure 5.1 *Detour route for light and heavy vehicles (Macksville south to Macksville north)*

5.3.2 Southbound: Macksville north to Macksville south

Light Vehicles and Heavy Vehicles:

– Travel north along Giinagay Way to the Old Coast Road interchange to access the Pacific Highway northbound.

– Travel north along the Pacific Highway to the Giinagay Way interchange, exiting the Pacific Highway at the Giinagay Way interchange and undertake a U-turn for southbound travel on the Pacific Highway using the interchange ramps.

– Continue south on the Pacific Highway to the Bald Hill Road interchange using the Giinagay Way exit.

– Travel north on Giinagay Way to Macksville South.

The detour distance is approximately 25 kilometres (or approximately 18 minutes travel time) (Refer to Figure 5.2).

Figure 5.2   Detour route for light and heavy vehicles (Macksville north to Macksville south)

5.3.3   Emergency services U-turn facility

It is noted that a U-turn facility (for emergency services only) is located approximately 1.4 km north of the Old Coast Road interchange, which provides a shorter detour between Macksville south and Macksville north. The use of this has been discussed with emergency services providers and it is at their discretion if they chose to use this facility.

–   Travel south to the Bald Hill Road interchange and turn left turn (north) to access the Pacific Highway.

–   Travel north on the Pacific Highway from the Bald Hill Road interchange to the emergency services U-turn facility north of the Old Coast Road interchange.

–   Use the emergency service U-turn facility to travel south to the Old Coast Road interchange, using the southbound off-ramp to access Giinagay Way.

–   Travel along Giinagay Way to reach Macksville North or other locations such as Macksville District Hospital or the Macksville Ambulance Station.

The detour distance is approximately 10.5 kilometres (or approximately 9 minutes travel time) (Refer to Figure 5.3).
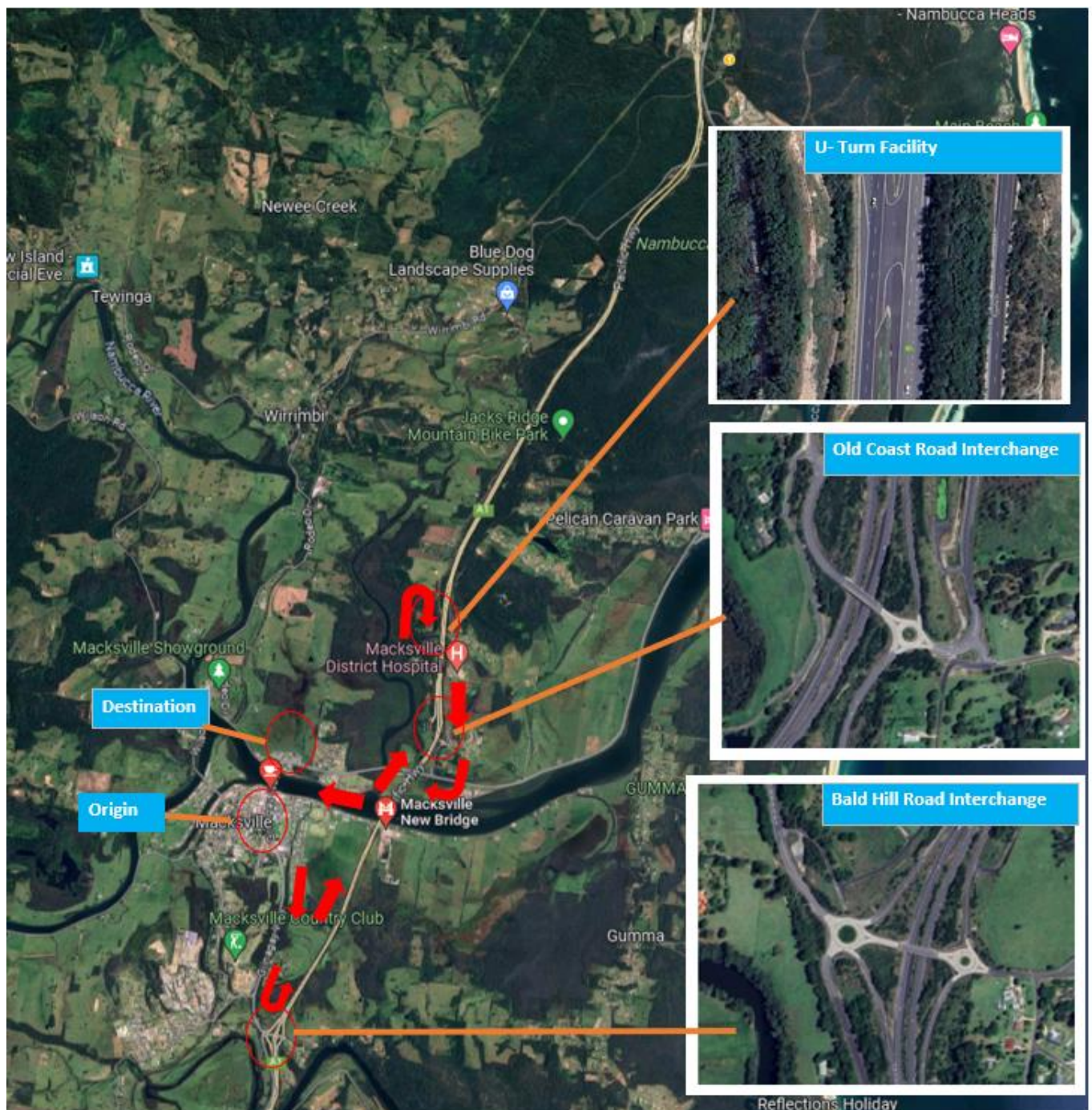
Figure 5.3   Detour route for emergency vehicles (Macksville south to Macksville north)

5.3.4   Potential conflicts and mitigation measures

During a full bridge closure (and to minimise the risk of u-turning vehicles in Macksville), advance warning will be required on both the Pacific Highway and Giinagay Way (for northbound travel) for road users with a destination on the northern side of the Nambucca River (i.e., Macksville north), see Figure 5.4.

The established detour would be for travel on the Pacific Highway to the Nambucca Heads interchange before southbound travel to Macksville north (via the Old Coast Road interchange). Indicative locations for the advance warning signs are provided below, noting that additional signs should also be used further south, including the TfNSW network of variable message signs (VMSs) on the Pacific Highway. Indicative advanced warning (using TfNSW's VMSs) for the Macksville Bridge closures should extend from at least Port Macquarie (northbound) through to south of Coffs Harbour (for southbound travel).

Figure 5.4   Locations for warning signs (closure of Macksville Bridge)

For southbound travel, advanced warning should be provided north of the Old Coast Road interchange (with repeaters further north), assessing that access to Macksville would be limited to the Bald Hill interchange, south of the Nambucca River (with additional signs also located near the Bald Hill interchange). Please refer to Figure 5.5.
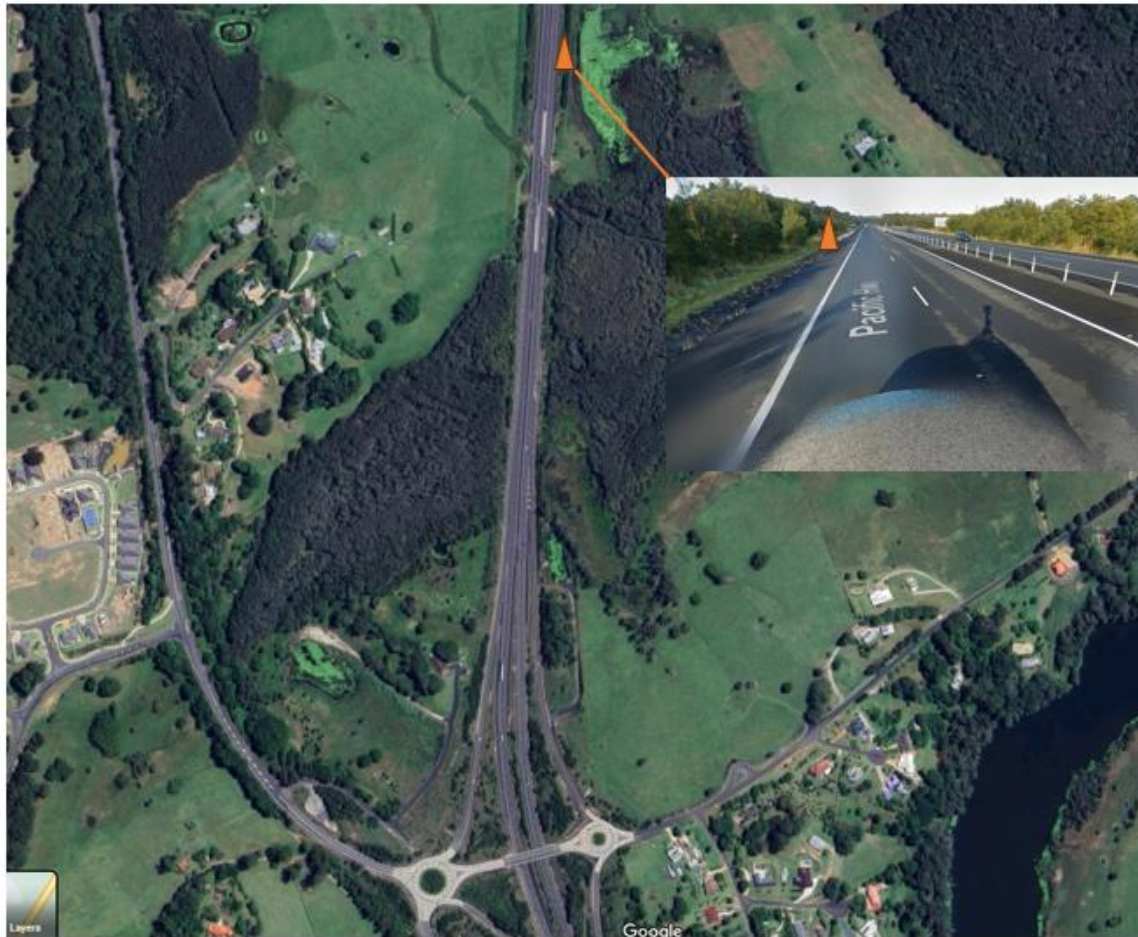
Figure 5.5   Locations for warning signs (closure of Macksville Bridge)

A particular concern for detoured traffic will be the attractiveness of existing U-turn facilities on the Pacific Highway between the Old Coast Road and Giinagay Way interchanges, which are limited to emergency service vehicles only. (Refer to Figure 5.6)

To ensure these are not used for general light and heavy vehicle traffic, temporary signs directing road users to the Nambucca Heads interchange are recommended, together with potential additional enforcement of the emergency U-turn facilities.

3 U-turn facilities on Pacific Highway for emergency vehicles

Figure 5.6   U-turn facilities in between Old Coast Road Interchange and Giinagay Way Interchange

Should vehicles incorrectly continue until the northern and southern approaches of the Macksville Bridge, established U-turn facilities (using existing local roads to return to the Pacific Highway) would be in place, as shown in Figure 5.7 and Figure 5.8.
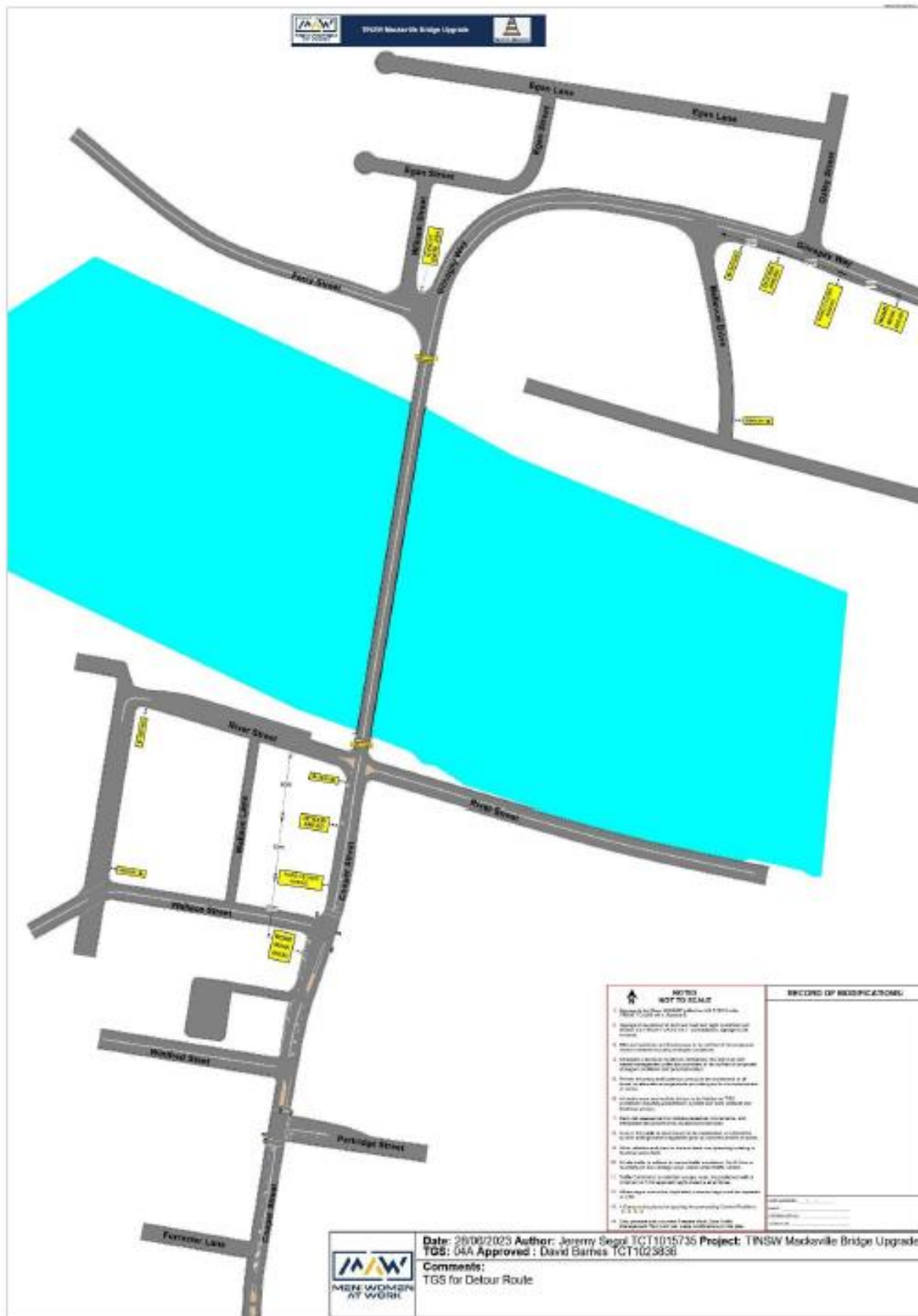
Figure 5.7   Detours to route vehicles onto Pacific Highway

Figure 5.8   Detours to route vehicles onto Pacific Highway

Further, the traffic should be facilitated with detours on Pacific Highway, too, to re-route them to either Macksville North or Macksville South.

6 Impact and mitigation summary

The impact and proposed traffic mitigations for each stage of the proposed Macksville Bridge rehabilitation are summarised in the table below (Table 6.1).

Table 6.1   Summary of road user impacts and proposed mitigation measures

Scenario	Duration	Road User Group Impacted	Nature of impact	Mitigation measure
Scenario 1 and 2	Single lane closures over approximately 3 years	Light vehicles	– Both northbound and southbound travel time are projected to increase by approximately 2 minutes. – The maximum queue is projected not to extend to Bellevue Road (north) and Forrester Lane (South) during peak hours.	– Increase signal phase time for intersections of Wallace Street and Partridge Street (from 65 sec to 100 sec) is recommended, to better align with cycle time for contra-flow traffic movements on Macksville Bridge. – Establishing detours using local roads to access Giinagay Way at Boundary Street, particularly for southbound movements. This would enable prioritisation of the traffic signals at Partridge and Wallace streets for northbound movements.
		Public transport (incl., school, scheduled)	– Public transport services (including school buses) are expected to experience additional delays, particularly for northbound travel.	– Bus operators are provided with advance notice of expected delays.
		Pedestrians and cyclists	– No changes along the bridge.	– Although there are no planned pedestrian / cycling facilities changes along the bridge, it is recommended to provide notices in advance to inform people of the upcoming construction, including dates and expected disturbance levels.
		OSOM	– Northbound and Southbound detour distance is approximately 10.5 kilometres or approximately 9 minutes travel time (via the Pacific Highway).	– Advance warnings will be required on both the Pacific Highway and Giinagay Way (for northbound travel) for OSOM operators with a destination on the northern side of the Nambucca River.
		Heavy vehicles	– During rehabilitation of steel bridge structural elements, heavy vehicles will not be allowed to travel across the bridge. – Vehicle restrictions are in place for vehicles with a height exceeding 4.6 meters. Vehicles taller than 4.6 meters are required to take a detour. The detour for both Northbound and Southbound extends for approximately 25 kilometres or roughly 18 minutes in travel time.	– Temporary signs directing heavy vehicles to the Nambucca Heads interchange are recommended.

Scenario	Duration	Road User Group Impacted	Nature of impact	Mitigation measure
Scenario 1 and 2	Full bridge closures during nightworks for approximately 25 days. Closed to heavy vehicles 24/7 during this time.	Light vehicles	– During day times, northbound travel times are projected to increase by approximately three minutes, while southbound travel times are projected to increase by approximately 1 minute. – For night-time travel, northbound and southbound detour distance is approximately 25 kilometres or approximately an extra 18-minute travel time (based on Google Maps travel time estimate).	– Where possible, full bridge closures are limited to night times to minimise impacts. – Provision of advance warnings of full bridge closures on both the Pacific Highway and Giinagay Way (for northbound travel) for drivers with a destination on the northern side of the Nambucca River. – Advance notice provided to Council and emergency services for full bridge closures. Should it be required, emergency service access will be provided across the bridge. – A concern with detoured traffic will be the attractiveness of existing U-turn facilities on the Pacific Highway between the Old Coast Road and Giinagay Way interchanges (limited to emergency vehicles only). Temporary signs are recommended to ensure all detoured vehicles are directed to the Nambucca Heads interchange are recommended to prevent this occurring.
		Public transport (incl., school, scheduled)	– Public transport services (including school buses) are expected to experience additional delays, particularly for northbound travel.	– Bus operators are provided with advance notice of expected delays.
		Pedestrians and cyclists	– No changes along the bridge.	– Although there are no planned pedestrian / cycling facilities changes along the bridge, it is recommended to provide notice in advance to inform people of the upcoming construction, including dates and expected disturbance levels.
		OSOM	– During full bridge closures, OSOM vehicles will be unable to use the bridge, with northbound and southbound detour distances for OSOM vehicles is approximately 10.5 kilometres or approximately 9 minutes travel time (based on Google Maps travel time estimate).	– Advance warnings will be required on both the Pacific Highway and Giinagay Way (for northbound travel) for OSOM operators with a destination on the northern side of the Nambucca River.

OFFICIAL

Scenario	Duration	Road User Group Impacted	Nature of impact	Mitigation measure
		Heavy vehicles	– Heavy vehicles will be unable to use the bridge, with northbound and southbound detour distances for heavy vehicles is approximately 10.5 kilometres or approximately 9 minutes travel time (based on Google Maps travel time estimate). – Northbound and Southbound detour distance is approximately 25 kilometres or approximately 18 minutes travel time (based on Google Maps travel time estimate).	– Advance warnings will be required on both the Pacific Highway and Giinagay Way (for northbound travel) for heavy vehicle drivers with a destination on the northern side of the Nambucca River. – A concern with detoured traffic will be the attractiveness of existing U-turn facilities on the Highway between the Old Coast Road and Giinagay Way interchanges (limited to emergency vehicles only). Temporary signs directing road users to the Nambucca Heads interchange are recommended to prevent this from occurring.

From Table 6.1, there are expected to be varied impacts associated with each stage of the Macksville Bridge rehabilitation, ranging from travel time delays during single lane operation, to detours (for all vehicle types) during full bridge closures.

Heavy vehicles (particularly OSOM) are expected to be the most impacted vehicle type, although these are expected to impact few vehicle movements.

Full bridge closures are expected to impact on access to health services, noting the location of the Macksville District Hospital on the northern bank of the Nambucca River, whilst the majority of residents are located on the southern bank of the Nambucca River. As such, ongoing liaison with emergency and health services is recommended to ensure the impact on access to health services is minimised.

During the replacement of support beams (Stage 2 – Steel rehabilitation, approximately 20 days), all heavy vehicles (excluding school buses) will be prohibited.

Noting the varied impacts upon various road user groups, continued liaison with road users is recommended during the project, including with:

– Nambucca Shire Council, including potential local road closures, detours, and pedestrian crossing impacts.
– Emergency services including NSW Ambulance, NSW Police, NSW Fire and Rescue, NSW Rural Fire Service and NSW State Emergency Services.
– Bus operators, including Busways, NSW TrainLink.
– Local heavy vehicle operators in the region.

Noting the duration of works (including length of detours during full bridge closures), a network of advanced warning signs is also recommended, which includes potential increased enforcement of the emergency U-turn bays on the Pacific Highway (with supporting signage), ensuring vehicles are directed to the appropriate interchanges to undertake safe turning movements (e.g. via the Nambucca, Old Coast Road, and Bald Hill Road interchanges).

7   Conclusion

7.1   Overview

The traffic assessment conducted by GHD describes the potential consequences on traffic flow due to each stage of the Macksville Bridge rehabilitation. The findings show the significance of the proposed bridge closure periods, varying from minor two-week repair operations to an extensive bridge painting over a 30 month period.

7.2   Key findings

The report evaluates the ramifications of both single-lane and full (two-lane) bridge closures throughout the various stages of the Macksville Bridge rehabilitation project which are expected to occur over a nearly three-year period to late 2027. These stages encompass:

– Stage 1: Pier Strengthening/Concrete Durability Works
– Stage 2: Steel Rehabilitation
– Stage 3: Bridge Painting
– Stage 4: Bridge Deck Repair

During most of the works, single lane (or contra-flow) operation will be enacted, in which temporary traffic signals will be placed at both the southern and northern approach to Macksville Bridge, to allow for bridge works to be undertaken.

Delays in travel time are expected for both directions of travel, with increased delays for northbound travel. Noting the proximity of temporary signals to the signalised intersection of Giinagay Way and Wallace Street, it is recommended that the existing signals (cycle times) at Wallace and Partridge streets be aligned with the operation of the temporary signals across the bridge.

Noting the limitation in the existing traffic models (where there may not be sufficiently robust to model use of local roads as potential detours by residents), the following additional mitigation measures are recommended to be further explored, noting residents are likely to make their own informed decisions to minimising delays during the rehabilitation of Macksville Bridge. Further, should safety or efficiency concerns arise, TfNSW requires discretion to implement additional changes as it relates to access to Giinagay Way. This may include:

– Establishing detours using local roads (in consultation with the Nambucca Valley Council) to access Giinagay Way at the Boundary Street intersection (Refer to Figure 4.13), particularly for southbound movements. This would enable prioritisation of the traffic signals at Partridge and Wallace streets for northbound movements. Should traffic conditions deteriorate, this could include a potential ban on the southbound right-turn at Wallace Street.
– Closing Winifred Street left-out/right-out, should Winifred Street be used as a "rat-run", where it may impact the operation of the Wallace Street signals.
– Closure of River Street West left-out, should River Street west be used as a "rat-run".

Noting the varied impacts upon various road user groups, continued liaison with road users is recommended during the project, including with:

– Nambucca Shire Council, including potential local road closures, detours and pedestrian crossing impacts.
– Emergency services including NSW Ambulance, NSW Police, NSW Fire and Rescue, NSW Rural Fire Service and NSW State Emergency Services.
– Bus operators, including Busways, NSW TrainLink.
– Local heavy vehicle operators in the region.

Noting the duration of works (including length of detours during full bridge closures), a network of advanced warning signs is also recommended, which includes potential increased enforcement of the emergency u-turn bays on the Pacific Highway (with supporting signage), ensuring vehicles are directed to the appropriate interchanges to undertake safe turning movements (e.g. via the Nambucca, Old Coast Road and Bald Hill Road interchanges).

7.3   Conclusion

Based on the study findings, modelling and mitigation measures outlined in this report, it is considered that road user impacts associated with the Macksville Bridge Rehabilitation could be appropriately managed, subject to ongoing stakeholder consultation.

Appendices

Appendix A
Queue Length Survey

Location: GIINAGAY WAY/BELLEVUE DVE NORTH MACKSVILLE

Date: 21-June-2023 7 m Light Vehicles

13 m Heavy Vehicles

Start Time: 8:30

End Time: 9:30

Peak Hour Ending: 9:30

Queues reported graphically relate to peak hour only

Approach 3: GIINAGAY WAY WESTBOUND

7	1	7

Peak Hour

	95% Queue Length	95% Queue Vehicles	Avg Length (m)
5	-	-	-
4	-	-	-

95% Queue Length	95% Queue Vehicles	Avg Length (m)

Peak Hour

Approach 1: GIINAGAY WAY EASTBOUND

14	-			95% Queue Length
2	-			95% Queue Vehicles
14	-			Avg Length (m)

Peak Hour

LEGEND
(Metres) — 95% Queue Length
(Number of Vehicles) — 95% Queue Vehicles
(Metres) — Avg Length (m)

Approach 2: BELLEVUE DVE NORTHBOUND

Location: GIINAGAY WAY/BELLEVUE DVE NORTH MACKSVILLE

Date: 21-June-2023 7 m Light Vehicles

13 m Heavy Vehicles

Start Time: 15:00

End Time: 16:00

Peak Hour Ending: 16:00

Queues reported graphically relate to peak hour only

Approach 3: GIINAGAY WAY WESTBOUND

20	3	12

Peak Hour

	95% Queue Length	95% Queue Vehicles	Avg Length (m)
5	-	-	-
4	-	-	-

Approach 1: GIINAGAY WAY EASTBOUND

-	7			95% Queue Length
-	1			95% Queue Vehicles
-	7			Avg Length (m)

Peak Hour

LEGEND
(Metres) — 95% Queue Length
(Number of Vehicles) — 95% Queue Vehicles
(Metres) — Avg Length (m)

Approach 2: BELLEVUE DVE NORTHBOUND

Location: WINIFRED ST/GIINAGAY WAY MACKSVILLE

Date: 21-June-2023 7 m Light Vehicles

13 m Heavy Vehicles

Start Time: 8:30

End Time: 9:30

Peak Hour Ending: 9:30

Approach 3: GIINAGAY WAY SOUTHBOUND

Peak Hour

95% Queue Length			12
95% Queue Vehicles			2
Avg Length (m)			8

Queues reported graphically relate to peak hour only

7	1	7
11	2	8

95% Queue Length	95% Queue Vehicles	Avg Length (m)

Peak Hour

Approach 1: WINIFRED ST EASTBOUND

-			95% Queue Length
-			95% Queue Vehicles
-			Avg Length (m)

Peak Hour

LEGEND
(Metres) — 95% Queue Length
(Number of Vehicles) — 95% Queue Vehicles
(Metres) — Avg Length (m)

Approach 2: GIINAGAY WAY NORTHBOUND

Location: WINIFRED ST/GIINAGAY WAY MACKSVILLE

Date: 21-June-2023 7 m Light Vehicles

13 m Heavy Vehicles

Start Time: 15:00

End Time: 16:00

Peak Hour Ending: 16:00

Approach 3: GIINAGAY WAY SOUTHBOUND

Peak Hour

95% Queue Length			18	-
95% Queue Vehicles			3	-
Avg Length (m)			9	-

Queues reported graphically relate to peak hour only

7	1	7
11	2	8

Peak Hour

Approach 1: WINIFRED ST EASTBOUND

-			95% Queue Length
-			95% Queue Vehicles
-			Avg Length (m)

Peak Hour

LEGEND
(Metres) — 95% Queue Length
(Number of Vehicles) — 95% Queue Vehicles
(Metres) — Avg Length (m)

Approach 2: GIINAGAY WAY NORTHBOUND

Location: PARTRIDGE ST/GIINAGAY WAY MACKSVILLE

Date: 21-June-2023 7 m Light Vehicles

13 m Heavy Vehicles

Start Time: 8:30

End Time: 9:30

Peak Hour Ending: 9:30

Approach 3: GIINAGAY WAY SOUTHBOUND

Peak Hour

95% Queue Length			23	21
95% Queue Vehicles			3	3
Avg Length (m)			14	12

Queues reported graphically relate to peak hour only

Approach 2: PARTRIDGE ST WESTBOUND

Peak Hour

95% Queue Length	95% Queue Vehicles	Avg Length (m)
28	4	13
14	2	8

18	13			95% Queue Length
3	2			95% Queue Vehicles
11	9			Avg Length (m)

Peak Hour

LEGEND
(Metres) — 95% Queue Length
(Number of Vehicles) — 95% Queue Vehicles
(Metres) — Avg Length (m)

Approach 1: GIINAGAY WAY NORTHBOUND

Location: PARTRIDGE ST/GIINAGAY WAY MACKSVILLE

Date: 21-June-2023 7 m Light Vehicles

13 m Heavy Vehicles

Start Time: 15:00

End Time: 16:00

Peak Hour Ending: 16:00

Approach 3: GIINAGAY WAY SOUTHBOUND

Peak Hour

95% Queue Length			22	14
95% Queue Vehicles			3	2
Avg Length (m)			10	9

Queues reported graphically relate to peak hour only

Approach 2: PARTRIDGE ST WESTBOUND

Peak Hour

95% Queue Length	95% Queue Vehicles	Avg Length (m)
39	6	16
24	3	14

32	16			95% Queue Length
5	2			95% Queue Vehicles
18	9			Avg Length (m)

Peak Hour

LEGEND
(Metres) — 95% Queue Length
(Number of Vehicles) — 95% Queue Vehicles
(Metres) — Avg Length (m)

Approach 1: GIINAGAY WAY NORTHBOUND

Location: RIVER ST/GIINAGAY WAY MACKSVILLE

Date: 21-June-2023   7 m Light Vehicles
13 m Heavy Vehicles
Start Time: 8:30
End Time: 9:30
Peak Hour Ending: 9:30

Approach 4: GIINAGAY WAY SOUTHBOUND

Peak Hour	95% Queue Length				-
	95% Queue Vehicles				-
	Avg Length (m)				-

Queues reported graphically relate to peak hour only

Approach 3: RIVER ST WESTBOUND

| 11 | 2 | 8 | 1 |

Peak Hour

| | 95% Queue Length | 95% Queue Vehicles | Avg Length (m) |

| 4 | 21 | 3 | 14 |

95% Queue Length | 95% Queue Vehicles | Avg Length (m)

Peak Hour

Approach 1: RIVER ST EASTBOUND

2	3				95% Queue Length
-	-				95% Queue Vehicles
-	-				Avg Length (m)

Peak Hour

LEGEND
(Metres) — 95% Queue Length
(Number of Vehicles) — 95% Queue Vehicles
(Metres) — Avg Length (m)

Approach 2: GIINAGAY WAY NORTHBOUND

Location: RIVER ST/GIINAGAY WAY MACKSVILLE

Date: 21-June-2023   7 m Light Vehicles
13 m Heavy Vehicles
Start Time: 15:00
End Time: 16:00
Peak Hour Ending: 16:00

Approach 4: GIINAGAY WAY SOUTHBOUND

Peak Hour	95% Queue Length				-
	95% Queue Vehicles				-
	Avg Length (m)				-

Queues reported graphically relate to peak hour only

Approach 3: RIVER ST WESTBOUND

| 18 | 3 | 11 | 1 |

Peak Hour

| | 95% Queue Length | 95% Queue Vehicles | Avg Length (m) |

| 4 | 25 | 4 | 12 |

Peak Hour

Approach 1: RIVER ST EASTBOUND

2	3				95% Queue Length
-	-				95% Queue Vehicles
-	-				Avg Length (m)

Peak Hour

LEGEND
(Metres) — 95% Queue Length
(Number of Vehicles) — 95% Queue Vehicles
(Metres) — Avg Length (m)

Approach 2: GIINAGAY WAY NORTHBOUND

Location: WALLACE SR/GIINAGAY WAY MACKSVILLE

Date: 21-June-2023   7 m Light Vehicles
13 m Heavy Vehicles
Start Time: 8:30
End Time: 9:30
Peak Hour Ending: 9:30

Approach 3: GIINAGAY WAY SOUTHBOUND

Peak Hour	95% Queue Length			35	56
	95% Queue Vehicles			5	8
	Avg Length (m)			19	21

Queues reported graphically relate to peak hour only

LIQUORWORKS ACCESS WESTBOUND

| 29 | 4 | 14 | 1 |
| 42 | 6 | 19 | 2 |

Peak Hour

| | 95% Queue Length | 95% Queue Vehicles | Avg Length (m) |

95% Queue Length | 95% Queue Vehicles | Avg Length (m)

Peak Hour

Approach 1: WALLACE SR EASTBOUND

3	4				95% Queue Length
12	33				
2	5				95% Queue Vehicles
8	17				Avg Length (m)

Peak Hour

LEGEND
(Metres) — 95% Queue Length
(Number of Vehicles) — 95% Queue Vehicles
(Metres) — Avg Length (m)

Approach 2: GIINAGAY WAY NORTHBOUND

Location: WALLACE SR/GIINAGAY WAY MACKSVILLE

Date: 21-June-2023   7 m Light Vehicles
13 m Heavy Vehicles
Start Time: 15:00
End Time: 16:00
Peak Hour Ending: 16:00

Approach 3: GIINAGAY WAY SOUTHBOUND

Peak Hour	95% Queue Length			35	25
	95% Queue Vehicles			5	4
	Avg Length (m)			17	14

Queues reported graphically relate to peak hour only

LIQUORWORKS ACCESS WESTBOUND

| 27 | 4 | 12 | 1 |
| 47 | 7 | 18 | 2 |

Peak Hour

| | 95% Queue Length | 95% Queue Vehicles | Avg Length (m) |

Peak Hour

Approach 1: WALLACE SR EASTBOUND

3	4				95% Queue Length
12	42				
2	6				95% Queue Vehicles
8	22				Avg Length (m)

Peak Hour

LEGEND
(Metres) — 95% Queue Length
(Number of Vehicles) — 95% Queue Vehicles
(Metres) — Avg Length (m)

Approach 2: GIINAGAY WAY NORTHBOUND

Location: FERRY ST/GIINAGAY WAY NORTH MACKSVILLE

Date: 21-June-2023   7 m Light Vehicles
13 m Heavy Vehicles
Start Time: 8:30
End Time: 9:30
Peak Hour Ending: 9:30

Approach 3: GIINAGAY WAY SOUTHBOUND

Peak Hour	95% Queue Length				-
	95% Queue Vehicles				-
	Avg Length (m)				-

Queues reported graphically relate to peak hour only

| 7 | 1 | 7 | 1 |
| 29 | 4 | 16 | 2 |

Peak Hour

95% Queue Length | 95% Queue Vehicles | Avg Length (m)

Peak Hour

Approach 1: FERRY ST EASTBOUND

3					95% Queue Length
-					95% Queue Vehicles
-					Avg Length (m)

Peak Hour

LEGEND
(Metres) — 95% Queue Length
(Number of Vehicles) — 95% Queue Vehicles
(Metres) — Avg Length (m)

Approach 2: GIINAGAY WAY NORTHBOUND

Location: FERRY ST/GIINAGAY WAY NORTH MACKSVILLE

Date: 21-June-2023   7 m Light Vehicles
13 m Heavy Vehicles
Start Time: 15:00
End Time: 16:00
Peak Hour Ending: 16:00

Approach 3: GIINAGAY WAY SOUTHBOUND

Peak Hour	95% Queue Length				-
	95% Queue Vehicles				-
	Avg Length (m)				-

Queues reported graphically relate to peak hour only

| 7 | 1 | 7 | 1 |
| 23 | 3 | 13 | 2 |

Peak Hour

95% Queue Length | 95% Queue Vehicles | Avg Length (m)

Peak Hour

Approach 1: FERRY ST EASTBOUND

3					95% Queue Length
-					95% Queue Vehicles
-					Avg Length (m)

Peak Hour

LEGEND
(Metres) — 95% Queue Length
(Number of Vehicles) — 95% Queue Vehicles
(Metres) — Avg Length (m)

Approach 2: GIINAGAY WAY NORTHBOUND

Appendix B

Intersection Counts

21/6/2023 - GIINAGAY WAY / BELLEVUE DVE, NORTH MACKSVILLE

9:30 <<< HOUR ENDING   Wednesday

Summary:		
	GIINAGAY WAY / BELLEVUE DVE	
620	Total Light Vehicles	
37	Total Heavy Vehicles	
1	Total Pedestrians	

295	Light Vehicles
13	Heavy Vehicles
0	Pedestrians

← *TO FERRY ST*

GIINAGAY WAY

1	295	13
2	7	0

0
7

24	313	6
0	0	5

1
9

0
5
3

0
0
4

8	0

N

GIINAGAY WAY

BELLEVUE DVE

21/6/2023 - GIINAGAY WAY / BELLEVUE DVE, NORTH MACKSVILLE

Light Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN HOUR		Pedestrians 7	8	9
07:15	47	0	0	0	0	49	96		2	0	1
07:30	38	0	0	0	0	47	85		1	0	0
07:45	62	2	1	0	0	54	119		1	0	0
08:00	46	2	1	0	0	66	115	415	1 <	0	1 <
08:15	74	3 <	3	0	0	71	151	470	0	0	0
08:30	74	0 <	4 <	0	0	87	165	550	1	1 <	0
08:45	88	1	1 <	0	0	87	177	608	0	0 <	0
09:00	65	1	1 <	0	0	79	146	639	0	0 <	1
09:15	76 <	3	1	0	0	73 <	153	641 <	0	0 <	0
09:30	66	2 <	2	0	0	74	144	620	0	0	0
09:45	92	1 <	3	1 <	0	67	164	607	0	0	0
10:00	58	1 <	1	0 <	0	82	142	603	0	1 <	2 <

Heavy Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN HOUR	
07:15	7	0	0	0	0	7	14	
07:30	7	0	0	0	0	5	12	
07:45	15	0	0	0	0	3	18	
08:00	5 <	0	0	0	0	6	11	55 <
08:15	6	0	0	0	0	7	13	54
08:30	0	0	0	0	0	6	6	48
08:45	4	0	0	0	0	5	9	39
09:00	4	0	0	0	0	4	8	36
09:15	3	0	0	0	0	7	10	33
09:30	2	0	0	0	0	8	10	37
09:45	7	0	0	0	0	4	11	39
10:00	6	0	0	0	0	7 <	13	44

All Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN HOUR	
07:15	54	0	0	0	0	56	110	
07:30	45	0	0	0	0	52	97	
07:45	77	2	1	0	0	57	137	
08:00	51	2	1	0	0	72	126	470
08:15	80	3 <	3	0	0	78	164	524
08:30	74	0 <	4 <	0	0	93	171	598
08:45	92	1	1 <	0	0	92	186	647
09:00	69 <	1	1 <	0	0	83	154	675 <
09:15	79	3	1	0	0	80 <	163	674
09:30	68	2 <	2	0	0	82	154	657
09:45	99 <	1 <	3	1 <	0	71	175	646
10:00	64	1 <	1	0 <	0	89	155	647

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

9:30 <<< HOUR ENDING   **Wednesday**

Summary:

GIINAGAY WAY / FERRY ST

740	**Total Light Vehicles**
53	**Total Heavy Vehicles**
7	**Total Pedestrians**

Quality Surveys

233669

GIINAGAY WAY

TO BELLEVUE DVE

FERRY ST

12 | 0

9 | 0 | 8 | 20 | 7 | 299
0 | 1 | 25

1 | 15 | 0
2 | 59 | 8
3 | 2 | 0

7
10

N

6 | 45 | 13 | 300 | 0 | 0
4 | 5 | 6

11 | 0

TO RIVER ST

GIINAGAY WAY

300	Light Vehicles
13	Heavy Vehicles
7	Pedestrian

21/6/2023 - GIINAGAY WAY / FERRY ST, NORTH MACKSVILLE

Light Vehicles

	1	2	3	4	5	6	7	8	9	Total Vehicles 15 MIN HOUR		Pedestrians 10	11	12
07:15	2	8	0	8	33	0	34	0	0	85		0	0	0
07:30	1	12	0	3	39	0	46	1	0	102		1	0	1
07:45	3	8	0	5	59	0	53	1	0	129		1	0	0
08:00	2	7	0	5	42	0	65	1	0	122	438	2	0	0 <
08:15	4	12	0	6	73	0	69	4	0	168	521	3	0	0 <
08:30	2	10	0	13	75	0	89	4	0	193	612	1	0	0
08:45	6	18	0	14	82	0	81	3	0	204	687	3 <	0	0
09:00	3 <	11	0	14 <	66	0	77 <	3	0	174	739	0	0	0
09:15	3	15	1	6 <	73	0	67	5	0	170	741 <	3	0	0
09:30	3 <	15 <	1 <	11	79	0	74	9 <	0	192	740	1	0	0
09:45	2	14	0 <	11	87 <	0	68	2	0	184	720	0	0	0
10:00	3	10	0 <	14	54	0	75	1	0	157	703	5 <	0	0

Heavy Vehicles

	1	2	3	4	5	6	7	8	9	Total Vehicles 15 MIN HOUR	
07:15	0	0	0	1	7	0	4	0	0	12	
07:30	0	1	0	1	7	0	6	0	0	15	
07:45	0	1	0	0	3	0	3	0	0	19	
08:00	0	1	0	3	5 <	0	6	0	0	15	61
08:15	0	0	0	4	6	0	7	0	0	17	66 <
08:30	0	1	0	0	1	0	6	0	0	8	59
08:45	0	3	0	2	3	0	5	0	0	13	53
09:00	0	2	0	4 <	4	0	5	0	0	15	53
09:15	0	1	0	0	3	0	7	0	0	11	47
09:30	0	2 <	0	0	3	0	8	1 <	0	14	53
09:45	1 <	1	0	2	6	0	5	0 <	0	15	55
10:00	0 <	2	0	1	6	0	8 <	0 <	0	17	57

All Vehicles

	1	2	3	4	5	6	7	8	9	Total Vehicles 15 MIN HOUR	
07:15	2	8	0	9	40	0	38	0	0	97	
07:30	1	13	0	4	46	0	52	1	0	117	
07:45	3	9	0	5	74	0	56	1	0	148	
08:00	2	8	0	8	47	0	71	1	0	137	499
08:15	4	12	0	10	79	0	76	4	0	185	587
08:30	2	11	0	13	76	0	95	4	0	201	671
08:45	6	21	0	16	85	0	86	3	0	217	740
09:00	3 <	13	0	18 <	70	0	82 <	3	0	189	792
09:15	3	16	1	6	76	0	74	5	0	181	788
09:30	3 <	17 <	1 <	11	82	0	82	10 <	0	206	793 <
09:45	3	15	0 <	13	93 <	0	73	2	0	199	775
10:00	3	12	0 <	15	60	0	83	1	0	174	760

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

16:00 <<< HOUR ENDING   Wednesday

Summary:	
GIINAGAY WAY / FERRY ST	
801	Total Light Vehicles
48	Total Heavy Vehicles
10	Total Pedestrians

tpe
Quality Surveys
233669

GIINAGAY WAY

TO BELLEVUE DVE

| 12 | 0 |

FERRY ST

9	8	7
0	8	345
0	0	18

1	3	1
2	34	9
3	0	0

| 10 |
| 10 |

3	17	0
56	355	0
4	5	6

N

355	Light Vehicles
17	Heavy Vehicles
10	Pedestrian

| 11 | 0 |

TO RIVER ST

GIINAGAY WAY

21/6/2023 - GIINAGAY WAY / FERRY ST, NORTH MACKSVILLE

Light Vehicles

	1	2	3	4	5	6	7	8	9	Total Vehicles 15 MIN HOUR		Pedestrians 10	11	12
15:15	1	12	0	12	83	0	99	0	0	207		3	0	0
15:30	1	2	0	18	102	0	94	1	0	218		4	0	0
15:45	1	13	0	9	93	0	78	4	0	198		1	0	0
16:00	0	7	0	17	77	0	74 <	3	0	178	801 <	2 <	0	0
16:15	1	9	0	21	89 <	0	74	3	0	197	791	2	0	0
16:30	2	10	0	22	83	0	92	0	0	209	782	2	0	0
16:45	1	12	0	17	78	0	80	2	0	190	774	1	0	0
17:00	1	13 <	0	18	66	0	62	6	0	166	762	3	0	0
17:15	1	4	0	22 <	73	0	71	4	0	175	740	0	0	0
17:30	2	12	0	10	54	0	71	6	0	155	686	2	0	0
17:45	3	9	0	15	53	0	69	3 <	0	152	648	1	0	0
18:00	2 <	6	0	10	24	0	54	1	0	97	579	0	0	0

Heavy Vehicles

	1	2	3	4	5	6	7	8	9	Total Vehicles 15 MIN HOUR	
15:15	0	3	0	1	7	0	3	0	0	14	
15:30	0	1	0	0	5	0	8	0	0	14	
15:45	0	1	0	1	4	0	2	0	0	8	
16:00	1 <	4 <	0	1	1 <	0	5	0	0	12	48 <
16:15	0 <	2	0	2 <	2	0	2	0	0	8	42
16:30	0 <	2 <	0	0 <	3	0	12	0	0	17	45
16:45	0 <	1 <	0	1 <	0	0	6 <	0	0	8	45
17:00	0	0	0	1 <	2	0	1	1	0	5	38
17:15	0	0	0	0	1	0	4	0	0	5	35
17:30	0	1	0	0	5	0	2	0	0	8	26
17:45	0	0	0	0	0	0	3	1 <	0	4	22
18:00	0	1	0	0	0	0	2	0	0	3	20

All Vehicles

	1	2	3	4	5	6	7	8	9	Total Vehicles 15 MIN HOUR	
15:15	1	15	0	13	90	0	102	0	0	221	
15:30	1	3	0	18	107	0	102	1	0	232	
15:45	1	14	0	10	97	0	80	4	0	206	
16:00	1	11	0	18	78	0	79 <	3	0	190	849 <
16:15	1	11	0	23	91 <	0	76	3	0	205	833
16:30	2	12	0	22	86	0	104	0	0	226	827
16:45	1	13	0	18	78	0	86	2	0	198	819
17:00	1	13 <	0	19 <	68	0	63	7	0	171	800
17:15	1	4	0	22	74	0	75	4	0	180	775
17:30	2	13	0	10	59	0	73	6	0	163	712
17:45	3	9	0	15	53	0	72	4 <	0	156	670
18:00	2 <	7	0	10	24	0	56	1	0	100	599

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

GHD | Transport for NSW | 12608031 | Traffic Assessment

OFFICIAL

21/6/2023 - COOPER ST / RIVER ST, MACKSVILLE

9:30 <<< HOUR ENDING   Wednesday

TO FERRY ST   COOPER ST

16 | 0

12 | 11 | 10
0 | 329 | 37
0 | 30 | 0

RIVER ST

1 | 88 | 1
2 | 0 | 0
3 | 0 | 0

0
13

0
15

0 | 0 | 9
0 | 0 | 8
1 | 44 | 7

RIVER ST

1 | 16 | 0
63 | 255 | 0
4 | 5 | 6

14 | 37

N

255	Light
16	Heavy
0	Pedestrians

GIINAGAY WAY   *TO WALLACE ST*
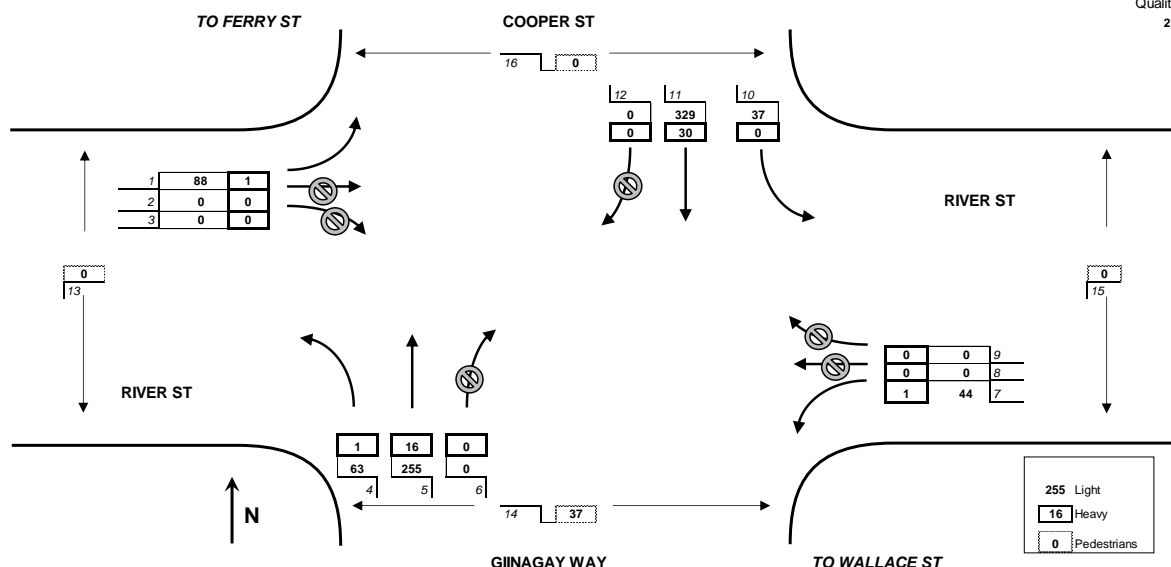
21/6/2023 - COOPER ST / RIVER ST, MACKSVILLE

Light Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR		Pedestrians 13	14	15	16
07:15	11	0	0	8	29	0	5	0	0	10	35	0	98		0	5	1	0
07:30	9	0	0	5	31	0	7	0	0	6	53	0	111		1	1	0	1
07:45	20	0	0	7	44	0	7	0	0	7	54	0	139		0	4	0	0
08:00	16	0	0	4	33	0	9	0	0	6	70	0	138	486	0 <	7	0 <	0 <
08:15	22	0	0	7	58	0	9	0	0	10	70	0	176	564	0 <	7	0 <	0 <
08:30	13	0	0	12	51	0	12	0	0	2	73	0	163	616	0	8	0	0
08:45	29	0	0	15	69	0	11	0	0	4	96	0	224	701	0	11	0	0
09:00	20	0	0	21	59	0	12	0	0	7	89	0	208	771	0	10	0	0
09:15	18	0	0	11	60	0	12 <	0	0	14	69	0	184	779	0	5	0	0
09:30	21 <	0	0	16 <	67	0	9	0	0	12	75 <	0	200	816 <	0	11 <	0	0
09:45	27	0	0	7	71 <	0	9	0	0	11	70	0	195	787	0	3	0	0
10:00	18	0	0	19	48	0	3	0	0	8 <	78	0	174	753	0	6	0	0

Heavy Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR	
07:15	0	0	0	1	8	0	2	0	0	1	3	0	15	
07:30	1	0	0	0	7	0	1	0	0	0	7	0	16	
07:45	1	0	0	1	14	0	0	0	0	1	3	0	20	
08:00	0	0	0	1 <	7 <	0	1 <	0	0	0	7	0	16	67
08:15	2 <	0	0	0	8 <	0	0	0	0	0	7	0	17	69 <
08:30	0	0	0	0	1	0	0	0	0	3 <	5	0	9	62
08:45	0	0	0	0	5	0	0	0	0	0	7	0	12	54
09:00	1	0	0	0	6	0	1	0	0	0	5	0	13	51
09:15	0	0	0	1	3	0	0	0	0	0	8	0	12	46
09:30	0	0	0	0	2	0	0	0	0	0	10	0	12	49
09:45	0	0	0	0	8	0	0	0	0	1	4	0	13	50
10:00	0	0	0	0	7	0	2	0	0	1	9 <	0	19	56

All Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR	
07:15	11	0	0	9	37	0	7	0	0	11	38	0	113	
07:30	10	0	0	5	38	0	8	0	0	6	60	0	127	
07:45	21	0	0	8	58	0	7	0	0	8	57	0	159	
08:00	16	0	0	5	40	0	10	0	0	6	77	0	154	553
08:15	24	0	0	7	66	0	9	0	0	10	77	0	193	633
08:30	13	0	0	12	52	0	12	0	0	5	78	0	172	678
08:45	29	0	0	15	74	0	11	0	0	4	103	0	236	755
09:00	21	0	0	21	65	0	13	0	0	7	94	0	221	822
09:15	18	0	0	12	63	0	12 <	0	0	14	77	0	196	825
09:30	21 <	0	0	16 <	69	0	9	0	0	12	85 <	0	212	865 <
09:45	27	0	0	7	79 <	0	9	0	0	12	74	0	208	837
10:00	18	0	0	19	55	0	5	0	0	9 <	87	0	193	809

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

21/6/2023 - COOPER ST / RIVER ST, MACKSVILLE

16:00 <<< HOUR ENDING   Wednesday

Quality Surveys
233669

TO FERRY ST   **COOPER ST**

16 | 0

12	11	10
0	319	64
0	23	4

RIVER ST

1	108	0
2	0	0
3	0	0

0
13

0
15

RIVER ST

0	0	9
0	0	8
0	64	7

1	20	0
69	300	1
4	5	6

N

14 | 35

300 Light
20 Heavy
0 Pedestrians

GIINAGAY WAY   **TO WALLACE ST**
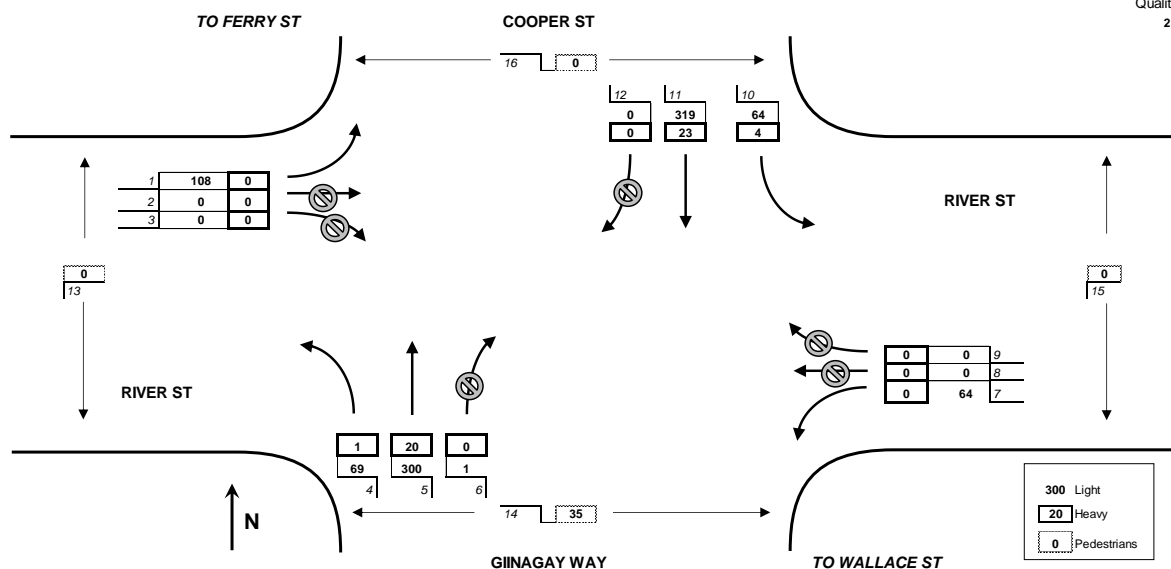
21/6/2023 - COOPER ST / RIVER ST, MACKSVILLE

Light Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR		Pedestrians 13	14	15	16
15:15	20	0	0	7	74	0	22	0	0	24	89	0	236		0	12	0	0
15:30	38	0	0	26	86	1	10	0	0	17	78	0	256		0	5	0	0
15:45	24	0	0	17	74	0	13	0	0	10	79	0	217		0	11	0	0
16:00	26	0	0	19	66 <	0 <	19	0	0	13 <	73 <	0	216	925	0	7	0	0
16:15	44 <	0	0	20 <	68	0 <	24	0	0	8	76	0	240	929 <	0	8	0	0
16:30	16	0	0	16	72	0	20 <	0	0	18	79	0	221	894	1	16 <	0	0
16:45	11	0	0	9	82	0	12	0	0	12	86	0	212	889	0	6	0	0
17:00	20	0	0	11	64	0	14	0	0	9	63	0	181	854	0	5	0	0
17:15	21	0	0	10	69	0	5	0	0	9	67	0	181	795	4	0	0	0
17:30	22	0	0	8	40	0	9	0	0	14	71	0	164	738	4	0	1 <	0
17:45	15	0	0	4	55	1 <	10	0	0	10	64	0	159	685	2	0	0 <	0
18:00	7	0	0	4	26	0 <	8	0	0	6	56	0	107	611	4 <	0	0 <	0

Heavy Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR	
15:15	0	0	0	0	8	0	0	0	0	0	6	0	14	
15:30	0	0	0	0	5	0	0	0	0	1	8	0	14	
15:45	0	0	0	0	5	0	0	0	0	1	2	0	8	
16:00	0	0	0	1	2 <	0	0	0	0	2	7	0	12	48 <
16:15	0	0	0	0	4	0	0	0	0	0	4	0	8	42
16:30	1	0	0	1	1	0	0	0	0	2 <	12	0	17	45
16:45	0	0	0	1 <	1	0	2	0	0	1 <	6 <	0	11	48 <
17:00	0	0	0	0	3	0	0	0	0	0	1	0	4	40
17:15	1 <	0	0	0	0	0	1 <	0	0	0	4	0	6	38
17:30	0	1 <	0	0	0	0	0 <	0	0	0	2	0	3	24
17:45	0	0 <	0	2	0	0	0	0	0	0	2	0	4	17
18:00	0	0 <	0	0	0	0	0	0	0	0	3	0	3	16

All Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR	
15:15	20	0	0	7	82	0	22	0	0	24	95	0	250	
15:30	38	0	0	26	91	1	10	0	0	18	86	0	270	
15:45	24	0	0	17	79	0	13	0	0	11	81	0	225	
16:00	26	0	0	20	68 <	0 <	19	0	0	15 <	80	0	228	973 <
16:15	44 <	0	0	20 <	72	0 <	24	0	0	8	80	0	248	971
16:30	17	0	0	17	73	0	20	0	0	20	91	0	238	939
16:45	11	0	0	10	83	0	14 <	0	0	13	92 <	0	223	937
17:00	20	0	0	11	67	0	14	0	0	9	64	0	185	894
17:15	22	0	0	10	69	0	6	0	0	9	71	0	187	833
17:30	22	1 <	0	8	40	0	9	0	0	14	73	0	167	762
17:45	15	0 <	0	6	55	1 <	10	0	0	10	66	0	163	702
18:00	7	0 <	0	4	26	0 <	8	0	0	6	59	0	110	627

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.
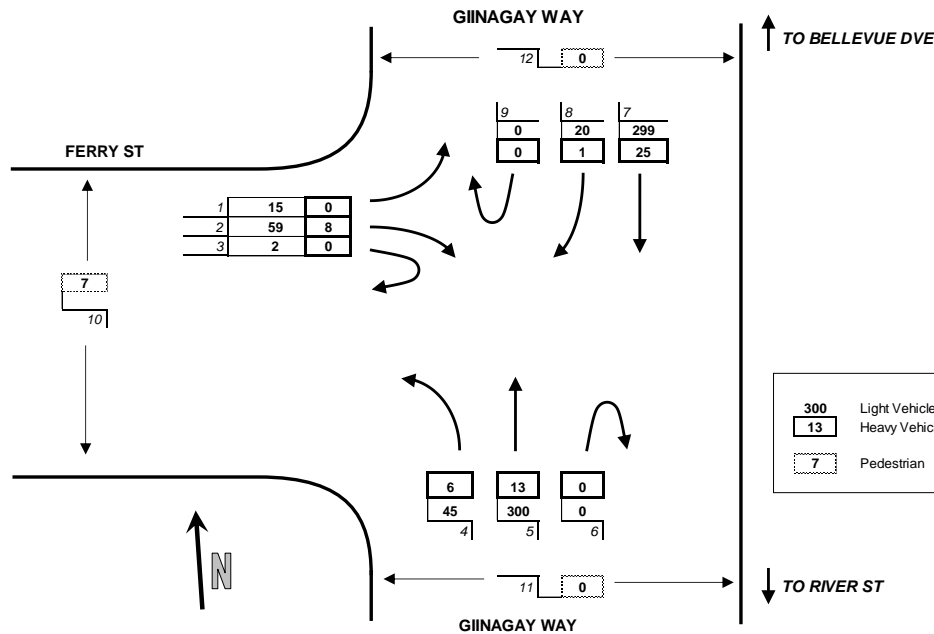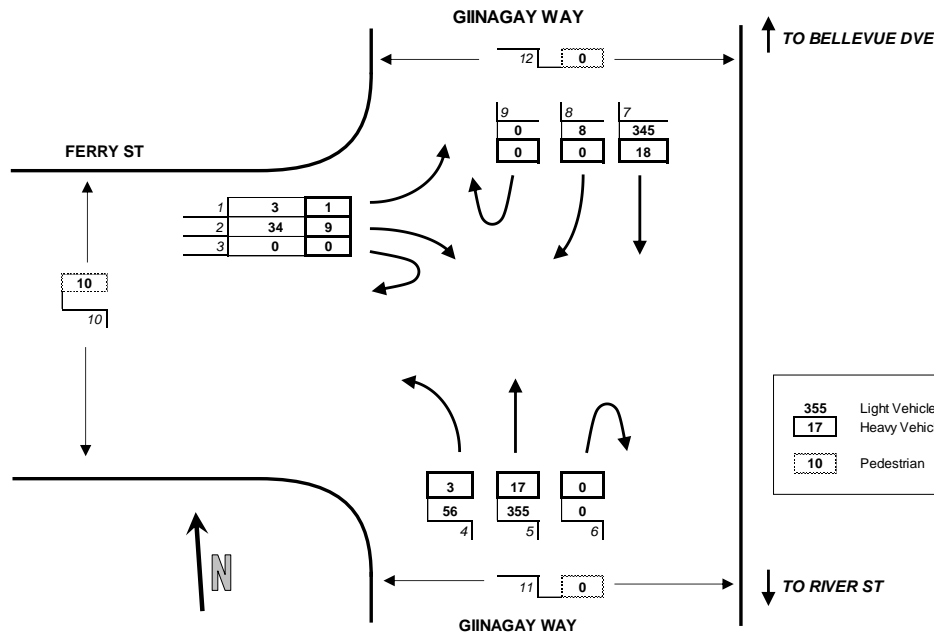
21/6/2023 - GIINAGAY WAY / WALLACE ST, MACKSVILLE

9:30 <<< HOUR ENDING   Wednesday

Quality Surveys
233669

TO RIVER ST   **GIINAGAY WAY**

12 | 51

9 | 8 | 7
153 | 212 | 4
9 | 21 | 0

LIQUORWORKS ACCESS

1 | 76 | 6
2 | 0 | 0
3 | 99 | 10

4
10

WALLACE ST

3 | 12 | 0
77 | 240 | 0
4 | 5 | 6

11 | 0

N

240	Light
12	Heavy
51	Pedestrians

GIINAGAY WAY   **TO WINIFRED ST**

21/6/2023 - GIINAGAY WAY / WALLACE ST, MACKSVILLE

Light Vehicles

	1	2	3	4	5	6	7	8	9	Total Vehicles 15 MIN HOUR		Pedestrians 10	11	12
07:15	8	0	8	14	31	0	0	24	13	98		0	0	2
07:30	11	0	4	5	25	0	0	39	22	106		1	0	2
07:45	12	0	15	15	41	0	0	38	19	140		3	0	3
08:00	8	0	12	17	35	0	0	46	37	155	499	1	0	2
08:15	14	0	19	18	48	0	0	40	40	179	580	3 <	0	4
08:30	23	0	23	16	58	0	0	61	43	224	698	0	0	6
08:45	17	0	24	16	62	0	0	58	42	219	777	0	0	12
09:00	22	0	25	20	55	0	0	66	39 <	227	849	1	0	21
09:15	20 <	0	25	17	54	0	2	53 <	27	198	868 <	1	0	10
09:30	17	0	25	24	69 <	0	2	35	45	217	861	2	0	8
09:45	23 <	3	26 <	17	53	0	4	46	31	203	845	1	0	14 <
10:00	15	2 <	25 <	21 <	54	0	1 <	42	37	197	815	1	0	13

Heavy Vehicles

	1	2	3	4	5	6	7	8	9	Total Vehicles 15 MIN HOUR	
07:15	0	0	0	0	7	0	0	5	1	13	
07:30	0	0	0	0	9	0	0	2	6	17	
07:45	4	0	1	1	9	0	0	3	0	18	
08:00	0	0	1	0	6 <	0	0	6	1	14	62
08:15	2	0	0	0	6	0	0	6	1	15	64 <
08:30	0	0	0	3	2	0	0	5	1	11	58
08:45	1	0	5	0	3	0	0	6	1	16	56
09:00	3	0	3	3 <	3	0	0	2	4	18	60
09:15	1	0	1	0 <	3	0	0	6	2	13	58
09:30	1	0	1 <	0	3	0	0	7	2 <	14	61
09:45	2 <	0	1	1	6	0	0	4	1 <	15	60
10:00	2	0	1	0	4	0	0	9 <	1	17	59

All Vehicles

	1	2	3	4	5	6	7	8	9	Total Vehicles 15 MIN HOUR	
07:15	8	0	8	14	38	0	0	29	14	111	
07:30	11	0	4	5	34	0	0	41	28	123	
07:45	16	0	16	16	50	0	0	41	19	158	
08:00	8	0	13	17	41	0	0	52	38	169	561
08:15	16	0	19	18	54	0	0	46	41	194	644
08:30	23	0	23	19	60	0	0	66	44	235	756
08:45	18	0	29	16	65	0	0	64	43	235	833
09:00	25	0	28	23	58	0	0	68	43 <	245	909
09:15	21	0	26	17	57	0	2	59 <	29	211	926 <
09:30	18	0	26 <	24	72 <	0	2	42	47	231	922
09:45	25 <	3	27	18 <	59	0	4	50	32	218	905
10:00	17	2 <	26	21	58	0	1 <	51	38	214	874

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

21/6/2023 - GIINAGAY WAY / WALLACE ST, MACKSVILLE

16:00 <<< HOUR ENDING   Wednesday

Quality Surveys
233669

TO RIVER ST   GIINAGAY WAY

12 | 26

9 | 8 | 7
172 | 179 | 31
3 | 22 | 0

1 | 74 | 8
2 | 19 | 0
3 | 94 | 10

LIQUORWORKS ACCESS

19
10

WALLACE ST

2 | 12 | 1
72 | 292 | 0
4 | 5 | 6

11 | 0

N

GIINAGAY WAY   *TO WINIFRED ST*

292 Light
12 Heavy
26 Pedestrians

21/6/2023 - GIINAGAY WAY / WALLACE ST, MACKSVILLE

Light Vehicles

	1	2	3	4	5	6	7	8	9	Total Vehicles 15 MIN	HOUR	Pedestrians 10	11	12
15:15	13	6	13	18	65	0	8	55	50	228		5	0	13
15:30	28	5	34	19	84	0	7	40	39	256		3	0	3
15:45	18	4	22	21	70	0	7	42	40	224		5	0	8
16:00	15	4	25	14	73	0	9	42	43 <	225	933	6 <	0	2
16:15	20 <	5	36 <	22	69	0	9 <	44	37	242	947	4	0	2
16:30	14	8	23	25	85 <	0	5	51	50	261	952	3	0	9
16:45	23	5	25	22	69	1	6	55 <	34	240	968 <	5	0	10
17:00	13	9 <	25	20	59	2 <	4	40	38	210	953	1	0	7
17:15	16	4	18	24 <	61	0 <	5	36	31	195	906	0	0	13 <
17:30	13	4	19	25 <	40	0 <	5	44	36	186	831	5	0	4
17:45	9	1	16	16	54	1 <	4	39	30	170	761	1	0	7
18:00	5	1	9	11	25	0	5	35	23	114	665	1	0	6

Heavy Vehicles

	1	2	3	4	5	6	7	8	9	Total Vehicles 15 MIN	HOUR
15:15	2	0	1	1	6	0	0	5	1	16	
15:30	3	0	0	0	1	0	0	8	0	12	
15:45	3	0	7	1	2	1	0	2	1	17	
16:00	0 <	0	2	0	3 <	0 <	0	7	1	13	58
16:15	1	0	3	1	4	0 <	0	3	1	13	55
16:30	1	0	3 <	0	1	0 <	0	10	2	17	60 <
16:45	1	0	2	0	1	0	1	5 <	2 <	12	55
17:00	0	0	0	1	3	0	0	1	0	5	47
17:15	0	0	0	1	0	0	1 <	2	1	5	39
17:30	3	0	2	1 <	1	0	0 <	2	1	10	32
17:45	0	0	1	0 <	2	0	0	2	0	5	25
18:00	0	0	0	1 <	0	0	0	3	0	4	24

All Vehicles

	1	2	3	4	5	6	7	8	9	Total Vehicles 15 MIN	HOUR
15:15	15	6	14	19	71	0	8	60	51	244	
15:30	31	5	34	19	85	0	7	48	39	268	
15:45	21	4	29	22	72	1	7	44	41	241	
16:00	15	4	27	14	76	0	9	49	44 <	238	991
16:15	21 <	5	39 <	23	73	0	9 <	47	38	255	1002
16:30	15	8	26	25	86 <	0	5	61	52 <	278	1012
16:45	24	5	27	22	70	1	7	60 <	36	252	1023 <
17:00	13	9 <	25	21	62	2 <	4	41	38	215	1000
17:15	16	4	18	25	61	0 <	6	38	32	200	945
17:30	16	4	21	26 <	41	0 <	5	46	37	196	863
17:45	9	1	17	16	56	1 <	4	41	30	175	786
18:00	5	1	9	12	25	0	5	38	23	118	689

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

21/6/2023 - GIINAGAY WAY / WINIFRED ST, MACKSVILLE

9:30 <<< HOUR ENDING   Wednesday

GIINAGAY WAY

↑ *TO WALLACE ST*

| 9 | 0 |

6	5
51	257
0	32

WINIFRED ST

| 1 | 26 | 0 |
| 2 | 21 | 1 |

| 41 |
| 7 |

304	Light Vehicles
15	Heavy Vehicles
0	Pedestrians

N

2	15
43	304
3	4

| 8 | 0 |

↓ *TO PARTRIDGE ST*

GIINAGAY WAY

21/6/2023 - GIINAGAY WAY / WINIFRED ST, MACKSVILLE

Light Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN HOUR		Pedestrians 7	8	9
07:15	3	2	0	40	30	3	78		0	0	0
07:30	3	5	3	27	30	8	76		2	0	0
07:45	6	4	7	54	47	8	126		9	0	0
08:00	3	4	2	47	45	12	113	393	4	0	0
08:15	7	6	11	59	45	10	138	453	11	0	0
08:30	7	4	13	72	55	14	165	542	4	0	0
08:45	5	2	7	77	65	14	170	586	5	0	0
09:00	5	6	14	73	67	20	185	658	6	0	0
09:15	6	9	13 <	73	74 <	11 <	186	706 <	7	0	0
09:30	10	4	9	81 <	51	6	161	702	8	0	0
09:45	12	10	8	60	61	11	162	694	5	0	0
10:00	7 <	7 <	11	76	64	7	172	681	6 <	0	0

Heavy Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN HOUR	
07:15	0	0	0	8	5	0	13	
07:30	1	0	0	8	2	0	11	
07:45	4	2	0	8	3	0	17	
08:00	0 <	0	0	8 <	6	2 <	16	57 <
08:15	0 <	0	1	6	6	0 <	13	57 <
08:30	0	1 <	0	5	5	0 <	11	57 <
08:45	0	0	0	3	11	0 <	14	54
09:00	0	0	1 <	7	7	0	15	53
09:15	0	0	1 <	3	7	0	11	51
09:30	0	1	0 <	2	7 <	0	10	50
09:45	0	0	0 <	7	6	0	13	49
10:00	0	0	0	4	9	0	13	47

All Vehicles

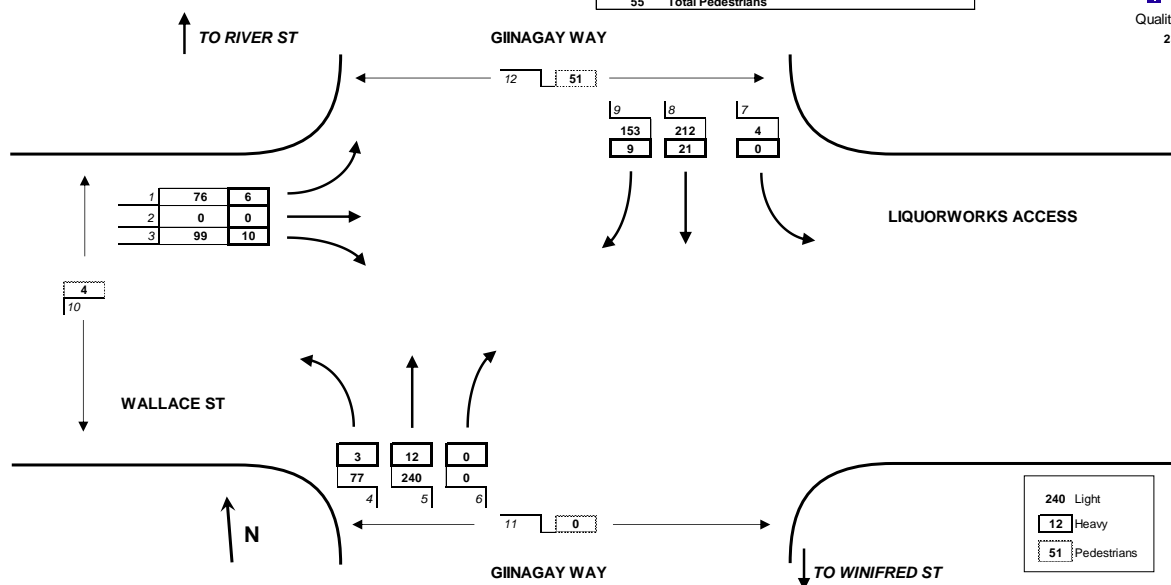|	1	2	3	4	5	6	Total Vehicles 15 MIN HOUR	
07:15	3	2	0	48	35	3	91	
07:30	4	5	3	35	32	8	87	
07:45	10	6	7	62	50	8	143	
08:00	3	4	2	55	51	14	129	450
08:15	7	6	12	65	51	10	151	510
08:30	7	5	13	77	60	14	176	599
08:45	5	2	7	80	76	14	184	640
09:00	5	6	15	80	74	20	200	711
09:15	6	9	14 <	76	81 <	11 <	197	757 <
09:30	10	5	9	83 <	58	6	171	752
09:45	12	10	8	67	67	11	175	743
10:00	7 <	7 <	11	80	73	7	185	728

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

21/6/2023 - GIINAGAY WAY / WINIFRED ST, MACKSVILLE

16:00 <<< HOUR ENDING   Wednesday

Quality Surveys

233669

TO WALLACE ST

GIINAGAY WAY

| 9 | 0 |

6		5	
44		294	
0		30	

WINIFRED ST

| 1 | 58 | 1 |
| 2 | 30 | 0 |

| 42 |
| 7 |

0		15	
52		330	
3		4	

| 8 | 0 |

N

330	Light Vehicles
15	Heavy Vehicles
0	Pedestrians

TO PARTRIDGE ST
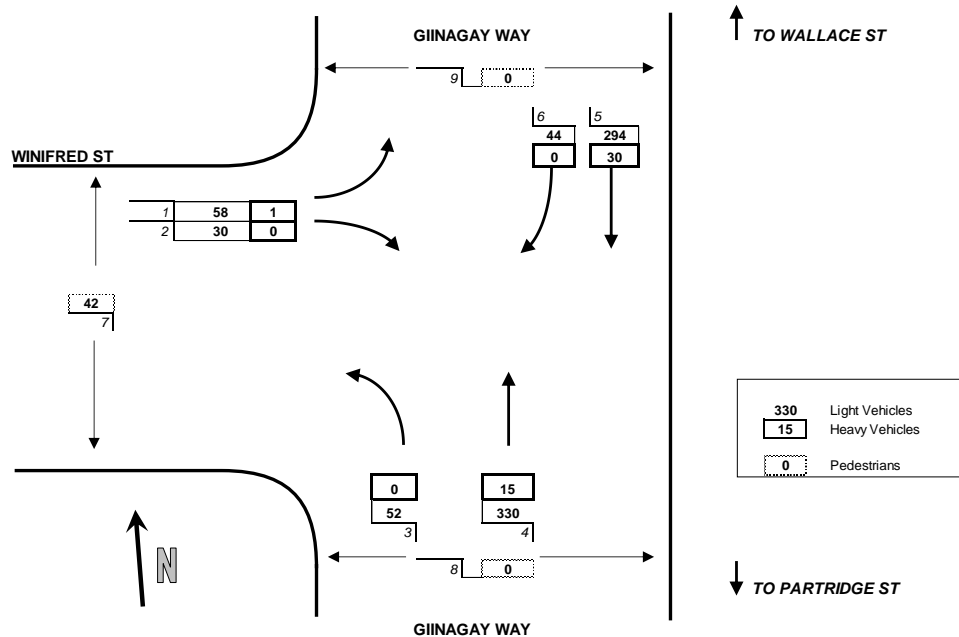
GIINAGAY WAY

21/6/2023 - GIINAGAY WAY / WINIFRED ST, MACKSVILLE

Light Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN HOUR		Pedestrians 7	8	9
15:15	17	9	15	80	72	17	210		12	0	0
15:30	16	6	10	93	77	7	209		9	0	0
15:45	13	6	15	79	73	9	195		8	0	0
16:00	12 <	9	12 <	78	72	11	194	808	13	0	0
16:15	9	13	10	93 <	75 <	13	213	811	6	0	0
16:30	14	7	11	89	64	21	206	808	16	0	0
16:45	22	10	11	76	85	11 <	215	828 <	17 <	0	0
17:00	11	16 <	14	78	63	11 <	193	827	7	0	0
17:15	6	9	11	86	50	11	173	787	8	0	0
17:30	6	8	9	63	57	13	156	737	8	0	0
17:45	8	1	13	59	48	10	139	661	8	0	0
18:00	5	5	13	33	39	14	109	577	14	0	0

Heavy Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN HOUR	
15:15	0	0	0	7	5	0	12	
15:30	0	0	0	3	8	0	11	
15:45	1	0	0	2	7	0	10	
16:00	0	0	0	3 <	10	0	13	46
16:15	0	0	0	6	6	0	12	46
16:30	1 <	0	0	1	12 <	0	14	49 <
16:45	0	0	0	0	6	0	6	45
17:00	0	0	1	4	2	0	7	39
17:15	0	0	1	1	2	0	4	31
17:30	0	0	0	1	4	1 <	6	23
17:45	1	0	1 <	1	3	0 <	6	23
18:00	0	0	0	1	3	0 <	4	20

All Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN HOUR	
15:15	17	9	15	87	77	17	222	
15:30	16	6	10	96	85	7	220	
15:45	14	6	15	81	80	9	205	
16:00	12 <	9	12 <	81	82	11	207	854
16:15	9	13	10	99 <	81	13	225	857
16:30	15	7	11	90	76	21	220	857
16:45	22	10	11	76	91 <	11 <	221	873 <
17:00	11	16 <	15	82	65	11 <	200	866
17:15	6	9	12	87	52	11	177	818
17:30	6	8	9	64	61	14	162	760
17:45	9	1	14	60	51	10	145	684
18:00	5	5	13	34	42	14	113	597

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.
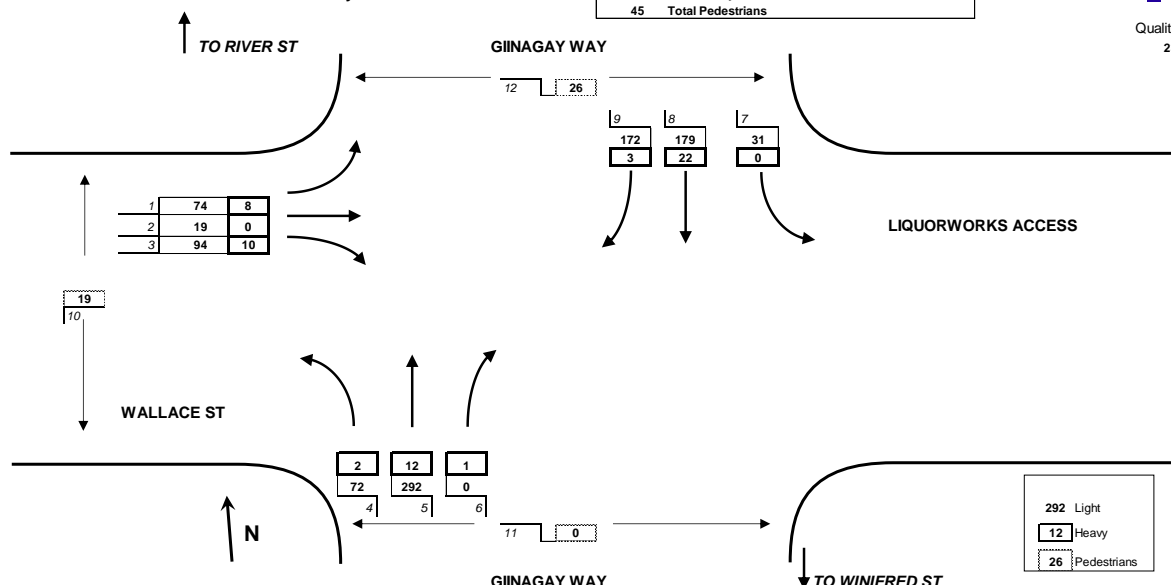
21/6/2023 - GIINAGAY WAY / PARTRIDGE ST, MACKSVILLE

9:30 <<< HOUR ENDING   Wednesday
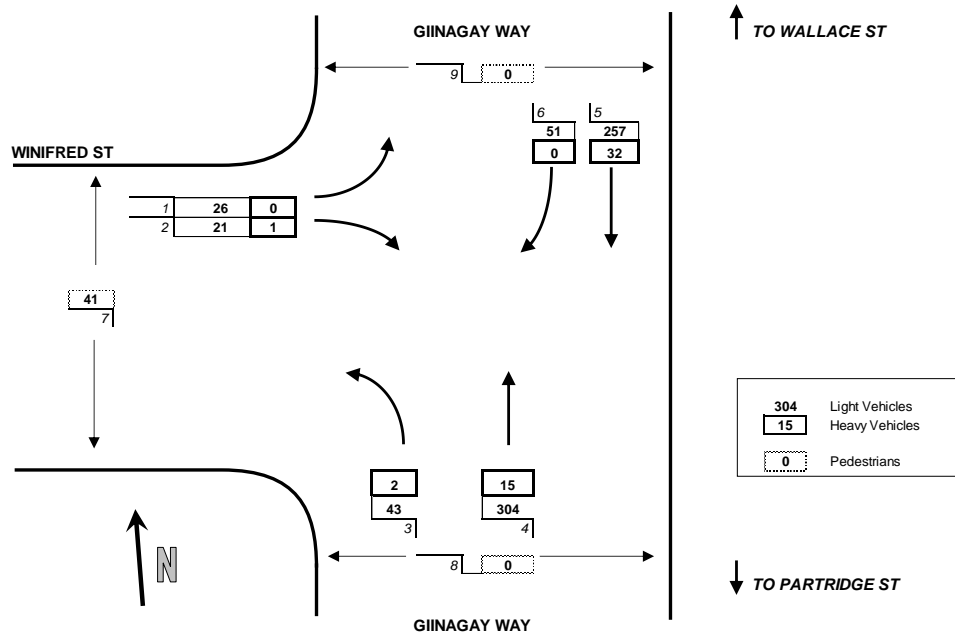
Summary:
GIINAGAY WAY / PARTRIDGE ST
696	Total Light Vehicles
66	Total Heavy Vehicles
16	Total Pedestrians
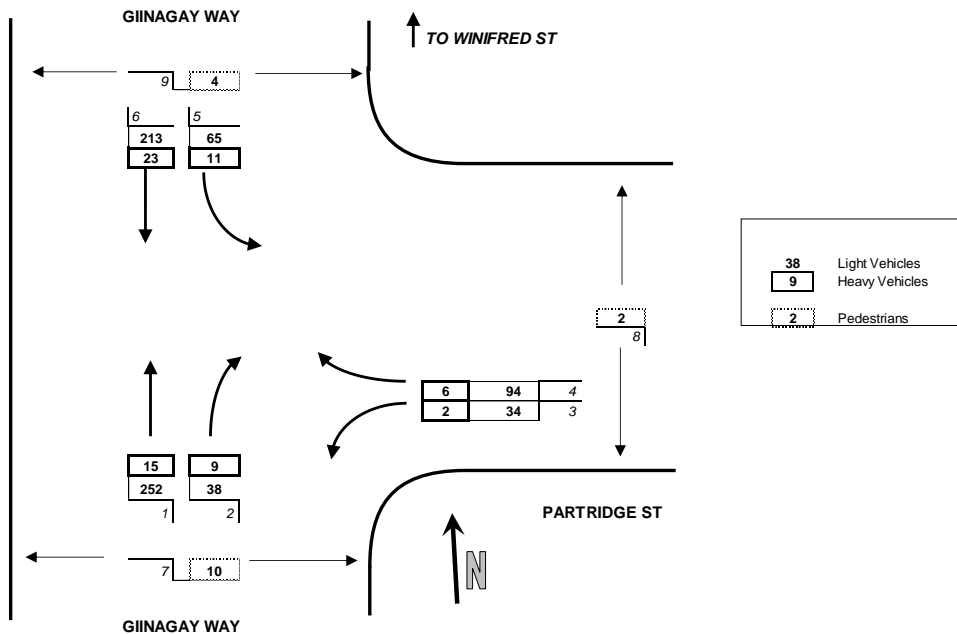
npE
Quality Surveys
233669

GIINAGAY WAY

↑ *TO WINIFRED ST*

9	4

6	5
213	65
23	11

Legend:
38	Light Vehicles
9	Heavy Vehicles
2	Pedestrians

| 2 |
| 8 |

| 6 | 94 | 4 |
| 2 | 34 | 3 |

15	9
252	38
1	2

PARTRIDGE ST

7	10

N

GIINAGAY WAY

21/6/2023 - GIINAGAY WAY / PARTRIDGE ST, NORTH MACKSVILLE

Light Vehicles

	1	2	3	4	5	6	15 MIN	HOUR		7	8	9
07:15	31	4	2	10	6	25	78			0	0	0
07:30	23	3	5	6	3	33	73			2	0	0
07:45	45	10	1	16	13	39	124			3	0	1
08:00	37	10	7	12	6	40	112	387		0	0	1
08:15	45	7	7	23	13	36	131	440		2	0	1
08:30	69	8	2	17	11	48	155	522		1	0	1
08:45	64	10	10	19	12	57	172	570		4	1	1
09:00	68	14	3	21	20	50	176	634		1	0	0
09:15	57 <	8	8	20	19	55	167	670		2	0	1
09:30	63	6	13	34	14	51	181	696		3 <	1	2
09:45	46	13 <	10	22	20 <	54	165	689		0	0	2
10:00	67	14 <	7 <	34 <	14	57 <	193	706 <		1	3 <	2 <

Heavy Vehicles

	1	2	3	4	5	6	15 MIN	HOUR
07:15	4	0	1	4	1	4	14	
07:30	3	0	0	5	0	2	10	
07:45	2	1	7	5	1	5	21	
08:00	6	1	0 <	2 <	0	5	14	59
08:15	4	1	1 <	3	1	5	15	60
08:30	4 <	1	0 <	1	0	6	12	62
08:45	2 <	0	0	2	1	11	16	57
09:00	5	6	0	3	1	6 <	21	64
09:15	2	3 <	1	1	4	1	12	61
09:30	6	0	1	0	5 <	5	17	66 <
09:45	2	1 <	0	2	1 <	5	11	61
10:00	6 <	6 <	0	2	1 <	8	23	63

All Vehicles

	1	2	3	4	5	6	15 MIN	HOUR
07:15	35	4	3	14	7	29	92	
07:30	26	3	5	11	3	35	83	
07:45	47	11	8	21	14	44	145	
08:00	43	11	7	14	6	45	126	446
08:15	49	8	8	26	14	41	146	500
08:30	73	9	2	18	11	54	167	584
08:45	66	10	10	21	13	68	188	627
09:00	73	20	3	24	21	56	197	698
09:15	59 <	11	9	21	23	56	179	731
09:30	69	6	14	34	19	56 <	198	762
09:45	48	14 <	10	24	21 <	59	176	750
10:00	73	20 <	7 <	36 <	15	65 <	216	769 <

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

21/6/2023 - GIINAGAY WAY / PARTRIDGE ST, MACKSVILLE

16:00 <<< HOUR ENDING   Wednesday

tpg Quality Surveys
233669

GIINAGAY WAY

TO WINIFRED ST

9	7

6	5
239	84
25	7

37	Light Vehicles
2	Heavy Vehicles
7	Pedestrians

7
8

4	119	4
7	34	3

11	2
256	37
1	2

PARTRIDGE ST

N

7	6
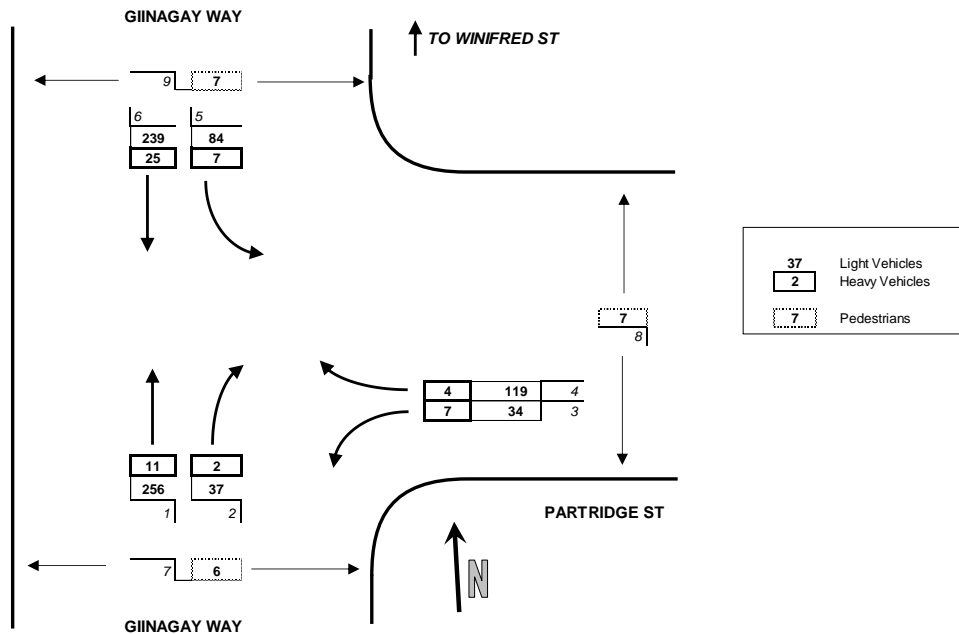
GIINAGAY WAY

21/6/2023 - GIINAGAY WAY / PARTRIDGE ST, NORTH MACKSVILLE

Light Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN	HOUR		Pedestrians 7	8	9
15:15	56	5	12	31	15	64	183			3	0	1
15:30	75	8	5	32	20	64	204			1	1	2
15:45	71	10	10	31	22	54	198			1	5	1
16:00	54	14	7	25	27	57	184	769		1	1	3
16:15	76 <	13 <	4	25	24 <	66	208	794 <		2	2	0
16:30	67	5	5	40	17	54	188	778		7	2 <	1
16:45	60	9	8	25	20	76	198	778		2	0	6 <
17:00	61	8	9	33	20	60 <	191	785		2 <	2	0
17:15	53	4	10	41 <	15	40	163	740		0	0	2
17:30	53	3	7	20	12	53	148	700		2	1	2 <
17:45	46	2	9 <	25	9	42	133	635		0	2	1
18:00	27	1	1	19	9	33	90	534		0	7 <	0

Heavy Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN	HOUR
15:15	5	1	5	2	1	5	19	
15:30	2	0	1	1	2	6	12	
15:45	2	0	0	1	1	8	12	
16:00	2 <	1	1 <	0	3	6	13	56
16:15	4	1	1	2	2	4	14	51
16:30	1	3	2	0	5	8 <	19	58 <
16:45	0	1 <	1	0	3 <	3	8	54
17:00	2	0	0	3 <	1	1	7	48
17:15	2	0	0	0	0	2	4	38
17:30	1	0	0	0	0	4	5	24
17:45	2	0	0	0	1	2	5	21
18:00	1	0	0	0	1	2	4	18

All Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN	HOUR
15:15	61	6	17	33	16	69	202	
15:30	77	8	6	33	22	70	216	
15:45	73	10	10	32	23	62	210	
16:00	56	15	8 <	25	30	63	197	825
16:15	80 <	14 <	5	27	26 <	70	222	845 <
16:30	68	8 <	7	40	22 <	62	207	836
16:45	60	10 <	9	25	23 <	79 <	206	832
17:00	63	8	9	36	21	61	198	833
17:15	55	4	10	41 <	15	42	167	778
17:30	54	3	7	20	12	57	153	724
17:45	48	2	9	25	10	44	138	656
18:00	28	1	1	19	10	35	94	552

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

Appendix C
Calibration Results

GEH	Light Vehicles		Heavy Vehicles	
	No. of Counts	**Share**	**No. of Counts**	**Share**
GEH≤ 5	36	100%	36	100%
5≤ GEH ≤ 10	0	0%	0	0%
GEH > 10	0	0%	0	0%

Intersection Counts: Observed vs. Modelled
All Vehicles, 3:35-4:35 pm

y = 0.9812x - 1.2154
R² = 0.9956
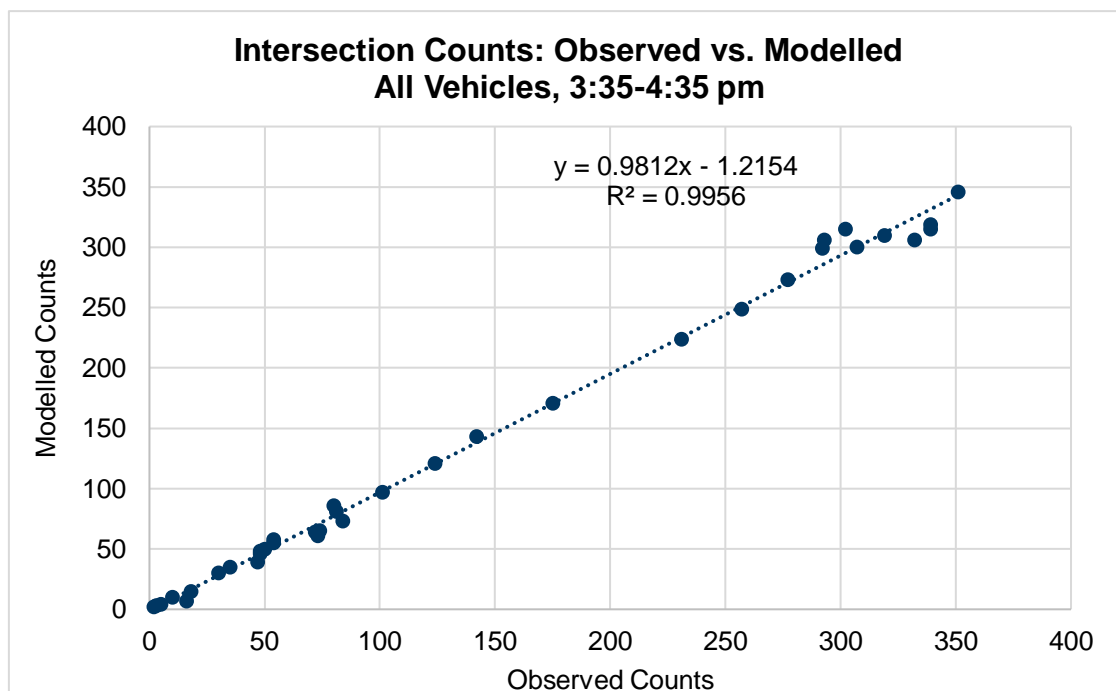
Figure C.1   Scatter plot of intersection turn counts: observed vs modelled, all vehicles 3:45 - 4:45

Intersection Counts: Observed vs. Modelled
Light Vehicles, 3:35-4:35 pm

y = 0.9825x
R² = 0.9978

Figure C.2   Scatter plot of intersection turn counts: observed vs modelled, light vehicle 3:45 - 4:45

**Intersection Counts: Observed vs. Modelled
Heavy Vehicles, 3:35-4:35 pm**

$y = 0.9147x$
$R^2 = 0.9701$

Figure C.3 *Scatter plot of intersection turn counts: observed vs modelled, heavy vehicle 3:45 - 4:45*

Detailed Calibration Spreadsheet

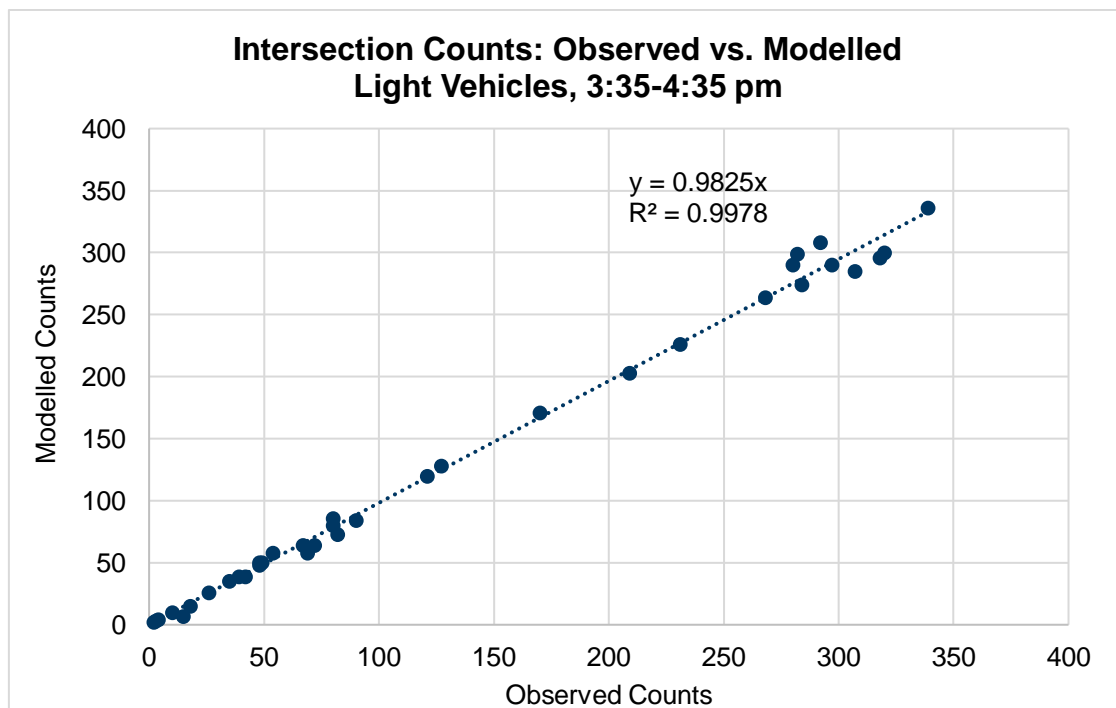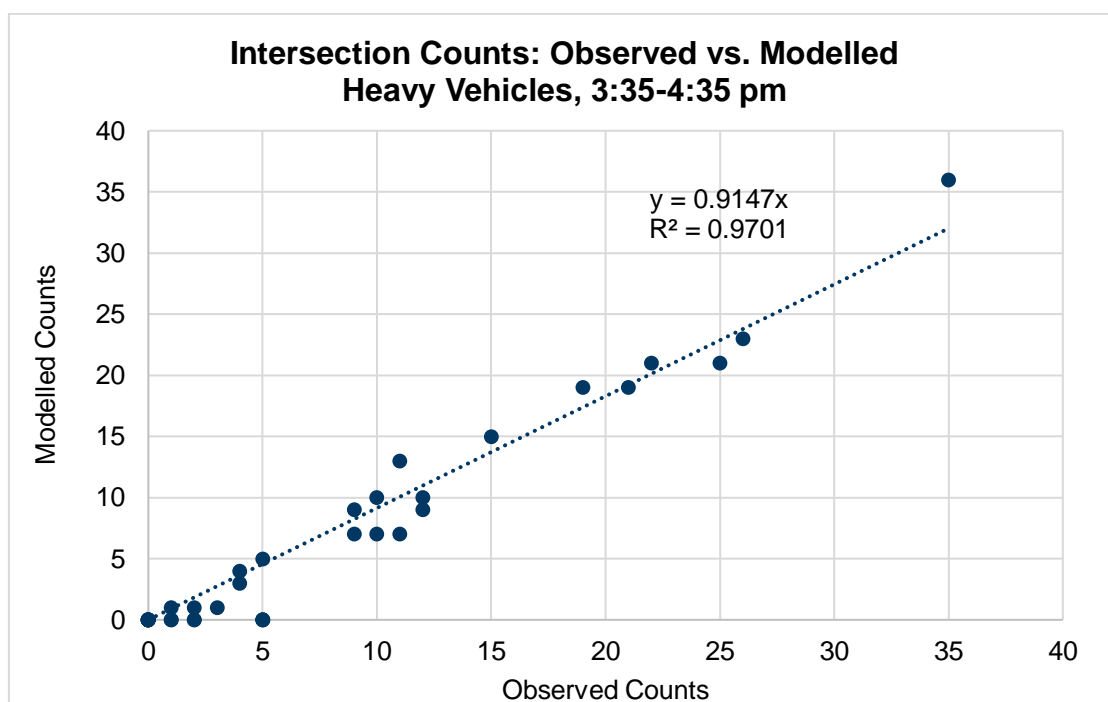| Int ID	Intersection	Site	Approach	Move	Movement ID	Unique ID	From Link	To Link	Vissim ID	LV_OBS	LV_MOD	LV_GEH	HV_OBS	HV_MOD	HV_GEH	Total_OBS	Total_MODEL
1	Giinagay Way/Bellevue Dr	Site1	S	L	1	1_1	38	3	38_3	15	7	2.4	1	0	1	16	7
		Site1	S	T	2	1_2											
		Site1	S	R	3	1_3	38	37	38_37	2	2	0.0	0	0	0.0	2	2
		Site1	E	L	4	1_4	36	39	36_39	3	3	0.0	0	0	0.0	3	3
		Site1	E	T	5	1_5	36	3	36_3	320	300	1.1	19	19	0.0	339	319
		Site1	E	R	6	1_6											
		Site1	N	L	7	1_7											
		Site1	N	T	8	1_8											
		Site1	N	R	9	1_9											
		Site1	W	L	10	1_10											
		Site1	W	T	11	1_11	4	37	4_37	282	299	1.0	11	7	1.3	293	306
		Site1	W	R	12	1_12	4	39	4_39	18	15	0.7	0	0	0.0	18	15
2	Giinagay Way/Ferry St	Site2	S	L	1	2_1	6	2	6_2	69	58	1.4	4	3	0.5	73	61
		Site2	S	T	2	2_2	6	4	6_4	292	308	0.9	10	7	1.0	302	315
		Site2	S	R	3	2_3											
		Site2	E	L	4	2_4											
		Site2	E	T	5	2_5											
		Site2	E	R	6	2_6											
		Site2	N	L	7	2_7											
		Site2	N	T	8	2_8	3	5	3_5	318	296	1.3	21	19	0.4	339	315
		Site2	N	R	9	2_9	3	2	3_2	10	10	0.0	0	0	0.0	10	10
		Site2	W	L	10	2_10	1	4	1_4	4	4	0.0	1	0	1.4	5	4
		Site2	W	T	11	2_11											
		Site2	W	R	12	2_12	1	5	1_5	39	39	0.0	9	7	0.7	48	46
3	Giinagay Way/River St	Site3	S	L	1	3_1	11	10	11_10	72	64	1.0	2	1	0.8	74	65
		Site3	S	T	2	3_2	11	6	11_6	280	290	0.6	12	9	0.9	292	299
		Site3	S	R	3	3_3											
		Site3	E	L	4	3_4	7	13	7_13	80	86	0.7	0	0	0.0	80	86
		Site3	E	T	5	3_5											
		Site3	E	R	6	3_6											
		Site3	N	L	7	3_7	5	8	5_8	49	50	0.1	5	5	0.0	54	55
		Site3	N	T	8	3_8	5	13	5_13	307	285	1.3	25	21	0.8	332	306
		Site3	N	R	9	3_9											
		Site3	W	L	10	3_10	9	6	9_6	80	80	0.0	1	1	0.0	81	81
		Site3	W	T	11	3_11											
		Site3	W	R	12	3_12											
4	Giinagay Way/ Wallace St	Site4	S	L	1	4_1	20	18	20_18	82	73	1.0	2	0	2.0	84	73
		Site4	S	T	2	4_2	20	11	20_11	297	290	0.4	10	10	0.0	307	300
		Site4	S	R	3	4_3											
		Site4	E	L	4	4_4											
		Site4	E	T	5	4_5											
		Site4	E	R	6	4_6											
		Site4	N	L	7	4_7											
		Site4	N	T	8	4_8	13	22	13_22	209	203	0.4	22	21	0.2	231	224
		Site4	N	R	9	4_9	13	18	13_18	170	171	0.1	5	0	3.2	175	171
		Site4	W	L	10	4_10	17	11	17_11	67	64	0.4	5	0	3.2	72	64
		Site4	W	T	11	4_11											
		Site4	W	R	12	4_12	17	22	17_22	127	128	0.1	15	15	0.0	142	143
5	Giinagay Way/Winifred St	Site5	S	L	1	5_1	29	27	29_27	48	48	0.0	0	0	0.0	48	48
		Site5	S	T	2	5_2	29	19	29_19	339	336	0.2	12	10	0.6	351	346
		Site5	S	R	3	5_3											
		Site5	E	L	4	5_4											
		Site5	E	T	5	5_5											
		Site5	E	R	6	5_6											
		Site5	N	L	7	5_7											
		Site5	N	T	8	5_8	24	28	24_28	284	274	0.6	35	36	0.2	319	310
		Site5	N	R	9	5_9	24	27	24_27	54	58	0.5	0	0	0.0	54	58
		Site5	W	L	10	5_10	26	19	26_19	48	50	0.3	2	0	2.0	50	50
		Site5	W	T	11	5_11											
		Site5	W	R	12	5_12	26	28	26_28	35	35	0.0	0	0	0.0	35	35
6	Ginnagay/Partridge St	Site6	S	L	1	6_1											
		Site6	S	T	2	6_2	32	29	32_29	268	264	0.2	9	9	0.0	277	273
		Site6	S	R	3	6_3	32	31	32_31	42	39	0.5	5	0	3.2	47	39
		Site6	E	L	4	6_4	30	33	30_33	26	26	0.0	4	4	0.0	30	30
		Site6	E	T	5	6_5											
		Site6	E	R	6	6_6	30	29	30_29	121	120	0.1	3	1	1.4	124	121
		Site6	N	L	7	6_7	28	31	28_31	90	84	0.6	11	13	0.6	101	97
		Site6	N	T	8	6_8	28	33	28_33	231	226	0.3	26	23	0.6	257	249
		Site6	N	R	9	6_9											
		Site6	W	L	10	6_10											
		Site6	W	T	11	6_11											
		Site6	W	R	12	6_12											

Appendix D

Queue Length Results

Table D.1   Average Queue Length Results

Intersection			Base (Existing) PM peak		
Name	**Approach**	**Movement**	**Observed (Average)**	**Modelled (Average)**	**Difference**
Giinagay Way/Bellevue Dr	South	Left			
		Right	1	0	-1
	East	Left			
		Through			
	West	Through	2	0	-2
		Right			
Giinagay Way/Ferry St	South	Left			
		Through			
	North	Through			
		Right			
	West	Left	1	0	-1
		Right	2	0	-2
Giinagay Way/ River St	South	Left			
		Through			
	East	Left	2	3	1
	North	Left			
		Through			
	West	Left	2	2	1
Giinagay Way/ Wallace St	South	Left	1	1	0
		Through	3	1	-2
	North	Through	2	0	-2
		Right	2	5	2
	West	Left	2	1	0
		Right	3	1	-1
Giinagay Way/ Winfred St	South	Left			
		Through			
	North	Through			
		Right	1	0	-1
	West	Left	1	0	-1
		Right	1	0	-1
Giinagay Way/Partridge St	South	Through	3	1	-2
		Right	1	1	-1
	East	Left	2	1	-1
		Right	2	1	-1
	North	Left	1	1	0
		Through	1	1	-1

Appendix E
Signal Timing

TCS 2563
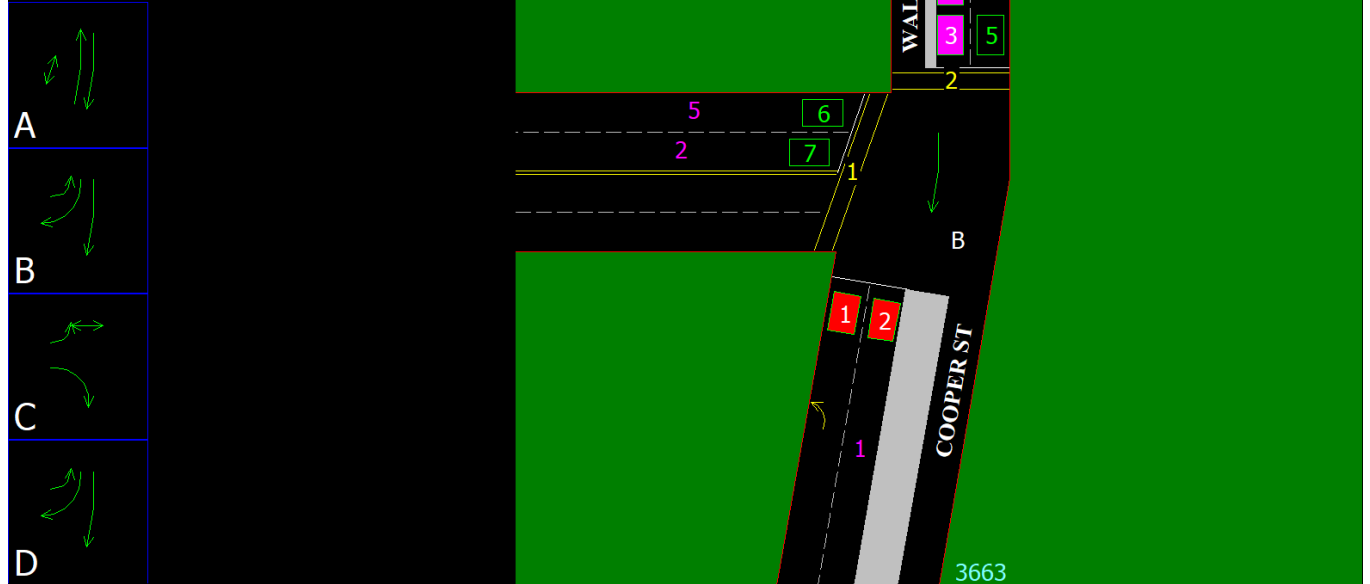
Warm Up Period

Phase	Total Phase Time	Phase Count	Average	MAX Phase Count	Adjusted Average Phase Time	Manually Adjusted Phase Time
A phase	2250	54	42	54	42	42
B phase	269	22	12	54	5	12
C phase	951	51	19	54	18	18
Cycle	3470	54	64			71

Peak hour Period

Phase	Total Phase Time	Phase Count	Average	MAX Phase Count	Adjusted Average Phase Time	Manually Adjusted Phase Time
A phase	2138	52	41	52	41	41
B phase	409	30	14	52	8	12
C phase	954	50	19	52	18	18
Cycle	3501	52	67			71

Cool Down Period

Phase	Total Phase Time	Phase Count	Average	MAX Phase Count	Adjusted Average Phase Time	Manually Adjusted Phase Time
A phase	2395	55	43.5	55	44	44
B phase	240	20	12.0	55	4	12
C phase	846	48	17.6	55	15	15
Cycle	3481	55	63.3			71

TCS 3663
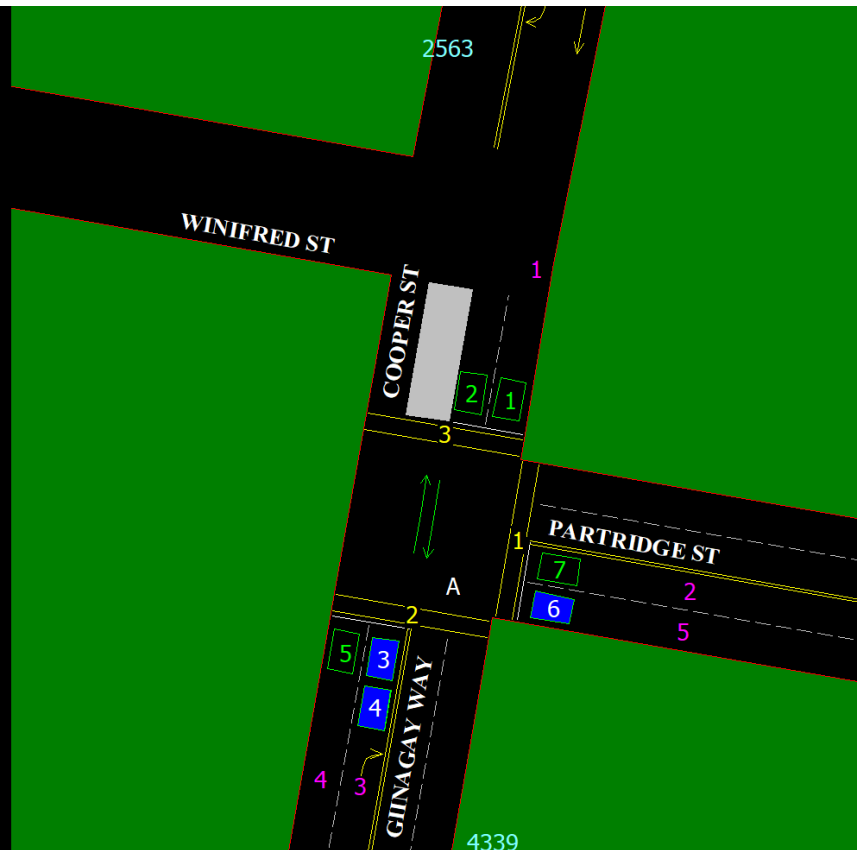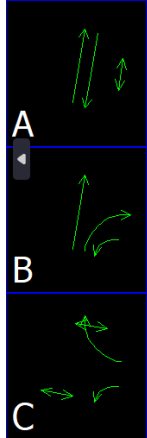
Warm Up Period

Phase	Total Phase Time	Phase Count	Average	MAX Phase Count	Adjusted Average Phase Time	Manually Adjusted Phase Time
A phase	2270	51	45	52	44	44
B phase	68	6	11	52	1	12
C phase	964	52	19	52	19	19
Cycle	3302	52	64			74

Peak Hour Period

Phase	Total Phase Time	Phase Count	Average	MAX Phase Count	Adjusted Average Phase Time	Manually Adjusted Phase Time
A phase	2385	47	51	48	50	50
B phase	101	8	13	48	2	12
C phase	857	48	18	48	18	18
Cycle	3343	48	70			80

Cool Down Period

Phase	Total Phase Time	Phase Count	Average	MAX Phase Count	Adjusted Average Phase Time	Manually Adjusted Phase Time
A phase	2426	53	46	54	45	45
B phase	86	7	12	54	2	12
C phase	875	54	16	54	16	16
Cycle	3387	54	63			73

Appendix F

Intersection LOS

Base Year Scenario

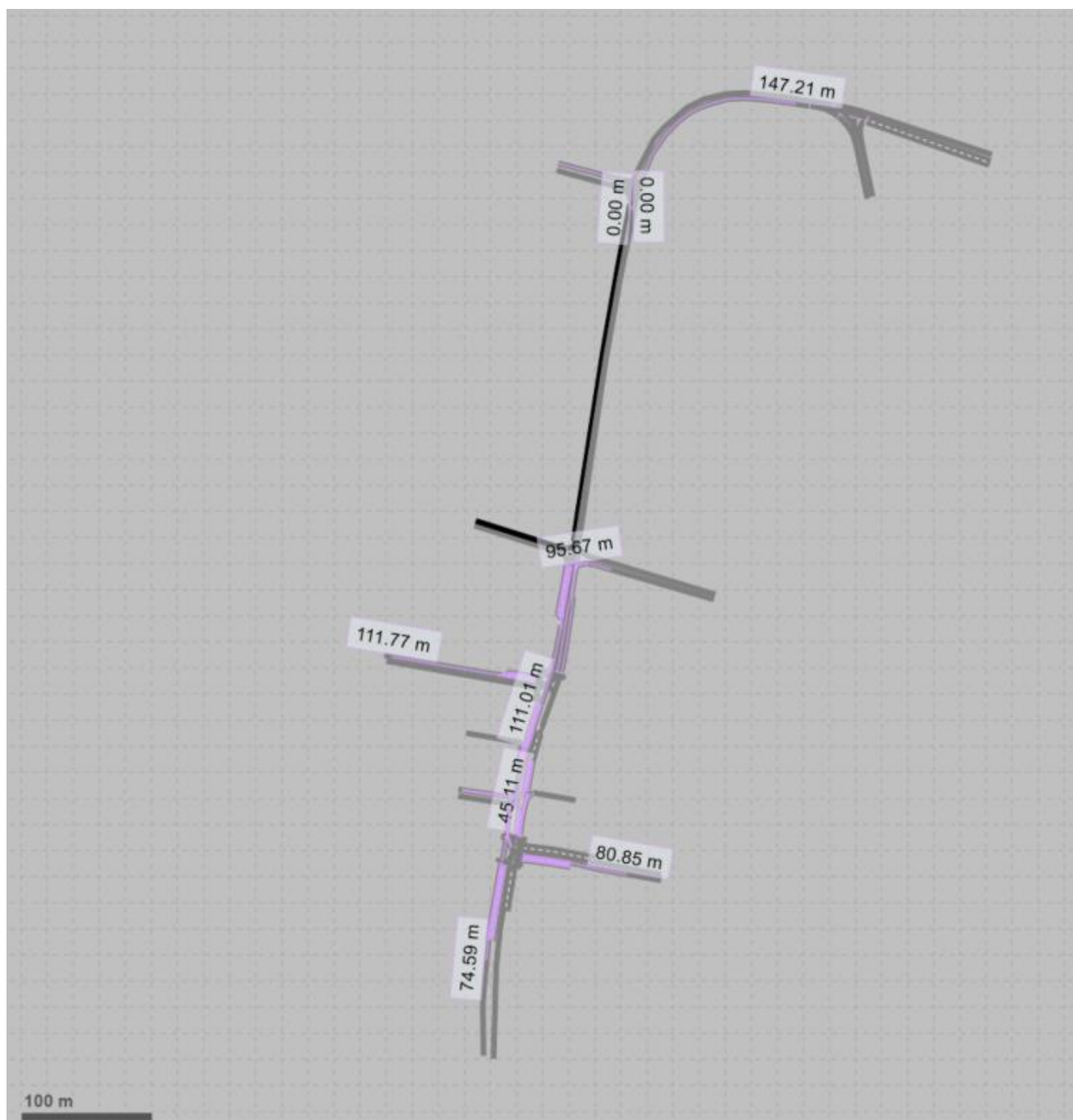| Int ID	Intersection	Site	App	Move	Symbol	Stick_ID	From Link	To Link	Vissim ID	Movement ID	Unique ID	Lookup	LV MOD	HV MOD	Total MOD	Total Delay	Total LOS
1	Giinagay Way/Bellevue Dr	Site1	S	L	↰	Site1-:	38	3	38_3	1	1_1	3600-7200-38-3	7	0	7	1	A
		Site1	S	T	↑	Site1-#				2	1_2	3600-7200--					
		Site1	S	R	↱	Site1-;	38	37	38_37	3	1_3	3600-7200-38-37	2	0	2	3	A
		Site1	E	L	⌐	Site1->	36	39	36_39	4	1_4	3600-7200-36-39	3	0	3	0	A
		Site1	E	T	←	Site1-!	36	3	36_3	5	1_5	3600-7200-36-3	300	19	319	0	A
		Site1	E	R	L	Site1-<											
		Site1	N	L	↪	Site1-9											
		Site1	N	T	↓	Site1-$											
		Site1	N	R	↵	Site1-8											
		Site1	W	L	⌐	Site1-=											
		Site1	W	T	→	Site1-"	4	37	4_37	11	1_11	3600-7200-4-37	299	7	306	0	A
		Site1	W	R	↓	Site1-6	4	39	4_39	12	1_12	3600-7200-4-39	15	0	15	1	A
2	Giinagay Way/Ferry St	Site2	S	L	↰	Site2-:	6	2	6_2	1	2_1	3600-7200-6-2	58	3	61	0	A
		Site2	S	T	↑	Site2-#	6	4	6_4	2	2_2	3600-7200-6-4	308	7	315	0	A
		Site2	S	R	↱	Site2-;											
		Site2	E	L	⌐	Site2->											
		Site2	E	T	←	Site2-!											
		Site2	E	R	L	Site2-<											
		Site2	N	L	↪	Site2-9											
		Site2	N	T	↓	Site2-$	3	5	3_5	8	2_8	3600-7200-3-5	296	19	315	0	A
		Site2	N	R	↵	Site2-8	3	2	3_2	9	2_9	3600-7200-3-2	10	0	10	1	A
		Site2	W	L	⌐	Site2-=	1	4	1_4	10	2_10	3600-7200-1-4	4	0	4	3	A
		Site2	W	T	→	Site2-"											
		Site2	W	R	↓	Site2-6	1	5	1_5	0	0	3600-7200-1-5	39	7	46	3	A
3	Giinagay Way/River St	Site3	S	L	↰	Site3-:	11	10	11_10	1	_1	3600-7200-11-10	64	1	65	0	A
		Site3	S	T	↑	Site3-#	11	6	11_6	2	3_2	3600-7200-11-6	290	9	299	0	A
		Site3	S	R	↱	Site3-;											
		Site3	E	L	⌐	Site3->	7	13	7_13	4	3_4	3600-7200-7-13	86	0	86	4	A
		Site3	E	T	←	Site3-!											
		Site3	E	R	L	Site3-<											
		Site3	N	L	↪	Site3-9	5	8	5_8	7	3_7	3600-7200-5-8	50	5	55	1	A
		Site3	N	T	↓	Site3-$	5	13	5_13	8	3_8	3600-7200-5-13	285	21	306	2	A
		Site3	N	R	↵	Site3-8											
		Site3	W	L	⌐	Site3-=	9	6	9_6	8	_8	3600-7200-9-6	80	1	81	1	A
		Site3	W	T	→	Site3-"											
		Site3	W	R	↓	Site3-6											
4	Giinagay Way/ Wallace St	Site4	S	L	↰	Site4-:	20	18	20_18	1	4_1	3600-7200-20-18	73	0	73	3	A
		Site4	S	T	↑	Site4-#	20	11	20_12	2	4_2	3600-7200-20-11	290	10	300	11	A
		Site4	S	R	↱	Site4-;											
		Site4	E	L	⌐	Site4->											
		Site4	E	T	←	Site4-!											
		Site4	E	R	L	Site4-<											
		Site4	N	L	↪	Site4-9											
		Site4	N	T	↓	Site4-$	13	22	16_22	8	4_8	3600-7200-13-22	203	21	224	6	A
		Site4	N	R	↵	Site4-8	13	18	16_18	9	4_9	3600-7200-13-18	171	0	171	102	F
		Site4	W	L	⌐	Site4-=	17	11	17_12	10	4_10	3600-7200-17-11	64	0	64	29	C
		Site4	W	T	→	Site4-"											
		Site4	W	R	↓	Site4-6	17	22	17_22	12	4_12	3600-7200-17-22	128	15	143	27	B
5	Giinagay Way/Winifred St	Site5	S	L	↰	Site5-:	29	27	29_27	1	5_1	3600-7200-29-27	48	0	48	0	A
		Site5	S	T	↑	Site5-#	29	19	29_19	2	5_2	3600-7200-29-19	336	10	346	0	A
		Site5	S	R	↱	Site5-;											
		Site5	E	L	⌐	Site5->											
		Site5	E	T	←	Site5-!											
		Site5	E	R	L	Site5-<											
		Site5	N	L	↪	Site5-9											
		Site5	N	T	↓	Site5-$	24	28	24_28	8	5_8	3600-7200-24-28	274	36	310	3	A
		Site5	N	R	↵	Site5-8	24	27	24_27	9	5_9	3600-7200-24-27	58	0	58	2	A
		Site5	W	L	⌐	Site5-=	26	19	26_19	10	5_10	3600-7200-26-19	50	0	50	2	A
		Site5	W	T	→	Site5-"											
		Site5	W	R	↓	Site5-6	26	28	26_28	12	5_12	3600-7200-26-28	35	0	35	3	A
6	Ginnagay/Partridge St	Site6	S	L	↰	Site6-:											
		Site6	S	T	↑	Site6-#	32	29	32_29	2	6_2	3600-7200-32-29	264	9	273	5	A
		Site6	S	R	↱	Site6-;	32	31	32_31	3	6_3	3600-7200-32-31	39	0	39	30	C
		Site6	E	L	⌐	Site6->	30	33	30_33	4	6_4	3600-7200-30-33	26	4	30	18	B
		Site6	E	T	←	Site6-!											
		Site6	E	R	L	Site6-<	30	29	30_29	6	6_6	3600-7200-30-29	120	1	121	29	C
		Site6	N	L	↪	Site6-9	28	31	28_31	7	6_7	3600-7200-28-31	84	13	97	7	A
		Site6	N	T	↓	Site6-$	28	33	28_33	8	6_8	3600-7200-28-33	226	23	249	8	A
		Site6	N	R	↵	Site6-8											
		Site6	W	L	⌐	Site6-=											
		Site6	W	T	→	Site6-"											
		Site6	W	R	↓	Site6-6											

Proposed one-lane closure Scenario.

Int ID	Intersection	Site	App	Move	Symbol	Stick_ID	From Link	To Link	Vissim ID	Movement ID	Unique ID	Lookup	Peak Hour			Total Delay	Total LOS
													LV MOD	HV MOD	Total MOD		
1	Giinagay Way/Bellevue Dr	Site1	S	L	⊣	Site1-:	38	3	38_3	1	1_1	3600-7200-38-3	7	0	7	1.733174	A
		Site1	S	T	↑	Site1-#											
		Site1	S	R	⊢	Site1-;	38	37	38_37	3	1_3	3600-7200-38-37	2	0	2	1.77347	A
		Site1	E	L	⌐	Site1->	36	39	36_39	4	1_4	3600-7200-36-39	3	0	3	0.412357	A
		Site1	E	T	←	Site1-!	36	3	36_3	5	1_5	3600-7200-36-3	319	20	339	0.337818	A
		Site1	E	R	∟	Site1-<											
		Site1	N	L	↳	Site1-9											
		Site1	N	T	↓	Site1-$											
		Site1	N	R	↵	Site1-8											
		Site1	W	L	⌙	Site1-=											
		Site1	W	T	→	Site1-"	4	37	4_37	11	1_11	3600-7200-4-37	312	8	320	0.112537	A
		Site1	W	R	↓	Site1-6	4	39	4_39	12	1_12	3600-7200-4-39	17	0	17	1.023528	A
2	Giinagay Way/Ferry St	Site2	S	L	⊣	Site2-:	6	2	6_2	1	2_1	3600-7200-6-2	64	3	67	0.192816	A
		Site2	S	T	↑	Site2-#	6	4	6_4	2	2_2	3600-7200-6-4	325	8	333	0.071688	A
		Site2	S	R	⊢	Site2-;											
		Site2	E	L	⌐	Site2->											
		Site2	E	T	←	Site2-!											
		Site2	E	R	∟	Site2-<											
		Site2	N	L	↳	Site2-9											
		Site2	N	T	↓	Site2-$	3	5	3_5	8	2_8	3600-7200-3-5	315	20	335	63.17969	E
		Site2	N	R	↵	Site2-8	3	2	3_2	9	2_9	3600-7200-3-2	11	0	11	52.599751	D
		Site2	W	L	⌙	Site2-=	1	4	1_4	10	2_10	3600-7200-1-4	4	0	4	106.08225	F
		Site2	W	T	→	Site2-"											
		Site2	W	R	↓	Site2-6	1	5	1_5	0	_0	3600-7200-1-5	41	8	49	125.52692	F
3	Giinagay Way/River St	Site3	S	L	⊣	Site3-:	11	10	11_10	1	_1	3600-7200-11-10	0	0	0	9.64707	A
		Site3	S	T	↑	Site3-#	11	6	11_6	2	3_2	3600-7200-11-6	389	11	400	11.820274	A
		Site3	S	R	⊢	Site3-;											
		Site3	E	L	⌐	Site3->	7	13	7_13	4	3_4	3600-7200-7-13	91	0	91	4.911136	A
		Site3	E	T	←	Site3-!											
		Site3	E	R	∟	Site3-<											
		Site3	N	L	↳	Site3-9	5	8	5_8	7	3_7	3600-7200-5-8	54	5	59	0.405575	A
		Site3	N	T	↓	Site3-$	5	13	5_13	8	3_8	3600-7200-5-13	302	23	325	0.312155	A
		Site3	N	R	↵	Site3-8											
		Site3	W	L	⌙	Site3-=	9	6	9_6	8	_8	3600-7200-9-6	0	0	0	0	A
		Site3	W	T	→	Site3-"											
		Site3	W	R	↓	Site3-6											
4	Giinagay Way/ Wallace St	Site4	S	L	⊣	Site4-:	20	18	20_18	1	4_1	3600-7200-20-18	144	1	145	3.560776	A
		Site4	S	T	↑	Site4-#	20	11	20_12	2	4_2	3600-7200-20-11	239	10	249	66.398825	E
		Site4	S	R	⊢	Site4-;											
		Site4	E	L	⌐	Site4->											
		Site4	E	T	←	Site4-!											
		Site4	E	R	∟	Site4-<											
		Site4	N	L	↳	Site4-9											
		Site4	N	T	↓	Site4-$	13	22	16_22	8	4_8	3600-7200-13-22	216	23	239	9.861382	A
		Site4	N	R	↵	Site4-8	13	18	16_18	9	4_9	3600-7200-13-18	179	0	179	53.680477	D
		Site4	W	L	⌙	Site4-=	17	11	17_12	10	4_10	3600-7200-17-11	150	1	151	84.749755	F
		Site4	W	T	→	Site4-"											
		Site4	W	R	↓	Site4-6	17	22	17_22	12	4_12	3600-7200-17-22	135	16	151	37.92611	C
5	Giinagay Way/Winifred St	Site5	S	L	⊣	Site5-:	29	27	29_27	1	5_1	3600-7200-29-27	51	0	51	0.296667	A
		Site5	S	T	↑	Site5-#	29	19	29_19	2	5_2	3600-7200-29-19	355	10	365	0.950417	A
		Site5	S	R	⊢	Site5-;											
		Site5	E	L	⌐	Site5->											
		Site5	E	T	←	Site5-!											
		Site5	E	R	∟	Site5-<											
		Site5	N	L	↳	Site5-9											
		Site5	N	T	↓	Site5-$	24	28	24_28	8	5_8	3600-7200-24-28	292	39	331	4.40759	A
		Site5	N	R	↵	Site5-8	24	27	24_27	9	5_9	3600-7200-24-27	60	0	60	2.137878	A
		Site5	W	L	⌙	Site5-=	26	19	26_19	10	5_10	3600-7200-26-19	52	0	52	2.69198	A
		Site5	W	T	→	Site5-"											
		Site5	W	R	↓	Site5-6	26	28	26_28	12	5_12	3600-7200-26-28	37	0	37	2.911542	A
6	Ginnagay/Partridge St	Site6	S	L	⊣	Site6-:											
		Site6	S	T	↑	Site6-#	51	10034	32_29	2	6_2	3600-7200-51-10034	279	9	288	0.239592	A
		Site6	S	R	⊢	Site6-;	51	31	32_31	3	6_3	3600-7200-51-31	45	0	45	1.829746	A
		Site6	E	L	⌐	Site6->	55	33	30_33	4	6_4	3600-7200-55-33	28	4	32	23.038455	B
		Site6	E	T	←	Site6-!											
		Site6	E	R	∟	Site6-<	55	10038	30_29	6	6_6	3600-7200-55-10038	128	1	129	36.661762	C
		Site6	N	L	↳	Site6-9	28	31	28_31	7	6_7	3600-7200-28-31	90	14	104	6.795018	A
		Site6	N	T	↓	Site6-$	28	33	28_33	8	6_8	3600-7200-28-33	239	25	264	8.243376	A
		Site6	N	R	↵	Site6-8											
		Site6	W	L	⌙	Site6-=											
		Site6	W	T	→	Site6-"											
		Site6	W	R	↓	Site6-6											

Appendix G

Maximum Queue Length – Future Year Options

Scenario 1

147.21 m

0.00 m 0.00 m

95.67 m

111.77 m

111.01 m

45.11 m

80.85 m

74.59 m

100 m

Scenario 2

143.41 m   0.00 m

0.00 m

49.78 m

79.42 m

72.37 m

136.41 m
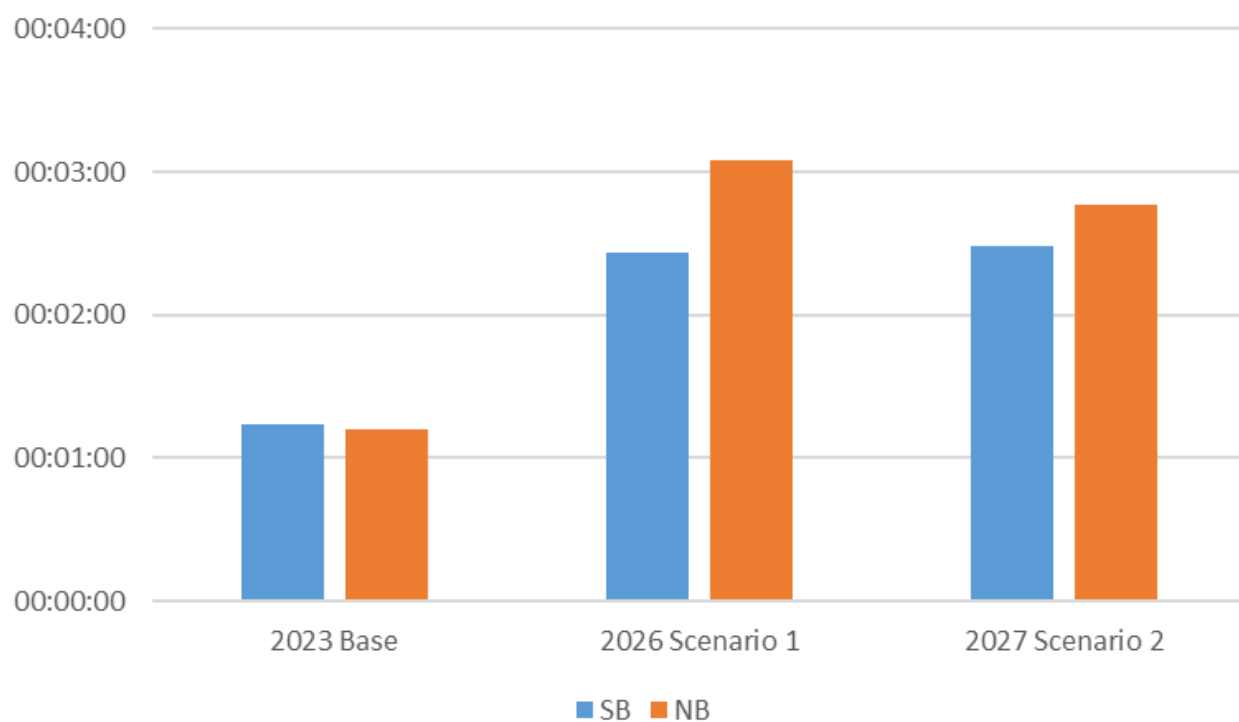
70.26 m

44.28 m   71.54 m

100 m
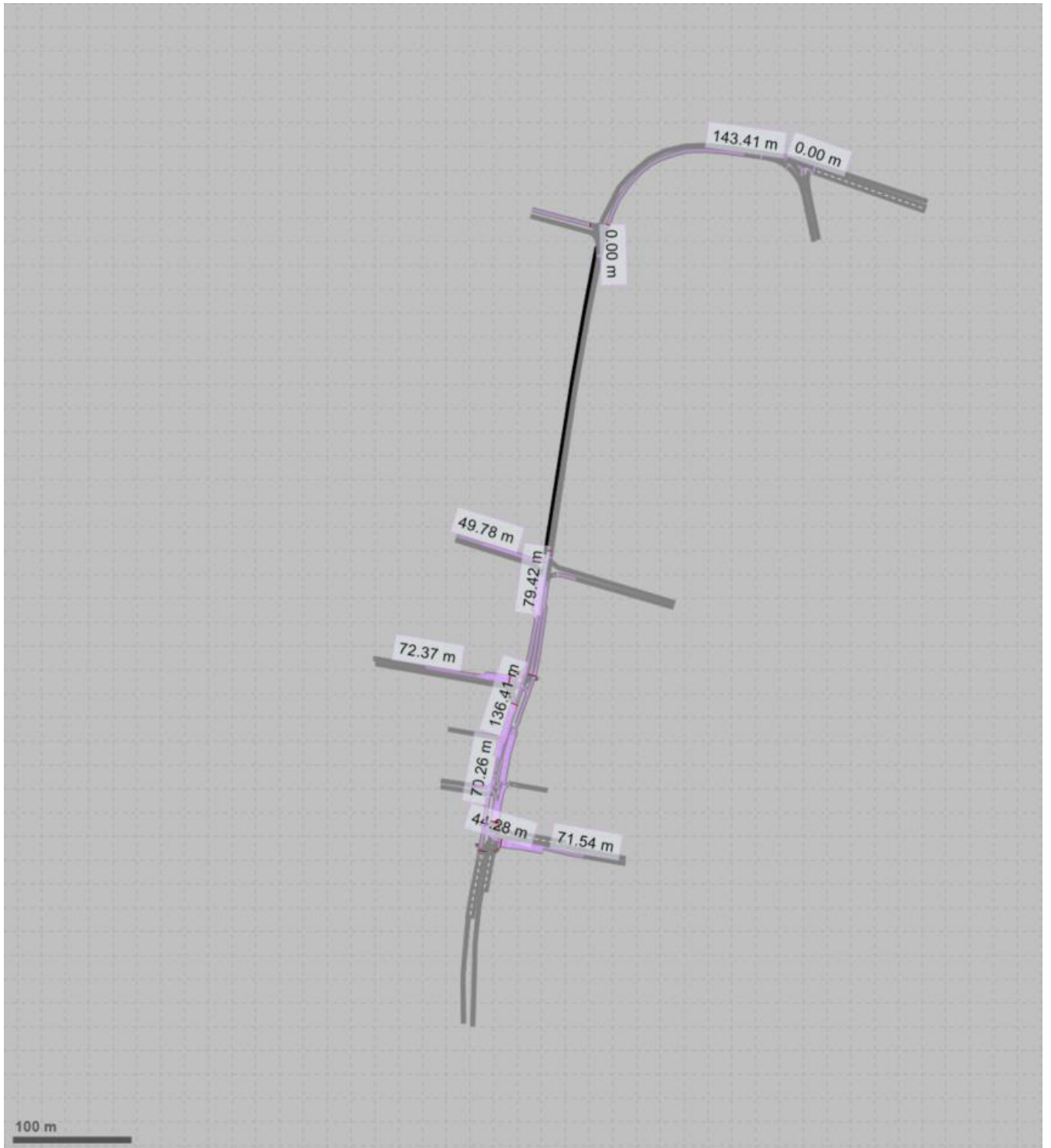
Appendix H

Travel Time – Future Year Options

Macksville Travel Time (hh:mm:ss)
PM peak (Cooper Street)

Legend: ■ SB ■ NB

Appendix I
Proposed Traffic Management Plans

Span 3-9 Painting

Traffic Arrangement
Macksville Bridge

V4 07/02/2024

Span 1 - 2 Painting

Traffic Arrangement
Macksville Bridge

V4 07/02/2024

22.0 m

22.0 m

22.0 m

3.5 m

10.7 m

BG800 Steel Barrier (Anchored to Bridge)
6m long sections TL-3

WORKZONE

End Terminals (Anchored to Road)
ABSORB-M Plastic Crash Cushion
5.3m long

Concrete Barrier

Type 2 Traffic Light
(Trailer Mounted)

STOP HERE
ON RED
SIGNAL

www.invarion.com

GHD

→ **The Power of Commitment**