Shoalhaven City Council

Warrah Road Subdivision

Traffic Impact Assessment

May 2018

TDG Ref: 15138 tia 180522 final.docx

Shoalhaven City Council

Warrah Road Subdivision

Traffic Impact Assessment

Quality Assurance Statement

Prepared by:

Michael Willson

Senior Associate / NSW Branch Manager

Reviewed by:

Fred Gennaoui

Senior Principal Consultant

Approved for Issue by:

Mark Apeldoorn

Director

Status: Final report

Date: 31 May 2018

PO Box 937, Newtown, Sydney, NSW 2042
Australia

P: +61 2 8378 7145

www.tdgaustralia.com.au

Table of Contents

1. Introduction

TDG NSW Pty Ltd has been asked by Shoalhaven City Council to examine and describe the traffic impacts of the proposed residential development, that is understood to yield up to 250 dwellings, at the southern end of Warrah Road, Bangalee.

A Traffic Impact Assessment has previously been prepared for the proposed subdivision by Traffix, dated June 2014. The scope of this Traffic Report is to assess the traffic impact of the subdivision on the wider road network, and more specifically has been prepared to examine and describe the key traffic effects of the proposal relating to:

- The expected traffic volumes generated by the development;
- The ability of the surrounding road network to accommodate the increase in traffic based on expected traffic volumes, future road upgrades and base traffic growth;
- Whether the nearby roads and intersections are able to accommodate 14.5m long buses in the event that future bus routes are proposed in the area;
- The expected time it would take to evacuate the 250 dwellings during a bush fire; and
- The accessibility and mobility for pedestrian and bicycle.

The area being investigated has been divided into two parts; the Primary Investigation Area (PIA) and the Secondary Investigation Area (SIA).

These and other matters are considered in the assessments that follow. By way of a summary, the following conclusions are provided:

- The addition of the development traffic to the signalised Princes Highway / Illaroo Road intersection is expected to further deteriorate the performance of the intersection changing from a satisfactory level of service 'C' to a very poor level of service 'F' during the morning peak, under existing conditions. Therefore, it is recommended that consideration be given to defer the development until the intersection is upgraded, when it would operate at a satisfactory level of service;
- All other roads within the PIA and SIA are expected to continue to operate with a good level of service 'A' in the future, even with the development traffic added;
- The time taken for the worst-case dwelling to exit the subdivision and reach Illaroo Road during a bush fire evacuation is about 260 seconds;
- In order to meet the requirements of the Austroads Guideline, it is recommended that an axillary left turn treatment and a channelised right turn treatment be provided at the intersection of Illaroo Road with Moondara Drive. It is also recommended that a channelised right turn treatment be provided at the intersection of Illaroo Road with Hockeys Lane;
- The road network within the Primary Investigation Area is able to accommodate a 14.5 metre long bus, with minor widening required to the north-western corner of the Bimbimbie Avenue / Moondara Drive intersection;
- In order to suitably provide for likely future additional bus services being provided within the area, it is recommended footpaths be provided on one side of the road along the key pedestrian routes; and

- The off-road shared path along Illaroo Road should provide a connection for cyclists turning to/from Moondara Drive.

The assessment documented in this report is based on on-site observations and surveys within the vicinity of the site.

2. Background

Shoalhaven City Council is currently considering a proposal to rezone land at Lots 21-24 DP 714096 located at the southern end of Warrah Road, Bangalee. The rezoning is expected to yield up to 250 dwellings, with no commercial or industrial component proposed as part of the proposal. The proponent has provided a Traffic Impact Assessment Report (Proponent Traffic Report), which has been prepared by Traffix, dated June 2014, and assesses the potential impacts of the proposal.

The purpose of this Traffic Impact Assessment is to assess the potential impacts of the proposal on the local community and the broader public interest in the functioning of the road network in the Illaroo Road catchment.

The area being investigated is to be broken into two parts. The Primary Investigation Area (PIA) and the Secondary Investigation Area (SIA). These areas are defined in **Figure 1**.

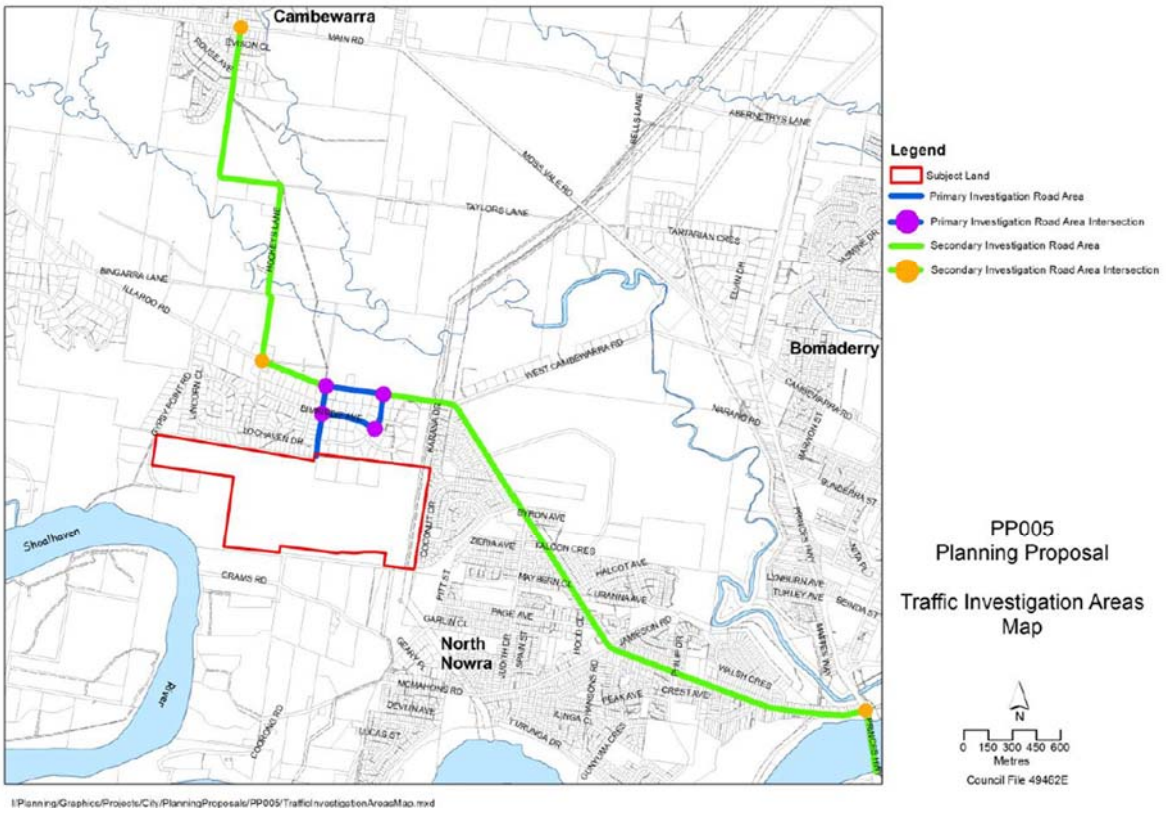


Figure 1: Study Area Map

The intersections within the PIA consists of:

- Warrah Road / Bimbimbie Avenue;
- Bimbimbie Avenue / Moondara Drive; and
- Moondara Drive / Illaroo Road.

The intersections within the SIA consist of:

- Princes Highway / Illaroo Road;

- Illaroo Road / Hockeys Lane;
- Hockeys Lane / Main Road; and
- Main Road / Tannery Road.

The aims of the Study are to ensure the proposal:

- Does not result in unreasonable traffic and safety impacts on the road network;
- Is provided with such infrastructure upgrades as may be necessary to mitigate traffic and safety issues that are likely to result from the proposal; and
- Is serviced by an efficient and safe road and transport network.

3. Existing Transport Infrastructure

3.1 Location in the Transport Network

The subject site is located at the southern end of Warrah Road, Bangalee, and is Lots 21-24 DP 714096. **Figure 2** shows the location of the site in relation to the surrounding transport network.

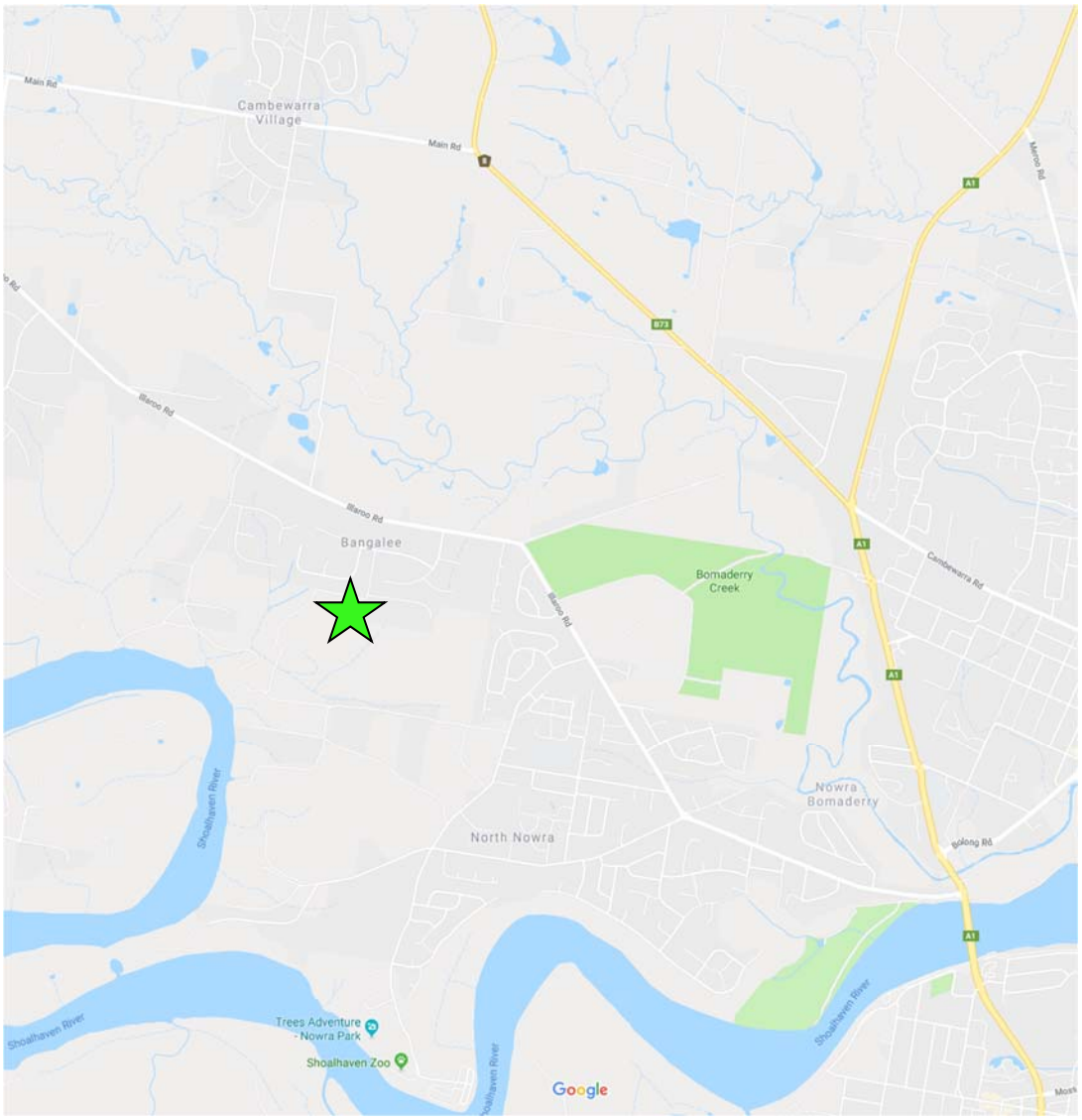


Figure 2: Site Location[1]

The site is currently unoccupied, and the majority of the site is covered in vegetation. Access to the site is provided at the termination of Warrah Road, at its southern end. Warrah Road connects to the wider road network via Bimbimbie Avenue, Moondara Drive and Illaroo Road. **Figure 3** provides and aerial photograph of the site and its surrounds.

[1] Source: Google Maps (https://www.google.com.au/maps/)

Wednesday, 4 April 2018 11:38:45 AM

REV	DATE	DRN	CHK	DESCRIPTION
00	12/04/18	TJG	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----

Warrah Road, Bangalee

Site Area

DRAWN: DA	---	---
DATE: 12/04/18	STATUS: ---	
SCALE: 1:10000 @ A3		
DWG NO:15318-0S1A		

TDG

3

C:\Users\tdgshared\Dropbox (TDG)\Australia Business\Australia Jobs\15100\15138 - Traffic Assessment - Warrah Road, Bangalee - Shoalhaven CC\DWGs\TDG\15318-0S1A.dwg

3.2 Land Use Zoning

Figure 4 shows the land use zoning of the subject site in the context of adjacent sites and the surrounding area.

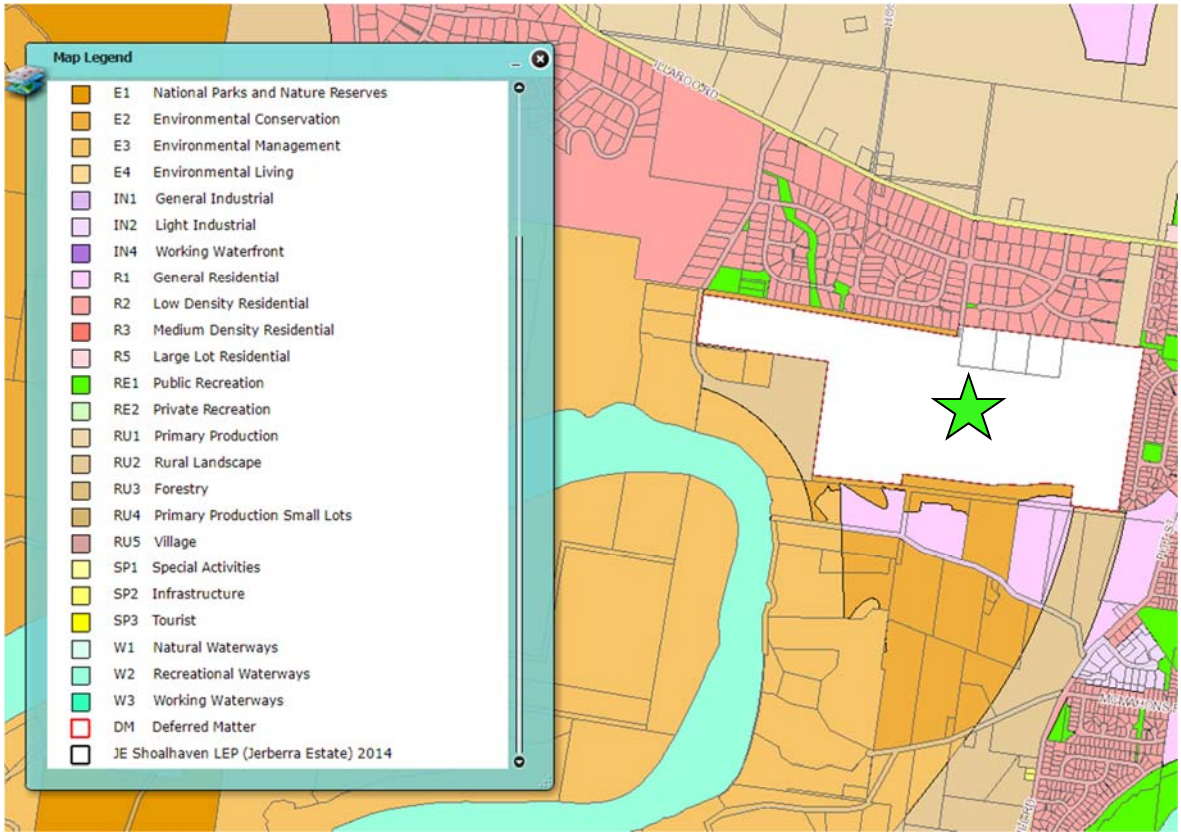


Figure 4: Site Location[2]

The site is located within a Deferred Matter (DM) Zone, with the land uses in the immediate vicinity of the site being predominantly residential in nature. Environmental Conservation and Management Zones are well established in the wider areas to the west and south of the site.

The key features of the surroundings include the following:

- Cambewarra Village is located 4km north of the site; and
- Nowra Shopping Centre is located 7km south-east of the site.

City plans indicate mixed use and commercial zones for Nowra City, thus heavier traffic movements can be expected between the site and Nowra City along Princes Highway.

3.3 Transport Network Characteristics

Warrah Road is a local road under the care and management of Council. It runs in a north-south alignment extending from Bimbimbie Avenue to its termination 225m to the south, at

[2] Source: https://NSW Planning Portal, www.planningportal.nsw.gov.au/find-a-property/...

the site boundary. It has a sealed road width of approximately 6.2m, allowing for simultaneous two-way traffic movement. Warrah Road has a speed limit of 50km/h.

Bimbimbie Avenue is also a local road which runs in an east-west alignment, extending from Moondara Drive to its termination 700m to the west. It has a sealed road width of approximately 6.5m, allowing for simultaneous two-way traffic movement.

Moondara Drive is another local road with a speed limit of 50km/h. It runs in a north-south alignment, extending from Illaroo Road to its termination 550m to the south. It has a sealed road width of approximately 6.5m, allowing for simultaneous two-way traffic movement.

Illaroo Road is a collector road with speed limits that vary from 60km/h to 80km/h. It runs in an east-west alignment, extending from Princes Highway to its termination 14.2km to the west at its intersection with Hughes Road and Bundanon Road. It has a sealed road width of approximately 7.0m, and provides one lane of traffic in each direction.

Hockeys Lane is a collector road. It runs in a north-south alignment, extending from Illaroo Road to its termination 2.4km to the north at Main Road. From Illaroo Road, the width of Hockeys Lane varies from 5.2m to 7.0m upon entering Cambewarra Village, allowing simultaneous two-way traffic. It has a posted speed limit of 40km/h, and chicanes are provided along its length where the road narrows to one two-way lane, to encourage slower travel speeds.

Main Road is also a collector road, which runs in the east-west alignment, extending from Moss Vale Road to its termination 3.5km to the west. It has a sealed road width of approximately 7.0m, allowing for simultaneous two-way traffic movement. It typically has a posted speed limit of 50km/h, which slows to 40km/h west of Tannery Road during school times.

Tannery Road is a local road, running in a north-south alignment, extending from Main Road to its termination 2.8km to the north. It has sealed road width of approximately 8.5m that allows for simultaneous two-way traffic.

Princes Highway is a Regional State Highway, that runs in a north-south direction. It has a divided carriageway of approximately 21m accommodating two lanes of traffic in each direction. South of Illaroo Road, Princes Highway forms two bridges (one for each direction of travel, which spans over the Shoalhaven River. Each bridge accommodates two traffic lanes each (i.e. two lanes in each direction), and often experiences congestion during peak times and holiday periods.

Table 1 shows the indicative form of these road environments.

Site Location		
Princes Highway	 Northbound direction	 Southbound direction
Illaroo Road	 Eastbound direction	 Westbound direction
Moondara Drive	 Northbound direction	 Southbound direction
Bimbimbie Avenue	 Eastbound direction	 Westbound direction

Site Location		
Warrah Road	 Northbound direction	 Southbound direction

Table 1: Roadways and Intersections

The intersection of Princes Highway with Illaroo Road is signalised. There is a total of six lanes on the northern approach of the intersection (three lanes in each direction) and five lanes on the southern approach. A raised central median is provided to separate opposing lanes of traffic and to provide a two-staged pedestrian crossing along Princes Highway. A channelised free left turn lane is provided on the southern approach.

The intersection of Bimbimbie Avenue with Warrah Road and Moondara Drive, and the intersection of Moondara Drive with Illaroo Road are all priority controlled.

3.4 Public Transport and Accessibility

3.4.1 Public Transport

The site has limited access to the public transport network. The nearest bus stop is located on the northern side of Illaroo Road, opposite Moondara Drive. The bus stop is located approximately 800m away (walking distance) from the site.

Figure 5 shows the bus services that currently operate within the vicinity of the site. The bus route that service the Illaroo Road bus stop is Route 722, which travels from Nowra to North Nowra in a loop service. At this location the bus only drops off passengers, with pick-up only occurring via prior arrangement for the morning service (arrives at approximately 7:40am). Currently residents who want to travel to Nowra using the bus, they will have to travel to the next bus stop along Illaroo Rd at Chittick Avenue, where pick up services are provided.

Shoal Bus provides four school buses during each of the morning and afternoon peaks, with all services travelling eastbound on Illaroo Road in the morning and westbound in the evening. Two of the services in each of the peaks drive down Moondara Drive, into Bimbimbie Avenue, and turn around at Warrah Road.

Figure 5: Bus Map for Route 722

From the site, the nearest train station is Bomaderry Station, which is approximately 4.2km east of the site. Residents travelling to the train station via bus is expected to be required to walk to the nearest bus stop and take Route 722, followed by Route 730. If residents were to use their private vehicle the travel time is approximately 14 minutes.

3.4.2 Walking and Cycling

The Shoalhaven City Council Bike Plan and the associated bicycle routes are illustrated in **Figure 6**. The Bike Plan shows the following key bicycle paths in the vicinity of the site:

- An existing shared path route extends from the termination of Burrandool Avenue, and connects with Chittick Avenue and Coconut Drive; and
- An existing off-road route is provided along Illaroo Road, which connects cyclists from the Princes Highway to Tapitallee Road.

Figure 6: Shoalhaven City Council Bike Plan

4. Transport Movements

4.1 Traffic Volumes

TDG commissioned turning movement counts on Wednesday 6 December 2017 for all intersections located within the PIA and SIA. The morning and evening peak hourly results are provided in **Figure 7**. In summary the survey results showed:

Primary Investigation Area:

- All roads within the PIA currently accommodate a low level of traffic;
- The intersections of Bimbimbie Avenue with Moondara Drive and Warrah Road currently operate below 10% of their practical capacity level;
- Illaroo Road recorded the highest traffic volumes in the PIA, with 337 and 309 vehicle movements during the morning and evening peak hour, respectively. Movements are predominantly to the east during the morning peak and are more evenly spread during the evening peak;
- The intersection of Illaroo Road with Moondara Drive currently operates at approximately 25% of its practical capacity.

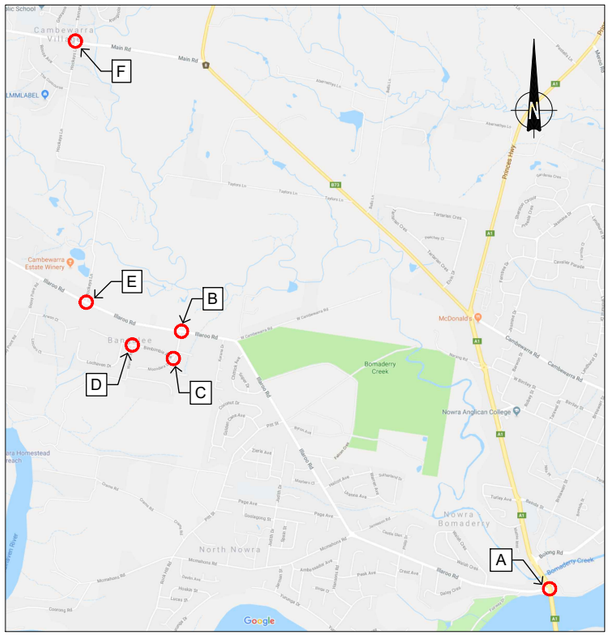
Secondary Investigation Area:

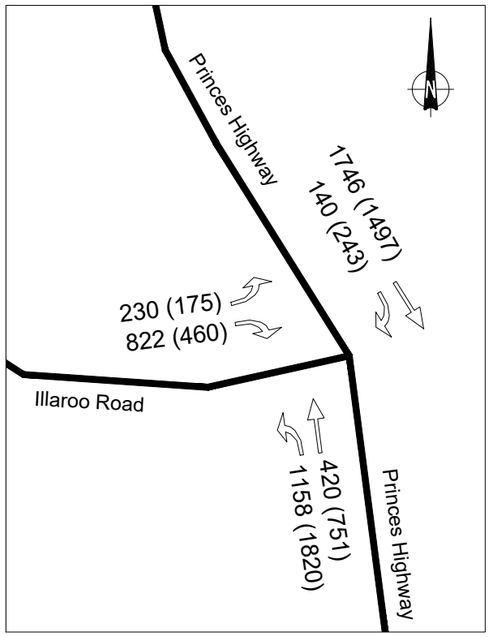
- The intersection of Princes Highway and Illaroo Road currently accommodates 4,516 and 4,958 vehicles during the morning and evening peak hours, respectively. The predominant movement is through traffic along Princes Highway. Vehicles turning at Illaroo Road primarily travel to/from the south;
- Hockeys Lane currently accommodates a low traffic volume;
- The Tannery Road / Main Road / Hockeys Lane intersection recorded 516 and 425 vehicle movements during the morning and evening peak periods, respectively. It is noted that the evening peak hour was recorded at 2:45pm due to the school located to the west of the intersection.

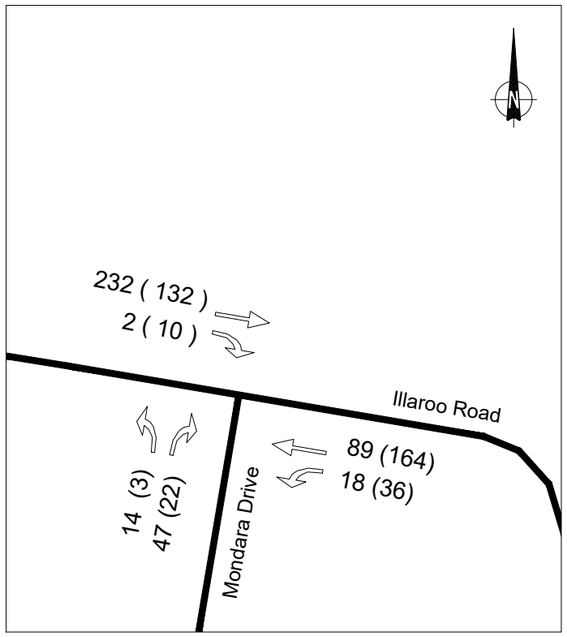
The survey results indicate that the majority of roads within the study area carry a low level of traffic. The traffic volumes along Illaroo Road increase towards the east as it passes through North Nowra to the east. Princes Highway currently carries a high level of traffic, which is representative of its classification as a Regional State Highway.

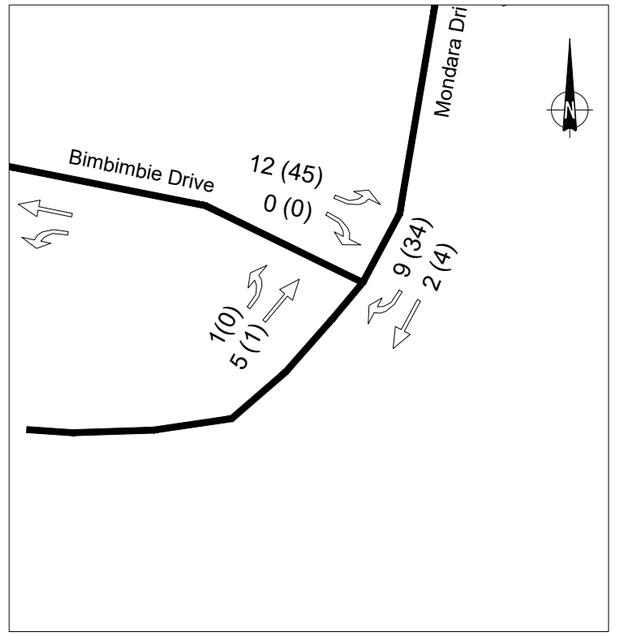
4.2 Road Midblock Performance

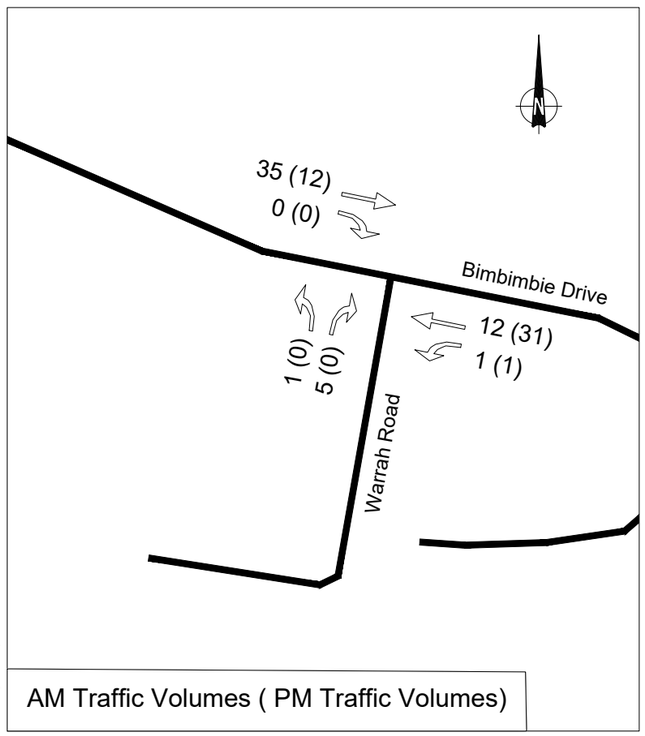
The existing traffic volumes within the study area are summarised in **Table 2**, together with their appropriate level of service. The concepts of carriageway capacity and Level of Service (LoS) are described in **Appendix A** together with criteria for their assessment.

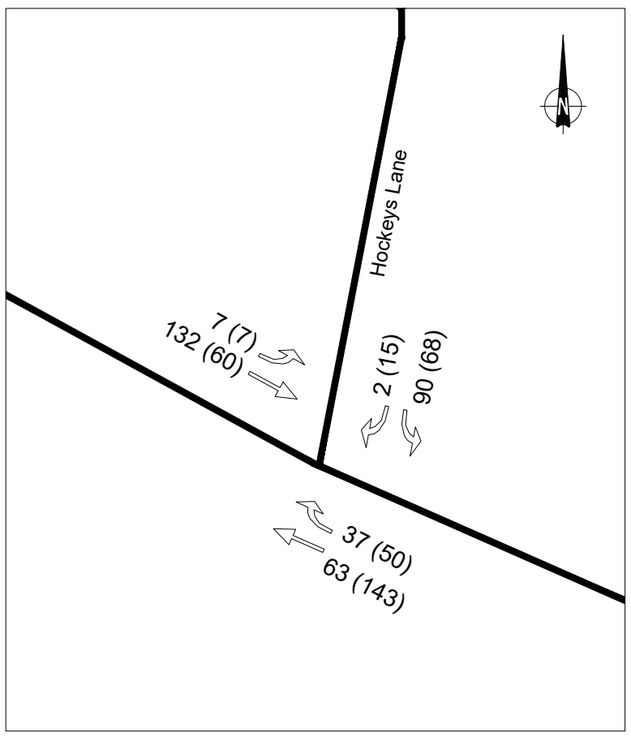


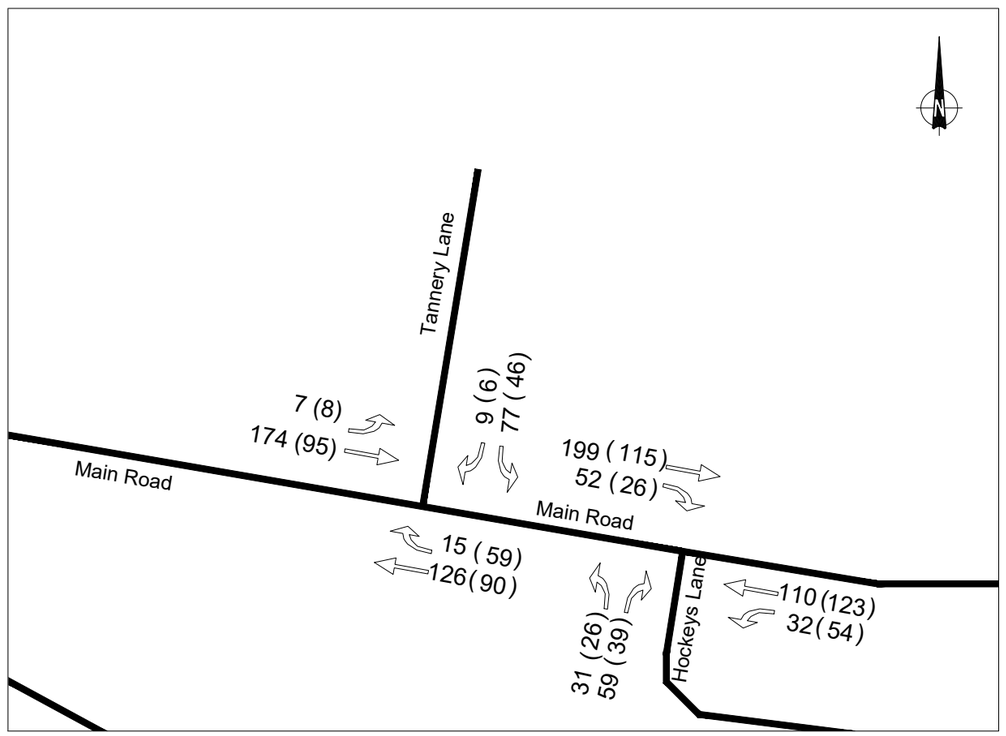












AM Traffic Volumes (PM Traffic Volumes)

Tuesday, 17 April 2018 1:05:22 PM

REV	DATE	DRN	CHK	DESCRIPTION
00	17/04/18	TJG	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----

WARRAH ROAD, BANGALEE, NSW

TRAFFIC VOLUMES

EXISTING

DRAWN: DA	---	---
DATE: 16-04-18	STATUS: ---	
SCALE: N.T.S		
DWG NO:15138A1B		

TDG

7

C:\Users\tdgshared\Dropbox (TDG)\Australia Business\Australia Jobs\15100\15138 - Traffic Assessment - Warrah Road, Bangalee - Shoalhaven CC\DWGs\TDG\15138A1b.dwg

LOCATION	LANES	MORNING PEAK			EVENING PEAK		
		Northbound Traffic Volumes	Southbound Traffic Volumes	Level of Service (LoS)	Northbound Traffic Volumes	Southbound Traffic Volumes	Level of Service (LoS)
INTERRUPTED FLOWS							
Warrah Road (South of Bimbimbie Avenue)	2 Lanes Undivided	6	1	**A**	0	1	**A**
Bimbimbie Avenue (West of Moondara Drive)	2 Lanes Undivided	15 (Westbound)	47 (Eastbound)	**A**	31 (Westbound)	15 (Eastbound)	**A**
Moondara Drive (South of Illaroo Road)	2 Lanes Undivided	50	2	**A**	20	9	**A**
Illaroo Road (West of Moondara Drive)	2 Lanes Undivided	103 (Westbound)	279 (Eastbound)	**A**	167 (Westbound)	154 (Eastbound)	**A**
Hockeys Lane (North of Illaroo Road)	2 Lanes Undivided	44	92	**A**	57	83	**A**
Illaroo Road (West of Princes Highway)	4 lanes undivided	560 (Westbound)	1052 (Eastbound)	**B**	903 (Westbound)	688 (Eastbound)	**A**
UNINTERRUPTED FLOWS							
Princes Highway (South of Illaroo Road)	4 Lanes Divided with Clearway	1,388	2,568	**A/E**	1945	2110	**C/C**

Table 2: Level of Service for Roadways

In general, all the roadways within the PIA have ample spare capacity and achieve free flow conditions at Level of Service 'A'. Princes Highway operates at a level of service 'E' and a

level of service 'C' during the morning and evening peak hour, respectively. This results in long queue lengths extending from the intersection of Princes Highway and Illaroo Road.

4.3 Intersection Performance

An analysis of the operation of all critical intersections within the study area was carried out using the SIDRA computer modelling program for the existing intersection traffic volumes and layouts.

The concepts of intersection capacity and level of service, as defined in the Guidelines published by the *RTA Guide to Traffic Generating Developments*, are described in **Appendix B** together with criteria for their assessment. The best indicator of the level of service at an intersection is the average delay experienced by vehicles at that intersection. For traffic signals, the average delay over all movements should be taken. For roundabouts and priority control intersections (with Stop and Give Way signs or operating under the T-junction rule) the critical movement for level of service assessment should be that with the highest average delay.

A summary of the SIDRA results is presented in **Table 3** for the existing conditions. The detailed SIDRA outputs for this analysis are provided in **Appendix C**.

Intersection	Time	Degree of Saturation (DoS)	Average Delay (seconds)	Level of Service (LoS)
Sign Controlled				
Warrah Road / Bimbimbie Avenue	AM Peak	0.021	6.2	A
	PM Peak	0.017	5.6	A
Bimbimbie Avenue / Moondara Drive	AM Peak	0.031	6.1	A
	PM Peak	0.023	5.8	A
Moondara Drive / Illaroo Road	AM Peak	0.129	9.0	A
	PM Peak	0.111	8.8	A
Illaroo Road / Hockeys Lane	AM Peak	0.079	7.5	A
	PM Peak	0.110	7.6	A
Hockeys Lane / Main Road	AM Peak	0.124	9.0	A
	PM Peak	0.067	7.9	A
Main Road / Tannery Road	AM Peak	0.095	8.1	A
	PM Peak	0.054	7.1	A
Signal Controlled				
Illaroo Road / Princes Highway	AM Peak	0.850	32.7	C
	PM Peak	0.924	31.9	C

Table 3: SIDRA Results – Existing Conditions

The SIDRA results indicate that all intersections within the study area, excluding the intersection of Illaroo Road and Princes Highway, operate under very good conditions with a level of service 'A'. This is not surprising given the low traffic volumes at all of these intersections.

The signalised intersection of Princes Highway with Illaroo Road operates within satisfactory conditions at a level of service 'C' during both the morning and evening peak hour. It is noted that the right turn from Princes Highway into Illaroo Road recorded a level of service 'E' (PM Peak), and vehicles turning from Illaroo Road recorded a level of service 'D' (AM Peak).

The degree of saturation indicates that the intersection is nearing capacity resulting in longer queue lengths and delays. The through movements along Princes Highway currently experience long queue lengths, which dissipate relatively quickly due to the long green time provided to these movements. During both peak times, extended queue lengths and delays are recorded along Illaroo Road.

5. Future Road Environment

5.1 Far North Collector Road

The Far North Collector Road was identified as part of the Nowra Bomaderry Structure Plan investigations as being required to service the new urban release areas along Moss Vale Road. The Far North Collector Road ensures the impacts of the Moss Vale Road urban release areas are minimised on Moss Vale Road and the Princes Highway by allowing travel directly between the new release areas and North Nowra. The proposed road alignment is shown below in **Figure 8**, with the project expected to be completed by 2022.

Figure 8: Far North Collector Road Project Alignment

5.2 North Nowra Link Road

In 2012 the NSW Department of Planning recommended approval for a link road to be constructed between Illaroo Road and Princes Highway. The aim of the link road is to address traffic constraints on Illaroo Road, particularly at its connection with Princes Highway, and to provide traffic network improvements to accommodate future growth under the Nowra-Bomaderry Structure Plan.

The Planning and Assessment Commission ultimately supported the northern route, which provides an extension to West Cambewarra Road to connect with the intersection of Princess Highway and Moss Vale Road. The upgrade is expected to reduce congestion at the

intersection of Princes Highway and Illaroo Road by providing drivers with an alternative access route.

5.3 Nowra Bridge Upgrade

The Princes Highway currently crosses the Shoalhaven River via two bridges, located immediately south of Illaroo Road. The bridges are a pinch point and the old southbound bridge in particular is constrained by two narrow lanes, which results in poor level of service during the morning and afternoon peak periods, as demonstrated by the assessment above.

Early investigations completed by RMS concluded the need for a new bridge over the Shoalhaven River. In 2014 the NSW Minister for Roads and Freight announced the preferred location for a new river crossing was immediately to the west of the existing river crossings. The preferred option is shown in **Figure 9** and consists of the following key upgrades relevant to this project:

- Reconfiguration of the existing northbound concrete bridge to carry three southbound traffic lanes;
- A new bridge is expected to provide three northbound lanes, and one slip lane to Illaroo Road;
- Intersection upgrades at Illaroo Road, including:
  - Two right turn lanes from Princes Highway (increased from one);
  - Two right turn lanes from Illaroo Road (increased from one); and
  - The existing right and left turn lane from Illaroo Road is expected to be retained.
- Keeping the old southbound bridge for adaptive reuse such as a shared pedestrian and cyclist path.

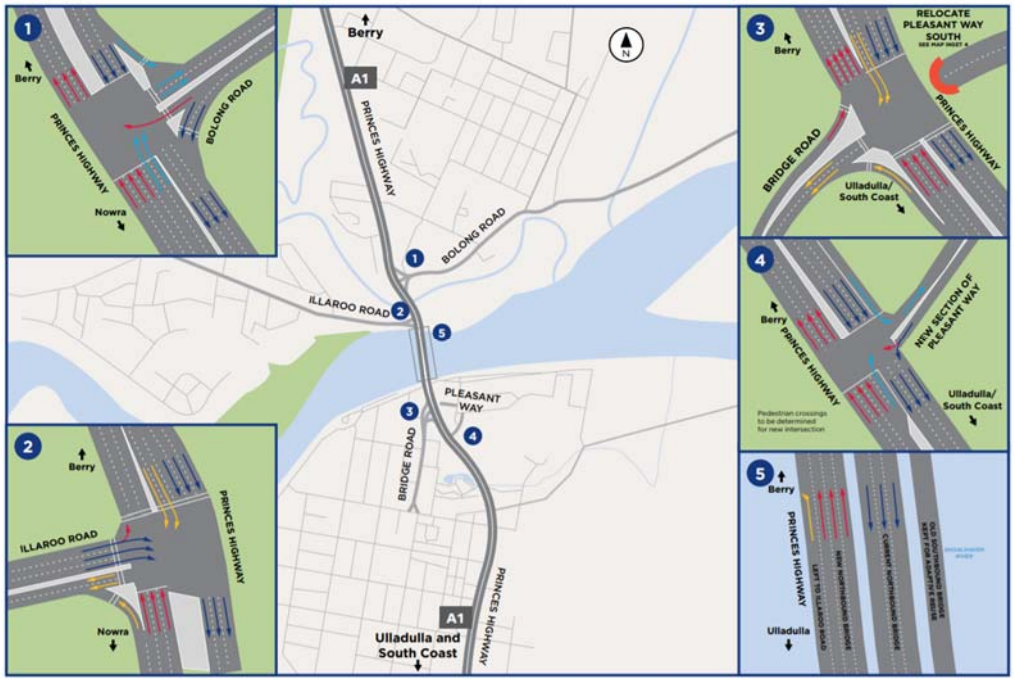


Figure 9: Nowra Bridge Project - Preferred Option

The project is expected to ultimately provide additional capacity along Princes Highway, and at its intersection with Illaroo Road.

It is noted that the agreement in relation to the approaches to the bridge, including the design of the Illaroo Road / Princes Highway and Princes Highway / Merro Road intersections has yet to be reached. Kiama (State) MP Gareth Ward has recently stated:

> *'Mr Ward agreed that there should be some changes to the initial design concept, and would be pushing for a permanent left turning lane only out of Illaroo Road.*
>
> *I'll be pushing the government for a dedicated left turning lane at Illaroo Road to reduce traffic congestion…'*

Accordingly, the modelled intersection included in this Traffic Impact Assessment may change. However, based on the comments provided by Gareth Ward, any change would likely result in improved operation of Illaroo Road.

The Australian Government has committed $155M funding in the 2018 Federal Budget towards the cost of the new bridge. This is expected to fund approximately half the cost of the new bridge, with the NSW Government expected to fund the remainder.

5.4 Berry to Bomaderry Princes Highway Upgrade

The project will involve the construction of 10.5 kilometres of four lanes of new divided road between Mullers Lane at Berry and the Cambewarra Road roundabout at Bomaderry. The project was awarded in May 2018, and is expected to provide the following benefits:

- Increase road capacity;
- Improve traffic flow;
- Deliver better and more reliable journeys;
- Increase overtaking opportunities; and
- Improve safety.

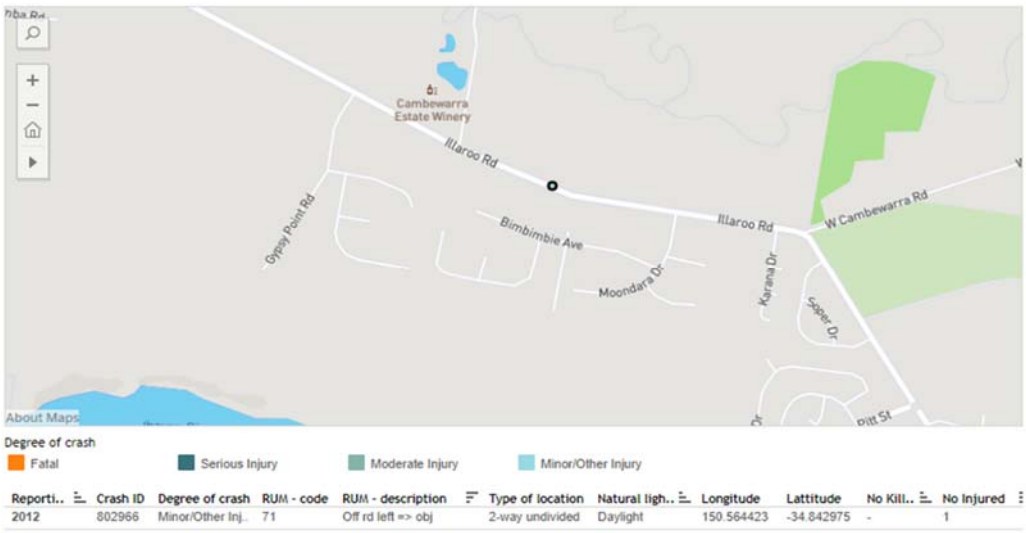
6. Road Safety

A search of the Road Safety Crash and Casualty Statistics Portal has been undertaken for the most recent five-year period 2012 to 2016. Data for the 2016 year is provisional and set down for confirmation by June 2018. The crash statistics are confined to crashes that conform to the national guidelines for reporting and classifying road vehicle crashes. The guidelines include crashes that meet all of these criteria:

- Were reported to the police;
- Occurred on a road open to the public;
- Involved at least one moving road vehicle; and
- Involved at least one person being killed or injured or at least one motor vehicle being towed away.

Reports for some crashes are not received until well into the following year and after the annual crash database has been finalised. These amount to fewer than 1 per cent of recorded crashes and are counted in the following year's statistics.

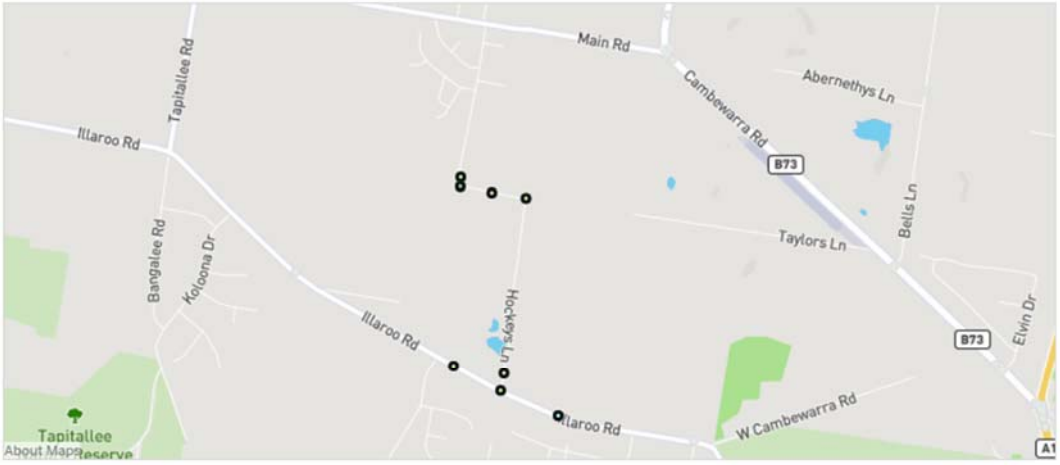
Search radius includes intersections from both the PIA and SIA. **Figure 10** to **Figure 12** show the results of the search and a summary of the crashes recorded in the study area.



Reporti..	Crash ID	Degree of crash	RUM - code	RUM - description	Type of location	Natural ligh..	Longitude	Lattitude	No Kill..	No Injured
2012	802966	Minor/Other Inj..	71	Off rd left => obj	2-way undivided	Daylight	150.564423	-34.842975	-	1

Figure 10: Crashes in the Primary Investigation Area

One crash was recorded within the PIA midblock on Illaroo Road. The crash resulted in a minor injury when a vehicle left the road to the left. Importantly, no fatalities were recorded and there have been no crashes recorded on the immediate site frontage, or crashes involving pedestrians or cyclists. Within the PIA, there is no evidence of a recurrent, persistent or adverse road crash history that would raise a road safety concern locally.



Degree of crash

Fatal | Serious Injury | Moderate Injury | Minor/Other Injury | Non-casualty (towaway)

Reporti..	Crash ID	Degree of crash	RUM - code	RUM - description	Type of location	Natural ligh..	Longitude	Lattitude	No Kill..	No Injurec
2012	802966	Minor/Other Inj..	71	Off rd left => obj	2-way undivided	Daylight	150.564423	-34.842975	-	1
	820758	Non-casualty (t..	71	Off rd left => obj	2-way undivided	Daylight	150.558415	-34.830868	-	-
2013	1016628	Non-casualty (t..	72	Off road to right	2-way undivided	Darkness	150.557971	-34.840432	-	-
2014	1011145	Non-casualty (t..	71	Off rd left => obj	2-way undivided	Daylight	150.560331	-34.831659	-	-
	1024229	Non-casualty (t..	71	Off rd left => obj	2-way undivided	Darkness	150.561079	-34.840807	-	-
	1033587	Moderate Injury	85	Off rt/lft bnd=>obj	2-way undivided	Darkness	150.55839	-34.831336	-	1
2015	1071682	Non-casualty (t..	85	Off rt/lft bnd=>obj	2-way undivided	Darkness	150.562436	-34.831931	-	-
	1086032	Non-casualty (t..	53	Overtake turning	T-junction	Daylight	150.560874	-34.841693	-	-

Figure 11: Crashes in Secondary Investigation Area (North)

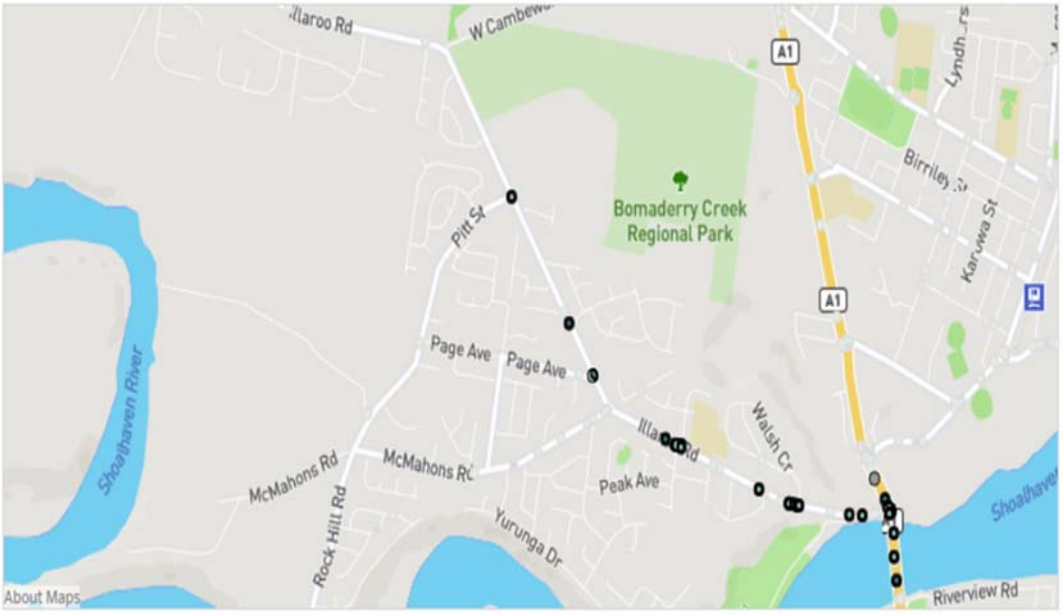


Figure 12: Crashes in the Secondary Investigation Area (South)

Reporti..	Crash ID	Degree of crash	RUM - code	RUM - description	Type of location	Natural ligh..	Longitude	Lattitude	No Kill..	No Injurec
2012	785763	Serious Injury	30	Rear end	Divided road	Daylight	150.601508	-34.864713	-	3
	789011	Serious Injury	32	Right rear	T-junction	Daylight	150.595487	-34.861862	-	2
	792673	Non-casualty (t..	34	Lane change right	Divided road	Daylight	150.601516	-34.864759	-	-
	793094	Moderate Injury	47	Emerging from drive	2-way undivided	Daylight	150.594946	-34.861795	-	1
	794424	Non-casualty (t..	30	Rear end	Divided road	Daylight	150.601213	-34.862933	-	-
	796240	Moderate Injury	87	Off lft/lft bnd=>obj	T-junction	Daylight	150.600986	-34.861949	-	1
	797234	Non-casualty (t..	11	Right far	T-junction	Daylight	150.593452	-34.861381	-	-
	803587	Non-casualty (t..	30	Rear end	T-junction	Daylight	150.601124	-34.861935	-	-
	807604	Non-casualty (t..	71	Off rd left => obj	2-way undivided	Darkness	150.590699	-34.860477	-	-
	810947	Minor/Other Inj..	30	Rear end	Divided road	Daylight	150.601643	-34.864708	-	1
	812220	Non-casualty (t..	32	Right rear	2-way undivided	Dusk	150.594415	-34.861698	-	-
	813363	Moderate Injury	21	Right through	T-junction	Daylight	150.598629	-34.862216	-	1
	816923	Non-casualty (t..	87	Off lft/lft bnd=>obj	T-junction	Daylight	150.600927	-34.862055	-	-
	823271	Serious Injury	13	Right near	T-junction	Darkness	150.582958	-34.856968	-	2
2013	827153	Moderate Injury	73	Off rd rght => obj	2-way undivided	Darkness	150.587978	-34.859582	-	2
	831978	Moderate Injury	30	Rear end	Divided road	Daylight	150.601344	-34.862916	-	1
	838892	Serious Injury	30	Rear end	Divided road	Daylight	150.600807	-34.861626	-	1
	845851	Moderate Injury	62	Accident	Divided road	Dusk	150.601075	-34.862175	-	1
	845852	Moderate Injury	30	Rear end	Divided road	Dusk	150.601073	-34.862168	-	2
	850969	Non-casualty (t..	20	Head on	T-junction	Darkness	150.588079	-34.859616	-	-
	855355	Non-casualty (t..	30	Rear end	Divided road	Daylight	150.601762	-34.865419	-	-
	1003912	Non-casualty (t..	30	Rear end	2-way undivided	Daylight	150.600606	-34.862109	-	-
	1005259	Moderate Injury	32	Right rear	T-junction	Daylight	150.595444	-34.861852	-	1
	1005641	Moderate Injury	47	Emerging from drive	T-junction	Daylight	150.601162	-34.862024	-	2
	1005831	Moderate Injury	10	Cross traffic	T-junction	Darkness	150.601162	-34.862024	-	1
	1009736	Non-casualty (t..	30	Rear end	Divided road	Daylight	150.601763	-34.865421	-	-
2014	1020781	Moderate Injury	30	Rear end	T-junction	Daylight	150.595552	-34.861865	-	1
	1027474	Moderate Injury	30	Rear end	T-junction	Daylight	150.60106	-34.862124	-	1
	1039594	Moderate Injury	40	U turn	T-junction	Daylight	150.578016	-34.850141	-	1
	1040415	Moderate Injury	40	U turn	2-way undivided	Daylight	150.594958	-34.861787	-	1
	1051007	Serious Injury	21	Right through	2-way undivided	Darkness	150.587409	-34.859374	-	1
	1052551	Moderate Injury	30	Rear end	2-way undivided	Daylight	150.599418	-34.862244	-	1
2015	1071525	Moderate Injury	32	Right rear	T-junction	Daylight	150.588357	-34.859685	-	1
	1073749	Moderate Injury	20	Head on	2-way undivided	Daylight	150.593114	-34.861254	-	1
	1076462	Moderate Injury	34	Lane change right	Divided road	Daylight	150.600943	-34.861872	-	1
	1080861	Moderate Injury	62	Accident	T-junction	Daylight	150.595444	-34.861852	-	1
	1081545	Moderate Injury	10	Cross traffic	T-junction	Darkness	150.588084	-34.859595	-	1
	1082366	Moderate Injury	10	Cross traffic	T-junction	Darkness	150.601034	-34.862036	-	2
	1083057	Moderate Injury	30	Rear end	Divided road	Daylight	150.601362	-34.863819	-	1
2016	1092663	Serious Injury	13	Right near	T-junction	Dusk	150.588084	-34.859595	-	1
	1115565	Moderate Injury	37	Left turn sideswipe	2-way undivided	Daylight	150.595228	-34.861823	-	1
	1125102	Moderate Injury	48	From footpath	T-junction	Daylight	150.60119	-34.862111	-	1
	1125485	Serious Injury	85	Off rt/lft bnd=>obj	T-junction	Darkness	150.588374	-34.859596	-	2

Table 4: Crash Details for the Secondary Investigation Area (South)

A total of 51 crashes have been identified within the SIA, with the majority of the crashes recorded south-east of the site. The key characteristics of the crashes are as follows:

- No fatalities were recorded;
- There were 7 serious injuries, 25 moderate injuries, 2 minor injuries and 17 non-casualties sustained from these crashes;
- 13 crashes occurred in darkness and 4 crashes occurred during dusk, outside of the core school hours;

In particular, the following crashes were recorded at intersections within the SIA:

- 43 crashes were recorded at the intersection of Princes Highway and Illaroo Road, including:
  - 3 cross traffic crashes; and

- 13 rear end crashes.

- A total of 8 crashes were recorded at the intersection of Illaroo Road and Hockeys Lane, including 7 off-road crashes; and
- No crashes were recorded at the intersection of Hockeys lane / Main Road / Tannery Road.

Given the road classifications and associated traffic volumes, the number of crashes recorded at the intersections is not surprising and it is considered that the road network is operating in a relatively safe manner.

The high number of off-road crashes at the intersection of Illaroo Road and Hockeys Lane indicates a crash trend. The development is expected to generate a minimal increase in traffic at the intersection resulting in a low crash risk. Further, the crashes recorded at the intersection were of low severity. Therefore, the crash record should not preclude the development from proceeding.

7. The Proposal

The proposal involves the rezoning of land at Lots 21-24 DP 714096 and construction of a residential development located at the southern end of Warrah Road, Bangalee. More specifically, the development proposal includes:

- A residential development yielding up to 250 dwellings;
- Access to the site is shown to be provided via Warrah Road from Bimbimbie Avenue, Moondara Drive and Illaroo Road.

An indicative site layout is provided within **Figure 13.**

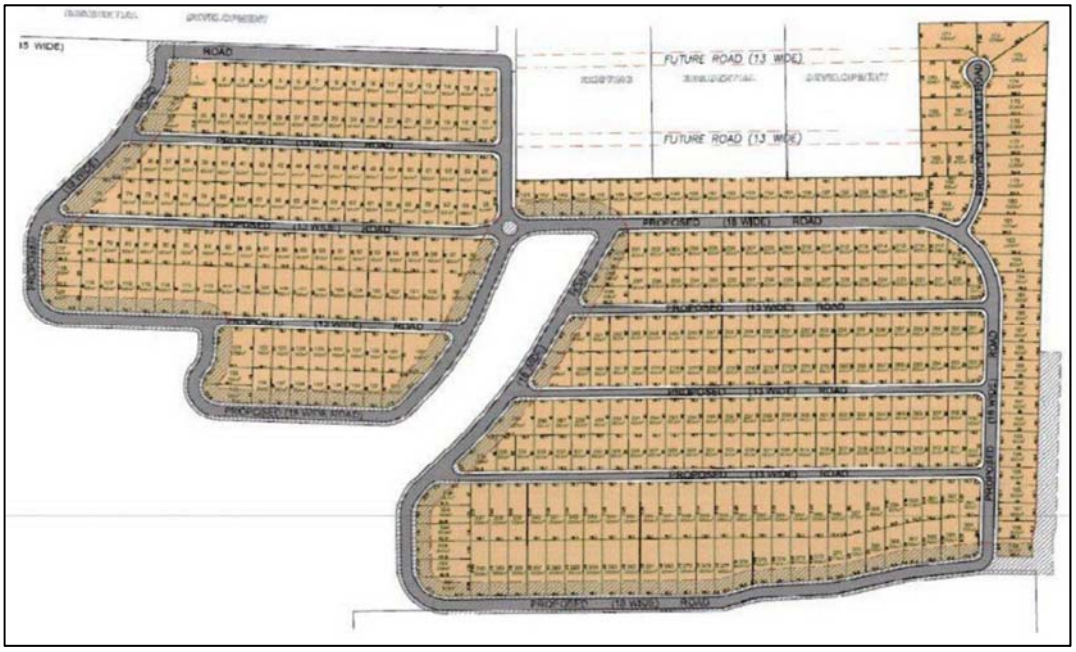


Figure 13: Proposed Development

8. Traffic Assessment

8.1 Existing Traffic Generation

As described in Section 3.1 of this report, the subject site is currently comprised of undeveloped rural vegetation and therefore does not generate any traffic.

The development will rely on access through an existing residential area in Bangalee. Access to the site is provided via Warrah Road, which connects to the wider road network via Bimbimbie Avenue, Moondara Drive and Illaroo Road.

8.2 Traffic Generation of Proposal

The *RMS Technical Direction Guide to Traffic Generating Developments TDT2013-04A (2013)* specifies the traffic generating potential of low density residential dwellings in non-metropolitan areas, which is considered to be an appropriate land use classification for the purposes of estimating traffic generation. The traffic generation rate for low density residential dwellings in regional areas is stated as:

- Weekday morning peak hour vehicle trips = 0.71 per dwelling;
- Weekday evening peak hour vehicle trips = 0.78 per dwelling.

It is typical for low density residential activities to yield a trip distribution involving about 80% of traffic in the morning peak hour being departing trips, and 20% arriving trips. Similarly, it is typical that 25% of trips will be departing and 75% will be arriving trips in the evening peak hour.

Low Density Residential Dwellings (250 dwellings)	RMS Traffic Generation Rates (trips per hour)	Estimated Proposed Traffic Generation (trips per hour)	Departing Trips During Peak hour	Arriving Trips During Peak hour
AM Peak	0.71 per dwelling	178	142	36
PM Peak	0.78 per dwelling	195	49	146

Table 5: Estimated Development Traffic Generation

As can be seen from the above table, it is estimated that the proposed residential development is expected to generate 178 and 195 vehicle trips per peak hour during the weekday morning and evening peak hours respectively.

8.3 Trip Distribution

In order to determine the distribution of the development traffic on the surrounding road network, the Shoalhaven Strategic model has been utilised. The model trip generation for the development has been compared with the expected period flows and adjusted where

necessary to meet expectations. The 2026 model has been taken through a full distribution-assignment convergence process for both the AM and PM peak periods until the period model settled into a consistent pattern of trip distribution. This process has produced the expected distribution of trips to and from the development throughout the surrounding area for both the existing and expected future road network and development situations.

The distribution of the development traffic within the study area is shown within **Figure 14** below.

8.4 Impact of Proposed Subdivision on the Transport Network

The traffic generation and distribution outputs from the strategic TRACKS model have been used to undertake an analysis of the operation of all critical intersections within the study area using the SIDRA computer modelling program. TDG has identified four traffic modelling scenarios for the road network, and modelled for the morning and evening peak periods:

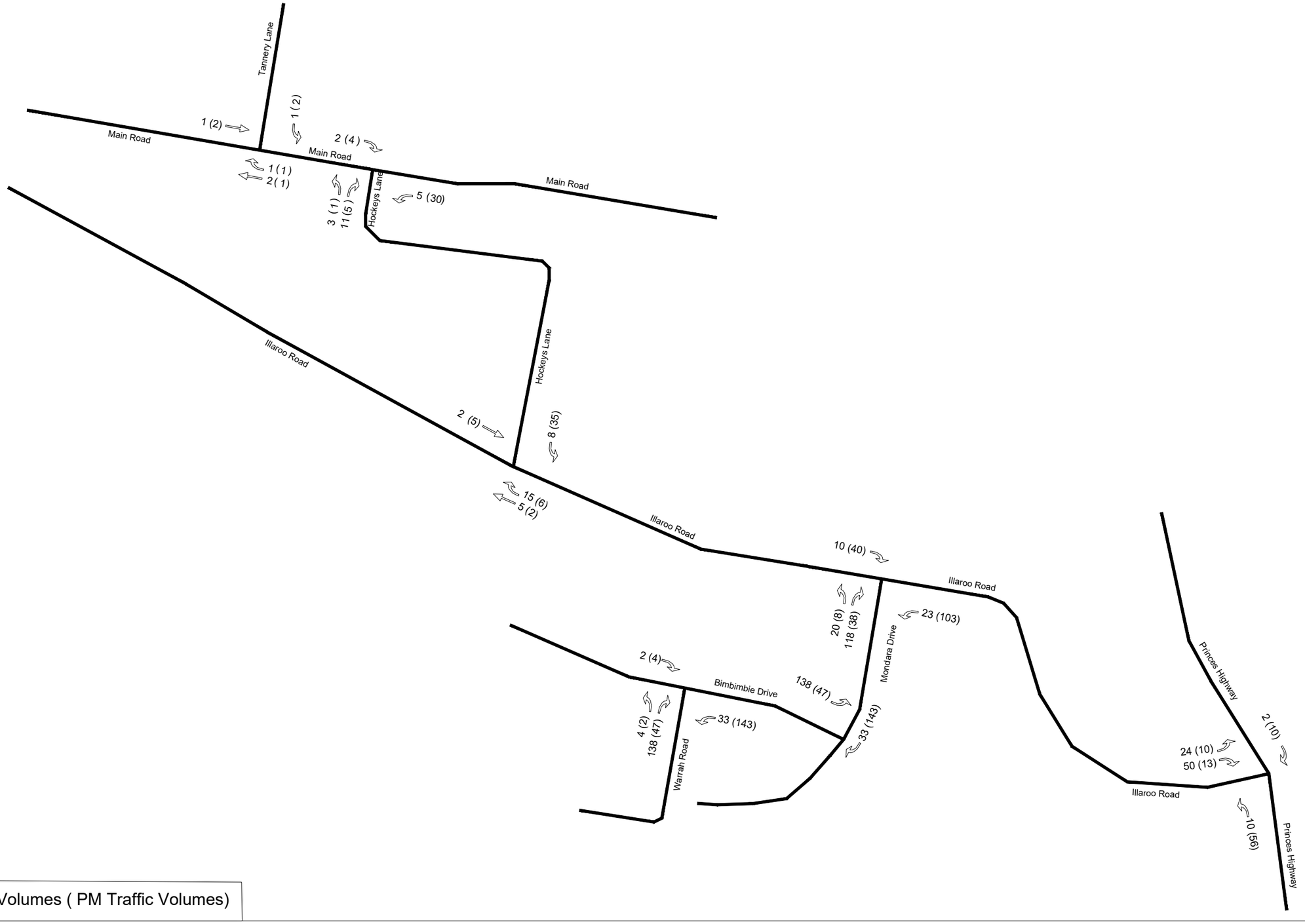
- Scenario 1 - Existing traffic volumes;
- Scenario 2 – Existing traffic volumes plus the development traffic;
- Scenario 3 – Future traffic volumes (2026); and
- Scenario 4 – Future traffic volumes (2026) plus the development traffic.

Each of the intersections within the PIA and SIA have been modelled for the above scenarios and the results are presented below. The traffic volumes for each scenario is provided within following Figures.

It is noted that the future traffic volumes (2026) have been adopted based on the Shoalhaven Strategic model, which includes a link road between Illaroo Road and Moss Vale Road has been constructed, and the Moss Vale Road Urban Release Areas are fully developed.

8.4.1 Primary Investigation Area

The results of the modelling exercise for the PIA are presented below in **Table 6**. The detailed SIDRA results are presented in **Appendix C-F**.



Tuesday, 17 April 2018 1:05:22 PM

AM Traffic Volumes (PM Traffic Volumes)

REV	DATE	DRN	CHK	DESCRIPTION
00	17/04/18	TJG	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----

WARRAH ROAD, BANGALEE,NSW

TRAFFIC VOLUMES

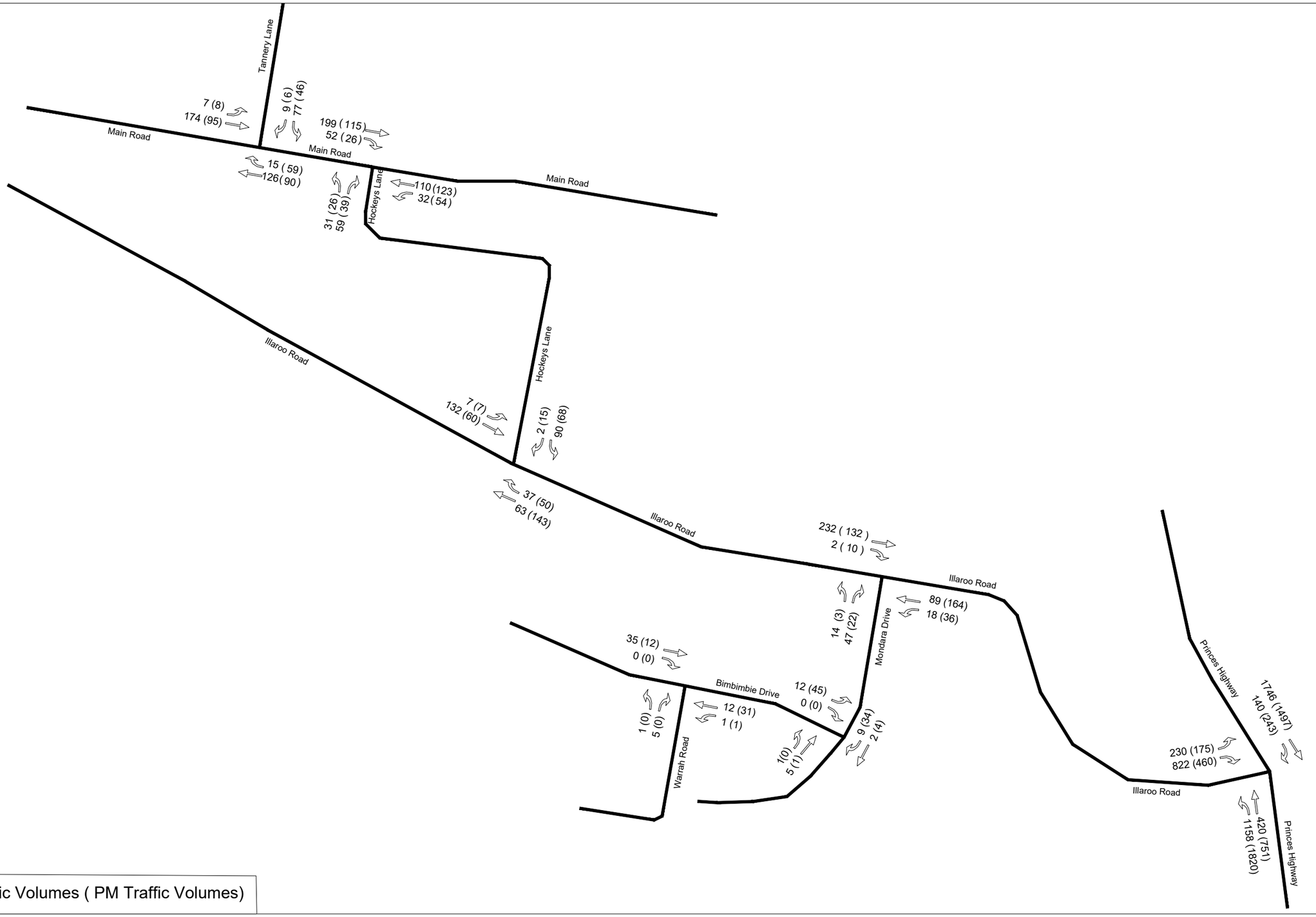
Development Traffic

DRAWN: DA	---	---
DATE: 17/04/18	STATUS: ---	
SCALE: N.T.S		
DWG NO:15138A1B		

TDG

13

C:\Users\tdgshared\Dropbox (TDG)\Australia Business\Australia Jobs\15100\15138 - Traffic Assessment - Warrah Road, Bangalee - Shoalhaven CC\DWGs\TDG\15138A1b.dwg



Tuesday, 17 April 2018 1:05:22 PM

AM Traffic Volumes (PM Traffic Volumes)

REV	DATE	DRN	CHK	DESCRIPTION
00	17/04/18	TJG	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----

WARRAH ROAD, BANGALEE,NSW

TRAFFIC VOLUMES

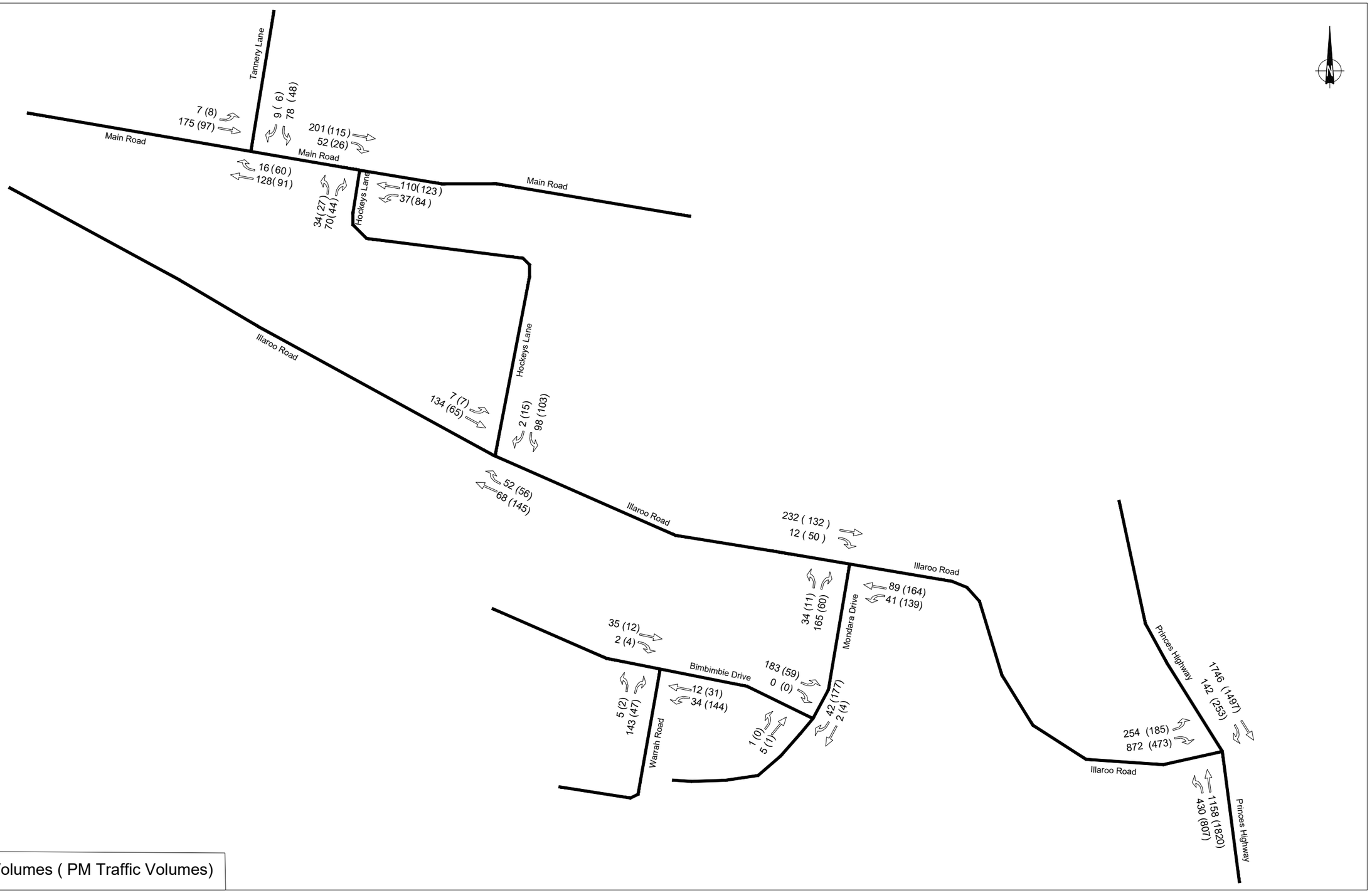
EXISTING

DRAWN: DA	---	---
DATE: 17/04/18	STATUS: ---	
SCALE: N.T.S		
DWG NO:15138A1B		

TDG

14

C:\Users\tdgshared\Dropbox (TDG)\Australia Business\Australia Jobs\15100\15138 - Traffic Assessment - Warrah Road, Bangalee - Shoalhaven CC\DWGs\TDG\15138A1b.dwg



Tuesday, 17 April 2018 1:05:22 PM

AM Traffic Volumes (PM Traffic Volumes)

REV	DATE	DRN	CHK	DESCRIPTION
00	17/04/18	TJG	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----

WARRAH ROAD, BANGALEE,NSW

TRAFFIC VOLUMES

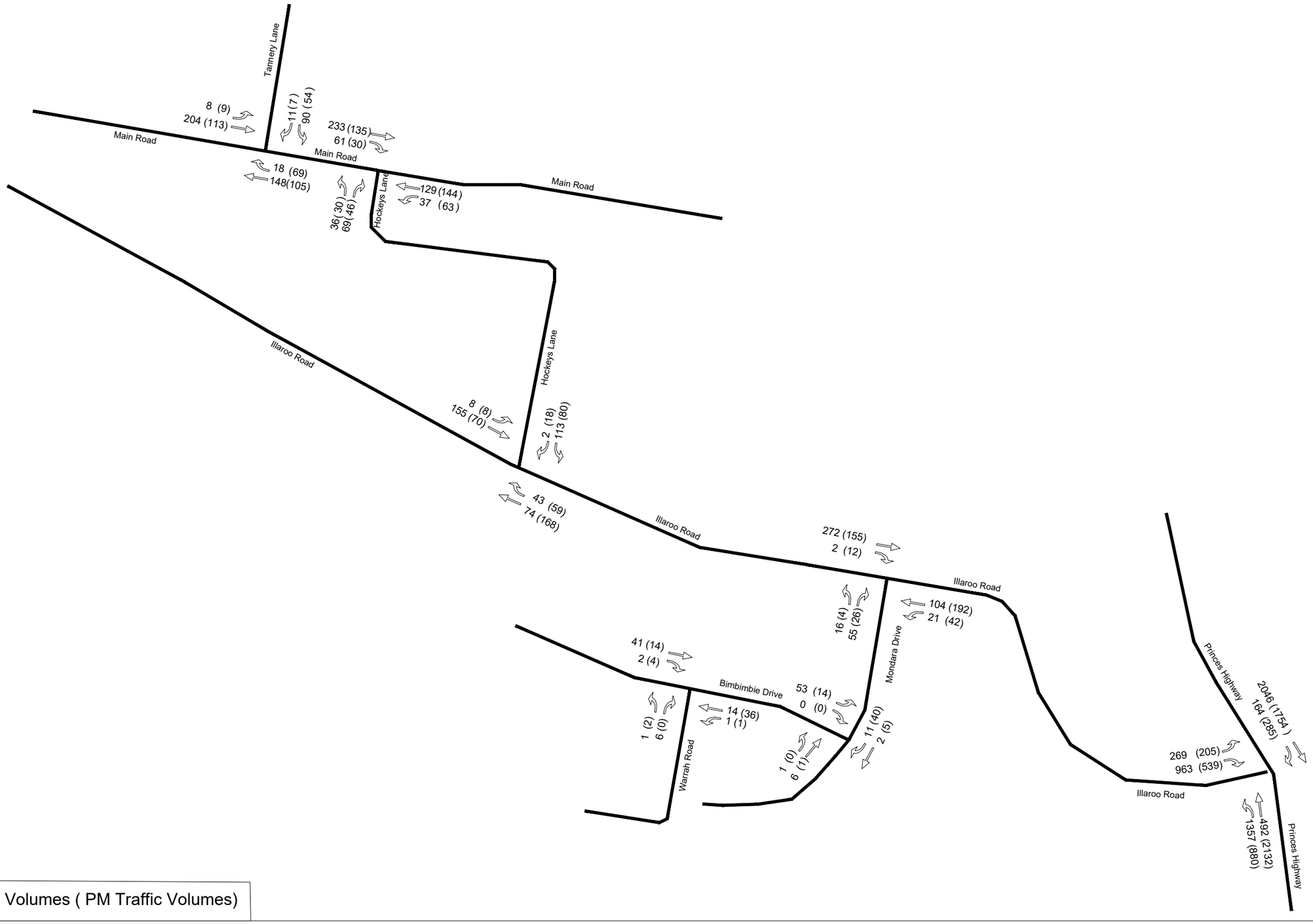
EXISTING WITH DEVELOPMENT

DRAWN: DA	---	---
DATE: 17/04/18	STATUS: ---	
SCALE: N.T.S		
DWG NO:15138A1B		

TDG

15

C:\Users\tdgshared\Dropbox (TDG)\Australia Business\Australia Jobs\15100\15138 - Traffic Assessment - Warrah Road, Bangalee - Shoalhaven CC\DWGs\TDG\15138A1b.dwg



AM Traffic Volumes (PM Traffic Volumes)

Tuesday, 17 April 2018 1:05:22 PM

REV	DATE	DRN	CHK	DESCRIPTION
00	17/04/18	TJG	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----

WARRAH ROAD, BANGALEE,NSW

TRAFFIC VOLUMES

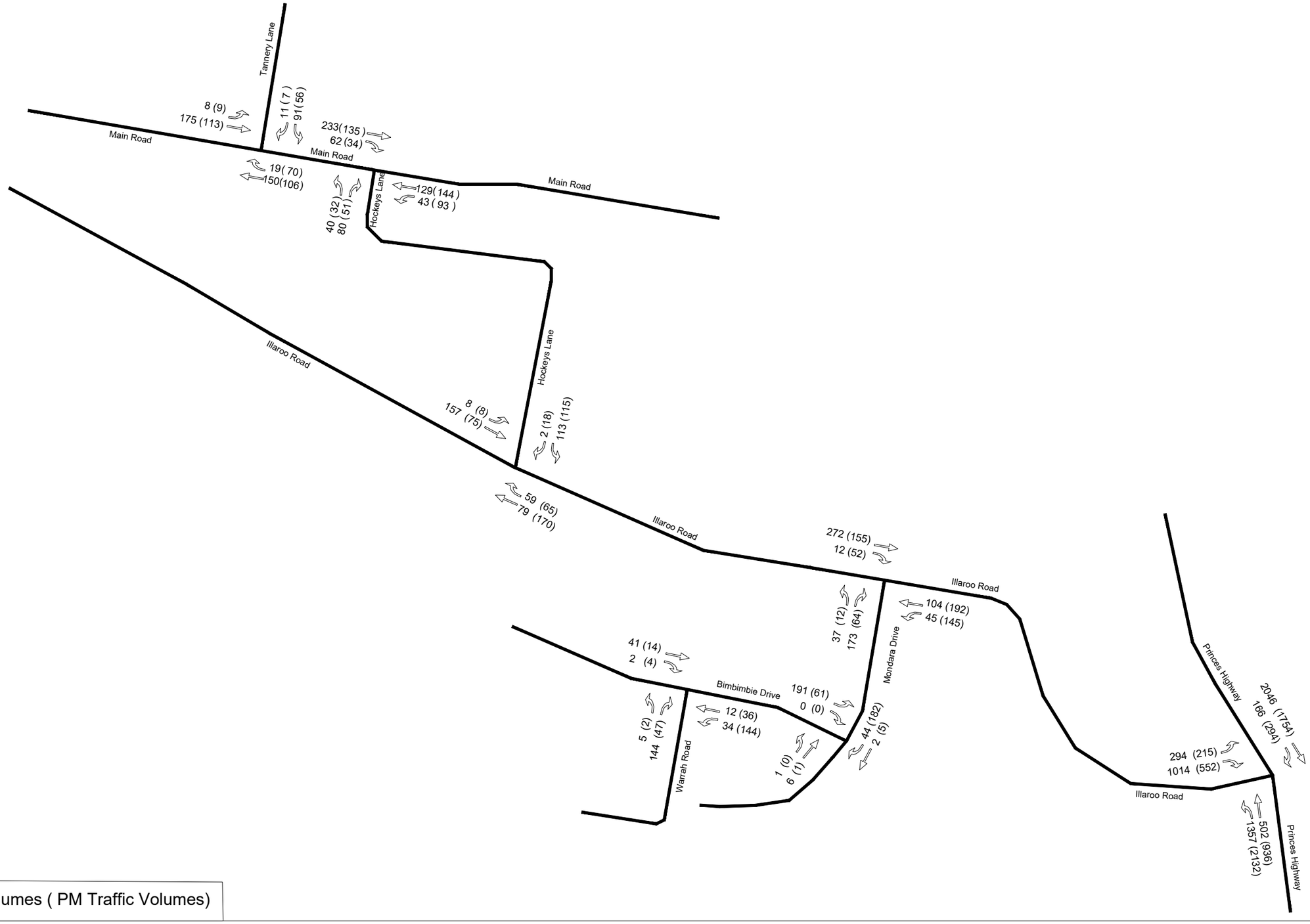
FUTURE WITHOUT DEVELOPMENT

DRAWN: DA	---	---
DATE: 17/04/18	STATUS: ---	
SCALE: N.T.S		
DWG NO:15138A1B		

TDG

16

C:\Users\tdgshared\Dropbox (TDG)\Australia Business\Australia Jobs\15100\15138 - Traffic Assessment - Warrah Road, Bangalee - Shoalhaven CC\DWGs\TDG\15138A1b.dwg



Tuesday, 17 April 2018 1:05:22 PM

AM Traffic Volumes (PM Traffic Volumes)

REV	DATE	DRN	CHK	DESCRIPTION
00	17/04/18	TJG	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----

WARRAH ROAD, BANGALEE,NSW

TRAFFIC VOLUMES

FUTURE WITH DEVELOPMENT

DRAWN: DA	---	---
DATE: 17/04/18	STATUS: ---	
SCALE: N.T.S		
DWG NO:15138A1B		

TDG

17

C:\Users\tdgshared\Dropbox (TDG)\Australia Business\Australia Jobs\15100\15138 - Traffic Assessment - Warrah Road, Bangalee - Shoalhaven CC\DWGs\TDG\15138A1b.dwg

INTERSECTION	SCENARIOS	MORNING PEAK			EVENING PEAK		
		DoS	Average Delay (sec)	LoS	DoS	Average Delay (sec)	LoS
Warrah Road / Bimbimbie Avenue	Scenario 1	0.021	6.2	A	0.017	5.6	A
	Scenario 2	0.121	5.8	A	0.098	5.9	A
	Scenario 3	0.024	6.2	A	0.020	5.6	A
	Scenario 4	0.130	5.8	A	0.101	4.5	A
Bimbimbie Avenue / Moondara Drive	Scenario 1	0.031	6.1	A	0.023	5.8	A
	Scenario 2	0.114	6.1	A	0.093	5.9	A
	Scenario 3	0.036	6.1	A	0.027	5.8	A
	Scenario 4	0.125	5.4	A	0.110	5.4	A
Moondara Drive / Illaroo Road	Scenario 1	0.129	9.0	A	0.111	8.8	A
	Scenario 2	0.232	9.2	A	0.161	9.3	A
	Scenario 3	0.150	9.4	A	0.129	9.2	A
	Scenario 4	0.281	3.8	A	0.188	3.4	A

Table 6: SIDRA Results – All Scenarios - Primary Investigation Area

The results presented in **Table 6** indicate the following:

- All roads within the PIA is expected to continue to operate with a good level of service 'A' in the future, even with the development traffic added;
- The maximum delay recorded for all scenarios was the right turn from Moondara Drive onto Illaroo Road during the morning peak, which recorded an average delay of 10.0 seconds; and
- This movement also recorded the longest queue length of approximately one vehicle.

Based on the results of the SIDRA analysis it is concluded that the road network within the PIA is expected to continue to operate with a good level of service.

8.4.2 Secondary Investigation Area

The results of the modelling exercise for the SIA are presented below in **Table 7**. The following additional scenarios have been assessed for the intersection of Illaroo Road with Princes Highway:

- Scenario 5 – Future intersection layout with future traffic volumes (2026); and
- Scenario 6 – Future intersection layout with future traffic volumes (2026) plus the development traffic.

The detailed SIDRA results are presented in **Appendix C-G**.

INTERSECTION	SCENARIOS	MORNING PEAK			EVENING PEAK		
		DoS	Average Delay (sec)	LoS	DoS	Average Delay (sec)	LoS
Illaroo Road / Hockeys Lane	Scenario 1	0.079	7.3	A	0.110	7.6	A
	Scenario 2	0.080	7.5	A	0.109	7.6	A
	Scenario 3	0.092	7.8	A	0.130	7.9	A
	Scenario 4	0.100	3.1	A	0.135	3.1	A
Hockeys Lane / Main Road	Scenario 1	0.124	9.0	A	0.067	7.9	A
	Scenario 2	0.135	8.8	A	0.082	7.9	A
	Scenario 3	0.158	9.9	A	0.097	8.4	A
	Scenario 4	0.181	10.0	A	0.109	8.6	A
Main Road / Tannery Road	Scenario 1	0.095	8.1	A	0.054	7.1	A
	Scenario 2	0.091	8.0	A	0.053	7.2	A
	Scenario 3	0.112	8.8	A	0.063	7.7	A
	Scenario 4	0.112	8.8	A	0.064	7.8	A
Illaroo Road / Princes Highway (Traffic Signals)	Scenario 1	0.850	32.7	C	0.924	31.9	C
	Scenario 2	0.872	35.8	C	0.932	32.7	C
	Scenario 3	1.048	71.5	F	1.139	69.1	E
	Scenario 4	1.076	79.3	F	1.144	70.9	F
	Scenario 5	0.693	27.1	B	0.723	21.9	B
	Scenario 6	0.700	29.0	C	0.724	22.4	B

Table 7: SIDRA Results – All Scenarios - Secondary Investigation Area

The results presented in **Table 7** indicate all intersections, excluding the intersection of Princes Highway and Illaroo Road, is expected to continue to operate with a good level of service 'A' under all scenarios. The following summarises the modelling results for the Princes Highway / Illaroo Road intersection for the various scenarios:

- *Scenario 1 (existing volumes):* The intersection currently operates with a level of service 'C'. It is noted that the intersection experiences long queue lengths and high delays in the scenarios.
- *Scenario 2 (existing volumes plus development traffic):* The intersection will continue to operate with a level of service 'C'.
- *Scenario 3 (future traffic volumes):* The intersection is assessed to operate with a level of service 'F' in the morning peak and a level of service 'E' during the evening peak. The level of service F corresponds with the intersection exceeding a degree of saturation of 1.0, indicating the intersection has reached capacity, resulting in large queue lengths and high delays.
- *Scenario 4 (future traffic volumes plus development traffic):* The intersection is assessed to operate with a level of service 'F' in the morning and evening peak. This

is not surprising given the increase in traffic and that the intersection was nearing capacity under current conditions.

- *Scenario 5 (future traffic volumes with road upgrades):* Following the upgrades to the intersection, based on the existing concept plans, the intersection is expected to operate with a good level of service 'B'.
- *Scenario 6 (future traffic volumes, plus development traffic, with road upgrades):* The intersection is expected to operate with a level of service 'C' and 'B' in the morning and evening peaks respectively.

Based on the above analysis it is concluded that the road network within the SIA, excluding the intersection of Princes Highway and Illaroo Road, is expected to continue to operate with a good level of service.

By way of a comparison, the addition of the development traffic to the Princes Highway / Illaroo Road intersection is assessed as being capable of being accommodated at present traffic demand levels. It is expected however, with underlying growth demands, to result in the intersection changing from a level of service 'C' to a 'F' earlier than would otherwise be expected during the evening peak. This corresponds to long queue lengths and high delays.

Using a linear interpolation of the degree of saturation between the existing and future scenarios would result in the intersection reaching capacity at approximately the following future years.

SCENARIO	SATURATION YEAR	
	AM Peak	PM Peak
Without Development	2024	2022
With Development	2023	2021

Table 8: Year of Saturation of the Princes Highway and Illaroo Intersection

Based on the assessment, the addition of the development traffic will bring forward the saturation of the intersection by approximately one year. In practice the subdivision is expected to gradually build up to generate traffic movements associated with 250 dwellings. As such, the actual impact of the subdivision at these years may not be as significant as assessed. It is recommended that careful consideration be given to the level of development permitted within the subdivision in relation to the timing of the Princes Highway and Illaroo intersection upgrade.

8.5 Road Midblock Analysis

An analysis of the carriageway capacity has been undertaken for the roadways within the study area for the future traffic volumes plus the development traffic. For the purposes of the analysis the upgrades to the Illaroo Road / Princes Highway intersection have been assumed to have been completed. The results of the assessment are provided within **Table 9**.

LOCATION	LANES	MORNING PEAK			EVENING PEAK		
		Northbound Traffic Volumes	Southbound Traffic Volumes	Level of Service (LoS)	Northbound Traffic Volumes	Southbound Traffic Volumes	Level of Service (LoS)
INTERRUPTED FLOWS							
Warrah Road (South of Bimbimbie Avenue)	2 Lanes Undivided	149	37	**A**	49	148	**A**
Bimbimbie Avenue (West of Moondara Drive)	2 Lanes Undivided	45 (Westbound)	190 (Eastbound)	**A**	182 (Westbound)	61 (Eastbound)	**A**
Moondara Drive (South of Illaroo Road)	2 Lanes Undivided	208	56	**A**	76	195	**A**
Illaroo Road (West of Moondara Drive)	2 Lanes Undivided	138 (Westbound)	245 (Eastbound)	**A**	200 (Westbound)	203 (Eastbound)	**A**
Hockeys Lane (North of Illaroo Road)	2 Lanes Undivided	60	113	**A**	72	130	**A**
Illaroo Road (West of Princes Highway)	4 lanes undivided	655 (Westbound)	1,283 (Eastbound)	**A/C**	1,208 (Westbound)	753 (Eastbound)	**B/A**
UNINTERRUPTED FLOWS							
Princes Highway (South of Illaroo Road)	6 Lanes Divided with Clearways	1,822	3,001	**A/C**	3,009	2,262	**C/A**

Table 9: Midblock Level of Service for Future Traffic Volumes

The analysis indicates that all roads within the study area, including Princes Highway, will continue to operate with satisfactory levels of service in the future assessment year (2026)

with the development traffic. In particular, all of the intersections within the PIA are assessed to operate with a good level of service 'A'.

8.6 Summary

Based on the above analysis the following conclusions and recommendations are provided:

- All roads within the PIA are expected to continue to operate with a good level of service 'A' in the future, including with the development traffic;
- The Princes Highway / Illaroo Road intersection currently operates with a level of service 'C'. It is noted that the intersection currently experiences long queue lengths and high delay;
- The addition of the development traffic to the Princes Highway / Illaroo Road intersection will result in the intersection continuing to operate at a level of service 'C' during the morning and evening peak times, under existing conditions;
- The Princes Highway / Illaroo Road intersection is assessed to operate with a level of service 'F' in the morning peak and a level of service 'E/F' during the evening peak, with and without the development traffic in the future (2026); and
- The addition of the development traffic will bring forward the saturation of the intersection by approximately one year, which will occur in year 2021.

In practice the subdivision is expected to gradually build up to generate traffic movements associated with 250 dwellings. The timing of the subdivision construction and levels of occupation should be considered to ensure that the intersection of Princes Highway does not reach unacceptable operating conditions prior to the construction of an additional bridge.

9. Bush Fire Evacuation

A bush fire evacuation assessment has been undertaken to determine the time it would take for vehicles to exit the subdivision and reach a safe location. For the purposes of this assessment the analysis has looked at the time taken for vehicles from the subdivision to reach Illaroo Road. Once vehicles reach the Moondara Drive / Illaroo Road intersection, the time taken for vehicles to enter Illaroo Road is expected to vary greatly as Illaroo Road is assessed to be operating at capacity during an evacuation, but most likely under police control. Under these conditions vehicles will access Illaroo Road via courtesy gaps, or traffic management measures will need to be established, which does not form part of this assessment.

9.1 Trip Generation

For the purposes of this assessment, the bush fire evacuation has been assumed to occur at night when all dwellings within the study area are occupied. Using Census data it has been identified that approximately 11% of all dwellings within the Bangalee area have five or more persons residing in the premises. It has been assumed that all dwellings will generate one vehicle movement during a bush fire, with any dwelling accommodating five or more people generating two vehicle movements. Therefore, a trip rate per dwelling of 1.11 vehicles has been applied to the study area.

The study area has been broken into the areas shown within **Figure 19** in order to determine the movements at the intersections.

Figure 19: Existing Dwelling Zones

The existing areas and proposed subdivision are shown to accommodate approximately 365 dwellings, generating about 400 vehicle movements, as noted in **Table 10**.

	AREAS								
	A	**B**	**C**	**D**	**E**	**F**	**G**	**Site**	**Total**
Dwellings	66	3	6	4	22	3	10	250	364
Trips	73	3	7	4	24	3	11	278	405

Table 10: Number of Dwellings in Study Area and Trip Generation

9.2 Traffic Analysis

A SIDRA analysis has then been undertaken for the intersections of Bimbimbie Avenue with Warrah Road and Moondara Drive in the event of an evacuation. The assessment has assumed that all residents will evacuate within 30 minutes. It has also been assumed that all vehicles on the road network are evacuating and using the left lane only, allowing entry by emergency vehicles. The results of the SIDRA analysis are provided within **Table 11** with the detailed results presented in **Appendix H**.

Scenarios	Degree of Saturation	Average Delay (sec)	Level of Service
Warrah Road / Bimbimbie Avenue	0.529	6.8	A
Bimbimbie Avenue / Moondara Drive	0.493	5.8	A

Table 11: Bush Fire Evacuation SIDRA Results

The SIDRA results show that the intersections are expected to operate in an acceptable manner and with minimal delays. The minimal delays are not unexpected given there has been assumed to be no base traffic during this time. Further, there is a clear dominant movement on all of the intersections allowing for relatively free-flowing traffic.

9.3 Summary

The longest travel path for a vehicle to exit a dwelling and reach Illaroo Road is approximately 2.0km based on the proposed layout of the subdivision provided within Section 7. Assuming an average travel speed of 30km/hr, the vehicle is expected to take approximately 240 seconds to traverse the midblock sections and reach Illaroo Road.

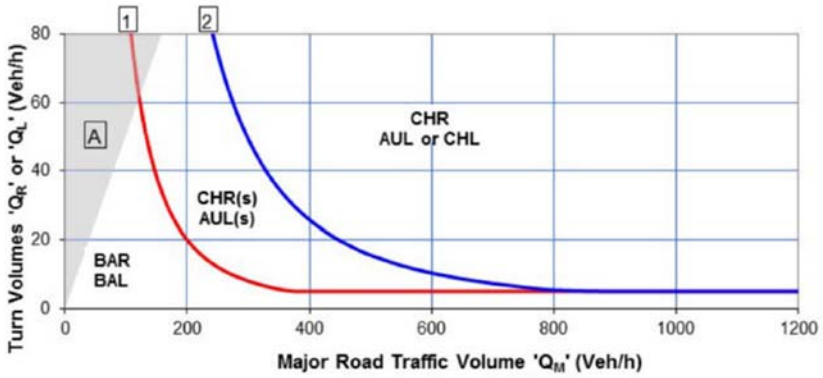
A vehicle evacuating from this dwelling would be required to give way at three intersections. The longest delay at an intersection would likely occur at the intersection of Bimbimbie Avenue and Moondara Drive which has the highest traffic volumes. The intersection was recorded to have an average delay of approximately six seconds. Adopting this delay at the three intersections would result in a total delay of 18 seconds at intersections.

Based on the above, the longest time it would take for a vehicle to exit the subdivision and reach the queue to exit onto Illaroo Road would be approximately 258 seconds. As discussed, the time taken to exit onto Illaroo Road is expected to vary depending on the

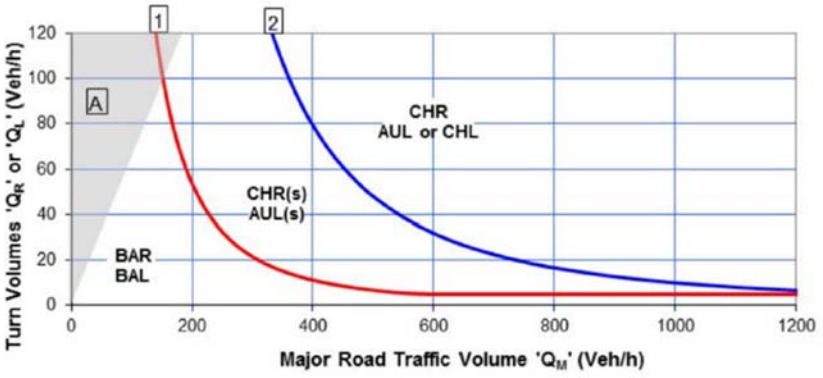
extent of the wider area evacuation, the location of where people are evacuated to, and the traffic management that is implemented during an evacuation.

10. Intersection Turning Treatments

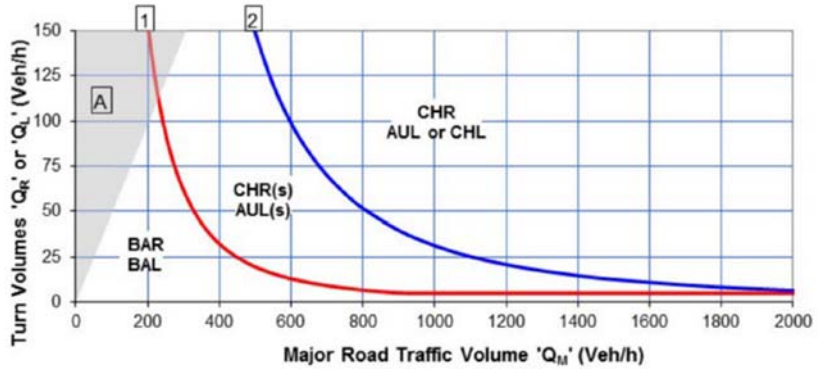
Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings specifies the turning treatments required at intersections. Figure 2.26 specifies the required turn treatments on the major road at unsignalised intersections, and is provided below.



(a) Design Speed ≥ 100 km/h



(b) 70 km/h < Design Speed < 100 km/h



(c) Design Speed < 100 km/h

Note: Figure (c) should read 'Design Speed < 70 km/h'

Figure 20: Austroads Warrants for Turning Treatments on Major Roads

An assessment of the required turning treatments has been undertaken for the following intersections, which are reflective of a rural road environment:

- Illaroo Road / Moondara Drive; and
- Illaroo Road / Hockeys Lane.

The Major Road Traffic Volume (Q_M) is the total through traffic flow in both directions on the major road. The turning volumes are the individual right and left turn traffic volumes turning from the major road (Q_R and Q_L). All volumes are for the peak hour traffic volumes (morning and evening peak).

An analysis of the required turning treatments at the intersections is provided within **Table 12**. The intersections have been assessed for Scenarios 1-4, as outlined within Section 8.4. For the purposes of the assessment, Illaroo Road has been assessed as having a design speed of 70km/h at Moondara Drive, and 90km/h at Hockeys Lane.

Location	Scenario	MORNING PEAK			EVENING PEAK		
		Q_M	Q_R / Q_L	Treatment	Q_M	Q_R / Q_L	Treatment
Illaroo Road / Moondara Drive	Scenario 1	321	2/18	BAR/BAL	296	10/36	BAR/BAL
	Scenario 2	321	12/41	BAR/BAL	296	50/139	BAR/AUL
	Scenario 3	376	2/21	BAR/BAL	347	42/12	BAR/BAL
	Scenario 4	376	12/45	BAR/AUL	347	52/145	CHR/AUL
Illaroo Road / Hockeys Lane	Scenario 1	195	37/7	BAR/BAL	203	50/7	BAR/BAL
	Scenario 2	202	52/7	BAR/BAL	210	56/7	CHR/BAL
	Scenario 3	229	43/8	CHR/BAL	238	59/8	CHR/BAL
	Scenario 4	236	59/8	CHR/BAL	245	65/8	CHR/BAL

Table 12: Required Rural Road Turning Treatments

The above treatment abbreviations correspond to the turning treatment provided within **Appendix I**.

The following conclusions can be drawn from Table 12:

- The addition of the development traffic at the intersection of Illaroo Road with Moondara Drive will generate the requirement for an AUL (Auxillary Left Turn) treatment. This is only triggered with the addition of the development traffic and would not be required under future traffic volumes without the development traffic. This is required during the evening peak under Scenario 2 and both the morning and evening peaks under Scenario 4.
- The Illaroo Road / Moondara Drive intersection also generates the requirement for a CHR (Channelised Right Turn) during the evening peak, under future traffic volumes with the development traffic added (Scenario 4).
- A CHR is required at the intersection of Illaroo Road and Hockeys lane under all future scenarios. It is also triggered during the evening peak for Scenario 2, indicating that the development traffic would bring forward the requirement for this turning treatment.

- The addition of the development traffic and the increase in base traffic volumes would not warrant a change in the left-turn treatment at the Illaroo Road / Hockeys Lane intersection.

It is noted that Illaroo Road currently has no turning treatments at its intersection with other roads, excluding the roundabout treatment at its intersection with McMahons Road.

In order to meet the requirements of the Austroads Guideline, it is recommended that an axillary left turn treatment and a channelised right turn treatment be provided at the intersection of Illaroo Road with Moondara Drive. It is also recommended that a channelised right turn treatment be provided at the intersection of Illaroo Road with Hockeys Lane.

Illaroo Road has a road reserve width of 27 metres at its connection with Moondara Drive, and approximately 20 metres at its intersection with Hockeys Lane. As such, the above turning treatments would be able to be accommodated within the road reserve, if provided.

11. Access Arrangements

11.1 Vehicle Access

This section provides consideration to the need for traffic speed controlling devices along the access route to the subdivision. Access to the site is provided via Warrah Road, which connects to the wider road network via Bimbimbie Avenue, Moondara Drive and Illaroo Road.

11.1.1 Road Humps

Careful consideration should be given to the location and design of road humps before committing to their implementation as they are the most often complained about device currently used in Australasia. It is appropriate to use road humps:

- Where there is a need to reduce vehicle speeds;
- Where there is adequate street lighting to maximise visibility;
- At mid-block locations;
- On streets with relatively low traffic volumes; and
- On streets with a low speed environment (less than 60 km/h).

Spacing of devices should not be less than 80 metres and generally not more than 120 to 150 metres. Given the spacing of the intersections within the PIA it is considered that road humps are not required. Further, the crash analysis presented in Section 6 indicates that the road network is currently operating, and is expected to continue to operate, in a safe manner.

In the event that high travel speeds are required in the future due to traffic associated with the subdivision, any road hump is expected to need appropriate street lighting and signage to ensure it is visible, and any device should not be installed in isolation.

11.1.2 Roundabouts

The advantages of roundabouts include:

- Reduction of vehicle conflict points and road crashes at intersections;
- Reduction of vehicle speeds on the approach to, and through, the intersection;
- Control of traffic movement and provision of orderly and largely uninterrupted flow of traffic;
- An increase in the visibility of the intersection;
- Clarification of the priority of traffic movements; and
- Enhancement in the appearance of the street when landscaped.

The disadvantages of roundabouts include:

- They have the potential to restrict larger service and emergency vehicles and buses unless the roundabout is mountable;
- They can be relatively expensive especially if land needs to be acquired;
- Traffic noise may possibly increase due to braking and acceleration;
- They can reduce the availability of on-street parking; and
- They can be difficult for cyclists and pedestrians to negotiate.

Given the existing road network is operating in a safe manner and the increase in traffic generated by the subdivision, it is concluded that the disadvantages of installing roundabouts to reduce speed outweigh their advantages, and therefore not appropriate as a traffic calming device in this instance.

11.2 Bus Access

Council has indicated that the increase in dwellings may result in the need to provide additional bus services in the area, and within the subdivision itself. TDG contacted Shoalbus, the company that provides the existing bus services in the area, who have indicated that they would consider providing additional bus services in the event that there was the demand.

In order to futureproof the road network, an assessment has been undertaken of the existing road network to determine if a 14.5 metre long bus could access the site. A swept path evaluation of the access route from Illaroo Road has been undertaken using the software package 'AutoTurn'. The evaluation is provided within **Appendix J** and demonstrates that buses are able to traverse the existing road network in a suitable manner, subject to some local widening on the north-western corner of the Bimbimbie Avenue / Moondara Drive intersection.

Therefore, it is recommended that the intersection be upgraded to accommodate the widening shown within **Appendix I**.

11.3 Pedestrian Access

No footpaths are currently provided within the surrounding area.

The subdivision is located an 800 metre walk from the nearest bus stop on Illaroo Road. It is typically accepted that pedestrians will walk up to about 400 metres to a bus stop in order to utilise public transport. Given the distance to the bus stop it is unlikely that residents of the subdivision will generate walking trips in the numbers or frequency that might typically be associated with a more accessible bus service. Based on this, it is concluded that no additional pedestrian facilities are required in the vicinity of the site, with pedestrians able to utilise the wide grassed berms on the roadside.

In the event that additional bus facilities are provided to service the subdivision the number of walking trips generated by the subdivision is expected to increase, as residents choose to use the bus services and walk to the relevant bus stop. During wet weather pedestrians are expected to walk on the road. No street lighting is currently provided in the area so at night

pedestrians walking on the road would be difficult to see by drivers creating a potentially unsafe environment.

Without suitable all-weather facilities, those in need of accessible paths will be materially impaired, and potentially exposed to significant additional risk.

Therefore, it is recommended that footpaths be considered along key pedestrian paths if additional bus services are provided in the area. The footpaths would only need to be provided on one side of the road, but should provide a continuous and accessible facility, given the low level of pedestrian traffic.

11.4 Bicycle Access

The following key bicycle paths are provided in the vicinity of the site:

- An existing shared path route extends from the termination of Burrandool Avenue, and connects with Chittick Avenue and Coconut Drive; and
- An existing on-road route is provided along Illaroo Road, which connects cyclists from North Nowra to Kangaroo Valley and avoids the use of Moss Vale Road.

The number of cyclist trips generated by the subdivision is expected to be low, given the proximity to nearby neighbourhood and town centres. Cyclists are expected to be able to continue to utilise the road carriageway to travel within the subdivision and the surrounding area, and link with the above cyclist facilities, in a safe manner.

It is recommended that a clear connection be provided for cyclists turning to/from Moondara Drive and the off-road shared path on Illaroo Road to improve access. There is currently and shallow ditch between the path and the road network which prevents this access. This is illustrated within **Figure 21** below.

Figure 21: Location for Cyclist Connection with Illaroo Road Off-Road Shared Path

12. Conclusion

TDG NSW Pty Ltd has assessed the potential traffic effects arising from the proposed residential development at Lots 21-24 DP 714096, located at the southern end of Warrah Road, Bangalee. The rezoning is expected to yield up to 250 dwellings, with access to the site provided via Warrah Road from Bimbimbie Avenue, Moondara Drive and Illaroo Road.

Based on the above assessment, it is concluded that:

- The addition of the development traffic to the signalised Princes Highway / Illaroo Road intersection is expected to further deteriorate the performance of the intersection, foreshortening its current forecast lifespan by approximately one year. Therefore, it is recommended that consideration be given to either defer the development until the intersection is upgraded, when it would operate at a satisfactory level of service 'D', or to provide for some other form of mitigation with regards to timing of the subdivision construction and levels of occupation;
- All other roads within the PIA and SIA is expected to continue to operate with a good level of service 'A' in the future, even with the development traffic added;
- The time taken for the worst case dwelling to exit the subdivision and reach Illaroo Road during a bush fire evacuation is 258 seconds;
- In order to meet the requirements of the Austroads Guideline, it is recommended that an axillary left turn treatment and a channelised right turn treatment be provided at the intersection of Illaroo Road with Moondara Drive. It is also recommended that a channelised right turn treatment be provided at the intersection of Illaroo Road with Hockeys Lane;
- The road network within the Primary Investigation Area is able to accommodate a 14.5 metre long bus, with minor widening required to the north-western corner of the Bimbimbie Avenue / Moondara Drive intersection;
- In the event of additional bus services being provided within the area, it is recommended footpaths be provided on one side of the road along key pedestrian routes; and
- The off-road shared path along Illaroo Road should provide a connection for cyclists turning to/from Moondara Drive.

The above conclusions are contingent on the proper timing of the development with regard to the road upgrades mentioned within this document. By way of a summary, the traffic generated by the proposed residential development is expected to result in a negligible change to the traffic and parking environments.

TDG

Appendix A

Concept of Carriageway Capacity and Level of Service

The capacity of major streets within an urban area can be based on an assessment of their operating Level of Service.

Level of service is defined within the *Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis* as:

> *'… a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. A level of service definition generally describes these conditions in terms of factors such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience, and safety.'*

Levels of service are designated from A to F from best (free flow conditions) to worst (forced flow with stop start operation, long queues and delays) as follows:

LEVELS OF SERVICE

- A - Free flow (almost no delays)
- B - Stable flow (slight delays)
- C - Stable flow (acceptable delays)
- D - Approaching unstable flow (tolerable delays)
- E - Unstable flow (congestion; intolerable delays), and
- F - Forced flow (jammed)

A service volume, as defined by Austroads, is the maximum number of vehicles that can pass over a given section of roadway in one direction for one hour while operating conditions are maintained at a specified level of service. It is suggested that ideally arterial and sub-arterial roads should not exceed service volumes at level of service C. At this level, whilst most drivers are restricted in their freedom to manoeuvre, operating speeds are still reasonable and acceptable delays experienced. However, in urban situations, arterial and sub-arterial roads operating at Level of Service D are still considered adequate. Traffic volumes along urban roads with interrupted and uninterrupted flow conditions are included in **Table A1** and **A2** respectively.

	DESCRIPTION	LEVEL OF SERVICE					
		A	B	C	D	E	F
2U	2 Lane Undivided	540	630	720	810	900	-
4UP	4 Lane Undivided with Two Parking Lanes	540	630	720	810	900	-
4U	4 Lane Undivided with Some Parking	900	1050	1200	1350	1500	-
4UC	4 Lane Undivided with Clearways	1080	1260	1440	1620	1800	-
4D	4 Lane Divided with Clearways	1140	1330	1520	1710	1900	-
6U	6 Lane Undivided	1440	1680	1920	2160	2400	-
6D	6 Lane Divided with Clearway	1740	2030	2320	2610	2900	-

Table A1: Level of Service Interrupted Flow Conditions along Urban Roads (One Way Hourly Volumes)

	DESCRIPTION	LEVEL OF SERVICE					
		A	B	C	D	E	F
2U	2 Lane Undivided	760	880	1000	1130	1260	-
4U	4 Lane Undivided with Some Parking	1260	1470	1680	1890	2100	-
4UC	4 Lane Undivided with Clearways	1510	1760	2010	2270	2520	-
4DC	4 Lane Divided with Clearways	1600	1860	2130	2400	2660	-
4DCL	6 Lane Undivided with Clearways	2250	2620	3000	3380	3740	-
6DC	6 Lane Divided with Clearway	2440	2840	3250	3660	4060	-

Table A2: Level of Service Uninterrupted Flow Conditions along Urban Roads (One Way Hourly Volumes)

Appendix B

Guidelines for Evaluation of Intersection Operation

The *RTA Guide to Traffic Generating Developments (October 2002, Issue 2.2)*, details the assessment of intersections. The assessment of the level of service of an intersection is based on the evaluation of the following Measures of Effectiveness:

(a) Average delay (seconds/veh) (all forms of control)

(b) Delay to critical movement (seconds/veh) (all forms of control)

(c) Degree of saturation (traffic signals and roundabouts)

(d) Cycle length (traffic signals)

SIDRA was used to calculate the relevant intersection parameters. The SIDRA software is an advanced lane-based micro-analytical tool for design and evaluation of individual intersections and networks of intersections including modelling of separate movement classes (light vehicles, heavy vehicles, buses, cyclists, large trucks, light rail / trams and so on). It provides estimates of capacity, level of service and a wide range of performance measures, including; delay, queue length and stops for vehicles and pedestrians, as well as fuel consumption, pollution emissions and operating costs.

It can be used to analyse signalised intersections (fixed-time / pretimed and actuated), signalised and unsignalised pedestrian crossings, roundabouts (unsignalised), roundabouts with metering signals, fully-signalised roundabouts, two-way stop sign and give-way / yield sign control, all-way stop sign control, single point interchanges (signalised), freeway diamond interchanges (signalised, roundabout, sign control), diverging diamond interchanges and other alternative intersections and interchanges. It can also be used for uninterrupted traffic flow conditions and merge analysis.

The best indicator of the level of service at an intersection is the average delay experienced by vehicles at that intersection. For traffic signals, the average delay over all movements should be taken. For roundabouts and priority control intersections (with Stop and Give Way signs or operating under the T-junction rule) the critical movement for level of service assessment should be that with the highest average delay.

With traffic signals, delays per approach tend to be equalised, subject to any over-riding requirements of signal co-ordination as well as to variations within individual movements. With roundabouts and priority - control intersections, the critical criterion for assessment is the movement with the highest delay per vehicle. With this type of control the volume balance might be such that some movements suffer high levels of delay while other movements have minimal delay. An overall average delay for the intersection of 25 seconds might not be satisfactory if the average delay on one movement is 60 seconds.

The average delay for level of service E should be no more than 70 seconds. The accepted maximum practical cycle length for traffic signals under saturated conditions is 120 - 140 seconds. Under these conditions 120 seconds is near maximum for two and three phase intersections and 140 seconds near maximum for more complex phase designs. Drivers and pedestrians expect cycle lengths of these magnitudes and their inherent delays in peak hours. A cycle length of 140 seconds for an intersection which is almost saturated has an average vehicle delay of about 70 seconds, although this can vary. If the average vehicle delay is more than 70 seconds, the intersection is assumed to be at Level of Service F.

Table B1 sets out average delays for different levels of service. There is no consistent correlation between definitions of levels of service for road links as defined elsewhere in this section, and the

ranges set out in Table B1. In assigning a level of service, the average delay to the motoring public needs to be considered, keeping in mind the location of the intersection. For example, drivers in inner urban areas of Sydney have a higher tolerance of delay than drivers in country areas. Table B1 provides a recommended baseline for assessment.

Level of Service	Average Delay per Vehicle (seconds/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 - 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals, incidents are expected to cause excessive delays Roundabouts require other control mode	At capacity, required other control mode

Table B1: Level of Service Criteria for Intersections

The figures in Table B1 are intended as a guide only. Any particular assessment should take into account site-specific factors including maximum queue lengths (and their effect on lane blocking), the influence of nearby intersections and the sensitivity of the location to delays. In many situations, a comparison of the current and future average delay provides a better appreciation of the impact of a proposal, and not simply the change in the level of service.

Appendix C

SIDRA Results – Scenario 1
Existing Traffic Volumes

MOVEMENT SUMMARY

Site: 302 [Bimbimbie Avenue - Warrah Road - AM Peak Hour - Existing]

Bimbimbie Avenue / Warrah Road
Existing AM Peak Hour
8:00am - 9:00am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warrah Road											
1	L2	1	100.0	0.005	6.2	LOS A	0.0	0.1	0.09	0.56	51.3
3	R2	5	0.0	0.005	5.6	LOS A	0.0	0.1	0.09	0.56	52.3
Approach		6	16.7	0.005	5.8	LOS A	0.0	0.1	0.09	0.56	52.1
East: Bimbimbie Avenue											
4	L2	1	100.0	0.008	6.1	LOS A	0.0	0.0	0.00	0.08	55.1
5	T1	13	16.7	0.008	0.0	LOS A	0.0	0.0	0.00	0.08	59.5
Approach		14	23.1	0.008	0.9	NA	0.0	0.0	0.00	0.08	59.1
West: Bimbimbie Avenue											
11	T1	37	8.6	0.021	0.0	LOS A	0.0	0.0	0.00	0.02	59.8
12	R2	1	0.0	0.021	5.5	LOS A	0.0	0.0	0.00	0.02	57.6
Approach		38	8.3	0.021	0.2	NA	0.0	0.0	0.00	0.02	59.7
All Vehicles		58	12.7	0.021	0.8	NA	0.0	0.1	0.01	0.09	58.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 302 [Bimbimbie Avenue - Warrah Road - PM Peak Hour - Existing]

Bimbimbie Avenue / Warrah Road
Existing PM Peak Hour
3:45pm - 4:45pm
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warrah Road											
1	L2	1	0.0	0.005	5.6	LOS A	0.0	0.1	0.10	0.56	53.4
3	R2	5	0.0	0.005	5.6	LOS A	0.0	0.1	0.10	0.56	52.2
Approach		6	0.0	0.005	5.6	LOS A	0.0	0.1	0.10	0.56	52.4
East: Bimbimbie Avenue											
4	L2	1	0.0	0.017	5.5	LOS A	0.0	0.0	0.00	0.02	58.0
5	T1	33	0.0	0.017	0.0	LOS A	0.0	0.0	0.00	0.02	59.8
Approach		34	0.0	0.017	0.2	NA	0.0	0.0	0.00	0.02	59.8
West: Bimbimbie Avenue											
11	T1	13	0.0	0.007	0.0	LOS A	0.0	0.0	0.02	0.05	59.5
12	R2	1	0.0	0.007	5.5	LOS A	0.0	0.0	0.02	0.05	57.3
Approach		14	0.0	0.007	0.4	NA	0.0	0.0	0.02	0.05	59.3
All Vehicles		54	0.0	0.017	0.9	NA	0.0	0.1	0.02	0.09	58.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 302 [Moondara Drive - Bimbimbie Avenue - AM Peak Hour - Existing]

Moondara Drive / Bimbimbie Avenue
Existing AM Peak Hour
8:00am - 9:00am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	1	100.0	0.004	6.1	LOS A	0.0	0.0	0.00	0.17	54.7
2	T1	5	0.0	0.004	0.0	LOS A	0.0	0.0	0.00	0.17	58.8
Approach		6	16.7	0.004	1.7	NA	0.0	0.0	0.00	0.17	57.9
North: Moondara Drive											
8	T1	2	100.0	0.007	0.0	LOS A	0.0	0.3	0.04	0.41	54.4
9	R2	9	11.1	0.007	5.6	LOS A	0.0	0.3	0.04	0.41	50.2
Approach		12	27.3	0.007	3.9	NA	0.0	0.3	0.04	0.41	51.0
West: Bimbimbie Avenue											
10	L2	47	4.4	0.031	5.6	LOS A	0.1	0.9	0.03	0.56	49.8
12	R2	1	0.0	0.031	5.5	LOS A	0.1	0.9	0.03	0.56	52.4
Approach		48	4.3	0.031	5.6	LOS A	0.1	0.9	0.03	0.56	49.8
All Vehicles		66	9.5	0.031	5.0	NA	0.1	0.9	0.03	0.50	50.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 302 [Moondara Drive - Bimbimbie Avenue - PM Peak Hour - Existing]

Moondara Drive / Bimbimbie Avenue
Existing PM Peak Hour
3:45pm - 4:45pm
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.00	0.30	55.5
2	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.30	56.4
Approach		2	0.0	0.001	2.8	NA	0.0	0.0	0.00	0.30	55.9
North: Moondara Drive											
8	T1	4	0.0	0.023	0.0	LOS A	0.1	0.8	0.02	0.53	53.9
9	R2	36	5.9	0.023	5.5	LOS A	0.1	0.8	0.02	0.53	50.0
Approach		40	5.3	0.023	4.9	NA	0.1	0.8	0.02	0.53	50.5
West: Bimbimbie Avenue											
10	L2	13	25.0	0.010	5.8	LOS A	0.0	0.3	0.01	0.57	47.1
12	R2	1	0.0	0.010	5.6	LOS A	0.0	0.3	0.01	0.57	52.5
Approach		14	23.1	0.010	5.8	LOS A	0.0	0.3	0.01	0.57	47.6
All Vehicles		56	9.4	0.023	5.1	NA	0.1	0.8	0.02	0.53	50.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 202 [Illaroo Road - Moondara Drive - AM Peak Hour - Existing]

Illaroo Road / Moondara Drive
Existing AM Peak Hour
8:00am - 9:00am
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	15	0.0	0.074	7.8	LOS A	0.3	1.8	0.29	0.92	46.7
3	R2	49	4.3	0.074	9.0	LOS A	0.3	1.8	0.29	0.92	45.9
Approach		64	3.3	0.074	8.7	LOS A	0.3	1.8	0.29	0.92	46.1
East: Illaroo Road											
4	L2	19	44.4	0.063	7.5	LOS A	0.0	0.0	0.00	0.11	60.1
5	T1	94	5.6	0.063	0.0	LOS A	0.0	0.0	0.00	0.11	75.5
Approach		113	12.1	0.063	1.3	NA	0.0	0.0	0.00	0.11	73.1
West: Illaroo Road											
11	T1	244	1.7	0.129	0.0	LOS A	0.0	0.2	0.01	0.01	59.9
12	R2	2	50.0	0.129	6.7	LOS A	0.0	0.2	0.01	0.01	53.3
Approach		246	2.1	0.129	0.1	NA	0.0	0.2	0.01	0.01	59.9
All Vehicles		423	5.0	0.129	1.7	NA	0.3	1.8	0.05	0.17	60.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 202 [Illaroo Road - Moondara Drive - PM Peak Hour - Existing]

Illaroo Road / Moondara Drive
Existing PM Peak Hour
3:45pm - 4:45pm
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	3	0.0	0.032	8.1	LOS A	0.1	0.7	0.36	0.89	46.8
3	R2	23	4.5	0.032	8.8	LOS A	0.1	0.7	0.36	0.89	46.0
Approach		26	4.0	0.032	8.7	LOS A	0.1	0.7	0.36	0.89	46.1
East: Illaroo Road											
4	L2	38	5.6	0.111	6.8	LOS A	0.0	0.0	0.00	0.12	66.8
5	T1	173	1.8	0.111	0.0	LOS A	0.0	0.0	0.00	0.12	74.5
Approach		211	2.5	0.111	1.2	NA	0.0	0.0	0.00	0.12	73.4
West: Illaroo Road											
11	T1	139	1.5	0.079	0.1	LOS A	0.1	0.5	0.05	0.04	59.4
12	R2	11	0.0	0.079	6.1	LOS A	0.1	0.5	0.05	0.04	54.2
Approach		149	1.4	0.079	0.5	NA	0.1	0.5	0.05	0.04	59.1
All Vehicles		386	2.2	0.111	1.5	NA	0.1	0.7	0.05	0.14	65.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 201 [Illaroo Road - Hockeys Lane - AM Peak Hour - Existing]

Illaroo Road / Hockeys Lane
Existing AM Peak Hour
8:00am - 9:00am
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Illaroo Road											
5	T1	66	7.9	0.061	0.3	LOS A	0.2	1.6	0.19	0.22	57.3
6	R2	39	2.7	0.061	6.0	LOS A	0.2	1.6	0.19	0.22	46.1
Approach		105	6.0	0.061	2.4	NA	0.2	1.6	0.19	0.22	52.5
North: Hockeys Lane											
7	L2	95	0.0	0.078	7.3	LOS A	0.3	2.2	0.26	0.87	43.1
9	R2	2	0.0	0.078	7.5	LOS A	0.3	2.2	0.26	0.87	42.8
Approach		97	0.0	0.078	7.3	LOS A	0.3	2.2	0.26	0.87	43.1
West: Illaroo Road											
10	L2	7	0.0	0.079	5.5	LOS A	0.0	0.0	0.00	0.03	58.1
11	T1	144	2.2	0.079	0.0	LOS A	0.0	0.0	0.00	0.03	59.7
Approach		152	2.1	0.079	0.3	NA	0.0	0.0	0.00	0.03	59.6
All Vehicles		354	2.7	0.079	2.8	NA	0.3	2.2	0.13	0.32	52.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 201 [Illaroo Road - Hockeys Lane - PM Peak Hour - Existing]

Illaroo Road / Hockeys Lane
Existing PM Peak Hour
3:45pm - 4:45pm
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Illaroo Road											
5	T1	151	2.8	0.110	0.1	LOS A	0.3	2.2	0.09	0.15	58.2
6	R2	53	0.0	0.110	5.7	LOS A	0.3	2.2	0.09	0.15	46.7
Approach		203	2.1	0.110	1.5	NA	0.3	2.2	0.09	0.15	54.7
North: Hockeys Lane											
7	L2	72	0.0	0.071	6.9	LOS A	0.3	1.9	0.15	0.91	43.1
9	R2	16	0.0	0.071	7.6	LOS A	0.3	1.9	0.15	0.91	42.8
Approach		87	0.0	0.071	7.0	LOS A	0.3	1.9	0.15	0.91	43.0
West: Illaroo Road											
10	L2	7	14.3	0.037	5.7	LOS A	0.0	0.0	0.00	0.06	57.2
11	T1	63	0.0	0.037	0.0	LOS A	0.0	0.0	0.00	0.06	59.5
Approach		71	1.5	0.037	0.6	NA	0.0	0.0	0.00	0.06	59.2
All Vehicles		361	1.5	0.110	2.7	NA	0.3	2.2	0.09	0.32	52.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101B [Main Road - Hockeys Lane - AM Peak Hour - Existing]

Network: N101 [Main Road - Hockeys Lane - Tannery Road - AM Peak - Existing]

Main Road / Hockeys Lane
Existing AM Peak Hour
8:00am - 9:00am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hockeys Lane													
1	L2	33	0.0	33	0.0	0.124	5.8	LOS A	0.5	3.4	0.27	0.62	47.8
3	R2	62	3.4	62	3.4	0.124	9.0	LOS A	0.5	3.4	0.27	0.62	51.5
Approach		95	2.2	95	2.2	0.124	7.9	LOS A	0.5	3.4	0.27	0.62	50.7
East: Main Road													
4	L2	34	9.4	34	9.4	0.019	5.7	LOS A	0.0	0.0	0.00	0.57	53.2
5	T1	116	2.7	116	2.7	0.060	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		149	4.2	149	4.2	0.060	1.3	NA	0.0	0.0	0.00	0.13	57.3
West: Main Road													
11	T1	209	2.0	209	2.0	0.109	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	55	3.8	55	3.8	0.045	2.7	LOS A	0.2	1.3	0.26	0.49	51.8
Approach		264	2.4	264	2.4	0.109	0.6	NA	0.2	1.3	0.05	0.10	58.1
All Vehicles		508	2.9	508	2.9	0.124	2.1	NA	0.5	3.4	0.08	0.21	55.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

MOVEMENT SUMMARY

Site: 101A [Main Road - Tannery Road - AM Peak Hour - Existing]

Network: N101 [Main Road - Hockeys Lane - Tannery Road - AM Peak - Existing]

Main Road / Tannery Road
Existing AM Peak Hour
8:00am - 9:00am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Main Road													
5	T1	133	2.4	133	2.4	0.069	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	16	0.0	16	0.0	0.013	2.9	LOS A	0.1	0.4	0.29	0.49	52.0
Approach		148	2.1	148	2.1	0.069	0.3	NA	0.1	0.4	0.03	0.05	59.0
North: Tannery Road													
7	L2	81	7.8	81	7.8	0.086	6.3	LOS A	0.3	2.4	0.26	0.57	49.4
9	R2	9	0.0	9	0.0	0.086	8.1	LOS A	0.3	2.4	0.26	0.57	52.6
Approach		91	7.0	91	7.0	0.086	6.5	LOS A	0.3	2.4	0.26	0.57	50.0
West: Main Road													
10	L2	7	28.6	7	28.6	0.005	5.9	LOS A	0.0	0.0	0.00	0.57	52.4
11	T1	183	2.3	183	2.3	0.095	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		191	3.3	191	3.3	0.095	0.2	NA	0.0	0.0	0.00	0.02	59.3
All Vehicles		429	3.7	429	3.7	0.095	1.6	NA	0.3	2.4	0.07	0.15	56.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

MOVEMENT SUMMARY

Site: 101B [Main Road - Hockeys Lane - PM Peak Hour - Existing]

Network: N101 [Main Road - Hockeys Lane - Tannery Road - PM Peak - Existing]

Main Road / Hockeys Lane
Existing PM Peak Hour
3:45pm - 4:45pm
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hockeys Lane													
1	L2	27	0.0	27	0.0	0.059	5.8	LOS A	0.2	1.6	0.23	0.58	49.1
3	R2	26	4.0	26	4.0	0.059	7.9	LOS A	0.2	1.6	0.23	0.58	52.2
Approach		54	2.0	54	2.0	0.059	6.8	LOS A	0.2	1.6	0.23	0.58	51.1
East: Main Road													
4	L2	57	1.9	57	1.9	0.031	5.6	LOS A	0.0	0.0	0.00	0.58	53.5
5	T1	129	0.8	129	0.8	0.067	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		186	1.1	186	1.1	0.067	1.7	NA	0.0	0.0	0.00	0.18	56.8
West: Main Road													
11	T1	121	7.0	121	7.0	0.065	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	27	3.8	27	3.8	0.023	2.9	LOS A	0.1	0.7	0.29	0.50	51.6
Approach		148	6.4	148	6.4	0.065	0.5	NA	0.1	0.7	0.05	0.09	58.2
All Vehicles		388	3.3	388	3.3	0.067	2.0	NA	0.2	1.6	0.05	0.20	56.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

MOVEMENT SUMMARY

Site: 101A [Main Road - Tannery Road - PM Peak Hour - Existing]

Network: N101 [Main Road - Hockeys Lane - Tannery Road - PM Peak - Existing]

Main Road / Tannery Road
Existing PM Peak Hour
3:45pm - 4:45pm
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Main Road													
5	T1	84	1.3	84	1.3	0.044	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	47	0.0	47	0.0	0.037	2.6	LOS A	0.1	1.0	0.22	0.48	52.3
Approach		132	0.8	132	0.8	0.044	0.9	NA	0.1	1.0	0.08	0.17	57.0
North: Tannery Road													
7	L2	48	4.3	48	4.3	0.048	5.9	LOS A	0.2	1.3	0.19	0.55	49.9
9	R2	6	0.0	6	0.0	0.048	7.1	LOS A	0.2	1.3	0.19	0.55	52.8
Approach		55	3.8	55	3.8	0.048	6.1	LOS A	0.2	1.3	0.19	0.55	50.4
West: Main Road													
10	L2	8	0.0	8	0.0	0.005	5.5	LOS A	0.0	0.0	0.00	0.58	53.6
11	T1	100	9.5	100	9.5	0.054	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		108	8.7	108	8.7	0.054	0.4	NA	0.0	0.0	0.00	0.04	59.0
All Vehicles		295	4.3	295	4.3	0.054	1.7	NA	0.2	1.3	0.07	0.20	56.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

MOVEMENT SUMMARY

Site: 203 [Illaroo Road - Princes Highway - AM Peak Hour - Existing]

Illaroo Road / Princes Highway
Existing AM Peak Hour
8:00am - 9:00am
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Princes Highway											
1	L2	420	3.3	0.232	6.7	LOS A	0.0	0.0	0.00	0.57	60.1
2	T1	1158	9.2	0.755	31.9	LOS C	28.7	182.8	0.92	0.82	43.5
Approach		1578	7.7	0.755	25.2	LOS B	28.7	182.8	0.67	0.75	47.0
North: Princes Highway											
8	T1	1746	4.8	0.848	25.3	LOS B	45.8	290.1	0.88	0.84	47.2
9	R2	140	7.1	0.792	69.5	LOS E	8.8	56.9	1.00	0.88	28.7
Approach		1886	5.0	0.848	28.6	LOS C	45.8	290.1	0.89	0.84	45.0
West: Illaroo Road											
10	L2	230	5.7	0.850	51.0	LOS D	31.7	198.0	0.99	0.93	32.7
12	R2	822	1.9	0.850	51.7	LOS D	31.7	198.0	1.00	0.93	32.9
Approach		1052	2.8	0.850	51.6	LOS D	31.7	198.0	1.00	0.93	32.8
All Vehicles		4516	5.4	0.850	32.7	LOS C	45.8	290.1	0.84	0.83	42.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	50	39.3	LOS D	0.1	0.1	0.81	0.81
P4	West Full Crossing	53	26.7	LOS C	0.1	0.1	0.67	0.67
All Pedestrians		103	32.8	LOS D			0.74	0.74

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 203 [Illaroo Road - Princes Highway - PM Peak Hour - Existing]

Illaroo Road / Princes Highway
Existing PM Peak Hour
3:45pm - 4:45pm
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Princes Highway											
1	L2	751	1.5	0.409	6.7	LOS A	0.0	0.0	0.00	0.57	60.5
2	T1	1820	3.5	0.924	43.1	LOS D	58.3	358.2	1.00	1.04	38.4
Approach		2571	2.9	0.924	32.5	LOS C	58.3	358.2	0.71	0.90	43.0
North: Princes Highway											
8	T1	1497	5.0	0.553	8.4	LOS A	20.1	124.9	0.51	0.47	60.3
9	R2	243	1.6	0.883	71.2	LOS F	15.9	96.5	1.00	0.94	28.3
Approach		1740	4.5	0.883	17.2	LOS B	20.1	124.9	0.58	0.53	52.1
West: Illaroo Road											
10	L2	175	2.9	0.901	68.9	LOS E	22.1	134.9	1.00	0.96	28.4
12	R2	460	1.7	0.901	69.8	LOS E	22.1	134.9	1.00	0.96	28.3
Approach		635	2.0	0.901	69.6	LOS E	22.1	134.9	1.00	0.96	28.3
All Vehicles		4946	3.4	0.924	31.9	LOS C	58.3	358.2	0.70	0.78	42.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	50	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	50	19.3	LOS B	0.1	0.1	0.57	0.57
All Pedestrians		100	36.8	LOS D			0.76	0.76

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Appendix D

SIDRA Results – Scenario 2
Existing Traffic Volumes Plus
Development Traffic

MOVEMENT SUMMARY

Site: 101B [Main Road - Hockeys Lane - AM Peak Hour - Existing with Dev]

Main Road / Hockeys Lane
Future AM Peak Hour
8:00am - 9:00am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hockeys Lane											
1	L2	34	0.0	0.135	5.9	LOS A	0.5	3.8	0.33	0.63	36.0
3	R2	70	2.9	0.135	8.8	LOS A	0.5	3.8	0.33	0.63	51.5
Approach		104	1.9	0.135	7.9	LOS A	0.5	3.8	0.33	0.63	47.4
East: Main Road											
4	L2	37	8.1	0.021	5.6	LOS A	0.0	0.0	0.00	0.57	53.3
5	T1	110	2.7	0.057	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		147	4.1	0.057	1.4	NA	0.0	0.0	0.00	0.14	57.1
West: Main Road											
11	T1	201	2.0	0.104	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	52	3.8	0.043	2.7	LOS A	0.2	1.2	0.26	0.49	51.8
Approach		253	2.4	0.104	0.6	NA	0.2	1.2	0.05	0.10	58.1
All Vehicles		504	2.8	0.135	2.3	NA	0.5	3.8	0.09	0.22	54.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101A [Main Road - Tannery Road - AM Peak Hour -Existing with Dev]

Main Road / Tannery Road
Future AM Peak Hour
8:00am - 9:00am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Main Road											
5	T1	128	2.3	0.067	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	16	0.0	0.013	2.8	LOS A	0.1	0.4	0.28	0.49	52.0
Approach		144	2.1	0.067	0.3	NA	0.1	0.4	0.03	0.05	59.0
North: Tannery Road											
7	L2	78	7.7	0.082	6.2	LOS A	0.3	2.2	0.25	0.57	48.5
9	R2	9	0.0	0.082	8.0	LOS A	0.3	2.2	0.25	0.57	52.6
Approach		87	6.9	0.082	6.4	LOS A	0.3	2.2	0.25	0.57	49.2
West: Main Road											
10	L2	7	28.6	0.005	5.9	LOS A	0.0	0.0	0.00	0.57	52.4
11	T1	175	2.3	0.091	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		182	3.3	0.091	0.2	NA	0.0	0.0	0.00	0.02	59.4
All Vehicles		413	3.6	0.091	1.6	NA	0.3	2.2	0.06	0.15	56.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101B [Main Road - Hockeys Lane - PM Peak Hour - Existing with Dev]

Main Road / Hockeys Lane
Future PM Peak Hour
3:45pm - 4:45pm
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hockeys Lane											
1	L2	27	0.0	0.082	5.8	LOS A	0.3	2.2	0.25	0.59	36.5
3	R2	44	2.3	0.082	7.9	LOS A	0.3	2.2	0.25	0.59	52.1
Approach		71	1.4	0.082	7.1	LOS A	0.3	2.2	0.25	0.59	47.2
East: Main Road											
4	L2	84	1.2	0.046	5.6	LOS A	0.0	0.0	0.00	0.58	53.6
5	T1	123	0.8	0.063	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		207	1.0	0.063	2.3	NA	0.0	0.0	0.00	0.23	56.1
West: Main Road											
11	T1	115	7.0	0.062	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	30	3.3	0.026	3.0	LOS A	0.1	0.7	0.30	0.50	51.5
Approach		145	6.2	0.062	0.6	NA	0.1	0.7	0.06	0.10	58.0
All Vehicles		423	2.8	0.082	2.5	NA	0.3	2.2	0.06	0.25	54.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101A [Main Road - Tannery Road - PM Peak Hour - Existing with Dev]

Main Road / Tannery Road
Future PM Peak Hour
3:45pm - 4:45pm
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Main Road											
5	T1	91	1.1	0.047	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	60	0.0	0.046	2.6	LOS A	0.2	1.3	0.21	0.48	52.3
Approach		151	0.7	0.047	1.0	NA	0.2	1.3	0.08	0.19	56.7
North: Tannery Road											
7	L2	48	4.2	0.047	5.9	LOS A	0.2	1.2	0.18	0.55	48.9
9	R2	6	0.0	0.047	7.2	LOS A	0.2	1.2	0.18	0.55	52.8
Approach		54	3.7	0.047	6.0	LOS A	0.2	1.2	0.18	0.55	49.6
West: Main Road											
10	L2	8	0.0	0.004	5.5	LOS A	0.0	0.0	0.00	0.58	53.6
11	T1	97	9.3	0.053	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		105	8.6	0.053	0.4	NA	0.0	0.0	0.00	0.04	59.0
All Vehicles		310	3.9	0.053	1.7	NA	0.2	1.3	0.07	0.20	56.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 201 [Illaroo Road - Hockeys Lane - AM Peak Hour - Existing with Dev]

Illaroo Road / Hockeys Lane
Future AM Peak Hour
8:00am - 9:00am
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Illaroo Road											
5	T1	68	7.4	0.070	0.3	LOS A	0.3	2.1	0.21	0.25	56.9
6	R2	52	1.9	0.070	5.9	LOS A	0.3	2.1	0.21	0.25	45.8
Approach		120	5.0	0.070	2.7	NA	0.3	2.1	0.21	0.25	51.5
North: Hockeys Lane											
7	L2	98	0.0	0.080	7.2	LOS A	0.3	2.3	0.25	0.88	43.1
9	R2	2	0.0	0.080	7.5	LOS A	0.3	2.3	0.25	0.88	42.8
Approach		100	0.0	0.080	7.2	LOS A	0.3	2.3	0.25	0.88	43.1
West: Illaroo Road											
10	L2	8	0.0	0.074	5.5	LOS A	0.0	0.0	0.00	0.03	58.1
11	T1	134	2.2	0.074	0.0	LOS A	0.0	0.0	0.00	0.03	59.7
Approach		142	2.1	0.074	0.3	NA	0.0	0.0	0.00	0.03	59.6
All Vehicles		362	2.5	0.080	3.0	NA	0.3	2.3	0.14	0.34	51.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 201 [Illaroo Road - Hockeys Lane - PM Peak Hour - Existing with Dev]

Illaroo Road / Hockeys Lane
Future PM Peak Hour
3:45pm - 4:45pm
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Illaroo Road											
5	T1	145	2.8	0.109	0.1	LOS A	0.3	2.4	0.10	0.16	58.1
6	R2	56	0.0	0.109	5.7	LOS A	0.3	2.4	0.10	0.16	46.6
Approach		201	2.0	0.109	1.6	NA	0.3	2.4	0.10	0.16	54.4
North: Hockeys Lane											
7	L2	103	0.0	0.093	6.9	LOS A	0.4	2.6	0.16	0.91	43.1
9	R2	15	0.0	0.093	7.6	LOS A	0.4	2.6	0.16	0.91	42.8
Approach		118	0.0	0.093	7.0	LOS A	0.4	2.6	0.16	0.91	43.1
West: Illaroo Road											
10	L2	7	14.3	0.037	5.7	LOS A	0.0	0.0	0.00	0.06	57.2
11	T1	65	0.0	0.037	0.0	LOS A	0.0	0.0	0.00	0.06	59.5
Approach		72	1.4	0.037	0.6	NA	0.0	0.0	0.00	0.06	59.3
All Vehicles		391	1.3	0.109	3.1	NA	0.4	2.6	0.10	0.37	51.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 202 [Illaroo Road - Moondara Drive - AM Peak Hour - Existing with Dev]

Illaroo Road / Moondara Drive
Future AM Peak Hour
8:00am - 9:00am
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	34	0.0	0.232	7.8	LOS A	0.9	6.2	0.34	0.93	46.5
3	R2	165	1.2	0.232	9.2	LOS A	0.9	6.2	0.34	0.93	45.9
Approach		199	1.0	0.232	8.9	LOS A	0.9	6.2	0.34	0.93	46.0
East: Illaroo Road											
4	L2	41	19.5	0.072	6.9	LOS A	0.0	0.0	0.00	0.20	61.2
5	T1	89	5.6	0.072	0.0	LOS A	0.0	0.0	0.00	0.20	71.0
Approach		130	10.0	0.072	2.2	NA	0.0	0.0	0.00	0.20	68.3
West: Illaroo Road											
11	T1	232	1.7	0.129	0.0	LOS A	0.1	0.7	0.03	0.03	59.6
12	R2	12	8.3	0.129	6.0	LOS A	0.1	0.7	0.03	0.03	54.2
Approach		244	2.0	0.129	0.3	NA	0.1	0.7	0.03	0.03	59.4
All Vehicles		573	3.5	0.232	3.7	NA	0.9	6.2	0.13	0.38	56.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 202 [Illaroo Road - Moondara Drive - PM Peak Hour - Existing with Dev]

Illaroo Road / Moondara Drive
Future PM Peak Hour
3:45pm - 4:45pm
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	11	0.0	0.089	8.1	LOS A	0.3	2.1	0.39	0.92	46.5
3	R2	60	1.7	0.089	9.3	LOS A	0.3	2.1	0.39	0.92	45.8
Approach		71	1.4	0.089	9.1	LOS A	0.3	2.1	0.39	0.92	45.9
East: Illaroo Road											
4	L2	139	1.4	0.161	6.4	LOS A	0.0	0.0	0.00	0.29	61.2
5	T1	164	1.8	0.161	0.0	LOS A	0.0	0.0	0.00	0.29	67.0
Approach		303	1.7	0.161	3.0	NA	0.0	0.0	0.00	0.29	64.6
West: Illaroo Road											
11	T1	132	1.5	0.106	0.5	LOS A	0.4	2.6	0.24	0.17	57.6
12	R2	50	0.0	0.106	6.6	LOS A	0.4	2.6	0.24	0.17	52.1
Approach		182	1.1	0.106	2.2	NA	0.4	2.6	0.24	0.17	56.3
All Vehicles		556	1.4	0.161	3.5	NA	0.4	2.6	0.13	0.33	59.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 302 [Moondara Drive - Bimbimbie Avenue - AM Peak Hour - Existing with Dev]

Moondara Drive / Bimbimbie Avenue
Future AM Peak Hour
8:00am - 9:00am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	1	100.0	0.003	6.1	LOS A	0.0	0.0	0.00	0.17	54.7
2	T1	5	0.0	0.003	0.0	LOS A	0.0	0.0	0.00	0.17	58.8
Approach		6	16.7	0.003	1.7	NA	0.0	0.0	0.00	0.17	57.9
North: Moondara Drive											
8	T1	2	100.0	0.025	0.0	LOS A	0.1	0.8	0.04	0.53	53.5
9	R2	42	2.4	0.025	5.5	LOS A	0.1	0.8	0.04	0.53	49.8
Approach		44	6.8	0.025	5.0	NA	0.1	0.8	0.04	0.53	50.0
West: Bimbimbie Avenue											
10	L2	183	1.1	0.114	5.6	LOS A	0.5	3.5	0.03	0.56	50.2
12	R2	1	0.0	0.114	5.6	LOS A	0.5	3.5	0.03	0.56	52.4
Approach		184	1.1	0.114	5.6	LOS A	0.5	3.5	0.03	0.56	50.3
All Vehicles		234	2.6	0.114	5.4	NA	0.5	3.5	0.03	0.55	50.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 302 [Moondara Drive - Bimbimbie Avenue - PM Peak Hour - Existing with Dev]

Moondara Drive / Bimbimbie Avenue
Future PM Peak Hour
3:45pm - 4:45pm
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.00	0.30	55.5
2	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.30	56.4
Approach		2	0.0	0.001	2.8	NA	0.0	0.0	0.00	0.30	55.9
North: Moondara Drive											
8	T1	4	0.0	0.101	0.0	LOS A	0.5	3.5	0.02	0.58	53.4
9	R2	177	1.1	0.101	5.5	LOS A	0.5	3.5	0.02	0.58	49.8
Approach		181	1.1	0.101	5.3	NA	0.5	3.5	0.02	0.58	49.9
West: Bimbimbie Avenue											
10	L2	59	5.1	0.038	5.6	LOS A	0.2	1.1	0.01	0.57	49.8
12	R2	1	0.0	0.038	6.1	LOS A	0.2	1.1	0.01	0.57	52.5
Approach		60	5.0	0.038	5.6	LOS A	0.2	1.1	0.01	0.57	49.8
All Vehicles		243	2.1	0.101	5.4	NA	0.5	3.5	0.02	0.57	50.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 302 [Bimbimbie Avenue - Warrah Road - AM Peak Hour - Existing with Dev]

Bimbimbie Avenue / Warrah Road
Future AM Peak Hour
8:00am - 9:00am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warrah Road											
1	L2	5	20.0	0.121	5.8	LOS A	0.4	3.0	0.13	0.58	52.5
3	R2	143	0.0	0.121	5.7	LOS A	0.4	3.0	0.13	0.58	52.2
Approach		148	0.7	0.121	5.7	LOS A	0.4	3.0	0.13	0.58	52.2
East: Bimbimbie Avenue											
4	L2	34	2.9	0.026	5.6	LOS A	0.0	0.0	0.00	0.43	54.0
5	T1	12	16.7	0.026	0.0	LOS A	0.0	0.0	0.00	0.43	55.7
Approach		46	6.5	0.026	4.1	NA	0.0	0.0	0.00	0.43	54.5
West: Bimbimbie Avenue											
11	T1	35	8.6	0.020	0.0	LOS A	0.0	0.1	0.02	0.03	59.6
12	R2	2	0.0	0.020	5.6	LOS A	0.0	0.1	0.02	0.03	57.4
Approach		37	8.1	0.020	0.3	NA	0.0	0.1	0.02	0.03	59.4
All Vehicles		231	3.0	0.121	4.5	NA	0.4	3.0	0.09	0.46	53.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 302 [Bimbimbie Avenue - Warrah Road - PM Peak Hour - Existing with Dev]

Bimbimbie Avenue / Warrah Road
Future PM Peak Hour
3:45pm - 4:45pm
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warrah Road											
1	L2	2	0.0	0.042	5.6	LOS A	0.1	0.9	0.18	0.57	53.2
3	R2	47	0.0	0.042	5.8	LOS A	0.1	0.9	0.18	0.57	52.0
Approach		49	0.0	0.042	5.8	LOS A	0.1	0.9	0.18	0.57	52.1
East: Bimbimbie Avenue											
4	L2	144	0.0	0.093	5.5	LOS A	0.0	0.0	0.00	0.48	53.9
5	T1	31	0.0	0.093	0.0	LOS A	0.0	0.0	0.00	0.48	55.4
Approach		175	0.0	0.093	4.6	NA	0.0	0.0	0.00	0.48	54.2
West: Bimbimbie Avenue											
11	T1	12	0.0	0.009	0.2	LOS A	0.0	0.2	0.15	0.15	57.9
12	R2	4	0.0	0.009	5.9	LOS A	0.0	0.2	0.15	0.15	56.0
Approach		16	0.0	0.009	1.6	NA	0.0	0.2	0.15	0.15	57.4
All Vehicles		240	0.0	0.093	4.6	NA	0.1	0.9	0.05	0.48	53.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 203 [Illaroo Road - Princes Highway - AM Peak Hour - Existing with Dev]

Illaroo Road / Princes Highway
Existing AM Peak Hour (plus Development)
8:00am - 9:00am
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Princes Highway											
1	L2	430	3.3	0.237	6.7	LOS A	0.0	0.0	0.00	0.57	60.1
2	T1	1158	9.2	0.787	35.0	LOS C	30.2	192.5	0.94	0.86	41.9
Approach		1588	7.6	0.787	27.4	LOS B	30.2	192.5	0.69	0.78	45.7
North: Princes Highway											
8	T1	1746	4.8	0.872	30.1	LOS C	49.5	306.8	0.91	0.89	44.4
9	R2	142	7.1	0.804	70.0	LOS E	8.9	56.1	1.00	0.88	28.6
Approach		1888	5.0	0.872	33.1	LOS C	49.5	306.8	0.92	0.89	42.6
West: Illaroo Road											
10	L2	254	5.7	0.867	51.6	LOS D	34.6	212.5	1.00	0.95	32.5
12	R2	872	1.9	0.867	52.3	LOS D	34.6	212.5	1.00	0.95	32.7
Approach		1126	2.8	0.867	52.2	LOS D	34.6	212.5	1.00	0.95	32.7
All Vehicles		4602	5.4	0.872	35.8	LOS C	49.5	306.8	0.86	0.87	40.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	50	37.7	LOS D	0.1	0.1	0.79	0.79
P4	West Full Crossing	50	28.1	LOS C	0.1	0.1	0.68	0.68
All Pedestrians		100	32.9	LOS D			0.74	0.74

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 203 [Illaroo Road - Princes Highway - PM Peak Hour - Existing with Dev]

Illaroo Road / Princes Highway
Existing PM Peak Hour (plus Development)
3:45pm - 4:45pm
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Princes Highway											
1	L2	807	1.5	0.439	6.7	LOS A	0.0	0.0	0.00	0.57	60.5
2	T1	1820	3.5	0.924	43.1	LOS D	58.3	358.2	1.00	1.04	38.4
Approach		2627	2.9	0.924	31.9	LOS C	58.3	358.2	0.69	0.90	43.3
North: Princes Highway											
8	T1	1497	5.0	0.553	8.4	LOS A	20.1	124.9	0.51	0.47	60.3
9	R2	253	1.6	0.919	76.0	LOS F	17.3	104.7	1.00	0.96	27.3
Approach		1750	4.5	0.919	18.2	LOS B	20.1	124.9	0.58	0.54	51.3
West: Illaroo Road											
10	L2	185	2.9	0.932	74.1	LOS F	24.0	146.3	1.00	0.99	27.2
12	R2	473	1.7	0.932	74.9	LOS F	24.0	146.3	1.00	0.99	27.2
Approach		658	2.1	0.932	74.7	LOS F	24.0	146.3	1.00	0.99	27.2
All Vehicles		5035	3.3	0.932	32.7	LOS C	58.3	358.2	0.69	0.78	42.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	50	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	50	19.3	LOS B	0.1	0.1	0.57	0.57
All Pedestrians		100	36.8	LOS D			0.76	0.76

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Appendix E

SIDRA Results – Scenario 3
Future Traffic Volumes (2026)

MOVEMENT SUMMARY

Site: 101A [Main Road - Tannery Road - AM Peak Hour - Future without Dev]

Main Road / Tannery Road
Future AM Peak Hour
8:00am - 9:00am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Main Road											
5	T1	156	2.0	0.081	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	19	0.0	0.016	3.0	LOS A	0.1	0.4	0.32	0.50	51.7
Approach		175	1.8	0.081	0.3	NA	0.1	0.4	0.03	0.05	59.0
North: Tannery Road											
7	L2	95	6.7	0.104	6.4	LOS A	0.4	2.9	0.29	0.59	48.3
9	R2	12	0.0	0.104	8.8	LOS A	0.4	2.9	0.29	0.59	52.5
Approach		106	5.9	0.104	6.6	LOS A	0.4	2.9	0.29	0.59	49.0
West: Main Road											
10	L2	8	25.0	0.005	5.8	LOS A	0.0	0.0	0.00	0.57	52.6
11	T1	215	2.0	0.112	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		223	2.8	0.112	0.2	NA	0.0	0.0	0.00	0.02	59.4
All Vehicles		504	3.1	0.112	1.6	NA	0.4	2.9	0.07	0.15	56.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101A [Main Road - Tannery Road - PM Peak Hour - Future without Dev]

Main Road / Tannery Road
Future PM Peak Hour
3:45pm - 4:45pm
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Main Road											
5	T1	111	1.0	0.057	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	73	0.0	0.057	2.6	LOS A	0.2	1.6	0.24	0.49	52.2
Approach		183	0.6	0.057	1.0	NA	0.2	1.6	0.09	0.19	56.6
North: Tannery Road											
7	L2	57	3.7	0.058	6.0	LOS A	0.2	1.5	0.20	0.56	48.8
9	R2	7	0.0	0.058	7.7	LOS A	0.2	1.5	0.20	0.56	52.8
Approach		64	3.3	0.058	6.2	LOS A	0.2	1.5	0.20	0.56	49.5
West: Main Road											
10	L2	9	0.0	0.005	5.5	LOS A	0.0	0.0	0.00	0.58	53.6
11	T1	117	8.1	0.063	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		126	7.5	0.063	0.4	NA	0.0	0.0	0.00	0.04	59.0
All Vehicles		374	3.4	0.063	1.7	NA	0.2	1.6	0.08	0.21	55.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101B [Main Road - Hockeys Lane - AM Peak Hour - Future without Dev]

Main Road / Hockeys Lane
Future AM Peak Hour
8:00am - 9:00am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hockeys Lane											
1	L2	38	0.0	0.158	6.0	LOS A	0.6	4.4	0.38	0.66	35.5
3	R2	73	2.9	0.158	9.9	LOS A	0.6	4.4	0.38	0.66	51.0
Approach		111	1.9	0.158	8.6	LOS A	0.6	4.4	0.38	0.66	46.7
East: Main Road											
4	L2	39	8.1	0.022	5.6	LOS A	0.0	0.0	0.00	0.57	53.3
5	T1	136	2.3	0.071	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		175	3.6	0.071	1.3	NA	0.0	0.0	0.00	0.13	57.4
West: Main Road											
11	T1	245	1.7	0.127	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	64	3.3	0.054	2.9	LOS A	0.2	1.5	0.29	0.51	51.7
Approach		309	2.0	0.127	0.6	NA	0.2	1.5	0.06	0.10	58.0
All Vehicles		595	2.5	0.158	2.3	NA	0.6	4.4	0.10	0.22	54.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101B [Main Road - Hockeys Lane - PM Peak Hour - Future without Dev]

Main Road / Hockeys Lane
Future PM Peak Hour
3:45pm - 4:45pm
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hockeys Lane											
1	L2	32	0.0	0.097	5.9	LOS A	0.4	2.6	0.29	0.61	36.3
3	R2	48	2.2	0.097	8.4	LOS A	0.4	2.6	0.29	0.61	51.9
Approach		80	1.3	0.097	7.4	LOS A	0.4	2.6	0.29	0.61	46.8
East: Main Road											
4	L2	66	1.6	0.036	5.6	LOS A	0.0	0.0	0.00	0.58	53.6
5	T1	152	0.7	0.078	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		218	1.0	0.078	1.7	NA	0.0	0.0	0.00	0.18	56.8
West: Main Road											
11	T1	142	5.9	0.076	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	32	3.3	0.028	3.0	LOS A	0.1	0.8	0.31	0.51	51.5
Approach		174	5.5	0.076	0.5	NA	0.1	0.8	0.06	0.09	58.2
All Vehicles		472	2.7	0.097	2.2	NA	0.4	2.6	0.07	0.22	54.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 201 [Illaroo Road - Hockeys Lane - AM Peak Hour - Future without Dev]

Illaroo Road / Hockeys Lane
Future AM Peak Hour
8:00am - 9:00am
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Illaroo Road											
5	T1	78	6.8	0.072	0.3	LOS A	0.3	2.0	0.21	0.22	57.3
6	R2	45	2.3	0.072	6.0	LOS A	0.3	2.0	0.21	0.22	46.0
Approach		123	5.1	0.072	2.4	NA	0.3	2.0	0.21	0.22	52.5
North: Hockeys Lane											
7	L2	111	0.0	0.092	7.4	LOS A	0.4	2.6	0.28	0.87	43.1
9	R2	2	0.0	0.092	7.8	LOS A	0.4	2.6	0.28	0.87	42.7
Approach		113	0.0	0.092	7.4	LOS A	0.4	2.6	0.28	0.87	43.1
West: Illaroo Road											
10	L2	8	0.0	0.089	5.5	LOS A	0.0	0.0	0.00	0.03	58.1
11	T1	163	1.9	0.089	0.0	LOS A	0.0	0.0	0.00	0.03	59.7
Approach		172	1.8	0.089	0.3	NA	0.0	0.0	0.00	0.03	59.6
All Vehicles		407	2.3	0.092	2.9	NA	0.4	2.6	0.14	0.32	52.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 201 [Illaroo Road - Hockeys Lane - PM Peak Hour - Future without Dev]

Illaroo Road / Hockeys Lane
Future PM Peak Hour
3:45pm - 4:45pm
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Illaroo Road											
5	T1	177	2.4	0.130	0.1	LOS A	0.4	2.7	0.11	0.15	58.2
6	R2	62	0.0	0.130	5.7	LOS A	0.4	2.7	0.11	0.15	46.7
Approach		239	1.8	0.130	1.6	NA	0.4	2.7	0.11	0.15	54.7
North: Hockeys Lane											
7	L2	84	0.0	0.085	7.0	LOS A	0.3	2.3	0.17	0.91	43.1
9	R2	19	0.0	0.085	7.9	LOS A	0.3	2.3	0.17	0.91	42.7
Approach		103	0.0	0.085	7.1	LOS A	0.3	2.3	0.17	0.91	43.0
West: Illaroo Road											
10	L2	8	12.5	0.043	5.7	LOS A	0.0	0.0	0.00	0.06	57.3
11	T1	74	0.0	0.043	0.0	LOS A	0.0	0.0	0.00	0.06	59.5
Approach		82	1.3	0.043	0.6	NA	0.0	0.0	0.00	0.06	59.3
All Vehicles		424	1.2	0.130	2.7	NA	0.4	2.7	0.10	0.32	52.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 202 [Illaroo Road - Moondara Drive - AM Peak Hour - Future without Dev]

Illaroo Road / Moondara Drive
Future AM Peak Hour
8:00am - 9:00am
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	17	0.0	0.092	7.9	LOS A	0.3	2.3	0.33	0.92	46.4
3	R2	58	3.6	0.092	9.4	LOS A	0.3	2.3	0.33	0.92	45.7
Approach		75	2.8	0.092	9.1	LOS A	0.3	2.3	0.33	0.92	45.9
East: Illaroo Road											
4	L2	22	38.1	0.073	7.4	LOS A	0.0	0.0	0.00	0.11	61.2
5	T1	109	4.8	0.073	0.0	LOS A	0.0	0.0	0.00	0.11	75.4
Approach		132	10.4	0.073	1.3	NA	0.0	0.0	0.00	0.11	73.2
West: Illaroo Road											
11	T1	286	1.5	0.150	0.0	LOS A	0.0	0.2	0.01	0.00	60.0
12	R2	2	50.0	0.150	6.8	LOS A	0.0	0.2	0.01	0.00	53.3
Approach		288	1.8	0.150	0.1	NA	0.0	0.2	0.01	0.00	59.9
All Vehicles		495	4.3	0.150	1.7	NA	0.3	2.3	0.05	0.17	60.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 202 [Illaroo Road - Moondara Drive - PM Peak Hour - Future without Dev]

Illaroo Road / Moondara Drive
Future PM Peak Hour
3:45pm - 4:45pm
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	4	0.0	0.040	8.2	LOS A	0.1	0.9	0.39	0.90	46.5
3	R2	27	3.8	0.040	9.2	LOS A	0.1	0.9	0.39	0.90	45.8
Approach		32	3.3	0.040	9.0	LOS A	0.1	0.9	0.39	0.90	45.9
East: Illaroo Road											
4	L2	44	4.8	0.129	6.8	LOS A	0.0	0.0	0.00	0.12	67.0
5	T1	202	1.6	0.129	0.0	LOS A	0.0	0.0	0.00	0.12	74.5
Approach		246	2.1	0.129	1.2	NA	0.0	0.0	0.00	0.12	73.4
West: Illaroo Road											
11	T1	163	1.3	0.093	0.1	LOS A	0.1	0.7	0.06	0.04	59.3
12	R2	13	0.0	0.093	6.3	LOS A	0.1	0.7	0.06	0.04	54.1
Approach		176	1.2	0.093	0.5	NA	0.1	0.7	0.06	0.04	59.0
All Vehicles		454	1.9	0.129	1.5	NA	0.1	0.9	0.05	0.14	65.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 302 [Moondara Drive - Bimbimbie Avenue - AM Peak Hour - Future without Dev]

Moondara Drive / Bimbimbie Avenue
Future AM Peak Hour
8:00am - 9:00am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	1	100.0	0.004	6.1	LOS A	0.0	0.0	0.00	0.14	54.8
2	T1	6	0.0	0.004	0.0	LOS A	0.0	0.0	0.00	0.14	58.9
Approach		7	14.3	0.004	1.5	NA	0.0	0.0	0.00	0.14	58.2
North: Moondara Drive											
8	T1	2	100.0	0.008	0.0	LOS A	0.0	0.3	0.04	0.43	54.2
9	R2	12	9.1	0.008	5.6	LOS A	0.0	0.3	0.04	0.43	50.1
Approach		14	23.1	0.008	4.1	NA	0.0	0.3	0.04	0.43	50.7
West: Bimbimbie Avenue											
10	L2	56	3.8	0.036	5.6	LOS A	0.1	1.0	0.04	0.56	49.8
12	R2	1	0.0	0.036	5.5	LOS A	0.1	1.0	0.04	0.56	52.4
Approach		57	3.7	0.036	5.6	LOS A	0.1	1.0	0.04	0.56	49.9
All Vehicles		78	8.1	0.036	5.0	NA	0.1	1.0	0.03	0.50	50.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 302 [Moondara Drive - Bimbimbie Avenue - PM Peak Hour - Future without Dev]

Moondara Drive / Bimbimbie Avenue
Future PM Peak Hour
3:45pm - 4:45pm
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.00	0.30	55.5
2	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.30	56.4
Approach		2	0.0	0.001	2.8	NA	0.0	0.0	0.00	0.30	55.9
North: Moondara Drive											
8	T1	5	0.0	0.027	0.0	LOS A	0.1	0.9	0.02	0.53	54.0
9	R2	42	5.0	0.027	5.5	LOS A	0.1	0.9	0.02	0.53	50.1
Approach		47	4.4	0.027	4.9	NA	0.1	0.9	0.02	0.53	50.6
West: Bimbimbie Avenue											
10	L2	15	21.4	0.011	5.8	LOS A	0.0	0.3	0.01	0.57	47.6
12	R2	1	0.0	0.011	5.6	LOS A	0.0	0.3	0.01	0.57	52.5
Approach		16	20.0	0.011	5.8	LOS A	0.0	0.3	0.01	0.57	48.0
All Vehicles		65	8.1	0.027	5.0	NA	0.1	0.9	0.02	0.53	50.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 302 [Bimbimbie Avenue - Warrah Road - AM Peak Hour - Future without Dev]

Bimbimbie Avenue / Warrah Road
Future AM Peak Hour
8:00am - 9:00am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warrah Road											
1	L2	1	100.0	0.006	6.2	LOS A	0.0	0.2	0.10	0.56	51.3
3	R2	6	0.0	0.006	5.6	LOS A	0.0	0.2	0.10	0.56	52.2
Approach		7	14.3	0.006	5.8	LOS A	0.0	0.2	0.10	0.56	52.1
East: Bimbimbie Avenue											
4	L2	1	100.0	0.009	6.1	LOS A	0.0	0.0	0.00	0.07	55.1
5	T1	15	14.3	0.009	0.0	LOS A	0.0	0.0	0.00	0.07	59.5
Approach		16	20.0	0.009	0.8	NA	0.0	0.0	0.00	0.07	59.2
West: Bimbimbie Avenue											
11	T1	43	7.3	0.024	0.0	LOS A	0.0	0.0	0.00	0.01	59.8
12	R2	1	0.0	0.024	5.5	LOS A	0.0	0.0	0.00	0.01	57.6
Approach		44	7.1	0.024	0.1	NA	0.0	0.0	0.00	0.01	59.8
All Vehicles		67	10.9	0.024	0.8	NA	0.0	0.2	0.01	0.09	58.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 302 [Bimbimbie Avenue - Warrah Road - PM Peak Hour - Future without Dev]

Bimbimbie Avenue / Warrah Road
Future PM Peak Hour
3:45pm - 4:45pm
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warrah Road											
1	L2	1	0.0	0.002	5.6	LOS A	0.0	0.0	0.11	0.55	53.3
3	R2	1	0.0	0.002	5.6	LOS A	0.0	0.0	0.11	0.55	52.2
Approach		2	0.0	0.002	5.6	LOS A	0.0	0.0	0.11	0.55	52.8
East: Bimbimbie Avenue											
4	L2	1	0.0	0.020	5.5	LOS A	0.0	0.0	0.00	0.02	58.1
5	T1	38	0.0	0.020	0.0	LOS A	0.0	0.0	0.00	0.02	59.8
Approach		39	0.0	0.020	0.2	NA	0.0	0.0	0.00	0.02	59.8
West: Bimbimbie Avenue											
11	T1	15	0.0	0.008	0.0	LOS A	0.0	0.0	0.02	0.04	59.5
12	R2	1	0.0	0.008	5.5	LOS A	0.0	0.0	0.02	0.04	57.3
Approach		16	0.0	0.008	0.4	NA	0.0	0.0	0.02	0.04	59.4
All Vehicles		57	0.0	0.020	0.4	NA	0.0	0.0	0.01	0.04	59.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 203 [Illaroo Road - Princes Highway - AM Peak Hour - Future without Dev]

Illaroo Road / Princes Highway
Future without Development
AM Peak Hour
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Princes Highway											
1	L2	518	3.3	0.285	5.7	LOS A	0.0	0.0	0.00	0.53	54.8
2	T1	1428	9.2	0.932	53.5	LOS D	48.4	365.7	1.00	1.07	32.0
Approach		1946	7.7	0.932	40.8	LOS C	48.4	365.7	0.73	0.93	36.0
North: Princes Highway											
8	T1	2154	4.8	1.051	81.3	LOS F	97.5	710.3	1.00	1.28	25.5
9	R2	173	7.1	0.977	89.4	LOS F	12.7	94.5	1.00	1.03	24.1
Approach		2326	5.0	1.051	81.9	LOS F	97.5	710.3	1.00	1.26	25.4
West: Illaroo Road											
10	L2	283	5.7	1.048	98.1	LOS F	56.2	405.5	1.00	1.11	22.5
12	R2	1014	1.9	1.048	98.3	LOS F	56.2	405.5	1.00	1.11	22.5
Approach		1297	2.8	1.048	98.3	LOS F	56.2	405.5	1.00	1.11	22.5
All Vehicles		5569	5.4	1.051	71.3	LOS F	97.5	710.3	0.91	1.11	27.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	53	39.3	LOS D	0.1	0.1	0.81	0.81
P4	West Full Crossing	53	26.7	LOS C	0.1	0.1	0.67	0.67
All Pedestrians		105	33.0	LOS D			0.74	0.74

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 203 [Illaroo Road - Princes Highway - PM Peak Hour - Future without Dev]

Illaroo Road / Princes Highway
Future without Development
PM Peak Hour
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Princes Highway											
1	L2	926	1.5	0.504	5.7	LOS A	0.0	0.0	0.00	0.53	54.8
2	T1	2244	3.5	1.090	103.5	LOS F	119.8	863.7	1.00	1.27	21.9
Approach		3171	2.9	1.090	74.9	LOS F	119.8	863.7	0.71	1.06	26.6
North: Princes Highway											
8	T1	1846	5.0	0.742	11.2	LOS A	42.8	312.8	0.58	0.54	50.7
9	R2	300	1.6	1.066	125.4	LOS F	30.2	214.5	1.00	1.07	19.1
Approach		2146	4.5	1.066	27.2	LOS B	42.8	312.8	0.64	0.62	41.1
West: Illaroo Road											
10	L2	216	2.9	1.102	135.0	LOS F	43.2	308.7	1.00	1.10	18.0
12	R2	567	1.7	1.102	135.4	LOS F	43.2	308.7	1.00	1.10	18.0
Approach		783	2.0	1.102	135.3	LOS F	43.2	308.7	1.00	1.10	18.0
All Vehicles		6100	3.4	1.102	65.9	LOS E	119.8	863.7	0.72	0.91	28.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	53	64.5	LOS F	0.2	0.2	0.93	0.93
P4	West Full Crossing	53	20.8	LOS C	0.1	0.1	0.53	0.53
All Pedestrians		105	42.7	LOS E			0.73	0.73

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Appendix F

SIDRA Results – Scenario 4
Future Traffic Volumes (2026) Plus Development Traffic

MOVEMENT SUMMARY

Site: 101A [Main Road - Tannery Road - AM Peak Hour - Future]

Main Road / Tannery Road
Future AM Peak Hour
8:00am - 9:00am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Main Road											
5	T1	158	2.0	0.082	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	20	0.0	0.017	3.0	LOS A	0.1	0.5	0.32	0.51	51.7
Approach		178	1.8	0.082	0.3	NA	0.1	0.5	0.04	0.06	58.9
North: Tannery Road											
7	L2	96	6.6	0.106	6.4	LOS A	0.4	2.9	0.30	0.59	48.3
9	R2	12	0.0	0.106	8.8	LOS A	0.4	2.9	0.30	0.59	52.5
Approach		107	5.9	0.106	6.6	LOS A	0.4	2.9	0.30	0.59	49.0
West: Main Road											
10	L2	8	25.0	0.005	5.8	LOS A	0.0	0.0	0.00	0.57	52.6
11	T1	216	2.0	0.112	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		224	2.8	0.112	0.2	NA	0.0	0.0	0.00	0.02	59.4
All Vehicles		509	3.1	0.112	1.6	NA	0.4	2.9	0.07	0.15	56.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101B [Main Road - Hockeys Lane - AM Peak Hour - Future]

Main Road / Hockeys Lane
Future AM Peak Hour
8:00am - 9:00am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hockeys Lane											
1	L2	42	0.0	0.181	6.1	LOS A	0.7	5.1	0.39	0.67	35.4
3	R2	84	2.5	0.181	10.0	LOS A	0.7	5.1	0.39	0.67	51.0
Approach		126	1.7	0.181	8.7	LOS A	0.7	5.1	0.39	0.67	46.7
East: Main Road											
4	L2	45	7.0	0.026	5.6	LOS A	0.0	0.0	0.00	0.57	53.3
5	T1	136	2.3	0.071	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		181	3.5	0.071	1.4	NA	0.0	0.0	0.00	0.14	57.2
West: Main Road											
11	T1	245	1.7	0.127	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	65	3.2	0.055	2.9	LOS A	0.2	1.6	0.29	0.51	51.6
Approach		311	2.0	0.127	0.6	NA	0.2	1.6	0.06	0.11	58.0
All Vehicles		618	2.4	0.181	2.5	NA	0.7	5.1	0.11	0.23	54.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101A [Main Road - Tannery Road - PM Peak Hour - Future]

Main Road / Tannery Road
Future PM Peak Hour
3:45pm - 4:45pm
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Main Road											
5	T1	112	0.9	0.058	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	74	0.0	0.058	2.7	LOS A	0.2	1.6	0.24	0.49	52.2
Approach		185	0.6	0.058	1.1	NA	0.2	1.6	0.10	0.20	56.6
North: Tannery Road											
7	L2	59	3.6	0.059	6.0	LOS A	0.2	1.6	0.20	0.56	48.7
9	R2	7	0.0	0.059	7.8	LOS A	0.2	1.6	0.20	0.56	52.8
Approach		66	3.2	0.059	6.2	LOS A	0.2	1.6	0.20	0.56	49.5
West: Main Road											
10	L2	9	0.0	0.005	5.5	LOS A	0.0	0.0	0.00	0.58	53.6
11	T1	119	8.0	0.064	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		128	7.4	0.064	0.4	NA	0.0	0.0	0.00	0.04	59.0
All Vehicles		380	3.3	0.064	1.7	NA	0.2	1.6	0.08	0.21	55.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101B [Main Road - Hockeys Lane - PM Peak Hour - Future]

Main Road / Hockeys Lane
Future PM Peak Hour
3:45pm - 4:45pm
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hockeys Lane											
1	L2	34	0.0	0.109	5.9	LOS A	0.4	3.0	0.30	0.61	36.2
3	R2	54	2.0	0.109	8.6	LOS A	0.4	3.0	0.30	0.61	51.8
Approach		87	1.2	0.109	7.6	LOS A	0.4	3.0	0.30	0.61	46.8
East: Main Road											
4	L2	98	1.1	0.053	5.6	LOS A	0.0	0.0	0.00	0.58	53.6
5	T1	152	0.7	0.078	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		249	0.8	0.078	2.2	NA	0.0	0.0	0.00	0.23	56.2
West: Main Road											
11	T1	142	5.9	0.076	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	36	2.9	0.032	3.2	LOS A	0.1	0.9	0.34	0.52	51.3
Approach		178	5.3	0.076	0.6	NA	0.1	0.9	0.07	0.11	58.0
All Vehicles		515	2.5	0.109	2.6	NA	0.4	3.0	0.07	0.25	54.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 201 [Illaroo Road - Hockeys Lane - AM Peak Hour - Future]

Illaroo Road / Hockeys Lane
Future AM Peak Hour
8:00am - 9:00am
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Illaroo Road											
5	T1	83	6.3	0.086	0.4	LOS A	0.4	2.6	0.23	0.25	56.9
6	R2	62	1.7	0.086	6.0	LOS A	0.4	2.6	0.23	0.25	45.8
Approach		145	4.3	0.086	2.8	NA	0.4	2.6	0.23	0.25	51.5
North: Hockeys Lane											
7	L2	119	0.0	0.100	7.4	LOS A	0.4	2.8	0.28	0.87	43.1
9	R2	2	0.0	0.100	7.9	LOS A	0.4	2.8	0.28	0.87	42.7
Approach		121	0.0	0.100	7.4	LOS A	0.4	2.8	0.28	0.87	43.1
West: Illaroo Road											
10	L2	8	0.0	0.090	5.5	LOS A	0.0	0.0	0.00	0.03	58.1
11	T1	165	1.9	0.090	0.0	LOS A	0.0	0.0	0.00	0.03	59.7
Approach		174	1.8	0.090	0.3	NA	0.0	0.0	0.00	0.03	59.6
All Vehicles		440	2.2	0.100	3.1	NA	0.4	2.8	0.16	0.34	51.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 201 [Illaroo Road - Hockeys Lane - PM Peak Hour - Future]

Illaroo Road / Hockeys Lane
Future PM Peak Hour
3:45pm - 4:45pm
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Illaroo Road											
5	T1	179	2.4	0.135	0.1	LOS A	0.4	3.0	0.12	0.16	58.1
6	R2	68	0.0	0.135	5.7	LOS A	0.4	3.0	0.12	0.16	46.6
Approach		247	1.7	0.135	1.7	NA	0.4	3.0	0.12	0.16	54.4
North: Hockeys Lane											
7	L2	121	0.0	0.113	7.0	LOS A	0.5	3.2	0.18	0.90	43.1
9	R2	19	0.0	0.113	8.1	LOS A	0.5	3.2	0.18	0.90	42.7
Approach		140	0.0	0.113	7.1	LOS A	0.5	3.2	0.18	0.90	43.0
West: Illaroo Road											
10	L2	8	12.5	0.045	5.7	LOS A	0.0	0.0	0.00	0.06	57.3
11	T1	79	0.0	0.045	0.0	LOS A	0.0	0.0	0.00	0.06	59.5
Approach		87	1.2	0.045	0.6	NA	0.0	0.0	0.00	0.06	59.3
All Vehicles		475	1.1	0.135	3.1	NA	0.5	3.2	0.11	0.36	51.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 202 [Illaroo Road - Moondara Drive - AM Peak Hour - Future]

Illaroo Road / Moondara Drive
Future AM Peak Hour
8:00am - 9:00am
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	39	0.0	0.281	8.0	LOS A	1.1	7.8	0.40	0.96	46.0
3	R2	182	1.2	0.281	10.0	LOS A	1.1	7.8	0.40	0.96	45.4
Approach		221	1.0	0.281	9.6	LOS A	1.1	7.8	0.40	0.96	45.5
East: Illaroo Road											
4	L2	47	17.8	0.087	6.9	LOS A	0.0	0.0	0.00	0.19	61.8
5	T1	109	4.8	0.087	0.0	LOS A	0.0	0.0	0.00	0.19	71.3
Approach		157	8.7	0.087	2.1	NA	0.0	0.0	0.00	0.19	68.8
West: Illaroo Road											
11	T1	286	1.5	0.157	0.0	LOS A	0.1	0.7	0.03	0.03	59.7
12	R2	13	8.3	0.157	6.2	LOS A	0.1	0.7	0.03	0.03	54.2
Approach		299	1.8	0.157	0.3	NA	0.1	0.7	0.03	0.03	59.5
All Vehicles		677	3.1	0.281	3.8	NA	1.1	7.8	0.14	0.37	56.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 202 [Illaroo Road - Moondara Drive - PM Peak Hour - Future]

Illaroo Road / Moondara Drive
Future PM Peak Hour
3:45pm - 4:45pm
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	13	0.0	0.110	8.3	LOS A	0.4	2.6	0.43	0.94	46.1
3	R2	67	1.6	0.110	9.9	LOS A	0.4	2.6	0.43	0.94	45.4
Approach		80	1.3	0.110	9.7	LOS A	0.4	2.6	0.43	0.94	45.5
East: Illaroo Road											
4	L2	153	1.4	0.188	6.5	LOS A	0.0	0.0	0.00	0.27	61.8
5	T1	202	1.6	0.188	0.0	LOS A	0.0	0.0	0.00	0.27	67.7
Approach		355	1.5	0.188	2.8	NA	0.0	0.0	0.00	0.27	65.5
West: Illaroo Road											
11	T1	163	1.3	0.128	0.6	LOS A	0.4	3.1	0.25	0.16	57.7
12	R2	55	0.0	0.128	6.8	LOS A	0.4	3.1	0.25	0.16	52.2
Approach		218	1.0	0.128	2.1	NA	0.4	3.1	0.25	0.16	56.5
All Vehicles		653	1.3	0.188	3.4	NA	0.4	3.1	0.14	0.32	59.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 302 [Moondara Drive - Bimbimbie Avenue - AM Peak Hour - Future]

Moondara Drive / Bimbimbie Avenue
Future AM Peak Hour
8:00am - 9:00am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	1	100.0	0.004	6.1	LOS A	0.0	0.0	0.00	0.14	54.8
2	T1	6	0.0	0.004	0.0	LOS A	0.0	0.0	0.00	0.14	58.9
Approach		7	14.3	0.004	1.5	NA	0.0	0.0	0.00	0.14	58.2
North: Moondara Drive											
8	T1	2	100.0	0.027	0.0	LOS A	0.1	0.9	0.04	0.53	53.5
9	R2	46	2.3	0.027	5.5	LOS A	0.1	0.9	0.04	0.53	49.8
Approach		48	6.5	0.027	5.0	NA	0.1	0.9	0.04	0.53	50.0
West: Bimbimbie Avenue											
10	L2	201	1.0	0.125	5.6	LOS A	0.6	3.9	0.04	0.56	50.2
12	R2	1	0.0	0.125	5.7	LOS A	0.6	3.9	0.04	0.56	52.4
Approach		202	1.0	0.125	5.6	LOS A	0.6	3.9	0.04	0.56	50.2
All Vehicles		258	2.4	0.125	5.4	NA	0.6	3.9	0.04	0.54	50.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 302 [Moondara Drive - Bimbimbie Avenue - PM Peak Hour - Future]

Moondara Drive / Bimbimbie Avenue
Future PM Peak Hour
3:45pm - 4:45pm
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.00	0.30	55.5
2	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.30	56.4
Approach		2	0.0	0.001	2.8	NA	0.0	0.0	0.00	0.30	55.9
North: Moondara Drive											
8	T1	5	0.0	0.110	0.0	LOS A	0.5	3.8	0.02	0.58	53.4
9	R2	192	1.1	0.110	5.5	LOS A	0.5	3.8	0.02	0.58	49.9
Approach		197	1.1	0.110	5.3	NA	0.5	3.8	0.02	0.58	50.0
West: Bimbimbie Avenue											
10	L2	64	4.9	0.041	5.6	LOS A	0.2	1.2	0.01	0.57	49.8
12	R2	1	0.0	0.041	6.2	LOS A	0.2	1.2	0.01	0.57	52.5
Approach		65	4.8	0.041	5.6	LOS A	0.2	1.2	0.01	0.57	49.9
All Vehicles		264	2.0	0.110	5.4	NA	0.5	3.8	0.02	0.57	50.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 302 [Bimbimbie Avenue - Warrah Road - AM Peak Hour - Future]

Bimbimbie Avenue / Warrah Road
Future AM Peak Hour
8:00am - 9:00am
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warrah Road											
1	L2	5	20.0	0.130	5.8	LOS A	0.5	3.2	0.15	0.58	52.4
3	R2	152	0.0	0.130	5.7	LOS A	0.5	3.2	0.15	0.58	52.1
Approach		157	0.7	0.130	5.7	LOS A	0.5	3.2	0.15	0.58	52.1
East: Bimbimbie Avenue											
4	L2	37	2.9	0.029	5.6	LOS A	0.0	0.0	0.00	0.42	54.2
5	T1	15	14.3	0.029	0.0	LOS A	0.0	0.0	0.00	0.42	55.9
Approach		52	6.1	0.029	4.0	NA	0.0	0.0	0.00	0.42	54.7
West: Bimbimbie Avenue											
11	T1	43	7.3	0.024	0.0	LOS A	0.0	0.1	0.01	0.03	59.6
12	R2	2	0.0	0.024	5.6	LOS A	0.0	0.1	0.01	0.03	57.4
Approach		45	7.0	0.024	0.3	NA	0.0	0.1	0.01	0.03	59.5
All Vehicles		254	2.9	0.130	4.4	NA	0.5	3.2	0.09	0.45	53.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 302 [Bimbimbie Avenue - Warrah Road - PM Peak Hour - Future]

Bimbimbie Avenue / Warrah Road
Future PM Peak Hour
3:45pm - 4:45pm
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warrah Road											
1	L2	2	0.0	0.044	5.6	LOS A	0.1	1.0	0.19	0.58	53.1
3	R2	49	0.0	0.044	5.9	LOS A	0.1	1.0	0.19	0.58	52.0
Approach		52	0.0	0.044	5.9	LOS A	0.1	1.0	0.19	0.58	52.0
East: Bimbimbie Avenue											
4	L2	152	0.0	0.101	5.5	LOS A	0.0	0.0	0.00	0.47	54.0
5	T1	38	0.0	0.101	0.0	LOS A	0.0	0.0	0.00	0.47	55.5
Approach		189	0.0	0.101	4.4	NA	0.0	0.0	0.00	0.47	54.3
West: Bimbimbie Avenue											
11	T1	15	0.0	0.010	0.2	LOS A	0.0	0.2	0.14	0.13	58.1
12	R2	4	0.0	0.010	6.0	LOS A	0.0	0.2	0.14	0.13	56.1
Approach		19	0.0	0.010	1.5	NA	0.0	0.2	0.14	0.13	57.6
All Vehicles		260	0.0	0.101	4.5	NA	0.1	1.0	0.05	0.46	54.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 203 [Illaroo Road - Princes Highway - AM Peak Hour - Future]

Illaroo Road / Princes Highway
Future AM Peak Hour
8:00am - 9:00am
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Princes Highway											
1	L2	528	3.3	0.291	6.7	LOS A	0.0	0.0	0.00	0.57	60.1
2	T1	1428	9.2	0.971	65.1	LOS E	52.9	337.2	1.00	1.12	31.2
Approach		1957	7.6	0.971	49.3	LOS D	52.9	337.2	0.73	0.97	35.9
North: Princes Highway											
8	T1	2154	4.8	1.076	91.2	LOS F	100.8	623.9	1.00	1.33	25.2
9	R2	175	7.1	0.989	93.2	LOS F	13.1	82.4	1.00	1.01	24.2
Approach		2328	5.0	1.076	91.3	LOS F	100.8	623.9	1.00	1.30	25.1
West: Illaroo Road											
10	L2	309	5.7	1.060	101.1	LOS F	60.9	374.1	1.00	1.12	22.3
12	R2	1067	1.9	1.060	101.4	LOS F	60.9	374.1	1.00	1.12	22.4
Approach		1377	2.8	1.060	101.3	LOS F	60.9	374.1	1.00	1.12	22.4
All Vehicles		5662	5.4	1.076	79.3	LOS F	100.8	623.9	0.91	1.15	27.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	53	37.7	LOS D	0.1	0.1	0.79	0.79
P4	West Full Crossing	53	28.1	LOS C	0.1	0.1	0.68	0.68
All Pedestrians		105	32.9	LOS D			0.74	0.74

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 203 [Illaroo Road - Princes Highway - PM Peak Hour - Future]

Illaroo Road / Princes Highway
Future PM Peak Hour
3:45pm - 4:45pm
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Princes Highway											
1	L2	985	1.5	0.536	6.8	LOS A	0.0	0.0	0.00	0.57	60.5
2	T1	2244	3.5	1.139	117.0	LOS F	110.9	681.3	1.00	1.46	21.1
Approach		3229	2.9	1.139	83.4	LOS F	110.9	681.3	0.69	1.19	26.4
North: Princes Highway											
8	T1	1846	5.0	0.682	9.9	LOS A	29.4	182.2	0.60	0.56	58.8
9	R2	309	1.6	1.124	131.8	LOS F	28.7	174.4	1.00	1.13	18.7
Approach		2156	4.5	1.124	27.4	LOS B	29.4	182.2	0.66	0.64	44.9
West: Illaroo Road											
10	L2	226	2.9	1.144	137.1	LOS F	40.9	249.0	1.00	1.19	18.0
12	R2	581	1.7	1.144	137.3	LOS F	40.9	249.0	1.00	1.19	18.0
Approach		807	2.1	1.144	137.3	LOS F	40.9	249.0	1.00	1.19	18.0
All Vehicles		6193	3.4	1.144	70.9	LOS F	110.9	681.3	0.72	1.00	28.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	19.3	LOS B	0.1	0.1	0.57	0.57
All Pedestrians		105	36.8	LOS D			0.76	0.76

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Appendix G

SIDRA Results – Scenario 5 and 6
Upgraded Princes Highway / Illaroo Road Intersection

MOVEMENT SUMMARY

Site: 203 [Illaroo Road - Princes Highway - AM Peak Hour - Alt. Layout - without Dev]

Illaroo Road / Princes Highway
Future AM Peak Hour - Alternative Layout
8:00am - 9:00am
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Princes Highway											
1	L2	518	3.3	0.330	7.6	LOS A	4.1	29.5	0.20	0.64	56.1
2	T1	1428	9.2	0.597	27.8	LOS B	21.1	159.7	0.82	0.73	45.8
Approach		1946	7.7	0.597	22.4	LOS B	21.1	159.7	0.66	0.70	48.1
North: Princes Highway											
8	T1	2154	4.8	0.686	19.3	LOS B	30.0	219.0	0.76	0.69	51.2
9	R2	173	7.1	0.586	66.9	LOS E	5.1	38.2	1.00	0.79	29.4
Approach		2326	5.0	0.686	22.8	LOS B	30.0	219.0	0.78	0.70	48.5
West: Illaroo Road											
10	L2	283	5.7	0.693	40.3	LOS C	22.4	162.3	0.91	0.85	36.1
12	R2	1014	1.9	0.693	42.5	LOS D	22.4	162.3	0.93	0.85	36.0
Approach		1297	2.8	0.693	42.0	LOS C	22.4	162.3	0.92	0.85	36.0
All Vehicles		5569	5.4	0.693	27.1	LOS B	30.0	219.0	0.77	0.74	44.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	53	43.4	LOS E	0.2	0.2	0.85	0.85
P4	West Full Crossing	53	28.8	LOS C	0.1	0.1	0.69	0.69
All Pedestrians		105	36.1	LOS D			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 203 [Illaroo Road - Princes Highway - PM Peak Hour - Alt. Layout - without Dev]

Illaroo Road / Princes Highway
Future PM Peak Hour - Alternative Layout
3:45pm - 4:45pm
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Princes Highway											
1	L2	926	1.5	0.605	9.8	LOS A	12.7	76.8	0.36	0.73	54.5
2	T1	2244	3.5	0.713	21.2	LOS B	32.0	196.5	0.80	0.73	49.8
Approach		3171	2.9	0.713	17.9	LOS B	32.0	196.5	0.67	0.73	51.1
North: Princes Highway											
8	T1	1846	5.0	0.455	7.5	LOS A	14.8	91.9	0.45	0.41	61.2
9	R2	300	1.6	0.700	64.6	LOS E	8.9	54.1	1.00	0.84	30.0
Approach		2146	4.5	0.700	15.5	LOS B	14.8	91.9	0.53	0.47	53.4
West: Illaroo Road											
10	L2	216	2.9	0.723	52.8	LOS D	16.5	100.8	0.98	0.86	32.4
12	R2	567	1.7	0.723	56.8	LOS E	16.5	100.8	1.00	0.86	31.6
Approach		783	2.0	0.723	55.7	LOS D	16.5	100.8	0.99	0.86	31.8
All Vehicles		6100	3.4	0.723	21.9	LOS B	32.0	196.5	0.66	0.66	48.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	19.9	LOS B	0.1	0.1	0.58	0.58
All Pedestrians		105	37.1	LOS D			0.76	0.76

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 203 [Illaroo Road - Princes Highway - AM Peak Hour - Alt. Layout]

Illaroo Road / Princes Highway
Future AM Peak Hour - Alternative Layout
8:00am - 9:00am
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Princes Highway											
1	L2	528	3.3	0.340	7.7	LOS A	4.4	26.8	0.22	0.65	56.1
2	T1	1428	9.2	0.690	33.9	LOS C	23.4	149.3	0.90	0.80	42.5
Approach		1957	7.6	0.690	26.8	LOS B	23.4	149.3	0.72	0.76	45.5
North: Princes Highway											
8	T1	2154	4.8	0.690	20.8	LOS B	30.1	186.2	0.79	0.72	50.1
9	R2	175	7.1	0.396	60.2	LOS E	4.9	30.5	0.96	0.78	31.0
Approach		2328	5.0	0.690	23.8	LOS B	30.1	186.2	0.80	0.72	47.9
West: Illaroo Road											
10	L2	309	5.7	0.700	39.1	LOS C	23.6	145.6	0.90	0.86	36.6
12	R2	1067	1.9	0.700	41.3	LOS C	23.6	145.6	0.92	0.85	36.4
Approach		1377	2.8	0.700	40.8	LOS C	23.6	145.6	0.92	0.85	36.5
All Vehicles		5662	5.4	0.700	29.0	LOS C	30.1	186.2	0.80	0.77	43.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	53	41.8	LOS E	0.1	0.1	0.84	0.84
P4	West Full Crossing	53	33.8	LOS D	0.1	0.1	0.75	0.75
All Pedestrians		105	37.8	LOS D			0.79	0.79

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 203 [Illaroo Road - Princes Highway - PM Peak Hour - Alt. Layout]

Illaroo Road / Princes Highway
Future PM Peak Hour - Alternative Layout
3:45pm - 4:45pm
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Princes Highway											
1	L2	985	1.5	0.645	10.2	LOS A	15.6	94.3	0.40	0.74	54.2
2	T1	2244	3.5	0.724	22.0	LOS B	32.6	200.2	0.82	0.75	49.3
Approach		3229	2.9	0.724	18.4	LOS B	32.6	200.2	0.69	0.75	50.7
North: Princes Highway											
8	T1	1846	5.0	0.460	8.0	LOS A	15.3	94.6	0.47	0.42	60.8
9	R2	309	1.6	0.723	65.2	LOS E	9.3	56.3	1.00	0.85	29.8
Approach		2156	4.5	0.723	16.2	LOS B	15.3	94.6	0.54	0.49	52.9
West: Illaroo Road											
10	L2	226	2.9	0.712	51.6	LOS D	16.8	102.6	0.97	0.86	32.8
12	R2	581	1.7	0.712	55.7	LOS D	16.8	102.6	0.99	0.86	31.9
Approach		807	2.1	0.712	54.5	LOS D	16.8	102.6	0.99	0.86	32.1
All Vehicles		6193	3.4	0.724	22.4	LOS B	32.6	200.2	0.68	0.67	47.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	20.5	LOS C	0.1	0.1	0.58	0.58
All Pedestrians		105	37.4	LOS D			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Appendix H

SIDRA Results – Bush Fire Scenario

MOVEMENT SUMMARY

Site: 302 [Bimbimbie Avenue - Warrah Road - Scenario - Bush Fire]

Bimbimbie Avenue / Warrah Road
Scenario - Bush Fire
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warrah Road											
1	L2	2	0.0	0.529	5.9	LOS A	3.5	24.6	0.31	0.63	52.6
3	R2	592	0.0	0.529	6.8	LOS A	3.5	24.6	0.31	0.63	51.4
Approach		594	0.0	0.529	6.8	LOS A	3.5	24.6	0.31	0.63	51.4
East: Bimbimbie Avenue											
4	L2	2	0.0	0.002	5.5	LOS A	0.0	0.0	0.00	0.30	55.5
5	T1	2	0.0	0.002	0.0	LOS A	0.0	0.0	0.00	0.30	57.1
Approach		4	0.0	0.002	2.8	NA	0.0	0.0	0.00	0.30	56.3
West: Bimbimbie Avenue											
11	T1	154	0.0	0.080	0.0	LOS A	0.0	0.1	0.00	0.01	59.9
12	R2	2	0.0	0.080	5.5	LOS A	0.0	0.1	0.00	0.01	57.7
Approach		156	0.0	0.080	0.1	NA	0.0	0.1	0.00	0.01	59.9
All Vehicles		754	0.0	0.529	5.4	NA	3.5	24.6	0.24	0.50	53.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 302 [Moondara Drive - Bimbimbie Avenue - Scenario - Bush Fire]

Moondara Drive / Bimbimbie Avenue
Scenario - Bush Fire
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moondara Drive											
1	L2	2	0.0	0.027	5.5	LOS A	0.0	0.0	0.00	0.02	58.0
2	T1	51	0.0	0.027	0.0	LOS A	0.0	0.0	0.00	0.02	59.7
Approach		53	0.0	0.027	0.2	NA	0.0	0.0	0.00	0.02	59.6
North: Moondara Drive											
8	T1	2	0.0	0.002	0.1	LOS A	0.0	0.1	0.12	0.28	55.9
9	R2	2	0.0	0.002	5.6	LOS A	0.0	0.1	0.12	0.28	52.4
Approach		4	0.0	0.002	2.8	NA	0.0	0.1	0.12	0.28	54.2
West: Bimbimbie Avenue											
10	L2	771	0.0	0.493	5.8	LOS A	3.3	23.2	0.21	0.54	49.6
12	R2	2	0.0	0.493	5.8	LOS A	3.3	23.2	0.21	0.54	51.8
Approach		773	0.0	0.493	5.8	LOS A	3.3	23.2	0.21	0.54	49.7
All Vehicles		829	0.0	0.493	5.4	NA	3.3	23.2	0.19	0.50	50.3

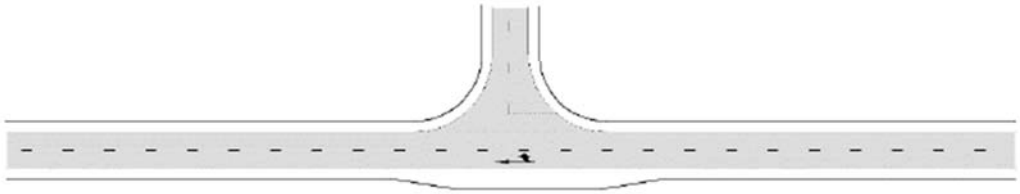
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix I

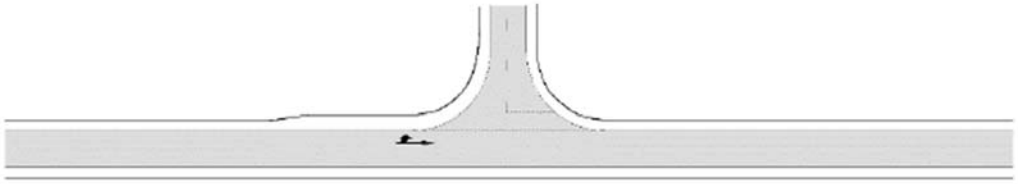
Turning Treatments

The following figures show the corresponding turning treatments with the associated abbreviation, as outlined within *Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings.*

Figure 2.1: Rural basic (BA) turn treatments

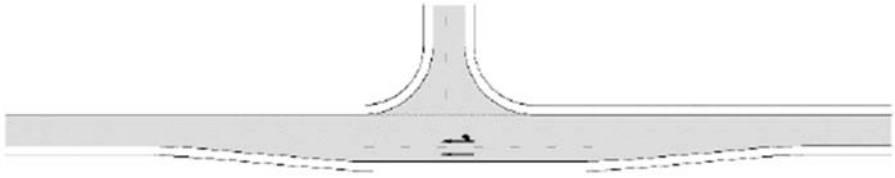


Basic Right Turn (BAR)
on the Major Road (Two-Lane, Two-Way Road)



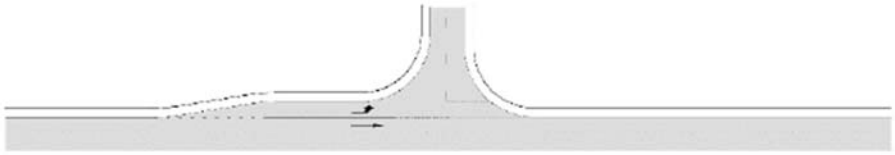
Basic Left Turn (BAL)
on the Major Road

Figure 2.5: Rural auxiliary lane (AU) turn treatments



Auxiliary Right Turn (AUR)
on the Major Road (Two-Lane, Two-Way Road)

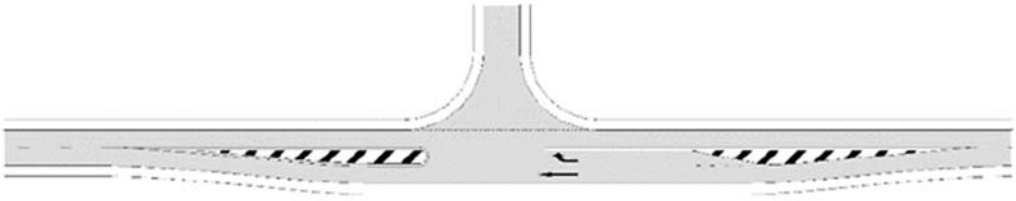
This turn type not as safe as a channelised treatment at unsignalised intersections



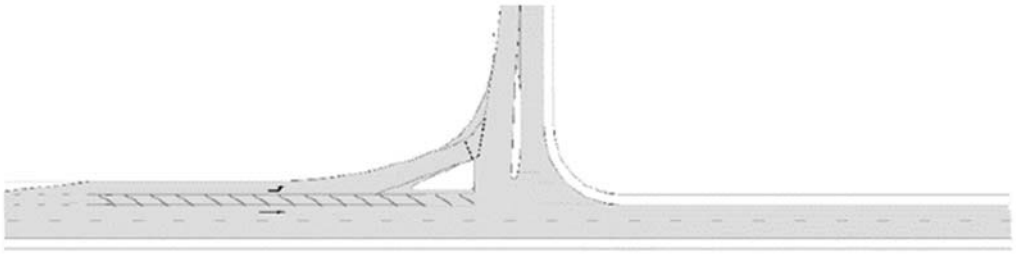
Auxiliary Left Turn (AUL)
on the Major Road

CHL treatment is preferred at unsignalised intersections to ensure a clear line of sight for vehicles turning from the minor road.

Figure 2.7: Rural channelised (CH) intersection turn treatments



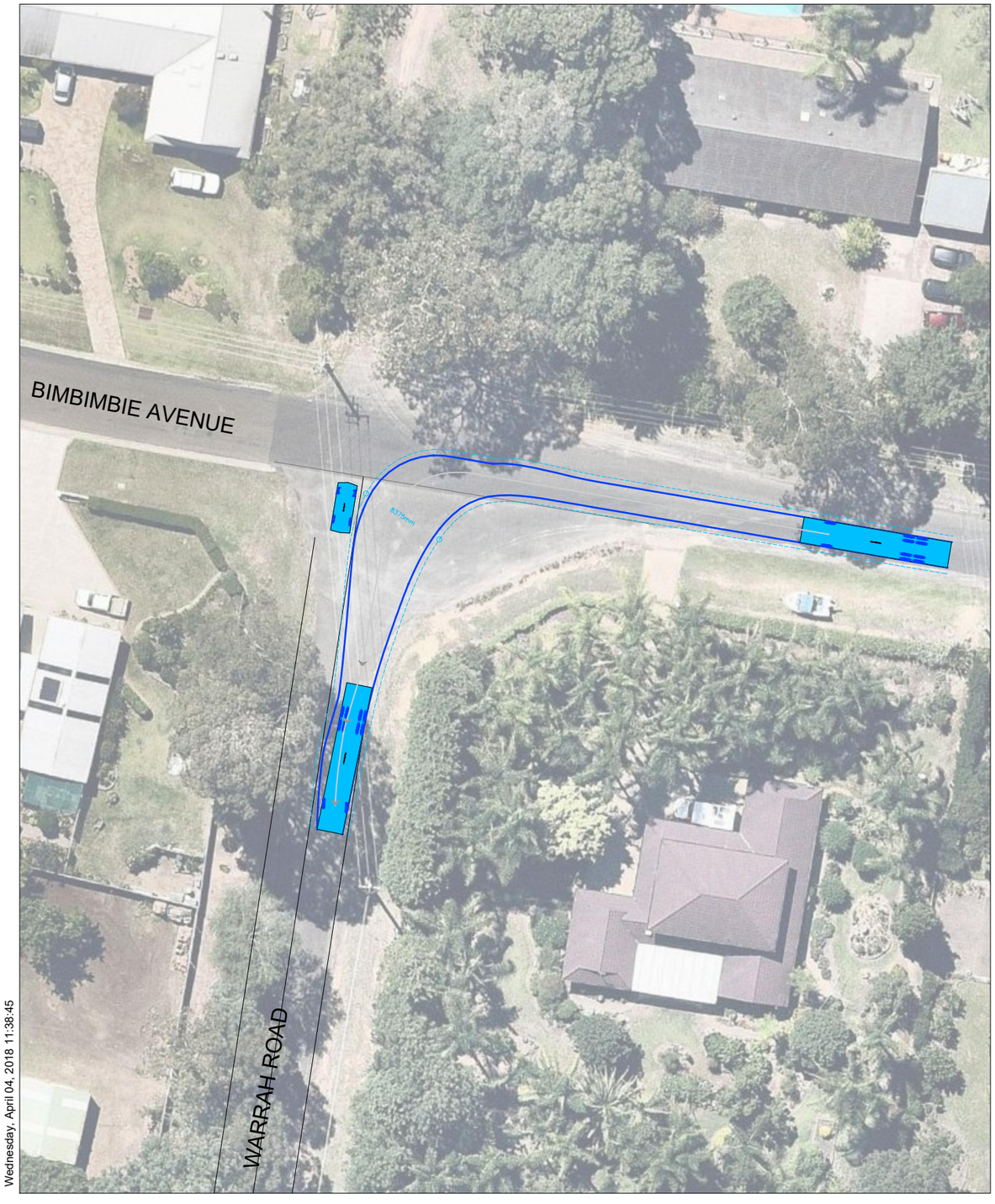
Channelised Right Turn (CHR)
on the Major Road

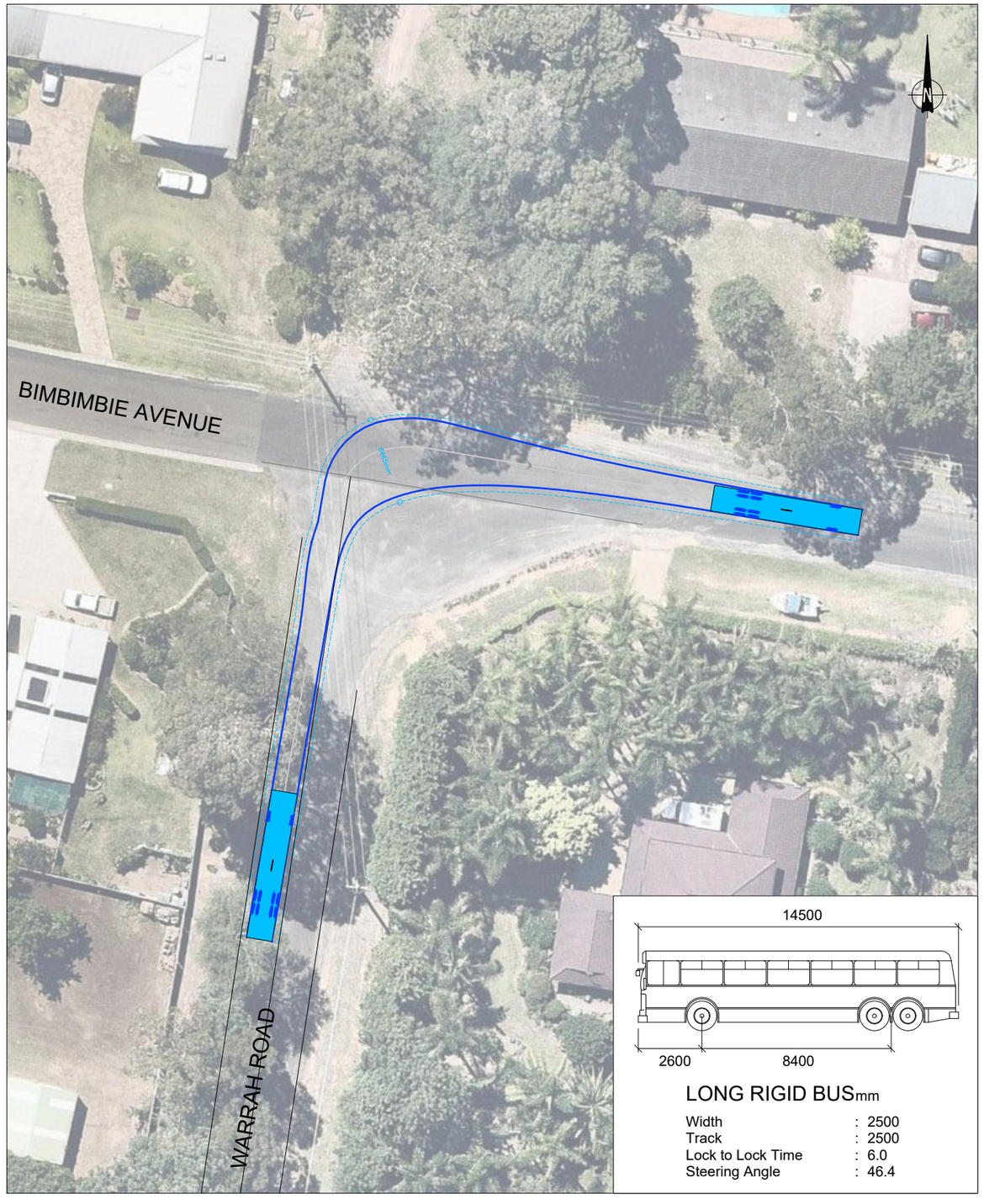


Channelised Left Turn (CHL)
on the Major Road

Appendix J

Swept Path Assessment





Wednesday, April 04, 2018 11:38:45

REV	DATE	DRN	CHK	DESCRIPTION
00	06/04/18	TJG	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----

Warrah Road, Bangalee

Warrah Road / Bimbimbie Avenue Intersection

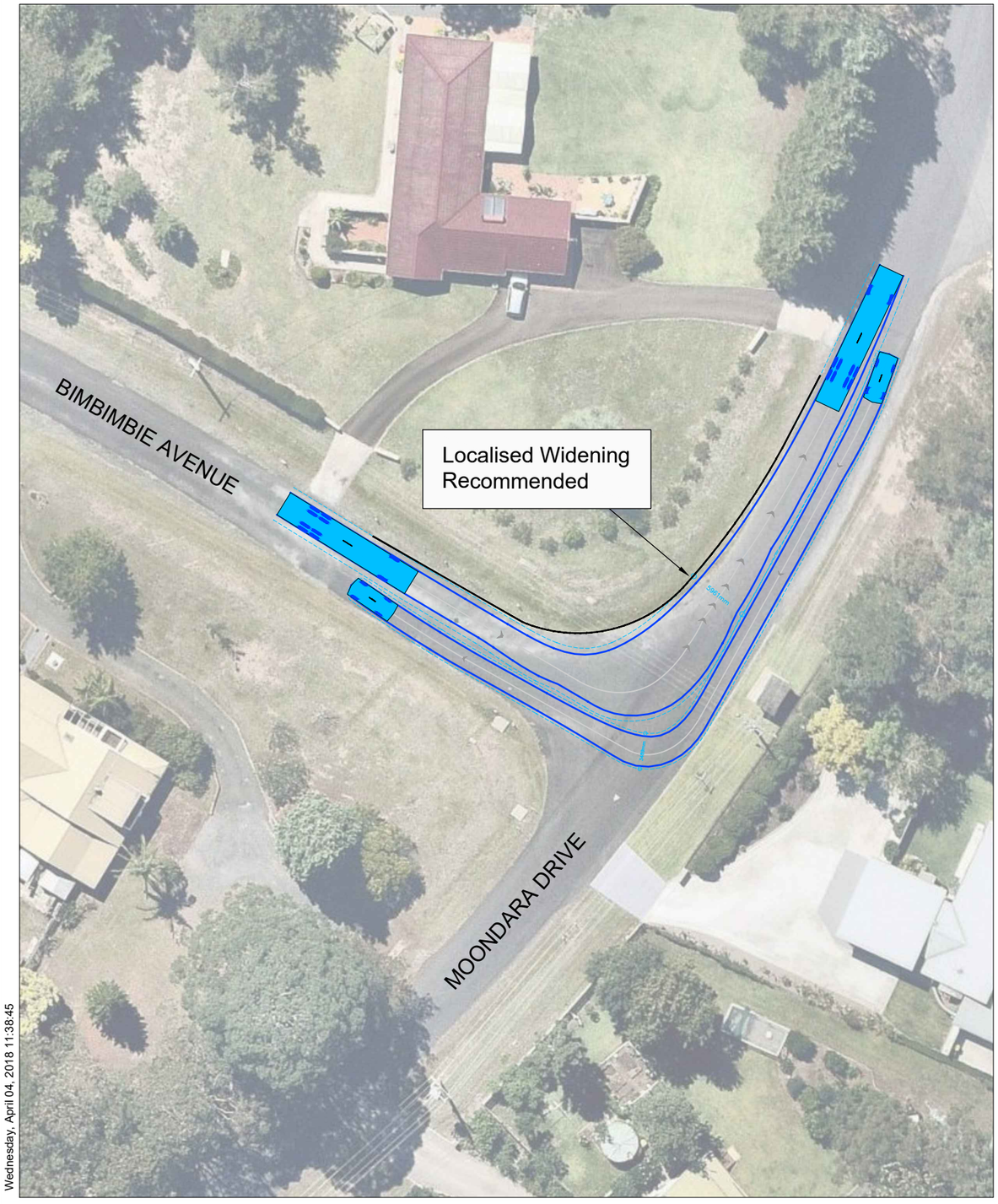
Swept Path Assessment - 14.5m Rigid Bus

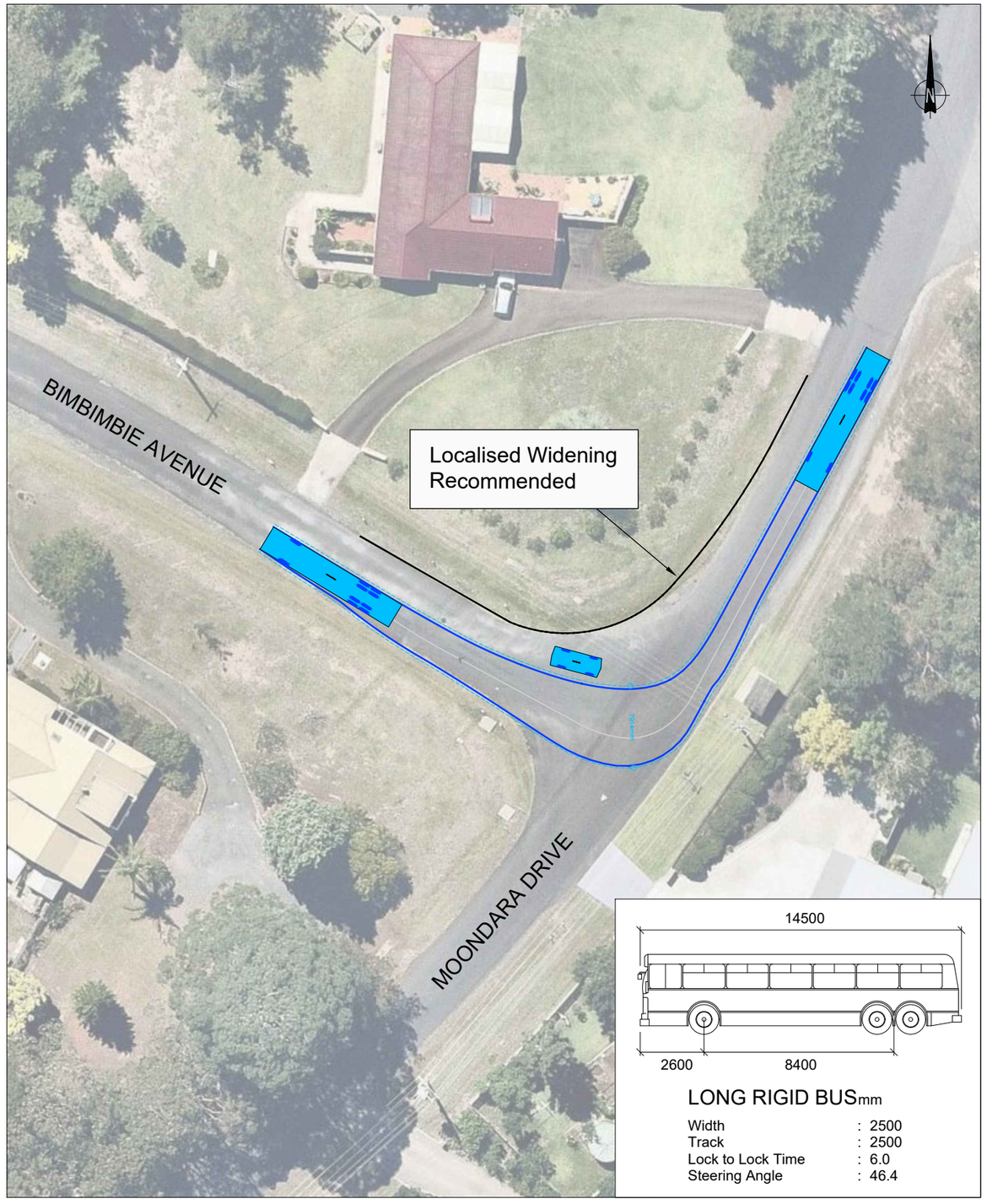
DRAWN: DA	---	---
DATE: 06/04/18	STATUS: ---	
SCALE: 1:500 @ A3		
DWG NO:15318-0S1A		

TDG

1

C:\Users\tdgshared\Dropbox (TDG)\Australia Business\Australia Jobs\15100\15138 - Traffic Assessment - Warrah Road, Bangalee - Shoalhaven CC\DWGs\TDG\15318-0S1A.dwg





Wednesday, April 04, 2018 11:38:45

REV	DATE	DRN	CHK	DESCRIPTION
00	17/04/18	TJG	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----

Warrah Road, Bangalee

Bimbimbie Avenue / Moondara Drive Intersection

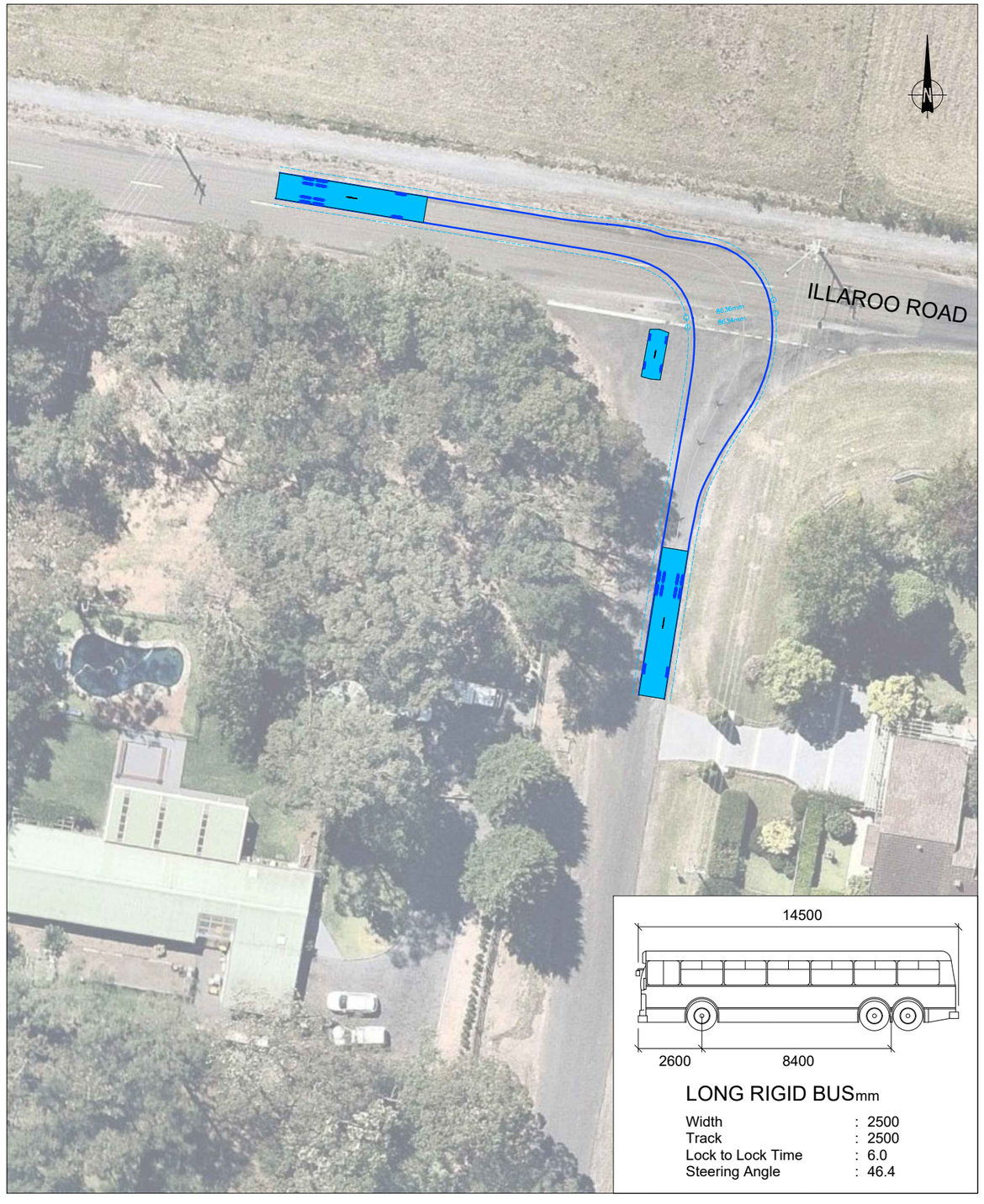
Swept Path Assessment - 14.5m Rigid Bus

DRAWN: DA	---	---
DATE: 17/04/18	STATUS: ---	
SCALE: 1:500 @ A3		
DWG NO:15318-0S1A		

TDG

2

C:\Users\tdgshared\Dropbox (TDG)\Australia Business\Australia Jobs\15100\15138 - Traffic Assessment - Warrah Road, Bangalee - Shoalhaven CC\DWGs\TDG\15318-0S1A.dwg



Wednesday, April 04, 2018 11:38:45

REV	DATE	DRN	CHK	DESCRIPTION
00	06/04/18	TJG	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----

Warrah Road, Bangalee

Illaroo Road / Moondara Drive Intersection

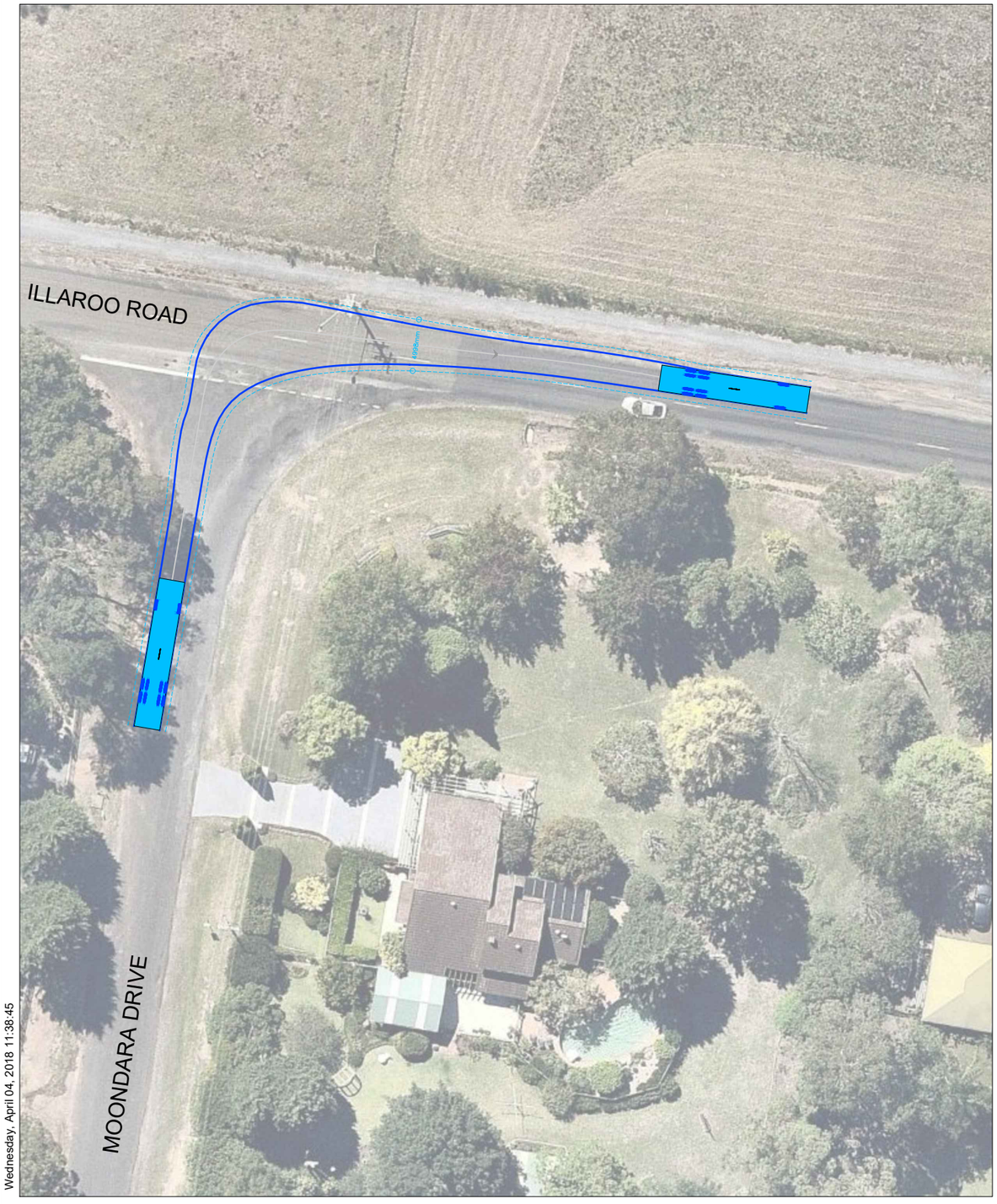
Swept Path Assessment - 14.5m Rigid Bus - West of Moondara Drive

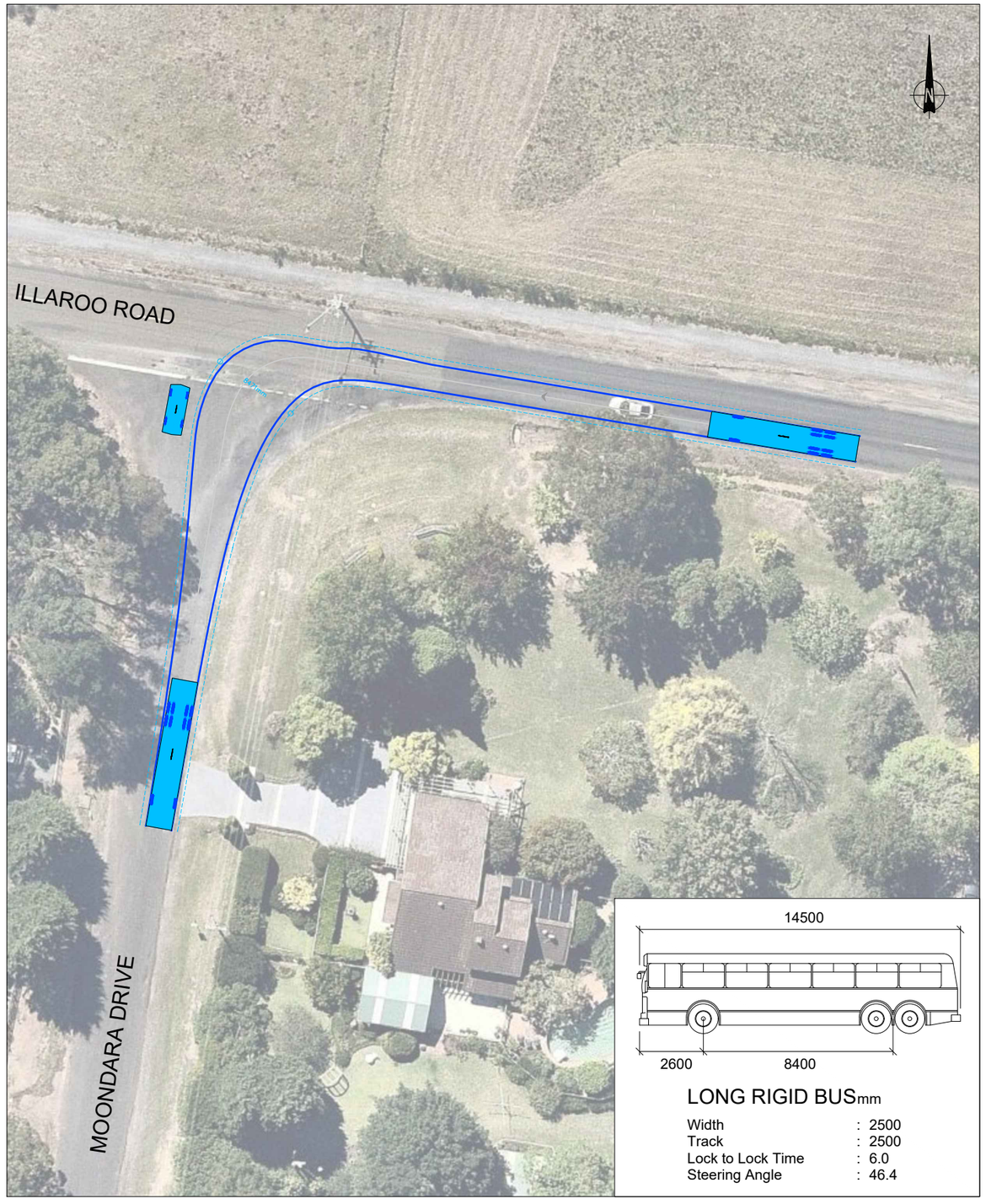
DRAWN: DA	---	---
DATE: 06/04/18	STATUS: ---	
SCALE: 1:500 @ A3		
DWG NO:15318-0S1A		

TDG

3

C:\Users\tdgshared\Dropbox (TDG)\Australia Business\Australia Jobs\15100\15138 - Traffic Assessment - Warrah Road, Bangalee - Shoalhaven CC\DWGs\TDG\15318-0S1A.dwg





Wednesday, April 04, 2018 11:38:45

REV	DATE	DRN	CHK	DESCRIPTION
00	06/04/18	TJG	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----
----	----	----	----	----

Warrah Road, Bangalee

Illaroo Road / Moondara Drive Intersection

Swept Path Assessment - 14.5m Rigid Bus - East of Moondara Drive

DRAWN: DA	---	---
DATE: 06/04/18	STATUS: ---	
SCALE: 1:500 @ A3		
DWG NO:15318-0S1A		

TDG

4

C:\Users\tdgshared\Dropbox (TDG)\Australia Business\Australia Jobs\15100\15138 - Traffic Assessment - Warrah Road, Bangalee - Shoalhaven CC\DWGs\TDG\15318-0S1A.dwg