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Lauren Connors
SENIOR PROJECT MANAGER
CARDNO

10 January 2018

Dear Lauren

Jacaranda Ponds - Glossodia: Traffic Statement

Jacaranda Ponds is a residential development site located off Spinks Road, Glossodia (the subject site) and is 185ha in size. The site was rezoned in December 2014, and the amended zoning approved for the site included a mix of RE1 Public Recreation, R2 Low Density Residential, R5 Large Lot Residential and SP2 Infrastructure. The approved development yield for the project was 580 residential lots, with associated roads and open space being delivered in support of the development.

Celestino are seeking an amendment to the land zoning of the subject site, to address ecological issues present at the site and to protect through land zoning amendments, existing ecological communities present at the site. The land zoning of the site will be refined to achieve this outcome while at the same time maintaining the overall residential yield for the project. The land zoning amendments will seek a different mix of RE1 Public Recreation, R2 Low Density Residential, E2 Environmental Conservation, R5 Large Lot Residential and SP2 Infrastructure across the site.

In March 2013, Arup prepared a Traffic and Transport Assessment in support of the rezoning of the Jacaranda Ponds site. This study recommended a suite of transport infrastructure improvements to support the proposed development. This included upgrades/improvements to the local road network in the vicinity of the site.

A traffic turning movement counts with vehicle classifications were undertaken in the morning and afternoon peak periods on Tuesday 5th of December 2017. In addition, seven-day bi-directional tube counts were also undertaken over the week commencing Monday 4th December 2017.

A comparison of the traffic volumes was undertaken between the previous survey (2012) and the survey conducted in December 2017. The comparison found the following:

- The traffic counts on Freemans Reach Road, Creek Ridge Road and Kurmond Road remained approximately the same between 2012 and 2017.
- The traffic counts on Spinks Road had slightly decreased between 2012 and 2017.
- Traffic volumes on local roads around the subject site had not significantly changed.

As such, it is assumed that the 2012 traffic counts remained valid for the traffic analysis. The traffic counts from 2012 and 2017 are appended to this report.

The proposed amendment to the land rezoning does not propose to alter the overall development yield initially envisaged in Arup's 2013 report. The proposed amendment will not generate any additional (or changed) traffic movements as a result of the project, and therefore will not result in any further impacts to that already considered. In this circumstance, the findings and recommendations of Arup's previous study for the site (from March 2013) remain unchanged. The report is attached for reference.

Please contact the undersigned should you have any queries.

Yours sincerely

Joshua Milston
Senior Transport Planner MIEAust CPEng

EJ Cooper & Son Pty Ltd

Jacaranda Ponds Glossodia

Traffic and Transport Assessment

0001-226722-R-05b

Issue-3 13 March 2013

Job number 226722

Arup
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Document Verification

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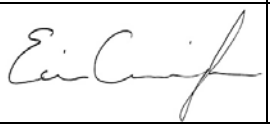
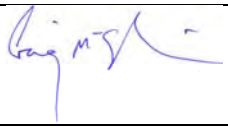
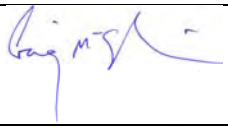
		Signature			
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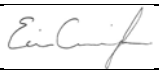
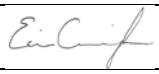
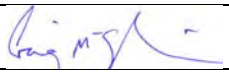
		Signature			
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1 Introduction

1.1 Background

This document reports on traffic and transportation issues related to the proposed 'Jacaranda Ponds' development rezoning of 185ha of land adjacent to Spinks Road, Glossodia for large lot residential and/or residential development.

Arup has previously provided a traffic impact assessment report for development on this land yielding 179 rural residential lots. As a result of the Council condition of approval for the provision of a centralised sewer system and the removal of chicken raising and egg production activities currently existing on the site, the proposal has since been revised to yield 580 residential lots.

1.2 Purpose and Scope

The revised rezoning proposal for the site has been submitted to Dept of Planning and Infrastructure (DPI) by Hawkesbury Council for a Gateway Determination. DPI has determined that the proposal should proceed subject to conditions in a Gateway Determination dated 27 July 2012.

The conditions of the determination include "an assessment of the traffic impact, in consultation with Roads and Maritime Services (RMS) regarding the impact of the proposal on peak performance of key intersections and bridge capacities at both Richmond and Windsor".

This report responds to this requirement through identifying the likely future access arrangements and travel patterns for rural residential traffic that would be generated by the revised development proposal, taking into account the existing road network constraints.

This includes investigating in detail the current morning and afternoon peak hour traffic at the following intersections providing access to the site:

- Bells Line of Road / Crooked Lane Intersection;
- Creek Ridge Road / Kurmond Road Intersection;
- Kurmond Road / Spinks Road Intersection;
- Kurmond Road / Wire Lane Intersection;
- Bells Line of Road / Terrace Road / Grose Vale Road Intersection; and
- Freemans Reach Road / Wilberforce Road Intersection.

The analysis uses the relevant traffic capacity standards for bridges and intersections to assess the traffic capacity and traffic congestion impacts of the proposed development at these locations.

Recommendations are provided for upgrades to roads and intersections of the local road network in order to provide for safe and efficient capacity for access to the site.

1.2.1 Cumulative Impacts – North Richmond Development

A separate (and unrelated) proposal has also been submitted to Hawkesbury Council for the development of approximately 1,400 homes in addition to a seniors living facility on 180ha of land at Grose Vale Road, North Richmond. This has also been given conditional approval through a DPI Gateway Determination. This separate development will also have impacts on the local road network of North Richmond. At the time of writing this report, a separate Transport Management and Access Plan (TMAP) for the North Richmond development was currently under preparation by others.

This Jacaranda Ponds report considers the cumulative impacts of the North Richmond development as well as the Jacaranda Ponds development.

2 Existing Conditions

2.1 Site Location and Context

The proposed Jacaranda Ponds rural residential land release is located on the southern edge of the existing rural settlement of Glossodia, approximately 32km by road from Penrith town centre, 38km from Blacktown town centre and 44km from Parramatta city centre. The location of the site in the wider context of these regional centres is shown in Figure 1.

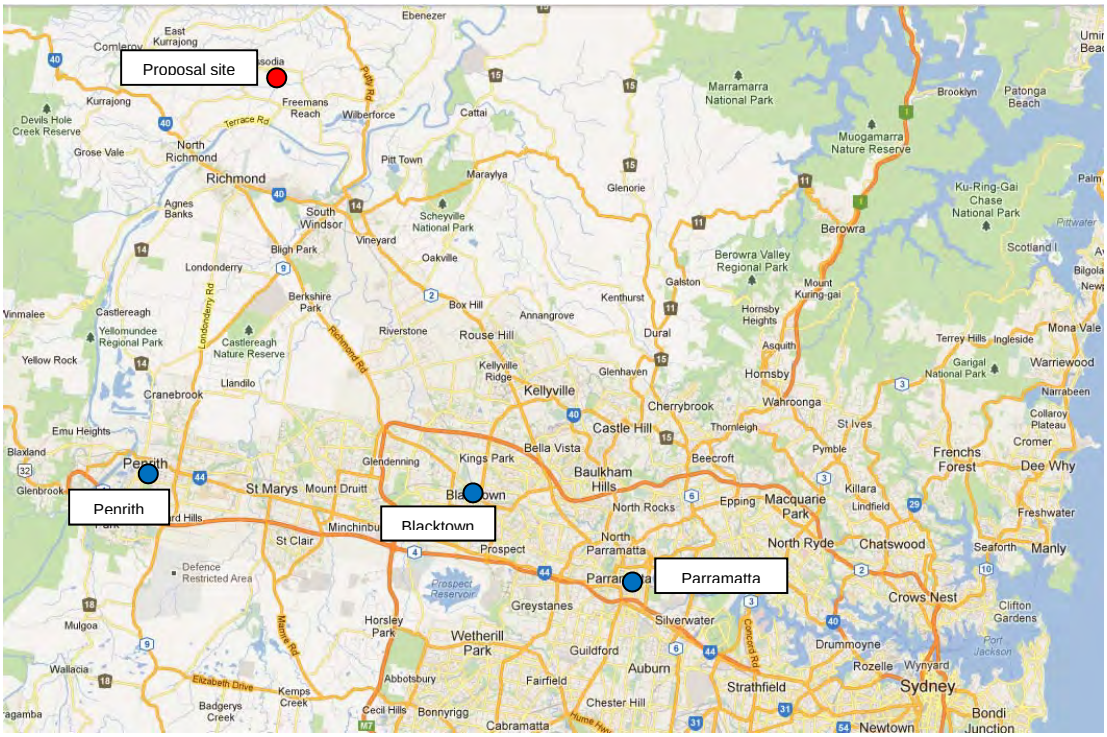


Figure 1. Site location

The site is approximately 11 kilometres by road from the township of Windsor, via the Windsor Bridge over the Hawkesbury River, and 12 kilometres from the township of Richmond via the North Richmond Bridge.

Glossodia is classified as a rural 'village' within the Hawkesbury LGA and is the second largest urban settlement within Hawkesbury north of the Hawkesbury River, behind North Richmond. Figure 2 shows the location of the Jacaranda Ponds site in the local context of Glossodia Village.

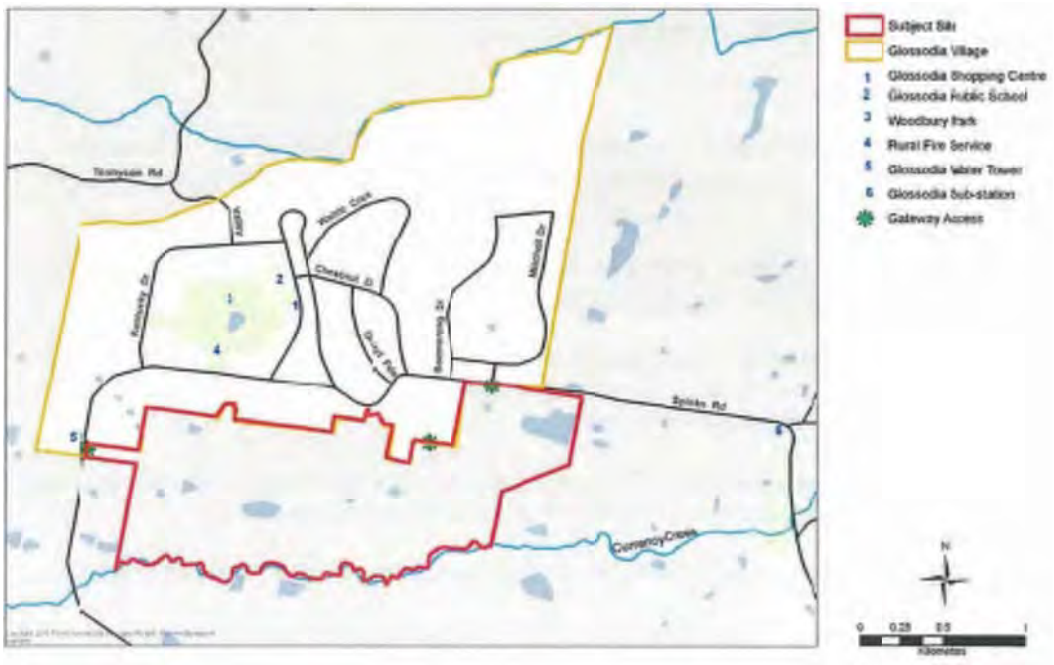


Figure 2. Local context map (Source: Urbis Planners)

Local retail and other services including a primary school are provided within the Glossodia village centre. There are also large primary and high schools at Freemans Reach, which is 2-3 kilometres away, and larger local school and shopping activities within the local township of North Richmond which is approximately eight kilometres away.

The subject site is shown at Figure 3. It is approximately 185 hectares and has proposed access to Spinks Road and two other intermediate locations potentially. The site is generally bounded by Currency Creek to the south.

Figure 3. Site area (Source: Hawkesbury City Council)

Up to 580 rural residential lots are proposed to be developed on the site. The existing free range egg farming sheds in the north western corner of the site will not remain in operation.

There are three existing road access points to the land, namely: a private access road to Pace's Farm from Kurmond Road, approximately 150 metres east of the Spinks Road and Wire Lane intersections and two further access points to Jacaranda Farm from James Street and Spinks Road. The existing private access road to Pace's farm will be utilised for construction and other access during the early stages of the development and will only be closed when the loop road is completed with the new western access to Spinks Road.

The future rural residential lots will mainly be accessed via a proposed loop road which will pass through the site connecting to Spinks Road at two locations, one about 1.5 kilometres north of Kurmond Road and the second about 2.5 kilometres further to the east.

2.2 Activity/Land-Use

The site is currently used for egg farming and grazing pasture and contains four houses. Its current vehicular traffic generation and vehicular servicing requirements are therefore relatively minor and are met by the existing private driveway access arrangements.

2.3 Site Accesses and Linkages

There are three primary routes providing road access to the site from key centres at Windsor, Richmond and the Sydney metropolitan area. These are shown below in Figure 4.

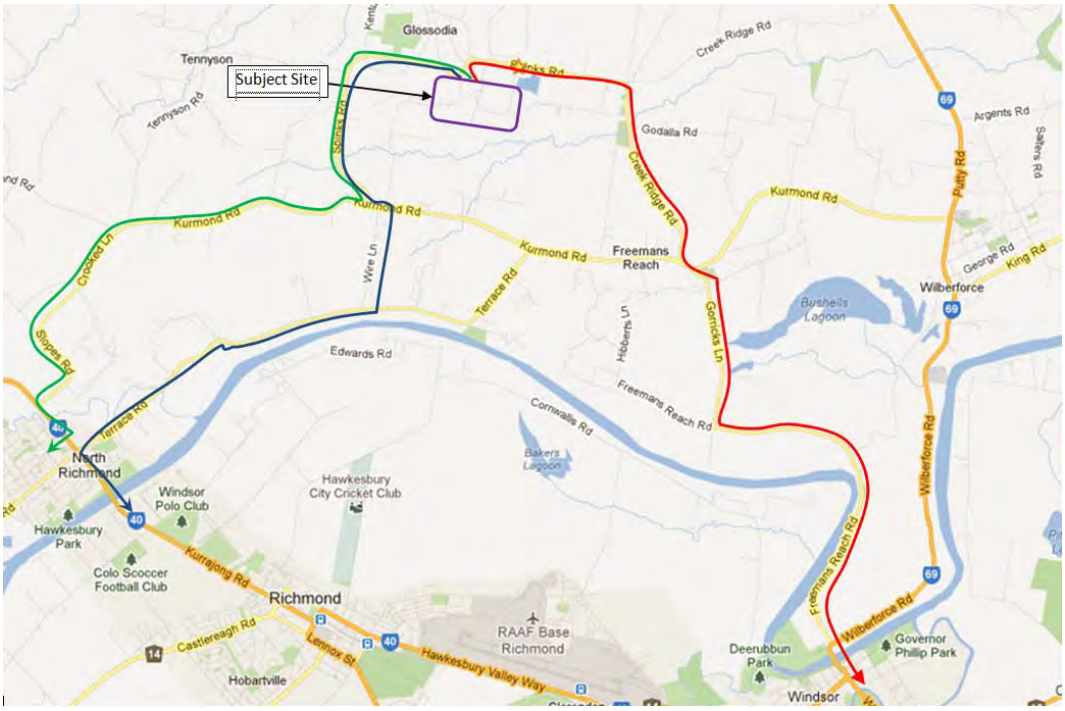


Figure 4. Key site access routes

The routes are:

1. To and from Windsor, via Creeks Ridge Road, Gorricks Lane, Freemans Reach Road, Wilberforce Road and the Windsor Bridge over the Hawkesbury River, illustrated on Figure 4 in red;
2. To and from the Richmond Town centre via Spinks Road, Wire Lane, Terrace Road, Bells Line of Road and the North Richmond Bridge over the Hawkesbury River, illustrated on Figure 4 in blue;
3. An alternative route for local traffic North Richmond via Spinks Road via Kurmond Road, Slopes Road and Crooked Lane and Bells Line of Road to reach North Richmond via the Charles Street intersection on Bells Line of Road. This is illustrated on Figure 4 in green.

Additionally, a small proportion of the future site traffic travelling to rural and regional destinations north east and north west of Sydney will use other routes via Kurrajong, East Kurrajong and Wilberforce and potentially the Sackville and Lower Portland Ferries.

2.4 Mode Share and Travel Distribution

The NSW Bureau of Transport Statistics (BTS) provides disaggregated analysis of the Journey to Work questions reported in the ABS Census to a fine level of geographical area called 'Transport Analysis Zones'. Figure 5 shows the BTS travel zone for Glossodia.

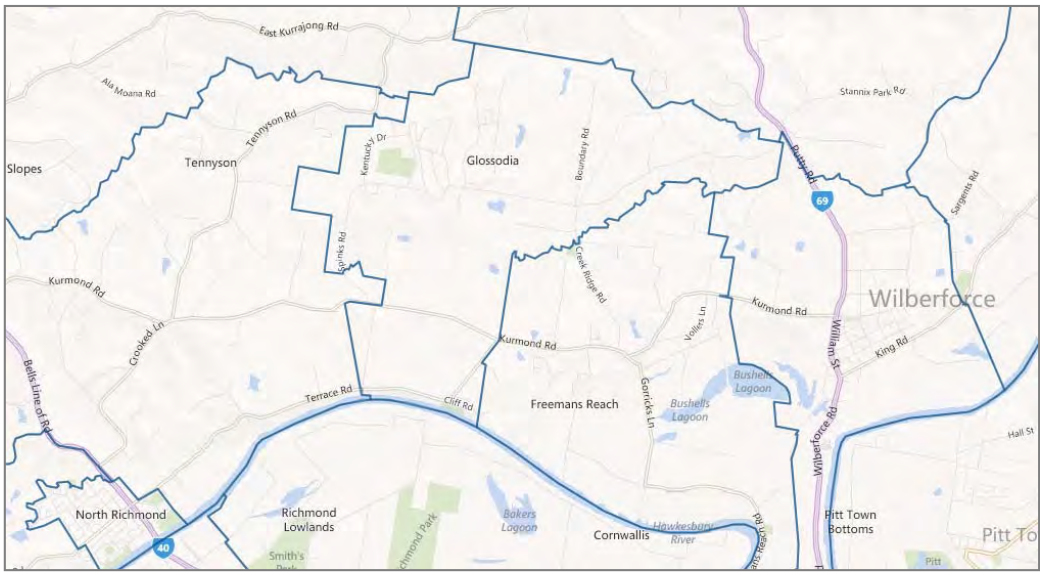


Figure 5. Bureau of Travel Statistics Glossodia Travel Zone
(Source: www.bts.nsw.gov.au)

The BTS data show the destinations and mode share of travel for the journey to work for residents living in this zone. Data from the 2011 Census have not yet been released by the Australian Bureau of Statistics (ABS) and data from the 2006 census are the most recent available.

2.4.1 Mode Share

Table 1 shows the proportions currently travelling by each travel mode from Glossodia (BTS zone no. 2028) from the 2006 census. These data exclude people who did not travel to work or did not state their mode of travel in the census data.

Table 1. Travel modes from 2006 census for Glossodia residents' journey to work

Mode of Travel	All persons	
	Number	%
Car as Driver (incl Truck and Motorbike)	1,790	89%
Car as Passenger	113	6%
Train	64	3%
Other Modes	44	2%
Total	**2,011**	**100%**

The level of public transport usage for journey to work travel from the Glossodia locality was relatively low in 2006, being 3% for bus and/or rail. A substantial proportion (16%) of the census respondents in Glossodia indicated that they worked at home or did not go to work on the census day. Excluding these people and non-respondents of the census, 95% of those persons who did travel to work travelled by car.

The dependence on car travel for the majority of residents' travel needs is unlikely to change significantly in either the short or medium term for existing or future residents of the Glossodia area, and their future traffic generation patterns should correspondingly be assessed on this basis.

2.4.2 Travel Distribution

The directional distribution of traffic generated by the proposed development during the main morning and afternoon commuter peak traffic periods will effectively be dominated by journey to work travel. An assessment was made of the distributional patterns of journey to work traffic generated from the Glossodia travel zone as reported in the 2006 census, in order to provide a basis for understanding the likely patterns that will be generated by the Jacaranda Ponds development.

Figure 6 and Figure 7, derived from the BTS data, show the destinations of travellers departing from the Glossodia travel zone as reported in the 2006 census.

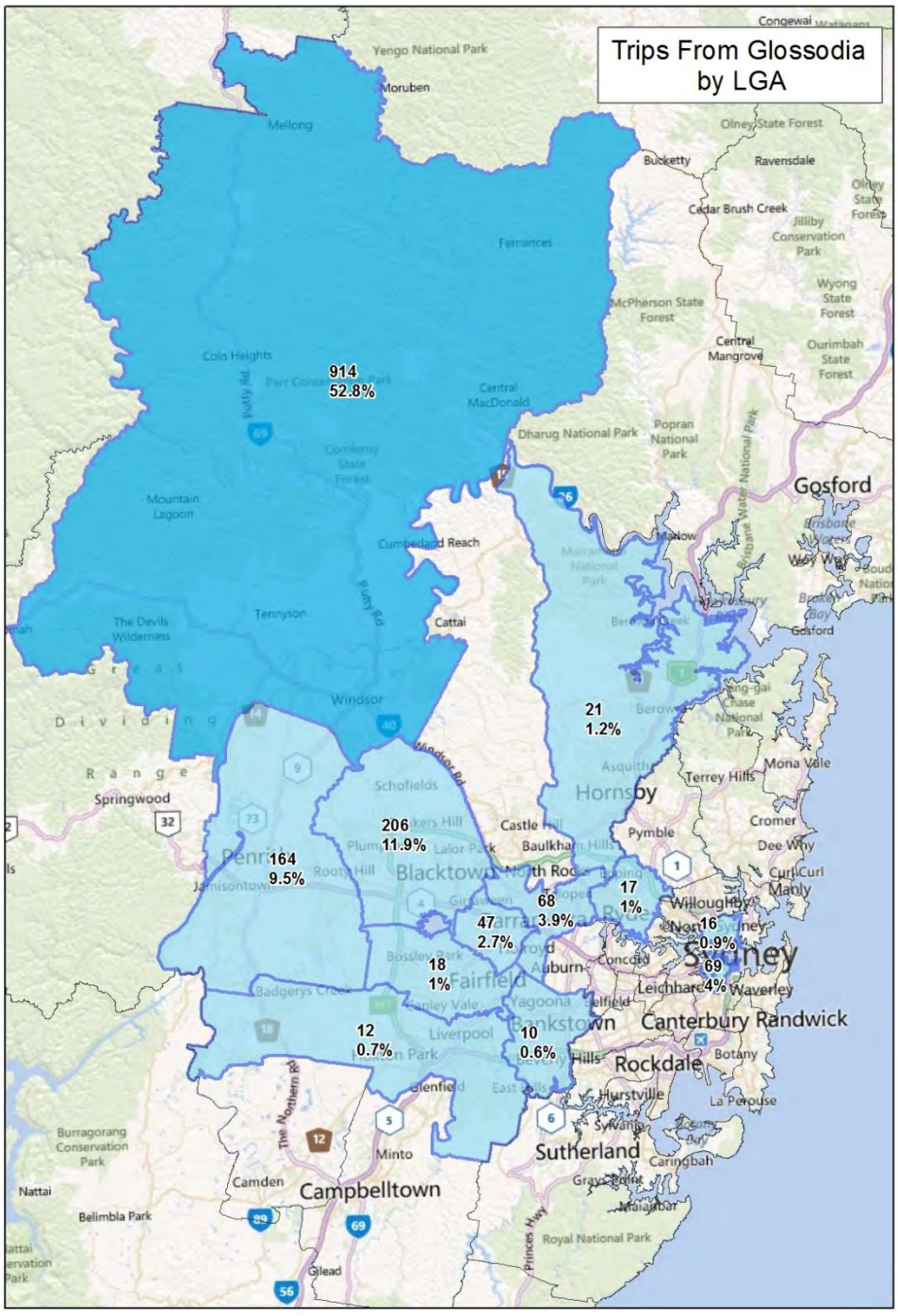


Figure 6. LGA destinations of journey to work trips from Glossodia, 2006 census

Figure 6 shows that just over half of journey to work trips departing from Glossodia had destinations within the Hawkesbury Local Government Area (LGA). Other key destinations were Blacktown and Penrith LGAs.

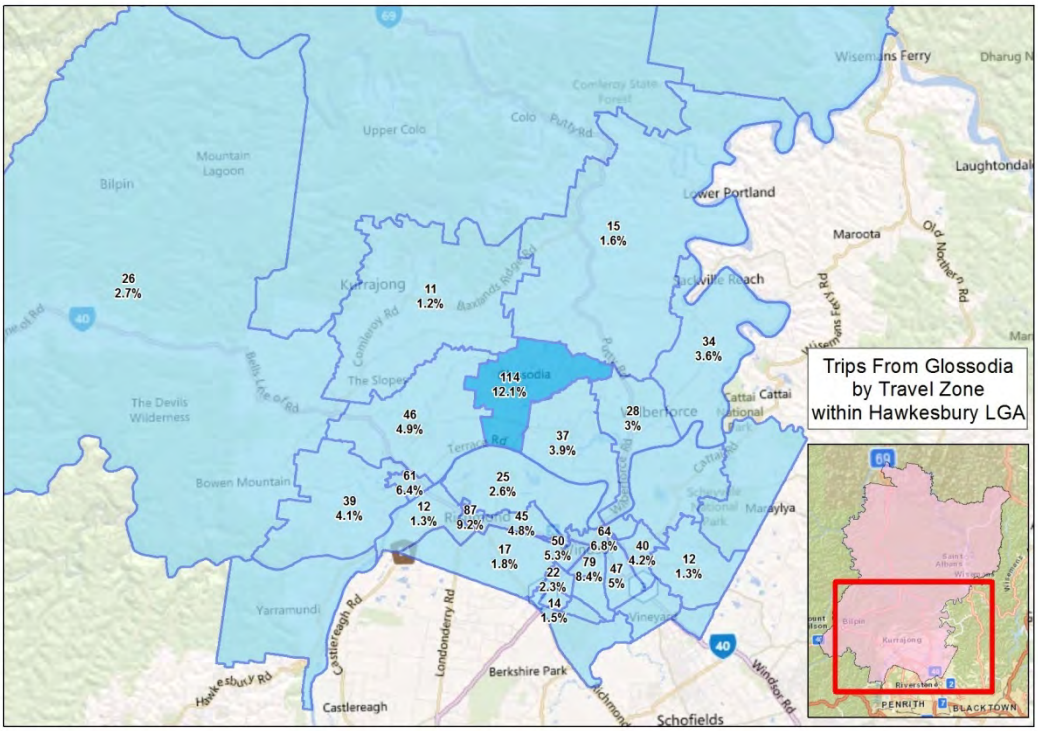


Figure 7. Destination of trips from Glossodia with destinations in Hawkesbury LGA, 2006 census.

Figure 7 shows that a substantial proportion (114 trips or 12%) of journey to work trips from Glossodia were local, i.e. having destinations within Glossodia itself. Travel to other destinations within Hawkesbury was distributed across all parts of the LGA. Other key destinations within the LGA were Richmond (9%), North Richmond (6%), Windsor (7%) and the South Windsor Industrial Area (8%).

2.5 Local Road Network

Kurmond Road, Spinks Road, Wire Lane, Terrace Road, Freemans Reach Road and Crooked Lane are the main local roads which will distribute site traffic travelling between Glossodia and the regional road network. The local road network and key intersections providing access for the site is shown at Figure 8.

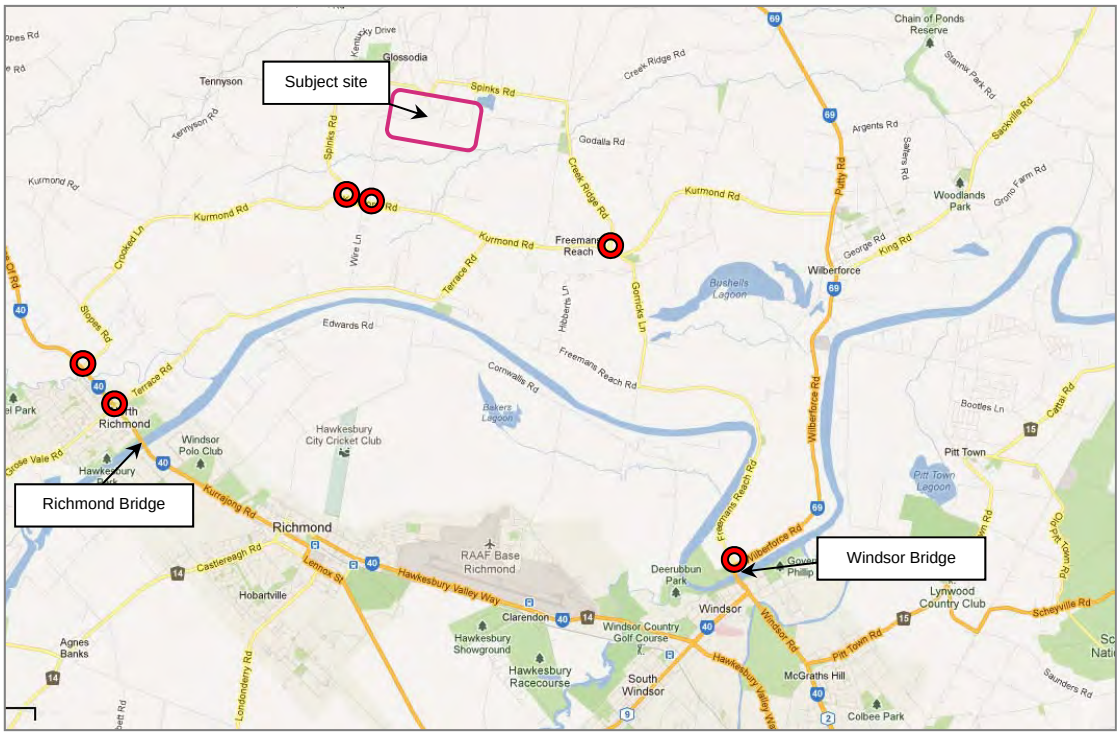


Figure 8. Local road network and key intersections

The main local rural roads in the Glossodia and Freemans Reach areas are:

- Kurmond Road;
- Crooked Lane – Maddens Road – Slopes Road;
- Wire Lane;
- Terrace Road ;
- Creek Ridge Road; and,
- Freemans Reach Road.

These roads are all relatively lightly trafficked and are demonstrated in this report not to require significant capacity improvements to carry the likely additional traffic to and from the proposed development on the subject land.

Spinks Road is the main local distributor road through Glossodia and providing access to the subject site. Many local sections of this road already have urban standard kerb and gutter and are in a relatively good condition.

The key intersections providing access to the subject site and shown in Figure 8 are:

- Freemans Reach Road / Wilberforce Road;
- Grose Vale Road / Terrace Road / Bells Line of Road;
- Crooked Lane / Bells Line of Road;
- Creek Ridge Road / Kurmond Road;
- Kurmond Road / Spinks Road;
- Kurmond Road / Wire Lane.

2.6 Bridges

Access for the site from Richmond, Windsor and metropolitan Sydney is via two key bridges crossing the Hawkesbury River, being the Windsor Bridge and the Richmond Bridge.

2.6.1 Windsor Bridge

The Windsor Bridge is a narrow two lane bridge. The original bridge was built in 1874 and the bridge deck was subsequently raised and reconstructed in 1896/7. Figure 9 shows the existing bridge.

Figure 9. Windsor Bridge

In terms of current road design standards, the narrow bridge lane width of 3.0 metres in each direction, with no trafficable road shoulders, requires all wider and heavier vehicles to negotiate the bridge with caution.

This limited width has an effect in reducing the overall traffic capacity of this bridge in comparison to a wider, more contemporary 2 lane bridge design.

RMS has commenced public consultation for the construction of a replacement bridge at Windsor to a higher flood level. In June 2008, the NSW Government announced that it had committed $25 million to the project. It is currently planned to demolish the existing bridge and construct a new bridge to the east of the existing bridge, connecting to and realigning with the intersection of Freemans Reach Road and Wilberforce Road. The bridge deck will initially be marked with one traffic lane in each direction, but will be constructed with sufficient width to accommodate three lanes, allowing for two lanes to operate in the peak direction of travel in morning and afternoon traffic peak periods. The concept plan exhibited by RMS is shown at Figure 10.

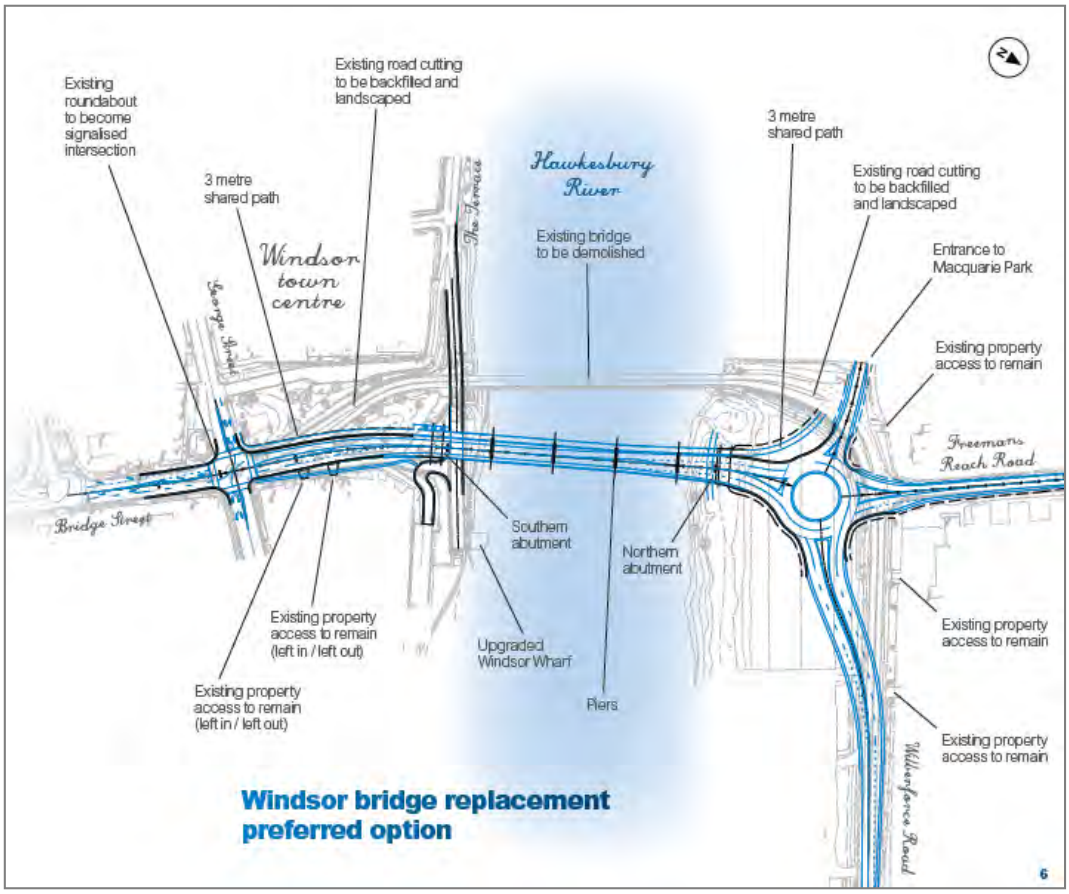


Figure 10. Windsor Bridge replacement concept plan
(Source: RMS Community Update)

A new bridge at this location, with wider traffic lanes and road shoulders, would increase the peak period traffic capacity of the bridge by 20-30% approximately in comparison to the existing bridge, and would also provide improved flood free access to the Freemans Reach, Wilberforce and Glossodia areas.

The statutory requirements for the Jacaranda Ponds development are that the proponent contributes an amount of $30,000 per lot for infrastructure development in Hawkesbury City Council. The proponents of the Jacaranda Ponds development have undertaken to contribute an additional amount of $10,000 per lot, over and above the statutory requirement of $30,000 per lot, for

further development of transport infrastructure supporting access to the development site. This will result in an additional contribution fund of $5,800,000 being available for local infrastructure works.

A desirable application of these additional funds is to facilitate the development of the Windsor Bridge replacement project to enable the operation of the bridge as three lanes. In particular, the additional funds put forward by the proponent could desirably be directed towards improvements and signalisation of the George St/Bridge St roundabout in Windsor town centre which is necessary to facilitate operation of the bridge as three lanes.

2.6.2 Richmond Bridge

The Richmond Bridge (Figure 11) was originally built in 1905 and was widened in 1926 to carry the Railway Line extension to Kurrajong until 1952. The wider bridge lane of 3.7 metres give this bridge a higher traffic carrying capacity in comparison to the narrower Windsor Bridge.

Figure 11. Richmond Bridge

Richmond Bridge and its approach roads are congested during morning and afternoon peak traffic periods. In April 2011, the Australian Government allocated $2 million to investigate the bridge and adjoining approach roads from Grose Vale Road to East Market Street.

2.6.3 Richmond Bridge and Approaches Congestion Study

RMS is currently investigating options for short and long term measures to improve traffic flow between Richmond and North Richmond. RMS is working with Hawkesbury City Council and has engaged consultants to carry out traffic modelling for the project area incorporating Richmond Bridge, approaches and associated roads, in order to identify potential solutions to the current traffic congestion[1]. Figure 12 shows the study area for this investigation.

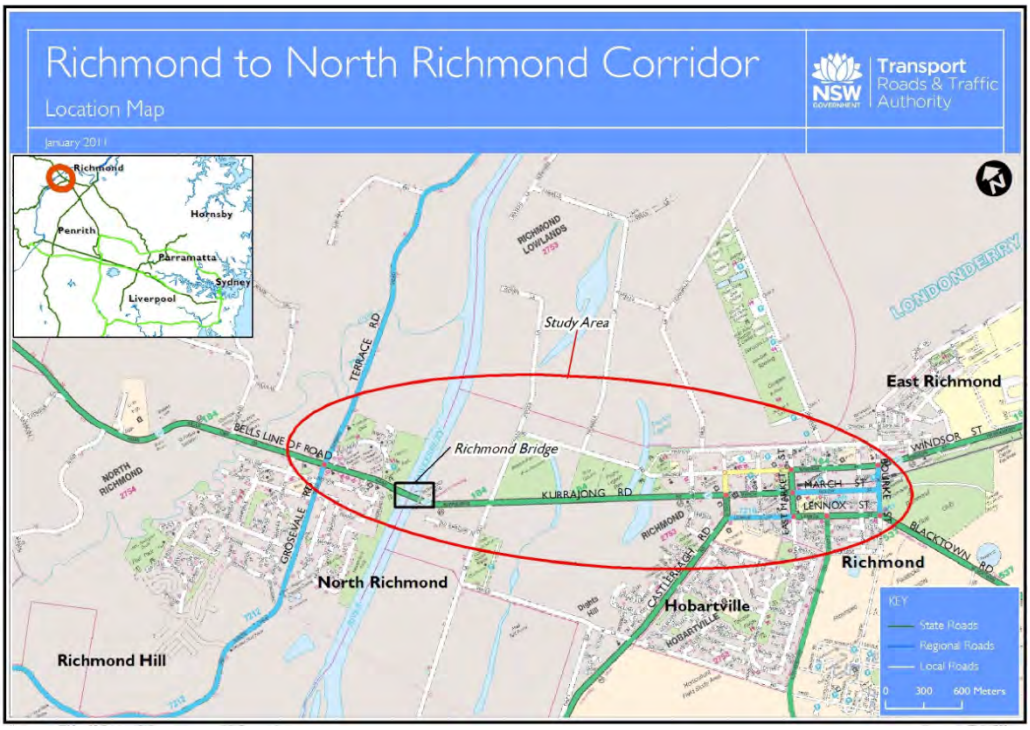


Figure 12. Study area for Richmond Bridge and Approaches Congestion Study (Source: RMS)

The study area includes the key intersection of Grose Vale Rd/Terrace Rd/Bells Line of Road. This signalised intersection is congested in peak periods and is a critical access point for all traffic to and through North Richmond.

The study is being undertaken in two stages, and at the time of writing the Stage 1 Report was available. The first stage of the investigation included:

- an appraisal by RMS of the condition of the existing Richmond Bridge, together with reporting of its analysis of two options for future development of the bridge, i.e. the three lane augmentation announced by Minister Albanese and an alternative four lane option;
- a detailed assessment by Hyder Consulting Pty Ltd (Hyder) of current traffic conditions in the area of the bridge and options for addressing congestion,

1 http://www.rta.nsw.gov.au/roadprojects/projects/sydney_region/outer_west_blue_mtns/richmond_bridge/index.html, accessed 20 September 2012

providing a recommended short and medium-term solution to relieve traffic congestion both on the bridge and in the local area.

Whilst the work undertaken by Hyder underlines the necessity of undertaking intersection improvements to relieve traffic congestion, it is also recommended that planning for future bridge expansion is required.

The Stage 1 Study Report identifies that the Richmond bridge is approaching capacity. However, congestion on the route is identified primarily to occur as a result of bottlenecks caused by capacity constraints at intersections surrounding the bridge.

The Hyder study assessed 10 options to ameliorate congestion in the corridor, consisting of variations of amendments to the following intersections:

- Kurrajong Road/ Bosworth Road intersection;
- Bells Line of Road / Gross Vale Road intersection; and
- Kurrajong Road / Yarramundi Lane intersection.

The preferred option of the study, 'Option H', recommends a set of intersection improvements over the next five years (to 2016) as the short term solution to congestion on the network. The works recommended in Option H at the Bells Line of Road/Grose Vale Road/Terrace Road intersection are shown in Table 2. The recommended works at the three intersections above are shown in Figure 13.

Table 2. Works Recommended to Bells Line of Road/Grose Vale Road/Terrace Road intersection – 'Option H'

Bells Line of Road/ Grose Vale Road intersection	
1	Provision of a westbound shared through/left turn lane on Bells Line of Road, east of Grose Vale Road replacing the existing left turn lane
2	Provision of an additional westbound short through lane on Bells Line of Road, west of Grose Vale Road
3	Provision of a clearway during peak periods between Pitt Lane and Grose Vale Road
4	Banning of eastbound right turns from Bells Line of Road into Grose Vale Road
5	Conversion of the existing eastbound right-turn bay to a second westbound through lane
6	Extension of the eastbound merge (east of Grose Vale Road intersection)

Source: Hyder Consulting

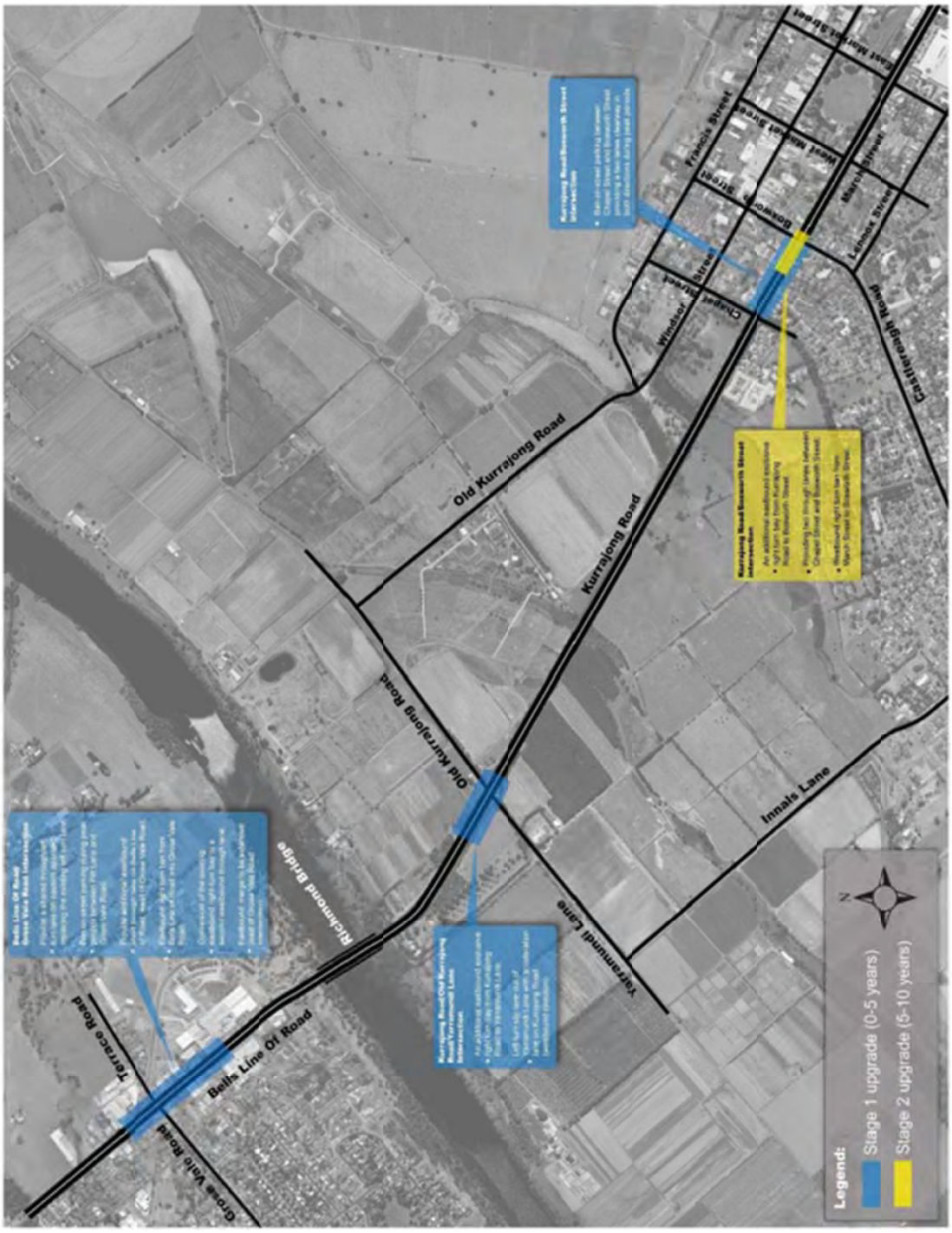


Figure 13. Recommended Works and Staging for Richmond Bridge Corridor
Source: Hyder Consulting

The recommended works include modifications to the Bells Line of Road/Grose Vale Road/Terrace Road intersection to ban the right turn from Bells Line of Road south/east-bound and conversion of the turn bay to a westbound through lane. These works have been considered/included in the scenarios of this report assessing development traffic associated with the Jacaranda Ponds development.

2.7 Public Transport

The Richmond Rail Line service provides a train services to the Sydney CBD and other major destinations along the route e.g. Blacktown and Parramatta. Connecting bus services or car travel, enable passengers to catch trains at either Richmond or Windsor stations. On average the travel time for trains between Richmond and Central Station is about 1 hour 25 minutes.

There is only one regular scheduled public bus route currently operating in the Glossodia area (Route 668) as shown in Figure 14.

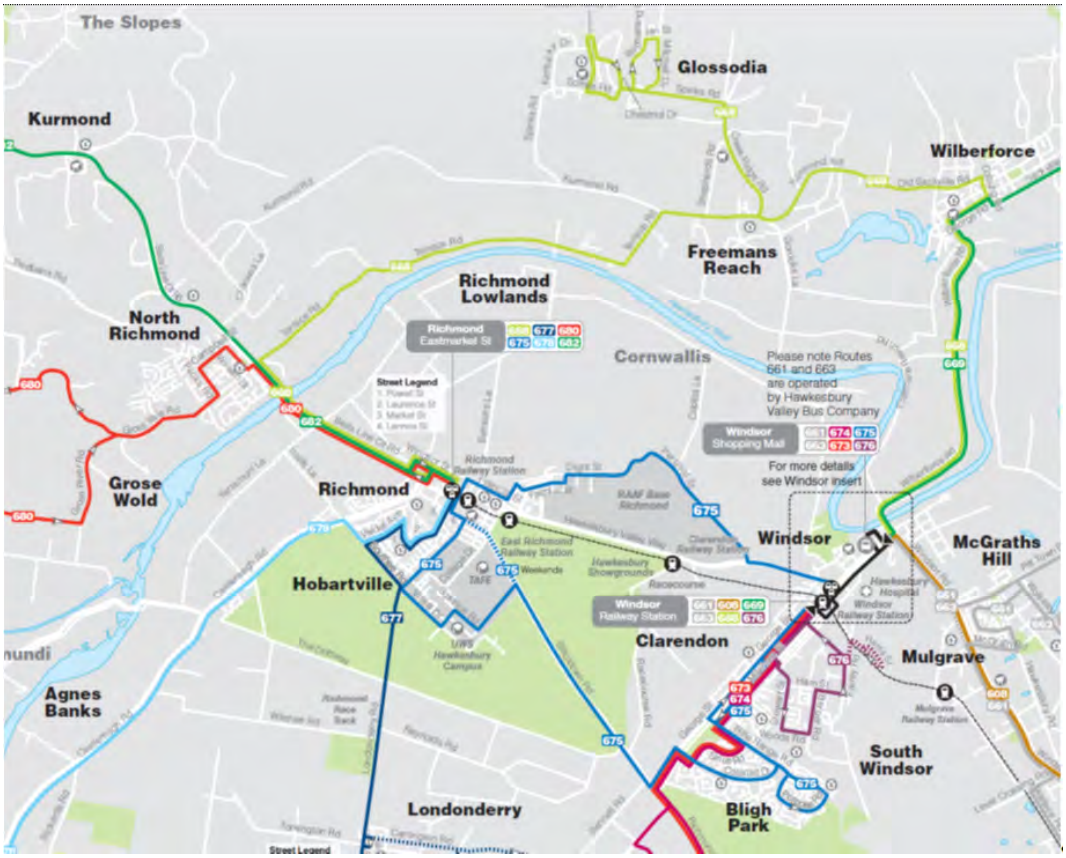


Figure 14. Local bus route network

Bus services are relatively infrequent and do not provide significant daytime travel options for persons who need to travel outside the peak hours. A summary of the services is as follows:

Daily Bus Trips From Windsor to Richmond via Glossodia:

- 10 buses per day Monday to Friday (6 travel from Windsor to Glossodia only);
- 2 buses per day on Saturdays (from Glossodia only);
- 1 bus on Sundays (from Glossodia only).

Daily Bus Trips From Richmond to Windsor via Glossodia:

- 11 buses per day Monday to Friday (7 travel from Glossodia to Windsor only);
- 2 buses per day on Saturdays (to Glossodia only);
- 1 bus on Sundays (to Glossodia only).

2.8 Traffic Data Collection

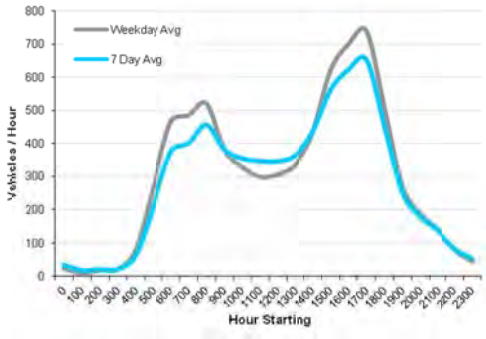
Traffic turning movement counts with vehicle classifications were undertaken in the morning and afternoon peak periods on Wednesday 29th of August 2012 at:

- Kurmond Road and Creek Ridge Road;
- Kurmond Road and Wire Lane; and,
- Kurmond Road and Spinks Road.

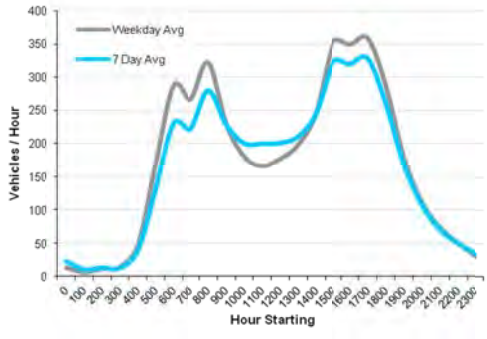
Seven day bi-directional tube counts were also undertaken over the week commencing 27th August 2012 at:

- Freemans Reach Road north of Wilberforce Road;
- Spinks Road north of Kurmond Road;
- Kurmond Road west of Shepherds Road; and,
- Creek Ridge Road north of Kurmond Road.

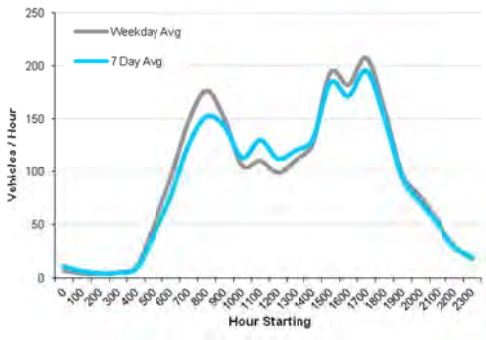
Figure 15 shows the all-week and average weekday distribution of two-way traffic recorded at these sites.



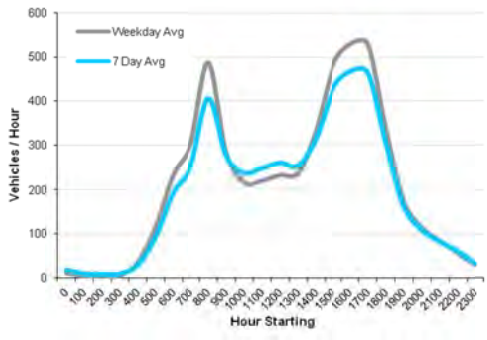
Freemans Reach Rd N of Wilberforce Rd



Creek Ridge Rd N of Kurmond Rd



Spinks Rd N of Kurmond Rd



Kurmond Rd W of Shepherds Rd

Figure 15. Daily distribution of traffic, key local roads surrounding Jacaranda Ponds site

Traffic volumes on local roads around the subject site are generally quite moderate, with the PM peak having higher than the AM peak.

In addition, classified turning movement counts were carried out on 23rd February 2010 at the following intersections as part of Arup's work for the previous application for the subject site:

- Bells Line of Road and Terrace Road;
- Wilberforce Road and Freemans Reach Road; and,
- Crooked Lane and Bells Line of Road.

A comparison of the traffic volumes was undertaken between the 2010 count locations and the nearby 2012 count locations. The comparison found that traffic counts on Freemans Reach Road had decreased or remained approximately the same between 2010 and 2012. As such, it is assumed that the 2010 traffic counts remained valid for the traffic analysis.

The outputs of the traffic data collection are included at **Appendix A** of this report. These results were used to analyse the performance of these intersections in peak hours using the intersection computer simulation model SIDRA.

2.9 Road and Bridge Capacity

The traffic capacity of roads and bridges providing access to the subject site was assessed using criteria from the Austroads *Guide to Traffic Management – Part 3*, which provides guidance to calculate the capacity of two-lane two-way traffic facilities in rural environments and sections of single lanes of roadway.

The capacity of two-way carriageways and single traffic lanes is affected by factors including pavement width, lateral clearances, the presence of heavy vehicles and grades.

The two-way capacity of a two-lane two-way road in a rural environment is given by its service flow rate at level of service E. The service flow rate at any level of service is calculated as:

$$SF_i = 2800 \cdot (v/c)_i \cdot f_d \cdot f_w \cdot f_{HV}$$

where:

- $(v/c)_i$ is the maximum volume/capacity ratio which can be accommodated at level of service i for a given terrain and percent of length with no overtaking;
- f_d = adjustment factor for directional distribution of traffic;
- f_w = adjustment factor for narrow lanes and shoulders;
- f_{HV} = adjustment facor for heavy vehicles, given by:

$$f_{HV} = 1/[1 + P_T(E_T - 1) + P_B(E_B - 1)]$$

with:

P_T & P_B = the proportion of trucks and buses respectively in the traffic stream;

E_T & E_B = the average passenger car equivalents for trucks and buses.

The capacity of a length of a single traffic lane for the prevailing roadway and traffic conditions is given in the Austroads Guide by the following equation:

$$C = 1{,}800\ f_w\ f_{hv}$$

where:

- C = capacity in vehicles per hour under prevailing roadway and traffic conditions;
- f_w = adjustment factor for narrow lanes and lateral clearances;
- f_{hv} = adjustment factor for heavy vehicles, given by:

  $$f_{hv} = 1 / (1 + P_{hv}(E_{hv} - 1))$$

  with:

  P_{hv} = proportion of heavy vehicles in the traffic stream

  E_{hv} = the average passenger car equivalents for heavy vehicles.

The peak hourly capacity of two-lane two-way roads providing access to the Jacaranda Ponds site was calculated using the formula for two-lane roads in rural environments, and the capacity of Richmond and Windsor Bridges was estimated using the forumula for sections of single directional lanes. The outcomes of this analysis are shown in Table 3 and Table 4. The tables also show observed peak hour traffic volumes on these roads/bridges and the existing situation volume-to-capacity or v/c ratios.

Table 3. Road capacity and volume for two-lane two-way roads providing access for Jacaranda Ponds.

Location	***i***	***Peak period***	$(v/c)_i$	***Directional split***	f_d	f_w	P_T	E_T	P_B	E_B	f_{HV}	SF_E - 2W	***2W Observed Volume***	***2W Volume / capacity***
Freemans Reach Road N of Wilberforce Road	LOS E	AM	1.0	80/20	0.83	0.88	7%	2.0	0%	1.6	0.9	1,911	576	0.30
		PM		70/30	0.89	0.88	5%	2.0	0%	1.6	1.0	2,089	695	0.33
Spinks Road N of Kurmond Road	LOS E	AM	1.0	80/20	0.83	0.88	2%	2.0	0%	1.6	1.0	2,005	397	0.20
		PM		60/40	0.94	0.88	5%	2.0	0%	1.6	1.0	2,206	539	0.24
Kurmond Road W of Shepherds Road	LOS E	AM	1.0	60/40	0.94	0.88	6%	2.0	0%	1.6	0.9	2,185	488	0.22
		PM		75/25	0.86	0.88	5%	2.0	0%	1.6	1.0	2,018	530	0.26
Creek Ridge Road N of Kurmond Road	LOS E	AM	1.0	75/25	0.86	0.88	5%	2.0	0%	1.6	1.0	2,018	322	0.16
		PM		70/30	0.89	0.88	5%	2.0	0%	1.6	1.0	2,089	351	0.17
Wire Lane S of Kurmond Road	LOS E	AM	1.0	80/20	0.83	0.88	7%	2.0	0%	1.6	0.9	1,911	346	0.18
		PM		60/40	0.94	0.88	4%	2.0	0%	1.6	1.0	2,227	512	0.23
Terrace Road N of Grose Vale Road	LOS E	AM	1.0	60/40	0.94	0.88	2%	2.0	0%	1.6	1.0	2,271	526	0.23
		PM		65/55	0.97	0.88	2%	2.0	0%	1.6	1.0	2,343	660	0.28

Table 4. Road capacity and volume for directional lanes on Richmond and Windsor Bridges.

Location	f_w	E_{hv}	***Peak period***	P_{hv}	E_{hv}	f_{HV}	***C (veh/lane/hr)***	***Avg. weekday directional peak hour observed volume‡***		***Avg. weekday directional peak hour v/c ratio***	
								NB/EB	*SB/WB*	*NB/EB*	*SB/WB*
Richmond Bridge	0.8	2.0	AM	2%	2.0	0.98	1,410	1,537†	635†	**1.09**	0.45
			PM	2%	2.0	0.98	1,410	917†	1,333†	0.65	**0.95**
Windsor Bridge	0.8	2.0	AM	3%	2.0	0.97	1,400	344	1,173	0.25	**0.84**
			PM	5%	2.0	0.95	1,370	1,296	468	**0.95**	0.34

† Source: RMS Richmond Bridge and Approaches Congestion Study Stage 1 Report, Appendix 3: Traffic Analysis Report Volume 1

The results in Table 3 and and Table 4 show that the local road network surrounding the Jacaranda Ponds site is currently carrying relatively low traffic volumes and has substantial spare capacity in peak hours. On the primary access route for the site, Creek Ridge Road is carrying less than 20% of its directional midblock capacity in peak hours, and Freemans Reach Road is carrying less than 40% of its directional capacity in peak hours.

The Richmond and Windsor Bridges are operating at close to capacity in peak travel directions in the morning and afternoon peak periods and do not have substantial available capacity for additional traffic. The RMS Richmond Bridge and Approaches Congestion Study and the RMS Windsor Bridge Replacement Project are assessing options to upgrade the capacity of these bridges. The traffic analysis of the RMS Richmond Bridge and Approaches Congestion Study found that found that proposed improvements that could be undertaken over the next five years would maintain an acceptable level of service to key intersections including Richmond Bridge over the period of the next 10 years without the need for widening of the bridge[2].

As discussed in Section 2.6.1 the proponent of the development has indicated it is prepared to provide an amount of up to $5.8 million in additional funds to facilitate the development of the Windsor Bridge replacement project to enable the operation of the bridge as three lanes, potentially for improvements and signalisation of the George St/Bridge St roundabout in Windsor town centre which is necessary to facilitate operation of the bridge as three lanes.

2.9.1 Environmental Capacity and Application of Development Contributions

The capacity of a road may be measured by its theoretical lane traffic carrying capacity but also by its ‘environmental capacity’, which is the capacity of a street or area to accommodate moving and parked vehicles having regard to the need to maintain environmental standards.

While local roads providing access to the Jacaranda Ponds development can be demonstrated to exhibit sufficient traffic carrying capacity, some have inconsistent treatments or are showing minor deterioration and could be imporoved to provide a greater amenity and safety environment for residents of Jacaranda Ponds and Glossodia.

Figure 16 shows the cross section of Spinks Road travelling towards Creek Ridge Road away from the Jacaranda Ponds site. This will be a key access route for the development. Note from the figure that the carriageway is not of a uniform seal width and the shoulders are not sealed.

[2] Richmond Bridge and Approaches Congestion Study, Traffic Analysis Report Volume 1, March 2012

Figure 16. Spinks Road travelling eastbound towards Creek Ridge Road

While the cross section of Spinks Road offers sufficient theoretical lane traffic capacity for the Jacaranda Ponds development, the amenity and environmental standard of this road and other roads providing access to the site will be significantly enhanced by upgrading to a consistent standard, which is recommended to be a sealed carriageway of 9m width, including sealed shoulders.

The Jacaranda Ponds development will result in contributions of $30,000 per lot, resulting in a total contribution of $17,400,000 for the total 580 lots, which may be applied to local infrastructure within Hawkesbury Council. It is strongly recommended that these contributions be applied as much as possible to upgrading the local road network of Jacaranda Ponds and Glossodia.

Hawkesbury Council has suggested a set of road improvement works that could be undertaken in the local network of Glossodia and Jacaranda Ponds that will enhance environment and amenity. These works are shown at **Appendix B**.

In general, it is recommended that most, but not necessarily all, of these works be undertaken in conjunction with and utilising development contribution funds from the Jacaranda Ponds development.

Based on the analysis of traffic distribution and impacts of following section of this report, a slightly modified schedule of recommended works is provided at Section 5 relating more closely to the impacts of Jacaranda Ponds traffic.

2.10 Current Intersection Performance

2.10.1 Level of Service

The results of the SIDRA analysis are presented as 'levels of service' (LOS), denoted from A (good) to F (over capacity) and defined as shown in Table 5.

Table 5. Intersection Level of Service

Description	**Level of Service (RMS Definition)**	**Average Delay per Vehicle (s)**
Very Good	A	< 14.5
Good	B	14.5 ≤ 28.5
Satisfactory	C	28.5 ≤ 42.5
Near Capacity	D	42.5 ≤ 56.5
At Capacity	E	56.5 ≤ 70.5
Over Capacity	F	≥ 70.5

(Source: RMS NSW Guide to Traffic Generating Developments)

A LOS of C or better is generally considered desirable at all major road intersections, however in practice it is reasonable for some intersections in urbanised areas to operate at LOS D during peak times. Another common measure of intersection performance is the degree of saturation (DOS), which provides an overall measure of the capability of the intersection to accommodate additional traffic. A DOS of 1.0 indicates that an intersection is operating at capacity. The desirable maximum degree of saturation for an intersection with traffic signals is 0.9.

2.10.2 Freemans Reach Road / Wilberforce Road

This intersection is shown in Figure 17. It is priority controlled and at peak times, southbound traffic on Freemans Reach Road must queue to wait for gaps to turn right into the traffic stream on Wilberforce Road, approaching the Windsor Bridge.

Figure 17. Freemans Reach Road / Wilberforce Road

Intersection modelling indicates that this intersection currently operates at poor levels of service in peak periods with Level of Service F in both the AM and PM peaks.

Visibility is generally good at the intersection, with the most constrained sightline being from Freemans Reach Road towards Windsor Bridge, which has a sight distance of approximately 90 metres. This is above required design standards.

2.10.3 Grose Vale Road / Terrace Road / Bells Line of Road

This intersection is shown in Figure 18. It is the major traffic controlled intersection in the local area on the north-western bank of the Hawkesbury River and provides the main access for a large geographical area to connect with Bells Line of Road and access the Hawkesbury River bridge crossing at North Richmond.

Figure 18. Grose Vale Road / Terrace Road / Bells Line of Road

This intersection currently has separate through, left and right turning traffic lanes on all four approaches. It is somewhat congested in both the morning and afternoon peak hour traffic periods, exhibiting level of service D in each of these.

2.10.4 Crooked Lane / Bells Line of Road

This intersection (Figure 19) is a rural type highway intersection with no additional dedicated right turning lane on the Bells Line of Road carriageway. Crooked Lane nevertheless provides an additional local access route for traffic travelling to and from Glossodia to North Richmond and the major road network via Bells Line of Road.

Figure 19. Crooked Lane / Bells Line of Road

The intersection is currently operating at acceptable traffic conditions reporting a congested traffic conditions reporting level of service B and A in the AM and PM peaks respectively. As such there is spare capacity to accommodate additional development generated traffic from Jacaranda Ponds. Sightlines at this intersection meet the requirements of Australian Standards.

2.10.5 Creek Ridge Road / Kurmond Road

The intersection of Creek Ridge Road with Kurmond Road (Figure 20) is a rural highway intersection with a wide lanes and an auxiliary though lane for westbound through vehicles on Kurmond Road.

Figure 20. Creek Ridge Road / Kurmond Road

The intersection is currently operating at sufficient capacity levels reporting level of service A in both the AM and PM peaks. As such there is spare capacity to accommodate additional development generated traffic from a rural residential development at Jacaranda Ponds. Sightlines at this intersection meet the requirements of Australian Standards.

2.10.6 Kurmond Road / Spinks Road

In this area Kurmond Road is a single lane carriageway with no additional dedicated right turning lane to Spinks Road (Figure 21). Spinks Road provides an additional local access route for traffic travelling to and from Glossodia to North Richmond and the major road network via Bells Line of Road.

Figure 21. Kurmond Road / Spinks Road

The intersection is currently operating at sufficient capacity levels reporting level of service A in the AM and PM peaks. As such there is spare capacity to accommodate additional development generated traffic from rural residential development at Jacaranda Ponds. Sightlines at this intersection meet the requirements of Australian Standards.

2.10.7 Kurmond Road / Wire Lane

Kurmond Road is a single lane each direction carriageway through this intersection (Figure 22), with no additional dedicated right turning lane onto Wire Lane. Wire Lane provides local access route for traffic travelling to and from Glossodia to North Richmond and the major road network via Bells Line of Road.

Figure 22. Kurmond Road / Wire Lane

The intersection is currently operating at sufficient capacity levels reporting level of service A in both the AM and PM peaks. As such there is spare capacity to accommodate additional development generated traffic from rural residential development at Jacaranda Ponds. Sightlines at this intersection meet the requirements of Australian Standards.

3 The Proposed Development

3.1 Plans and Details

The proposal involves rezoning 185 hectares of land to provide for 580 residential development lots at Jacaranda Ponds within Glossodia, as shown in Figure 23. A larger image including the surrounding area is attached at **Appendix C**. The primary feature of the local road network within the site will be an internal east-west collector road, which will be located close to the southern (Currency Creek) boundary of the site, connecting to Kurmond Road via Spinks Road to the west and to Kurmond Road via Spinks Road and Creek Ridge Road or Shepherds Road to the east.

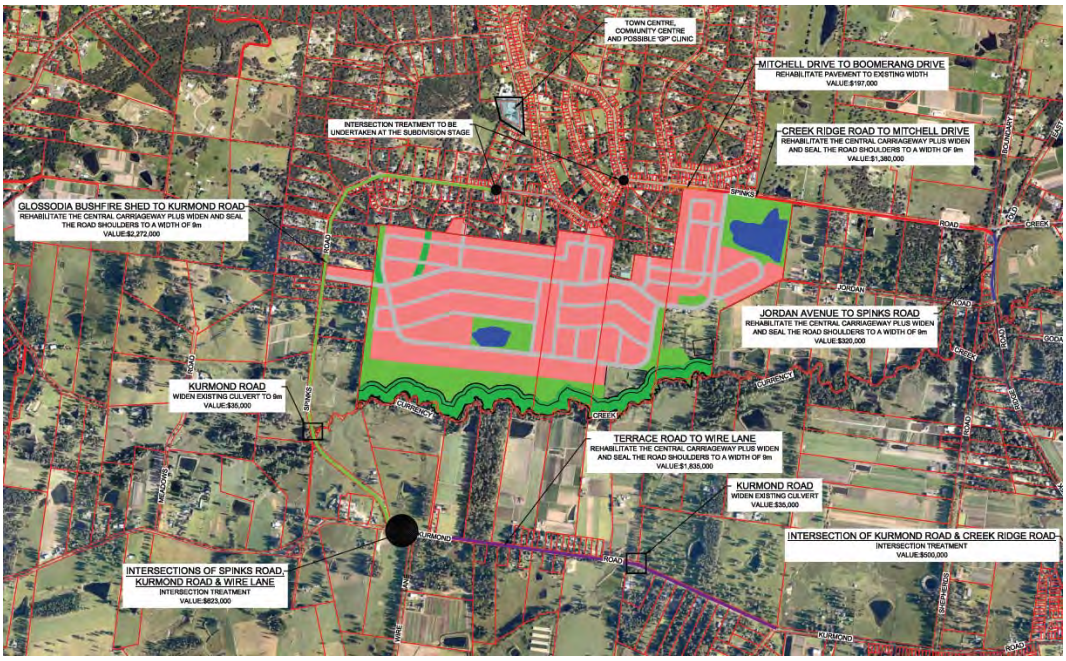


Figure 23: Site location and surrounding area

3.2 Local Access Routes and Intersections

Future vehicular traffic access to the Jacaranda Ponds site is proposed from four locations in total on Spinks Road so that the movement of traffic is shared to provide for:

- a permeable road network;
- alternative access points for bushfire and other emergency access;
- improved connectivity of the rural residential area with surrounding land uses; and,
- reinforcing the local character of villages and towns with easy accessibility by motor vehicles and other road based travel modes.

4 Impact of the Proposed Development

4.1 Traffic Generation

The RMS *Guide to Traffic Generating Developments* guidelines recommend an estimated traffic generation of 0.85 vehicle trips per household during the morning and evening peaks for developments similar to that proposed at Jacaranda Ponds. This rate is considered appropriate for new residential subdivisions in areas with relatively limited public transport accessibility.

This traffic generation rate will result in a total of up to 493 vehicle trips in the AM and PM peak hours for the 580 residential lots. A high proportion of the future vehicular generated traffic by Jacaranda Ponds residents will be likely to be regionally based, travelling via the arterial road network across the Hawkesbury River through to Windsor Road, the Blacktown-Richmond Road, The Northern Road and Castlereagh Road and ultimately to the M4 and M2-M7 Motorway networks.

4.2 Traffic Distribution

The 'unconstrained' distribution of the future peak hour traffic from the Jacaranda Ponds rural residential subdivision has been estimated using patterns exhibited in historical journey to work data (refer Section 2.4.2) and likely routes based on travel zone and LGA data. The estimated distribution of Jacaranda Ponds traffic is shown in Figure 24.

For capacity analysis purposes a conservative 'highest likely loading' assumption was made by assuming a 100% directional split for the traffic distribution in peak periods, ie that all of the traffic generated by the proposed development would depart form the subject site in the morning and return in the evening. In reality the directional split will be such that most, but not all, of the traffic generated by the development will depart from the site in the morning peak with some generated traffic travelling in towards the site, and vice versa in the evening. Assuming a 100% directional split provdes a conservative worst case estimate of the impacts of generated traffic on local roads and intersections for analysis purposes.

Figure 24. Trip distribution diagram

Of the vehicle trips generated from Jacaranda Ponds, a proportion of peak hour journeys are likely to occur in two parts, such as a drop-off to a commercial or retail centre or at a school before the primary journey to work purpose. A review of the trip distribution was undertaken considering potential proportional changes given secondary peak hour trips. The proximity of schools in the area including the nearby Glossodia Public School indicates that school runs on the way to work would be unlikely to affect the route choice. The majority of trips pass retail and commercial centres which would require minimal deviation from the expected trip.

4.3 Redbank / North Richmond Residential Development

A separate proposal is currently in the planning stages for residential development on 180 hectares of land at Redbank to the west of North Richmond town centre. The development is proposed to contain approximately 1,400 residential units.

The proposal for the North Richmond development is understood to include the provision of a new crossing of the Hawkesbury River at Grose River Road to the south of that subject site. Development traffic from the North Richmond development has been included in the traffic assessment for Jacaranda Ponds to assess the sensitivity of this cumulative developments scenario.

Arup did not have access to the TMAP for the North Richmond development proposal at the time of preparing this assessment for Jacaranda Ponds, and assumptions for traffic generation and distribution were made to enable cumulative sensitivity impact assessment. The North Richmond development was

estimated to produce a peak hour trip generation of 0.85 vehicle trips per dwelling. The distribution of traffic was estimated as follows:

- 50% of development traffic will cross via the proposed Gross Vale Road bridge in the peak hour;
- 25% of development traffic will cross the Richmond Bridge in the peak hour;
- 21% of development traffic will remain in the development site or travel to North Richmond Town Centre;
- 3% of development traffic will travel east along Terrace Road; and,
- 1% of development traffic will travel north along Bells Line of Road.

Traffic generated by the proposed North Richmond development is not projected to impact on roads providing access to the Jacaranda Ponds site or the Windsor Bridge, with only the Richmond Bridge carrying minor volumes for each of the sites.

4.4 Future Road (Midblock) Capacity Performance

4.4.1 Local Roads

The local routes providing road access to Jacaranda Ponds are sealed, two-lane two-way carriageways having traffic carrying capacities of around 2,000 vehicles per hour in both directions combined (refer Table 3). The traffic counts undertaken on these roads report peak two-way traffic volumes ranging from around 300 vehicles per hour to 700 vehicles per hour. The development results in an increase of 304 peak hour trips on the most affected route from the site and as such is within the midblock capacity of all access roads. Table 6 shows the capacity analysis discussed in Section 2.9 with the addition of peak period traffic generated by the proposed Jacaranda Ponds Development, demonstrating that volumes remain within existing capacity of these roads. As a result, capacity constraints will be dictated by the intersections in the area.

4.4.2 Windsor and Richmond Bridges

The Richmond and Windsor Bridges are already operating close to capacity in peak travel directions in the morning and afternoon peak periods and do not have substantial available capacity for additional traffic. The RMS Richmond Bridge and Approaches Congestion Study and the RMS Windsor Bridge Replacement Project are assessing options to upgrade the capacity of these bridges. With these upgrades, the bridges and adjacent corridors will have sufficient capacity to accommodate traffic associated with the Jacaranda Ponds development.

Table 6. Road capacity and volume for two-lane two-way roads providing access for Jacaranda Ponds, with development traffic

Location	***i***	***Peak period***	$(v/c)_i$	***Directional split***	f_d	f_w	P_T	E_T	P_B	E_B	f_{HV}	SF_E - ***2W***	***2W Observed Volume***	***2W Volume / capacity***
Freemans Reach Road N of Wilberforce Road	LOS E	AM	1.0	80/20	0.83	0.88	7%	2.0	0%	1.6	0.9	1,911	**859**	0.45
		PM		70/30	0.89	0.88	5%	2.0	0%	1.6	1.0	2,089	**978**	0.47
Spinks Road N of Kurmond Road	LOS E	AM	1.0	80/20	0.83	0.88	2%	2.0	0%	1.6	1.0	2,005	**521**	0.26
		PM		60/40	0.94	0.88	5%	2.0	0%	1.6	1.0	2,206	**663**	0.30
Kurmond Road W of Shepherds Road	LOS E	AM	1.0	60/40	0.94	0.88	6%	2.0	0%	1.6	0.9	2,185	488	0.22
		PM		75/25	0.86	0.88	5%	2.0	0%	1.6	1.0	2,018	530	0.26
Creek Ridge Road N of Kurmond Road	LOS E	AM	1.0	75/25	0.86	0.88	5%	2.0	0%	1.6	1.0	2,018	**626**	0.31
		PM		70/30	0.89	0.88	5%	2.0	0%	1.6	1.0	2,089	**655**	0.31
Wire Lane S of Kurmond Road	LOS E	AM	1.0	80/20	0.83	0.88	7%	2.0	0%	1.6	0.9	1,911	**458**	0.24
		PM		60/40	0.94	0.88	4%	2.0	0%	1.6	1.0	2,227	**624**	0.28
Terrace Road N of Grose Vale Road	LOS E	AM	1.0	60/40	0.94	0.88	2%	2.0	0%	1.6	1.0	2,271	**638**	0.28
		PM		65/55	0.97	0.88	2%	2.0	0%	1.6	1.0	2,343	**772**	0.33

4.4.3 Implementation Timing of Bridge Improvement and Jacaranda Ponds Development Works

Capacity upgrade proposals for the Windsor and Richmond bridges are currently in planning by RMS. While a specific timing for implementation of upgrades to either of the bridges has not been defined by RMS, traffic generation from the Jacaranda Ponds residential development will only commence after development approval, site services and property construction and then sale of any property. This is not likely to occur substantially prior to the implementation of improvements to these bridges.

Regardless, the Jacaranda Ponds development is proposing extensive improvements to the surrounding road network providing additional capacity. The work by Hyder for RMS on the Richmond Bridge identifies that delays currently occurring on the bridge corridor are primarily as a result of congestion at intersections as opposed to bridge capacity constraints.

The existing capacity on the Richmond and Windsor Bridges is such that should delays in the upgrade of these bridges occur beyond the timing of Jacaranda Ponds development, the proposed intersection upgrades recommended to be implemented as part of Jacaranda Ponds will allow for a suitable Stage 1 extent for the development.

4.5 Future Traffic Operations at Intersections

As discussed in Section 4.1, the proposed Jacaranda development will generate approximately 493 vehicles throughout the network in peak hours. The key intersections have been modelled using SIDRA (Signalised Intersection Design and Research Aid) version 5.1 to assess the effects of the development on the surrounding traffic network.

SIDRA Intersection 5.1 is a computer software package used for the assessment and design of intersections. It enables the user to predict the capacity, vehicle queues and delays at a variety of intersection types. As previously shown in Table 5, the performance of the intersection is quantified in terms of level of service (LOS) and degree of saturation (DOS).

SIDRA results for analyses of key intersections with development traffic are presented at Table 7 to Table 13. In each case the results in these tables are shown for the worse of the AM or PM peak periods. The full SIDRA analysis results for all intersections including AM and PM results are shown at **Appendix D**.

4.5.1 Bells Line of Road / Crooked Lane Intersection

The Bells Line of Road / Crooked Lane intersection reports a DOS of 0.732 with a level of service of B on the worst performing arm in the existing conditions AM peak scenario.

Additional traffic loading from the Jacaranda Ponds and North Richmond developments combined results in an increase of DOS to 0.77 and an average intersection delay of 7.9 seconds with LOS C on the right turn arm of Crooked Lane. Summary simulation results are shown in Table 7.

Table 7. AM peak Bells Line of Road / Crooked Lane intersection SIDRA results

Scenario	Degree of Saturation (DoS)	Avg. Delay (sec)	Overall LoS	Worst Movement	Worst Movement Avg. Delay (sec)	Worst Movement LoS
Existing	0.732	7.4	B	Crooked Lane Right Turn	28.1	B
Existing with Jacaranda Ponds Development	0.765	7.8	B	Crooked Lane Left Turn	29.5	C
Existing with Jacaranda Ponds plus North Richmond development and right turn ban into Grose Vale Road[a]	0.770	7.9	C	Crooked Lane Left Turn	29.9	C

[a]. as recommended in the Richmond Bridge and Approaches Congestion Study

The results of the analysis show that the proposed development traffic from the Jacaranda Ponds and North Richmond development result in minor changes to the performance of this intersection. The development does not exclude the RMS recommended amendments to provide short term traffic congestion relief to the Richmond area.

4.5.2 Creek Ridge Road / Kurmond Road Intersection

Creek Ridge Road and Kurmond Road intersection reports an existing DOS of 0.323 in the AM peak period, with an average intersection delay of 4.7seconds and a LOS of A on the worst performing arm, the right turn from Creek Ridge Road.

Additional traffic from Jacaranda Ponds and the North Richmond development simulate an increase in DOS to 0.705 with an average delay of 8.4 seconds on the intersection and an LOS of B on the worst arm, the right turn from Creek Ridge Road. AM peak simulation results for the intersection are shown in Table 8.

Table 8. AM peak Creek Ridge Road / Kurmond Road intersection SIDRA results

Scenario	Degree of Saturation (DoS)	Avg. Delay (sec)	Overall LoS	Worst Movement	Worst Movement Avg. Delay (sec)	Worst Movement LoS
Existing	0.323	4.7	A	Creek Ridge Road Right Turn	11.7	A
Existing with Jacaranda Ponds Development	0.705	8.4	A	Creek Ridge Road Right Turn	15.4	B
Existing with Jacaranda Ponds plus North Richmond development	0.734	8.7	A	Creek Ridge Road Right Turn	16.5	B

The results of the analysis show that the intersection will operate well and remaining below its capacity levels as a result of the additional traffic from the proposed developments.

4.5.3 Kurmond Road / Spinks Road Intersection

The Kurmond Road and Spinks Road intersection currently reports a DOS of 0.121 in the PM peak, with an average intersection delay of 5.4 seconds giving an LOS of A on the worst performing arm, the left turn on Spinks Road.

Summary SIDRA simulation results for the PM peak analysis of this intersection are shown in Table 9.

Table 9. PM peak Kurmond Road / Spinks Road intersection SIDRA results

Scenario	Degree of Saturation (DoS)	Avg. Delay (sec)	Overall LoS	Worst Movement	Worst Movement Avg. Delay (sec)	Worst Movement LoS
Existing	0.174	5.0	A	Spinks Road Right Turn	12.2	A
Existing with Jacaranda Ponds development	0.246	6.5	A	Spinks Road Right Turn	12.6	A

The addition of traffic from the Jacaranda Ponds development is not expected to impact on the operational performance of the Kurmond Road and Spinks Road intersection. The North Richmond development is not considered to contribute meaningful additional traffic to this intersection.

4.5.4 Kurmond Road / Wire Lane Intersection

The Kurmond Road and Wire Lane intersection currently exhibits a DOS of 0.142 with an average simulated intersection delay of 4.6 seconds in the AM peak period, giving an LOS of A on the worst performing arm, the right turn on Wire Lane.

Summary SIDRA simulation results for the AM peak analysis of this intersection are shown in Table 10. The North Richmond development is not considered to contribute meaningful additional traffic to this intersection.

Table 10. AM peak Kurmond Road / Wire Lane intersection SIDRA results

Scenario	Degree of Saturation (DoS)	Avg. Delay (sec)	Overall LoS	Worst Movement	Worst Movement Avg. Delay (sec)	Worst Movement LoS
Existing	0.142	4.6	A	Wire Lane Right Turn	14.4	A
Existing with Jacaranda Ponds development	0.211	6.2	B	Wire Lane Right Turn	14.9	B

The results of the analysis show that addition of the proposed Jacaranda Ponds development traffic results in only minor changes to the performance of this intersection.

4.5.5 Bells Line of Road / Terrace Road / Grose Vale Road

The Bells Line of Road/Terrace Road/Grose Vale Road intersection exhibits a DOS of 1.000 with a level of service of D in simulation of the existing PM peak scenario.

The addition of traffic from the proposed developments described in Section 4.3, results in an estimated 112 vehicles from the Jacaranda Ponds Development on the intersection and an estimated 340 vehicles on the intersection from the North Richmond development. This corresponds to 75% of the development traffic originating from the North Richmond Development and, conversely, 25% from the Jacaranda Ponds development. The results show a simulated increase of average intersection delay from 46.3 seconds to 49.8 seconds and LOS of D on the Bells Line of Road right turn arm in morning peak periods. The PM peak results are summarised in Table 11.

Table 11. PM Peak Bells Line Of Road / Terrace Road / Grose Vale Road intersection SIDRA results

Scenario	Degree of Saturation (DoS)	Avg. Delay (sec)	Overall LoS	Worst Movement	Worst Movement Avg. Delay (sec)	Worst Movement LoS
Existing	1.00[a]	46.3	D	Grose Vale Road Right Turn	115.1	F
Existing with Jacaranda Ponds Development	1.00[a]	46.3	D	Grose Vale Road Right Turn	113.3	F
Existing with Jacaranda Ponds plus North Richmond development	1.00[a]	49.8	D	Grose Vale Road Right Turn	113.3	F

[a]. resulting from a queue exceeding a short lane length

The analysis reinforces the anecdotal and observed evidence that capacity constraints already exist at this intersection. Additional traffic on the network from future developments will add to the existing congestion at this location. The worst performing movement of the intersection is indicated in the modelling to be on the Grose Vale Road leg. This leg of the intersection is not affected by the Jacaranda Ponds development.

The RMS *Richmond Bridge and Approaches Congestion Study* recommends alterations as set out in Table 2.

A SIDRA analysis was undertaken to assess the effects of the development flow with existing traffic being rerouted to Crooked Lane. The results of the assessment are shown in Table 12.

Table 12: Comparison of the upgraded Bells Line of Road intersection with PM existing traffic and with PM existing plus development traffic.

Scenario	Degree of Saturation (DoS)	Avg. Delay (sec)	Overall LoS	Worst Movement	Worst Movement Avg. Delay (sec)	Worst Movement LoS
Existing traffic with changes to intersection as per RMS Richmond Bridge Congestion Study	1.000[a]	45.3	D	Grose Vale Road Left Turn	113.2	F
Existing with Jacaranda Ponds and North Richmond developments and with changes to intersection	1.000 [a]	44.2	D	Grose Vale Road Right Turn	113.3	F

[a]. resulting from a queue exceeding a short lane length

The results show that the intersection improvements provide additional capacity on the intersection.. As a result, the average delay is reduced notwithstanding the additional traffic flow from the two developments. Full results are attached in the Appendix.

As shown from the above analysis, the amendments result in the intersection remaining at saturation. There are minor increases to the delay as a result of additional development traffic. However, traffic associated with the Jacaranda Ponds development represents a minor increase in traffic at the intersection and a negligible change in delay.

4.5.6 Freemans Reach Road / Wilberforce Road Intersection

The Freemans Reach Road and Wilberforce Road intersection currently reports a simulated DOS of 1.58 for the AM peak period, with an average intersection delay of 166 seconds giving an LOS of F, ie over-capacity with forced-flow operations.

An additional simulation scenario was undertaken with the conversion of the existing intersection to a three-arm roundabout intersection with an additional passing lane on Wilberforce Road. This layout will facilitate development of the future realignment of the Windsor Bridge and roundabout proposed by RMS as shown in Figure 10. The AM peak simulation results are shown in Table 13.

Table 13. AM peak Freemans Reach Road / Wilberforce Road intersection SIDRA results

Scenario	Degree of Saturation (DoS)	Avg. Delay (sec)	Overall LoS	Worst Movement	Worst Movement Avg. Delay (sec)	Worst Movement LoS
Existing	1.581	166	F	Freemans Reach Road Right Turn	>3 mins	F
Existing with Jacaranda Ponds Development	2.583	592	F	Freemans Reach Road Right Turn	>3 mins	F
Roundabout intersection with existing Windsor Bridge and Jacaranda Ponds plus North Richmond development	0.725	10.7	A	Wilberforce Road East Right Turn	16.1	B
Roundabout intersection with new Windsor Bridge and Jacaranda Ponds development plus North Richmond development	0.876	11.8	A	Wilberforce Road East Left Turn	19.4	B

The analysis confirms that this intersection is currently above capacity in the peak hours. With the addition of development traffic related to Jacaranda Ponds, conversion of the intersection to a three arm roundabout will reduce saturation and delay to within capacity limits. This layout will facilitate the concept proposed by RMS for replacement of the Windsor Bridge.

4.5.7 Intersection Performance Summary

The intersection simulation analyses show that the Jacaranda Ponds development proposal will generally have very minor impacts on local intersections providing access to the subject site, even considering the cumulative impacts of the separate development proposed at Redbank near North Richmond. Two key intersections providing access to the site however are already operating at capacity, and additional traffic will impact on these.

The intersection of Bells Line of Road and Terrace Road is currently at capacity and the increases in traffic from the Jacaranda Ponds development result in negligible changes to delay at the intersection. The *Richmond Bridge and Approaches Congestion Study* recommends alterations to the Bells Line of Road/ Grose Vale Road intersection. These amendments, outlined in Table 2, provide improvements to the intersection. These improvements aimed at additional capacity travelling from the Richmond Bridge, reduce congestion and allow for

additional right turners through Terrace Road and as a result add capacity for traffic moving through to the Jacaranda Ponds development. It is estimated that 75% of the estimated increase in traffic on the intersection will arise from the North Richmond Development. Effects on the intersection as a result of the development traffic from Jacaranda ponds are comparatively minimal

The Freemans Reach Road and Wilberforce Road intersection is currently also operating over capacity in peak periods. This intersection is proposed to be upgraded to a roundabout with realignment of Wilberforce Road as part of the Windsor Bridge replacement project currently being examined by RMS. The bridge replacement concept is currently being determined through community consultation and feedback and timings for the replacement are uncertain. If the Jacaranda Ponds development were to be completed before replacement of the Windsor Bridge, it is recommended that this intersection be upgraded to a roundabout to allow for the additional traffic at the intersection and facilitate proposals for the new Windsor Bridge.

4.6 Road User Safety

In developing the future local road network at the Jacaranda Ponds residential estate, internal site traffic and pedestrian safety issues will need to be given careful consideration. Where possible the local road network should provide three-way T intersections within the future development area while still maintaining well defined view corridors. The key features of the future road network should include:

- Limited cross-intersections, which where they do occur, should be located on roads that would be expected to carry lower volumes with clearly legible traffic priorities defined by signage;
- Appropriate future channelisation of traffic or other traffic calmed road designs along the longer straight sections of roads to assist with traffic speed control;
- Maximization of passive surveillance opportunities from adjoining residential properties to assist with pedestrian safety;
- Appropriate lighting levels for pedestrian paths and intersections.

4.7 Public Transport, Pedestrian and Cyclist Needs

The Jacaranda Ponds development should contribute positively to the future economic status of the Glossodia area, potentially leading to more development of local retail/commercial and recreational facilities in the area and also helping to facilitate a basic minimum level of pedestrian and cyclist activity and accessibility through the site and the surrounding local roads.

There will be increased potential for additional future bus services, either school bus services or additional general bus services on route 668, to operate through the site as part of improved local bus services to and from Windsor, Wilberforce, Richmond and North Richmond commercial and other facilities. With the proposed new east west road link passing through the site, it will be generally feasible to provide bus services within 400 metres of virtually all the future residents of the estate.

5 Conclusion and Recommendations

The Jacaranda Ponds development proposal provides for the development of 580 large lots to the south of Glossodia Village in Hawkesbury. This report assesses the impacts of traffic that would be generated by the development on the local and sub-regional road network and considers local public transport.

A separate development by others of 1,400 lots is proposed at Redbank near North Richmond. It is understood that a TMAP is being prepared for that proposal, however the details of that TMAP were not known at the time of preparation of this report, and assumptions were made regarding traffic generation and distribution from that development to allow sensitivity analysis of the cumulative impacts of that development with the Jacaranda Ponds development.

5.1 External Road Network and Bridges

The principal future vehicular access routes to the site are expected to be:

- To and from Windsor, via Creeks Ridge Road, Gorricks Lane, Freemans Reach Road, Wilberforce Road and the Windsor Bridge over the Hawkesbury River;
- To and from the Richmond Town centre via Spinks Road, Wire Lane, Terrace Road, Bells Line of Road and the North Richmond Bridge over the Hawkesbury River; and,
- An alternative route for local traffic North Richmond via Spinks Road via Kurmond Road, Slopes Road and Crooked Lane and Bells Line of Road to reach North Richmond via the Charles Street intersection on Bells Line of Road.

Additionally, a small proportion of the future site traffic travelling to rural and regional destinations north east and north west of Sydney will use other routes via Kurrajong, East Kurrajong and Wilberforce and potentially the Sackville and Lower Portland Ferries.

5.1.1 Road and Bridge Capacity Performance

Midblock capacity on roads surrounding the site are currently below the traffic carrying capacity limits. The development is expected to result in increases in traffic volumes, however midblock capacity will remain at acceptable levels below capacity constraints.

Nonetheless, enhancements to bring the local road network providing access to Jacaranda Ponds and Glossodia to a consistent standard having a 9m sealed carriageway including sealed shoulders are recommended. It is recommended that development contribution funds from the Jacaranda Ponds development be applied to local road and intersection improvements.

The Richmond and Windsor Bridge corridors are operating at close to capacity in peak travel directions in the morning and afternoon peak periods and do not have substantial spare capacity for additional development traffic. The capacity constraints in these corridors are primarily a result of intersection delays as opposed to bridge capacity constraints. The RMS Richmond Bridge and

Approaches Congestion Study and the RMS Windsor Bridge Replacement Project are assessing options to upgrade the capacity or replace these bridges. The intersection upgrades proposed as part of the Jacaranda Ponds development allow for additional road and intersection capacity to accommodate development traffic independent of proposed improvements/replacements to these bridges.

The proponents of the Jacaranda Ponds development have undertaken to contribute an additional amount of $10,000 per lot, over and above the statutory requirement of $30,000 per lot, for further development of transport infrastructure supporting access to the development site. This will result in an additional contribution fund of $5,800,000 being available for additional upgrades to the Windsor Bridge.

A desirable application of these additional funds is to facilitate the development of the Windsor Bridge replacement project to enable the operation of the bridge as three lanes. In particular, the additional funds put forward by the proponent could desirably be directed towards improvements and signalisation of the George St/Bridge St roundabout in Windsor town centre which is necessary to facilitate operation of the bridge as three lanes.

5.1.2 Intersections

Intersections on the local road network surrounding the Jacaranda Ponds site currently carry relatively low traffic volumes and have sufficient spare capacity to accommodate traffic that would be generated by the Jacaranda Ponds development.

Capacity constraints are already experienced at the intersections of Bells Line of Road/Terrace Road/Grose Vale Road and Freemans Reach Road/Wilberforce Road. These intersections are key sub-regional access points for the Jacaranda Ponds development.

The Bells Line of Road/Terrace Road intersection is a key feature of the Richmond Bridge corridor currently being investigated by RMS as part of the Richmond Bridge and Approaches Congestion Study.

Short term works recommended to the Bells Line of Road/Grose Vale Road/Terrace Road intersection as part of the RMS study will increase capacity for traffic travelling from Richmond along the Bells Line of Road. While these improvements will provide greater capacity at this intersection, the Jacaranda Ponds development will represent a minimal proportion of development traffic only at this location and will have negligible impacts on the intersection.

The Freemans Reach Road/Wilberforce Road intersection is proposed to be upgraded to a roundabout with realignment of Wilberforce Road as part of the Windsor Bridge replacement project currently being examined by RMS. The bridge replacement concept is currently being determined through community consultation and feedback and timings for the replacement are uncertain. If the Jacaranda Ponds development were to be completed before replacement of the Windsor Bridge, it is recommended that this intersection be upgraded to a roundabout to allow for the additional traffic at the intersection and facilitate proposals for the new Windsor Bridge.

The proposed traffic increases or proposals resulting from the development do not prohibit or alter the currently recommended alterations to the road network by the RMS Richmond Bridge and Approaches Congestion Study.

5.1.3 Schedule of Works

The schedule of transport network infrastructure improvements recommended in support of the proposed Jacaranda Ponds rezoning and development is shown in Table 14.

Table 14. Schedule of recommended transport infrastructure works supporting Jacaranda Ponds development

	Location	**Proposed Works**
1)	Spinks Road from Mitchell Drive to Boomerang Drive	Rehabilitate pavement to existing width
2)	Spinks Road from Boomerang Drive to Creek Ridge Road	Rehabilitate central carriageway plus widen and seal road shoulders to a width of 9m
3)	Creek Ridge Road from Spinks Road to Kurmond Road	Rehabilitate central carriageway plus widen and seal road shoulders to a width of 9m
4)	Currency Creek culvert on Spinks Road (east) north of Kurmond Road	Widen existing culvert to 9m
5)	Intersection of Kurmond Road and Creek Ridge Road	Intersection treatment
6)	Spinks Road from Glossodia Bushfire Shed to Kurmond Road	Rehabilitate central carriageway plus widen and seal road shoulders to a width of 9m
7)	Intersection of Spinks Road, Kurmond Road and Wire Lane	Intersection treatment
8)	Kurmond Road (Wire Land to Terrace Road)	Rehabilitate the central carriageway plus widen and seal the road shoulders to a width of 9m
9)	Wire Lane from Kurmond Road to Terrace Road	Rehabilitate central carriageway plus widen and seal road shoulders to a width of 9m
10)	Intersection of Freemans Reach Road and Wilberforce Road	Intersection treatment – roundabout facilitating development of Windsor Bridge replacement project
11)	Intersection of Bells Line of Road/ Grose Vale Road/ Terrace Road	Proportion of intersection improvements on the intersection as part of the RMS Richmond Bridge and Approaches Congestion Study.

	Location	Proposed Works
12)	Windsor Bridge Upgrade and surrounding intersections	It is recommended that development contribution funds over and above the statutory requirement offered by the Jacaranda Ponds proponent. This would desirably be directed to the upgrade and signalisation of the Windsor Bridge replacement and surrounding intersections.
13)	Gorricks Lane and Freemans Reach Road from Kurmond Road to Wilberforce Road	Rehabilitate central carriageway plus widen and seal road shoulders to a width of 9m

5.2 Internal Site Network

It is recommended that the internal road network of Jacaranda Ponds should function in such a manner as to minimize traffic conflicts, protect the amenity of residential areas and facilitate vehicular access between the site and adjoining residential areas. In particular, it is recommended that the proposed development facilitates:

- Limited cross-intersections, which where they do occur, should be located on roads that would be expected to carry lower volumes with clearly legible traffic priorities defined by signage;
- Appropriate future channelisation of traffic or other traffic calmed road designs along the longer straight sections of roads to assist with traffic speed control;
- Maximization of passive surveillance opportunities from adjoining residential properties to assist with pedestrian safety; and,
- Appropriate lighting levels for pedestrian paths and intersections.

5.3 Pedestrian and Cyclist Needs and Transport Sustainability Objectives

The recommended future transport strategy for Jacaranda Ponds should recognise the importance of all transport modes. Although the motor vehicle is the primary travel mode in most rural communities in Hawkesbury Shire, all future residential developments should also consider the longer term potential for incorporating alternatives to car travel for non time critical trips by either walking, cycling or public transport modes.

To achieve the desired longer term future transport sustainability objectives, the proposed Jacaranda Ponds development should target the following types of measures:

- providing stronger multi modal travel links into the townships of Richmond and Windsor;
- providing the alternative travel mode links as early as possible in the development to influence travel mode choice prior to car dependant travel patterns/habits being established;
- providing good quality safe pedestrian and cycling links within the site.

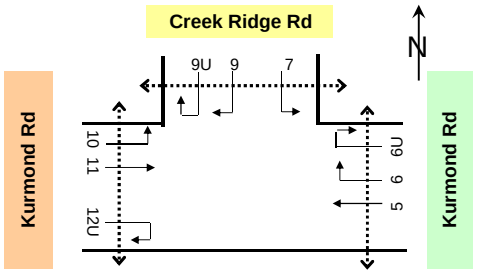
These measures will encourage the maximum use of non-car based means of travel while still providing suitable road network accessibility for those who do choose to drive.

Appendix A

Traffic Counts

Job No. : N901
Client : Arup
Suburb : Glossodia
Location : 1. Kurmond Rd / Creek Ridge Rd

Day/Date : Wed, 29th August 2012
Weather : Fine
Description : Classified Intersection Count
: Peak Hour Summary



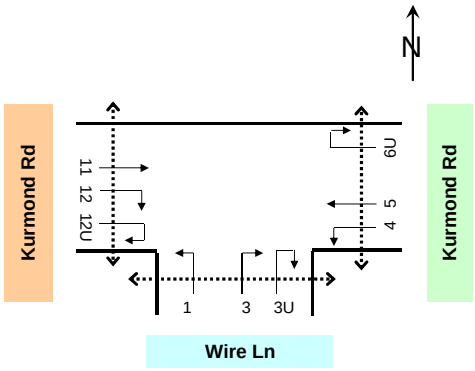
SKYHIGH - T

	Approach		Kurmond Rd					Creek Ridge Rd					Kurmond Rd					Grand Total
	Time Period		Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total	
AM	8:00	to 9:00	213	7	5	0	**225**	227	6	2	0	**235**	314	6	5	0	**325**	**785**
PM	17:00	to 18:00	608	21	1	0	**630**	88	2	1	0	**91**	135	8	0	0	**143**	**864**

Approach		Kurmond Rd					Creek Ridge Rd					Kurmond Rd					Grand Total
Time Period		Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total	
6:00	to 7:00	81	13	4	0	**98**	224	11	2	0	**237**	189	7	0	0	**196**	**531**
6:15	to 7:15	96	16	4	0	**116**	226	10	3	0	**239**	182	7	0	0	**189**	**544**
6:30	to 7:30	101	13	4	0	**118**	198	6	5	0	**209**	206	5	1	0	**212**	**539**
6:45	to 7:45	102	13	6	0	**121**	211	4	5	0	**220**	210	5	2	0	**217**	**558**
7:00	to 8:00	105	8	5	0	**118**	220	4	5	0	**229**	219	4	5	0	**228**	**575**
7:15	to 8:15	119	7	5	0	**131**	229	5	6	0	**240**	259	2	5	0	**266**	**637**
7:30	to 8:30	145	7	9	0	**161**	240	6	3	0	**249**	274	5	8	0	**287**	**697**
7:45	to 8:45	187	6	6	0	**199**	227	6	3	0	**236**	302	6	8	0	**316**	**751**
8:00	to 9:00	213	7	5	0	**225**	227	6	2	0	**235**	314	6	5	0	**325**	**785**
AM Totals		399	28	14	0	**441**	671	21	9	0	**701**	722	17	10	0	**749**	**1891**
15:00	to 16:00	380	26	4	0	**410**	102	4	2	1	**109**	183	11	11	0	**205**	**724**
15:15	to 16:15	434	22	3	0	**459**	92	7	2	1	**102**	145	10	4	0	**159**	**720**
15:30	to 16:30	475	25	4	0	**504**	98	5	3	1	**107**	146	7	4	0	**157**	**768**
15:45	to 16:45	498	24	4	0	**526**	99	6	3	1	**109**	146	5	4	0	**155**	**790**
16:00	to 17:00	523	15	5	0	**543**	100	6	4	0	**110**	148	4	3	0	**155**	**808**
16:15	to 17:15	540	13	3	0	**556**	111	3	4	0	**118**	148	5	1	0	**154**	**828**
16:30	to 17:30	588	14	1	0	**603**	94	2	3	0	**99**	142	6	0	0	**148**	**850**
16:45	to 17:45	591	17	2	0	**610**	89	2	2	0	**93**	137	5	0	0	**142**	**845**
17:00	to 18:00	608	21	1	0	**630**	88	2	1	0	**91**	135	8	0	0	**143**	**864**
PM Totals		1511	62	10	0	**1583**	290	12	7	1	**310**	466	23	14	0	**503**	**2396**

Job No. : N901
Client : Arup
Suburb : Glossodia
Location : 2. Kurmond Rd / Wire Ln

Day/Date : Wed, 29th August 2012
Weather : Fine
Description : Classified Intersection Count
: Peak Hour Summary



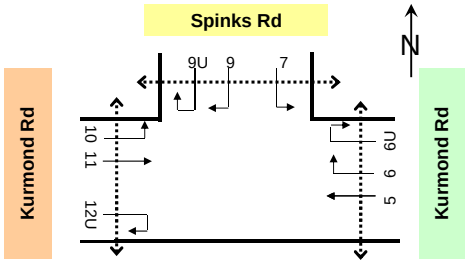
SKYHIGH - T

	Approach	Wire Ln					Kurmond Rd						Kurmond Rd					Grand Total
	Time Period	Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total		Cars	Trucks	Buses	Cyclists	Total	
AM	7:45 to 8:45	27	4	1	0	**32**	54	7	0	0	**61**		239	5	2	0	**246**	**339**
PM	17:00 to 18:00	99	2	0	0	**101**	220	5	0	0	**225**		103	4	0	0	**107**	**433**

Approach	Wire Ln					Kurmond Rd						Kurmond Rd					Grand Total
Time Period	Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total		Cars	Trucks	Buses	Cyclists	Total	
6:00 to 7:00	11	4	0	0	**15**	22	13	0	0	**35**		135	7	0	1	**143**	**193**
6:15 to 7:15	15	2	0	0	**17**	24	12	0	0	**36**		142	6	0	1	**149**	**202**
6:30 to 7:30	19	4	1	0	**24**	24	8	0	0	**32**		149	4	0	0	**153**	**209**
6:45 to 7:45	22	5	1	0	**28**	28	5	0	0	**33**		173	2	0	0	**175**	**236**
7:00 to 8:00	26	6	1	0	**33**	31	4	0	0	**35**		190	4	1	0	**195**	**263**
7:15 to 8:15	28	6	1	0	**35**	39	5	0	0	**44**		210	3	2	0	**215**	**294**
7:30 to 8:30	26	5	0	0	**31**	41	6	0	0	**47**		231	4	2	0	**237**	**315**
7:45 to 8:45	27	4	1	0	**32**	54	7	0	0	**61**		239	5	2	0	**246**	**339**
8:00 to 9:00	19	3	1	0	**23**	60	9	0	0	**69**		232	3	1	0	**236**	**328**
AM Totals	56	13	2	0	**71**	113	26	0	0	**139**		557	14	2	1	**574**	**784**
15:00 to 16:00	89	9	0	0	**98**	141	8	2	0	**151**		106	9	1	0	**116**	**365**
15:15 to 16:15	97	6	0	0	**103**	146	11	1	0	**158**		114	6	1	0	**121**	**382**
15:30 to 16:30	97	4	0	0	**101**	162	14	2	0	**178**		115	5	2	0	**122**	**401**
15:45 to 16:45	99	1	0	0	**100**	177	13	1	0	**191**		104	1	2	0	**107**	**398**
16:00 to 17:00	95	0	0	0	**95**	184	12	1	0	**197**		92	6	1	0	**99**	**391**
16:15 to 17:15	95	2	0	0	**97**	193	8	1	0	**202**		104	7	1	0	**112**	**411**
16:30 to 17:30	88	2	0	0	**90**	198	6	0	0	**204**		94	7	0	0	**101**	**395**
16:45 to 17:45	95	2	0	0	**97**	212	6	0	0	**218**		97	7	0	0	**104**	**419**
17:00 to 18:00	99	2	0	0	**101**	220	5	0	0	**225**		103	4	0	0	**107**	**433**
PM Totals	283	11	0	0	**294**	545	25	3	0	**573**		301	19	2	0	**322**	**1189**

Job No. : N901
Client : Arup
Suburb : Glossodia
Location : 3. Kurmond Rd / Spinks Rd

Day/Date : Wed, 29th August 2012
Weather : Fine
Description : Classified Intersection Count
: Peak Hour Summary



SKYHIGH - T

	Approach		Kurmond Rd					Spinks Rd					Kurmond Rd					Grand Total
	Time Period		Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total	
AM	7:45	to 8:45	60	7	1	0	**68**	115	1	0	0	**116**	159	3	1	0	**163**	**347**
PM	17:00	to 18:00	299	5	0	0	**304**	71	4	0	0	**75**	63	4	0	0	**67**	**446**

Approach		Kurmond Rd					Spinks Rd					Kurmond Rd					Grand Total
Time Period		Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total	
6:00	to 7:00	25	7	1	0	**33**	81	2	0	1	**84**	78	2	0	0	**80**	**197**
6:15	to 7:15	29	4	1	0	**34**	79	2	0	1	**82**	84	1	0	0	**85**	**201**
6:30	to 7:30	33	2	1	0	**36**	88	2	0	0	**90**	90	1	0	0	**91**	**217**
6:45	to 7:45	41	2	1	0	**44**	103	1	1	0	**105**	95	0	0	0	**95**	**244**
7:00	to 8:00	48	4	1	0	**53**	110	2	1	0	**113**	113	0	0	0	**113**	**279**
7:15	to 8:15	52	6	1	0	**59**	115	1	1	0	**117**	128	1	0	0	**129**	**305**
7:30	to 8:30	55	6	1	0	**62**	119	1	1	0	**121**	147	2	0	0	**149**	**332**
7:45	to 8:45	60	7	1	0	**68**	115	1	0	0	**116**	159	3	1	0	**163**	**347**
8:00	to 9:00	62	7	0	0	**69**	117	0	0	0	**117**	143	3	1	0	**147**	**333**
AM Totals		135	18	2	0	**155**	308	4	1	1	**314**	334	5	1	0	**340**	**809**
15:00	to 16:00	207	8	0	0	**215**	80	4	2	0	**86**	65	2	0	0	**67**	**368**
15:15	to 16:15	208	11	0	0	**219**	78	1	2	0	**81**	72	2	0	0	**74**	**374**
15:30	to 16:30	227	9	0	0	**236**	76	0	3	0	**79**	76	3	0	0	**79**	**394**
15:45	to 16:45	252	8	0	0	**260**	60	1	3	0	**64**	74	4	0	0	**78**	**402**
16:00	to 17:00	254	9	0	0	**263**	49	1	2	0	**52**	75	6	0	0	**81**	**396**
16:15	to 17:15	273	7	0	0	**280**	57	2	1	0	**60**	77	7	0	0	**84**	**424**
16:30	to 17:30	269	7	0	0	**276**	63	3	0	0	**66**	61	6	0	0	**67**	**409**
16:45	to 17:45	273	7	0	0	**280**	66	4	0	0	**70**	64	4	0	0	**68**	**418**
17:00	to 18:00	299	5	0	0	**304**	71	4	0	0	**75**	63	4	0	0	**67**	**446**
PM Totals		760	22	0	0	**782**	200	9	4	0	**213**	203	12	0	0	**215**	**1210**

Job No	N901
Client	ARUP
Road	Freemans Reach Rd - north of Wilberforce Rd
Location	Glossodia
Site No.	1
Start Date	29-Aug-12
Description	Volume Summary
Direction	Combined

Average Weekday	7,256
7 Day Average	6,802

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	3-Sep	4-Sep	29-Aug	30-Aug	31-Aug	1-Sep	2-Sep		
AM Peak	518	506	536	534	509	495	449		
PM Peak	745	720	741	744	783	521	442		
0:00	15	20	23	19	33	47	74	22	33
1:00	7	6	7	9	16	24	47	9	17
2:00	13	17	23	17	17	19	34	17	20
3:00	22	18	22	24	18	23	14	21	20
4:00	64	78	87	83	89	31	18	80	64
5:00	263	301	272	283	252	81	42	274	213
6:00	469	490	476	454	438	181	107	465	374
7:00	463	506	480	483	493	255	117	485	400
8:00	518	505	536	534	509	365	222	520	456
9:00	366	386	377	383	400	438	316	382	381
10:00	335	315	331	303	355	495	346	328	354
11:00	316	260	280	300	332	486	449	298	346
12:00	338	271	282	283	351	476	418	305	346
13:00	332	329	313	331	380	521	341	337	364
14:00	420	385	388	443	524	466	408	432	433
15:00	539	575	564	734	686	447	373	620	560
16:00	647	692	666	744	750	424	433	700	622
17:00	745	720	741	709	783	425	442	740	652
18:00	503	495	495	452	590	330	287	507	450
19:00	216	252	290	316	253	241	177	265	249
20:00	163	184	192	210	182	163	148	186	177
21:00	121	130	124	182	135	150	112	138	136
22:00	58	79	68	86	110	115	64	80	83
23:00	28	21	41	49	81	114	27	44	52
Total	6961	7035	7078	7431	7777	6317	5016	7256	6802

7-19	5522	5439	5453	5699	6153	5128	4152	5653	5364
6-22	6491	6495	6535	6861	7161	5863	4696	6709	6300
6-24	6577	6595	6644	6996	7352	6092	4787	6833	6435
0-24	6961	7035	7078	7431	7777	6317	5016	7256	6802

Job No	N901
Client	ARUP
Road	Creek Ridge Rd - north of Kurmond Rd
Location	Glossodia
Site No.	2
Start Date	29-Aug-12
Description	Volume Summary
Direction	Combined

Average Weekday	4,114
7 Day Average	3,908

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	3-Sep	4-Sep	29-Aug	30-Aug	31-Aug	1-Sep	2-Sep		
AM Peak	323	316	327	326	326	308	263		
PM Peak	369	347	354	374	404	295	244		
0:00	12	9	16	14	12	34	61	13	23
1:00	2	4	5	8	9	10	34	6	10
2:00	11	14	11	11	9	16	19	11	13
3:00	12	13	13	14	14	10	11	13	12
4:00	46	46	41	50	48	25	17	46	39
5:00	162	188	167	172	162	53	25	170	133
6:00	289	316	289	290	253	113	69	287	231
7:00	246	283	281	252	268	141	81	266	222
8:00	323	307	327	326	326	199	151	322	280
9:00	213	221	231	230	254	257	194	230	229
10:00	179	183	168	176	191	289	215	179	200
11:00	171	153	170	147	186	308	263	165	200
12:00	174	154	162	173	218	280	244	176	201
13:00	195	196	197	188	213	295	191	198	211
14:00	232	260	230	207	302	249	240	246	246
15:00	310	347	329	367	404	271	227	351	322
16:00	344	334	335	367	363	253	243	349	320
17:00	369	330	354	374	363	267	241	358	328
18:00	290	263	311	270	301	208	178	287	260
19:00	156	169	189	207	170	168	118	178	168
20:00	102	93	122	121	114	103	93	110	107
21:00	66	74	57	96	71	72	55	73	70
22:00	38	40	53	56	60	68	31	49	49
23:00	16	14	29	39	50	81	11	30	34
Total	3958	4011	4087	4155	4361	3770	3012	4114	3908

7-19	3046	3031	3095	3077	3389	3017	2468	3128	3018
6-22	3659	3683	3752	3791	3997	3473	2803	3776	3594
6-24	3713	3737	3834	3886	4107	3622	2845	3855	3678
0-24	3958	4011	4087	4155	4361	3770	3012	4114	3908

Job No	N901
Client	ARUP
Road	Kurmond Rd - btw Marlene St and Shepherds Rd
Location	Glossodia
Site No.	3
Start Date	29-Aug-12
Description	Volume Summary
Direction	WB

Average Weekday	2,757
7 Day Average	2,534

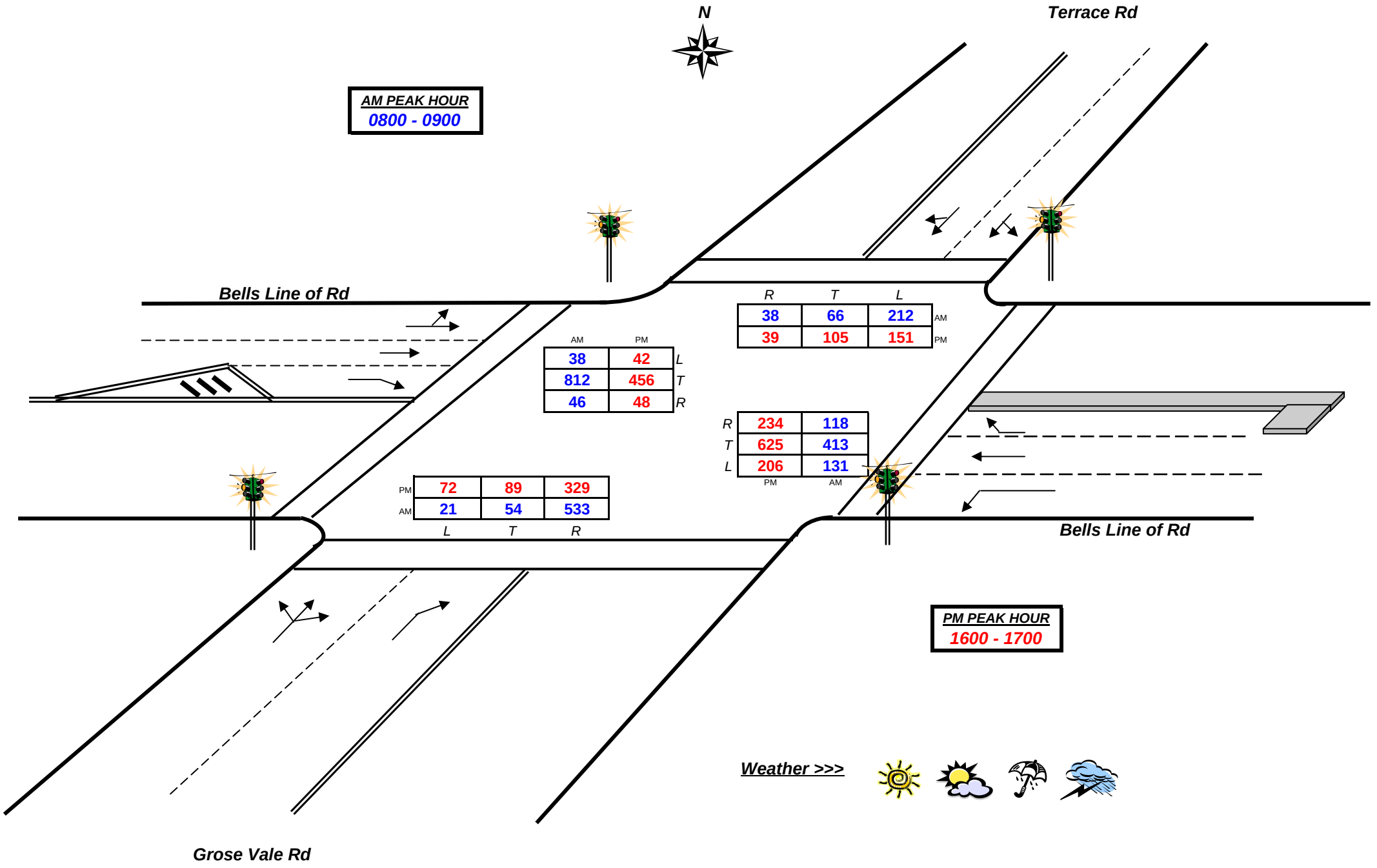
Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	3-Sep	4-Sep	29-Aug	30-Aug	31-Aug	1-Sep	2-Sep		
AM Peak	192	192	175	199	189	184	159		
PM Peak	353	405	398	396	438	184	188		
0:00	5	6	3	5	11	19	21	6	10
1:00	2	0	3	2	7	9	12	3	5
2:00	4	1	5	3	5	5	9	4	5
3:00	3	3	2	3	2	9	10	3	5
4:00	8	8	9	11	8	5	7	9	8
5:00	19	17	15	20	24	12	7	19	16
6:00	58	69	72	69	70	41	25	68	58
7:00	97	102	87	88	104	66	26	96	81
8:00	192	192	175	199	189	119	63	189	161
9:00	130	109	122	121	131	159	101	123	125
10:00	109	96	100	101	120	184	95	105	115
11:00	118	118	102	121	118	166	159	115	129
12:00	120	130	111	127	123	183	163	122	137
13:00	107	111	118	139	136	184	125	122	131
14:00	165	160	182	168	201	159	128	175	166
15:00	300	329	288	329	375	153	155	324	276
16:00	353	359	367	377	438	178	188	379	323
17:00	352	405	398	396	418	163	158	394	327
18:00	217	246	217	200	264	124	123	229	199
19:00	86	102	95	110	110	77	53	101	90
20:00	53	82	71	93	60	49	51	72	66
21:00	34	47	57	61	45	50	42	49	48
22:00	23	31	27	37	51	48	25	34	35
23:00	11	14	17	18	33	32	12	19	20
Total	2566	2737	2643	2798	3043	2194	1758	2757	2534

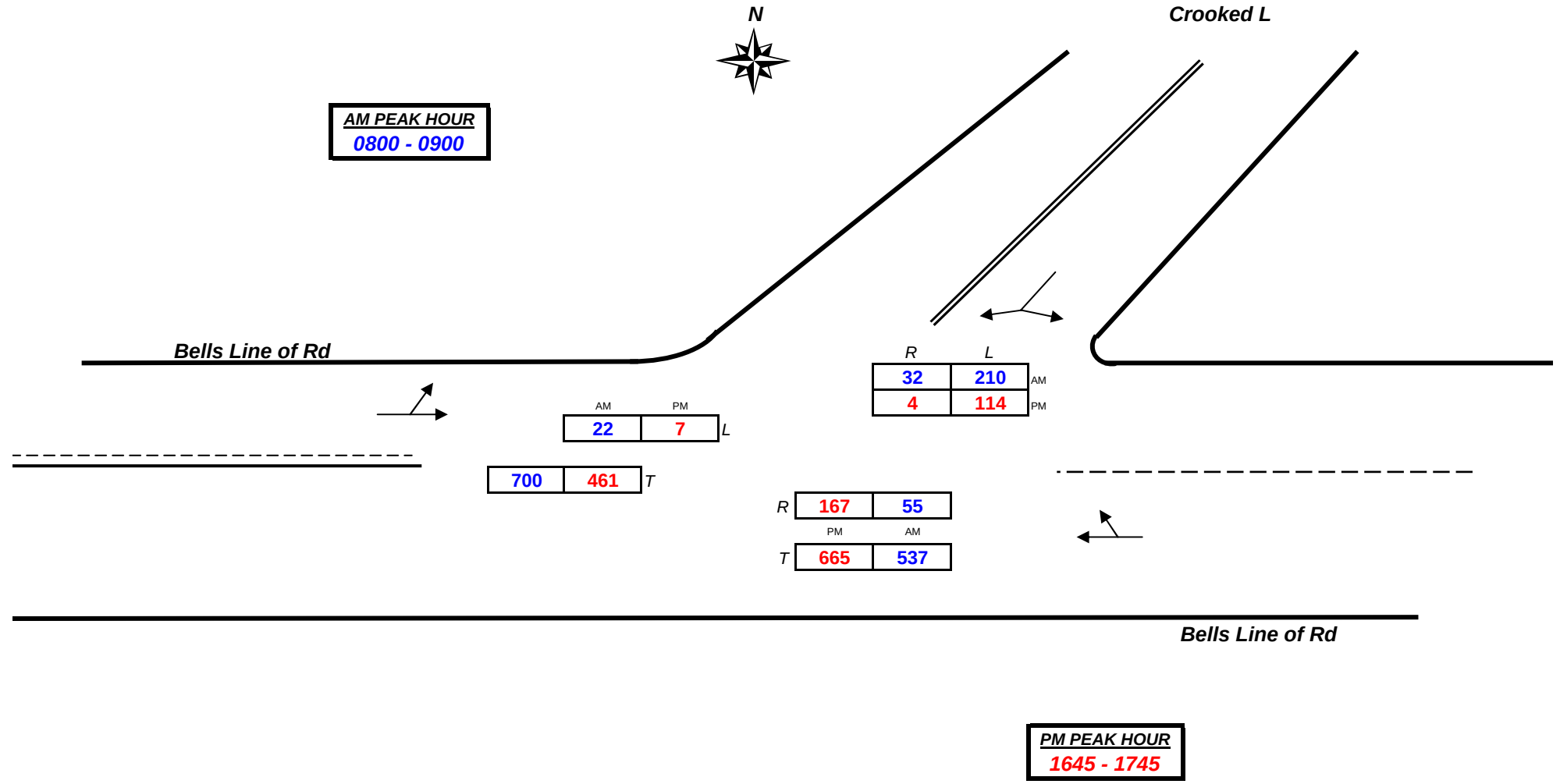
7-19	2260	2357	2267	2366	2617	1838	1484	2373	2170
6-22	2491	2657	2562	2699	2902	2055	1655	2662	2432
6-24	2525	2702	2606	2754	2986	2135	1692	2715	2486
0-24	2566	2737	2643	2798	3043	2194	1758	2757	2534

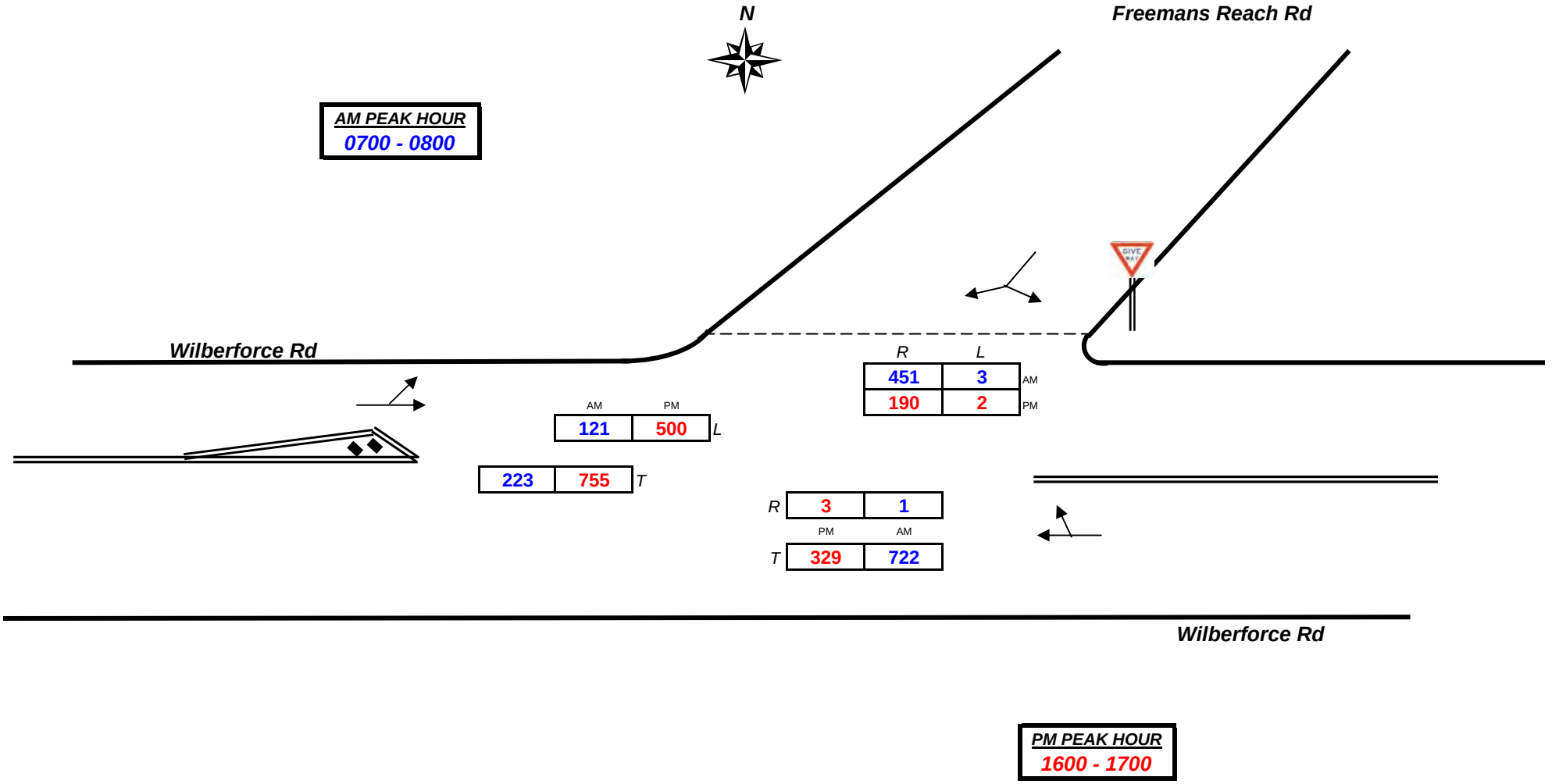
Job No	N901
Client	ARUP
Road	Spinks Rd - north of Kurmond Rd
Location	Glossodia
Site No.	4
Start Date	29-Aug-12
Description	Volume Summary
Direction	SB

Average Weekday	1,116
7 Day Average	1,074

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	3-Sep	4-Sep	29-Aug	30-Aug	31-Aug	1-Sep	2-Sep		
AM Peak	122	130	115	139	137	94	103		
PM Peak	87	81	81	125	77	84	78		
0:00	2	0	2	1	0	3	5	1	2
1:00	2	1	1	0	1	4	3	1	2
2:00	3	2	1	0	2	0	6	2	2
3:00	7	3	3	3	4	2	1	4	3
4:00	9	10	7	11	8	5	3	9	8
5:00	39	48	41	32	43	16	11	41	33
6:00	71	76	80	78	82	33	17	77	62
7:00	122	106	112	107	119	55	39	113	94
8:00	121	130	115	139	137	81	44	128	110
9:00	83	108	95	90	102	92	75	96	92
10:00	67	57	62	67	73	85	75	65	69
11:00	47	51	56	76	59	94	103	58	69
12:00	56	38	35	44	44	55	78	43	50
13:00	46	46	49	51	51	69	56	49	53
14:00	61	52	59	38	49	67	57	52	55
15:00	87	63	81	84	77	68	58	78	74
16:00	75	72	52	80	67	55	77	69	68
17:00	76	81	71	125	67	84	77	84	83
18:00	56	61	50	58	70	64	53	59	59
19:00	32	32	19	22	53	38	23	32	31
20:00	20	16	23	28	41	22	22	26	25
21:00	13	15	15	21	19	12	16	17	16
22:00	7	6	8	13	15	12	2	10	9
23:00	5	4	3	0	5	15	2	3	5
Total	1107	1078	1040	1168	1188	1031	903	1116	1074
7-19	897	865	837	959	915	869	792	895	876
6-22	1033	1004	974	1108	1110	974	870	1046	1010
6-24	1045	1014	985	1121	1130	1001	874	1059	1024
0-24	1107	1078	1040	1168	1188	1031	903	1116	1074


N
Terrace Rd
AM PEAK HOUR
0800 - 0900
Bells Line of Rd
R T L
38 66 212 AM
39 105 151 PM
AM PM
38 42 L
812 456 T
46 48 R
R 234 118
T 625 413
L 206 131
PM AM
PM 72 89 329
AM 21 54 533
L T R
Bells Line of Rd
PM PEAK HOUR
1600 - 1700
Weather >>>
Grose Vale Rd


N
Crooked L
AM PEAK HOUR
0800 - 0900
Bells Line of Rd
R
L
32
210
AM
4
114
PM
AM
PM
22
7
L
700
461
T
R
167
55
PM
AM
T
665
537
Bells Line of Rd
PM PEAK HOUR
1645 - 1745

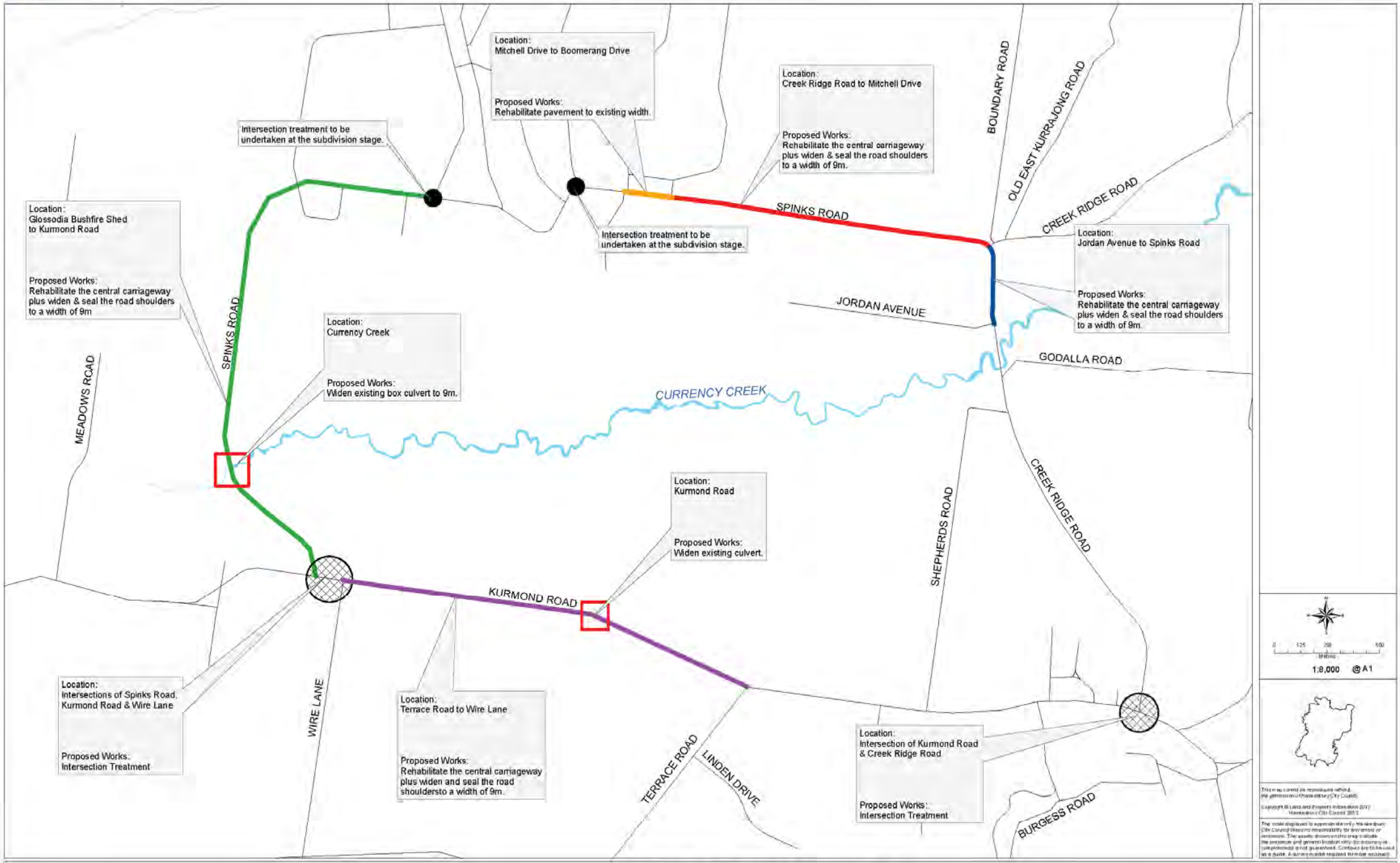

N
Freemans Reach Rd
AM PEAK HOUR
0700 - 0800
Wilberforce Rd
R L
451 3 AM
190 2 PM
AM PM
121 500 L
223 755 T
R 3 1
PM AM
T 329 722
Wilberforce Rd
PM PEAK HOUR
1600 - 1700

Appendix B

Hawkesbury City Council
Suggested Local Road
Improvement Works

HAWKESBURY CITY COUNCIL

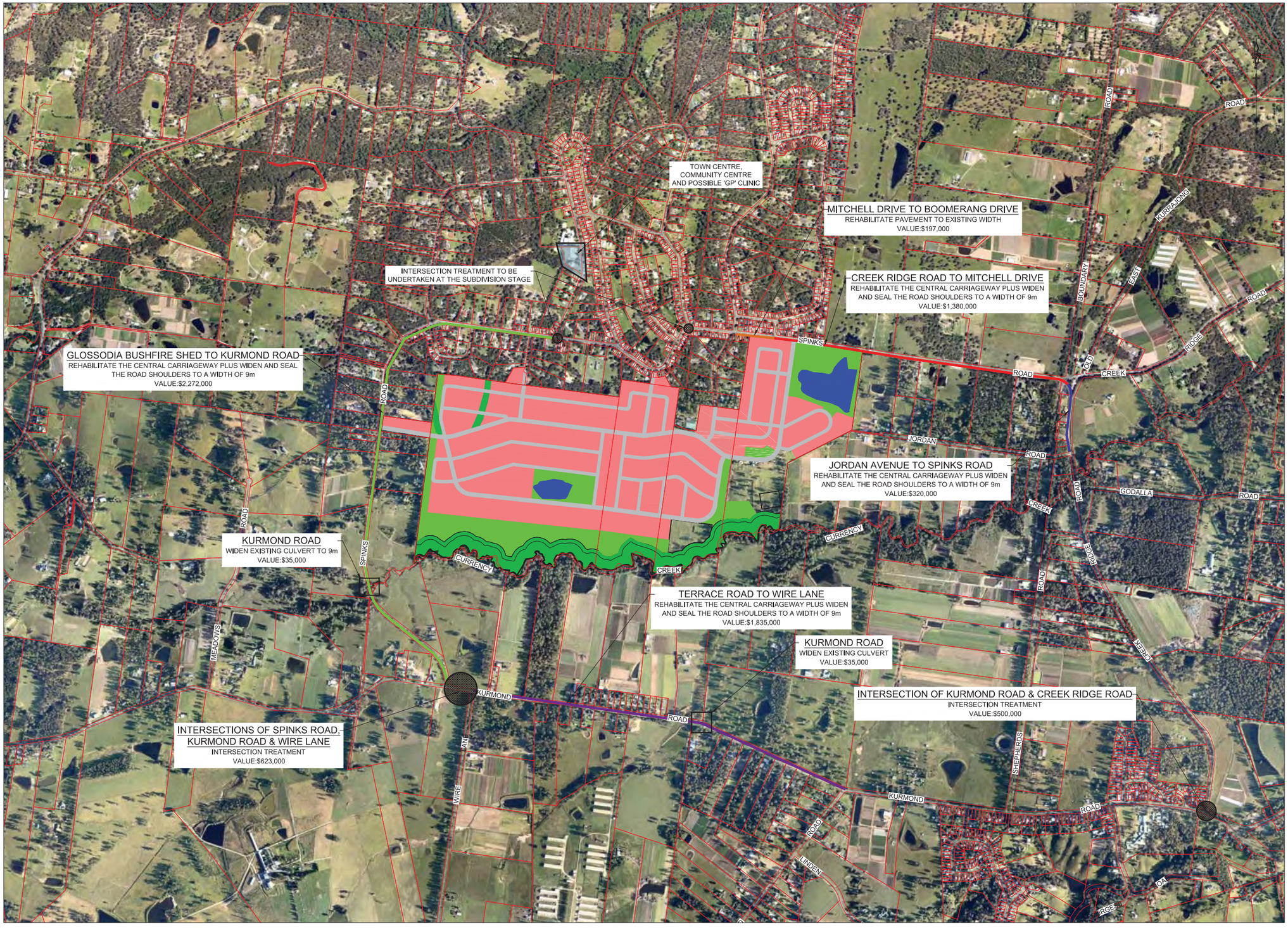
PO Box 146, Windsor NSW 2756
Website: www.hawkesbury.nsw.gov.au
Email: council@hawkesbury.nsw.gov.au
Hours: Monday to Friday 8.30am - 5.00pm
Phone: 02 4560 4444



PROPOSED GLOSSODIA SUBDIVISION

Appendix C

Site Layout Overview Plan



LEGEND

- RIPARIAN CORRIDOR
- LOCAL PARKS AND OPEN SPACE
- WATER BODIES
- STP ZONE/ EFFLUENT MANAGEMENT
- RESIDENTIAL LOTS

1:10000 (AT A1)

250 0 250 500 750 1000

METRES

CLIENT:

EJ Cooper and Son Pty Ltd
C/O Diverse Pty Ltd
PO Box 3715
ROUSE HILL NSW 2155

GLOSSODIA - JACARANDA PONDS

PROPOSED LAYOUT AND ROAD UPGRADE INFORMATION

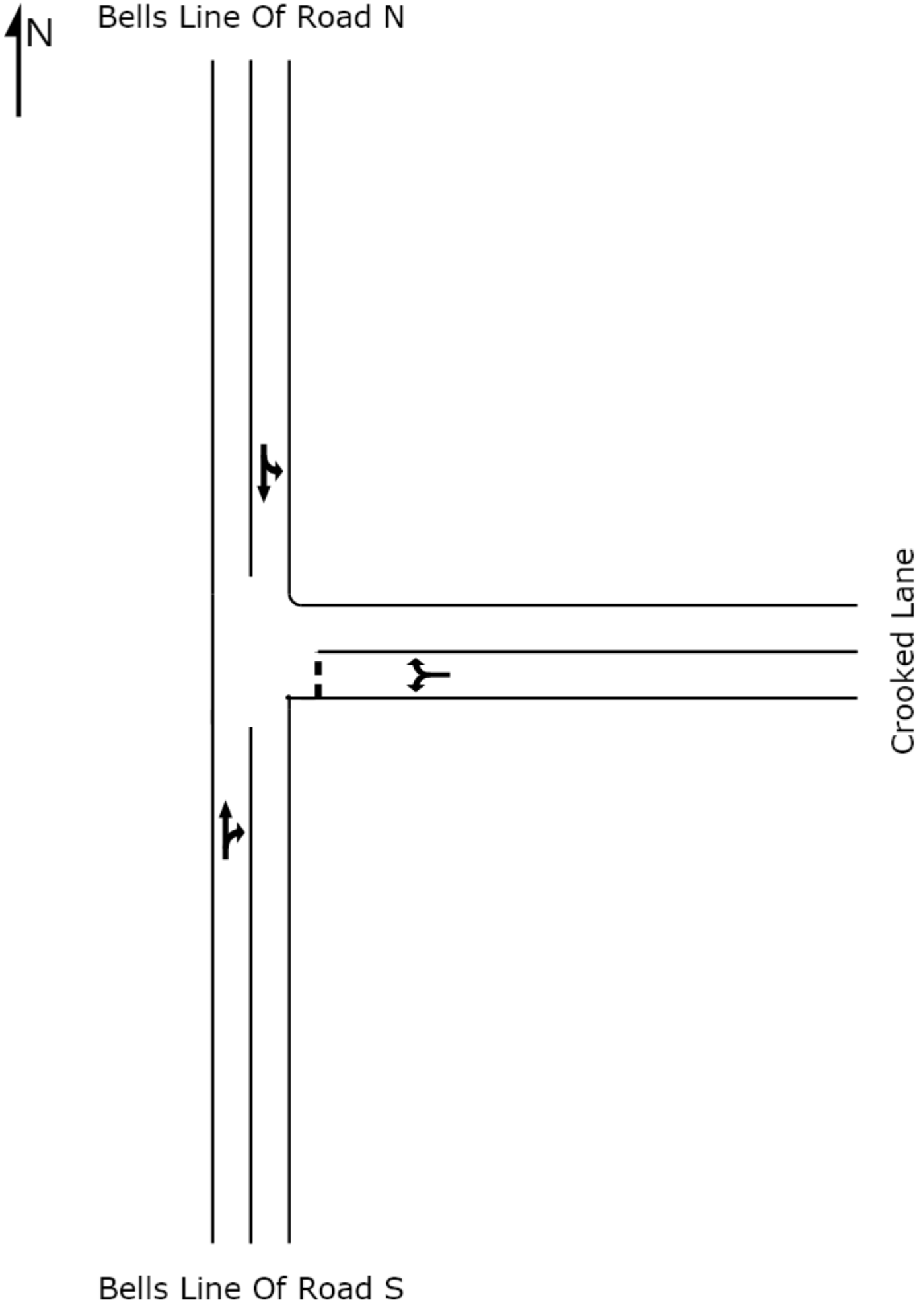
J. WYNDHAM PRINCE

9420/SK08 A

Plotted: 9 Feb 2012 5:41:35 PM File Name: J:\9420\DISK - Concept Sketch Designs\9420SK08.dwg

Appendix D

SIDRA Intersection Analyses


N
Bells Line Of Road N
Crooked Lane
Bells Line Of Road S

MOVEMENT SUMMARY

Site: AM Existing

Bells Line Of Road and Crooked Lane
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
2	T	565	3.0	0.373	7.0	LOS A	5.6	39.9	0.93	0.00	45.4
3	R	58	1.8	0.373	15.5	LOS B	5.6	39.9	0.93	1.10	45.5
Approach		623	2.9	0.373	7.8	NA	5.6	39.9	0.93	0.10	45.4
East: Crooked Lane											
4	L	221	1.0	0.732	28.0	LOS B	4.5	32.0	0.88	1.25	33.9
6	R	34	0.0	0.732	28.1	LOS B	4.5	32.0	0.88	1.21	33.9
Approach		255	0.8	0.732	28.0	LOS B	4.5	32.0	0.88	1.24	33.9
North: Bells Line Of Road N											
7	L	23	0.0	0.395	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
8	T	737	1.7	0.395	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		760	1.7	0.395	0.2	NA	0.0	0.0	0.00	0.03	59.6
All Vehicles		1638	2.0	0.732	7.4	NA	5.6	39.9	0.49	0.25	48.2

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

Site: AM With Dev

Bells Line Of Road and Crooked Lane
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
2	T	565	3.0	0.373	7.0	LOS A	5.6	39.9	0.93	0.00	45.4
3	R	58	1.8	0.373	15.5	LOS B	5.6	39.9	0.93	1.10	45.5
Approach		623	2.9	0.373	7.8	NA	5.6	39.9	0.93	0.10	45.4
East: Crooked Lane											
4	L	235	0.9	0.765	29.3	LOS C	5.1	35.9	0.89	1.30	33.2
6	R	34	0.0	0.765	29.5	LOS C	5.1	35.9	0.89	1.26	33.2
Approach		268	0.8	0.765	29.3	LOS C	5.1	35.9	0.89	1.29	33.2
North: Bells Line Of Road N											
7	L	23	0.0	0.395	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
8	T	737	1.7	0.395	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		760	1.7	0.395	0.2	NA	0.0	0.0	0.00	0.03	59.6
All Vehicles		1652	2.0	0.765	7.8	NA	5.6	39.9	0.50	0.26	47.8

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

Site: AM NRJV

Bells Line Of Road and Crooked Lane
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
2	T	576	2.9	0.379	7.1	LOS A	5.7	41.0	0.94	0.00	45.3
3	R	58	1.8	0.379	15.5	LOS B	5.7	41.0	0.94	1.11	45.5
Approach		634	2.8	0.379	7.9	NA	5.7	41.0	0.94	0.10	45.3
East: Crooked Lane											
4	L	221	1.0	0.737	28.3	LOS B	4.6	32.5	0.89	1.26	33.7
6	R	34	0.0	0.737	28.5	LOS B	4.6	32.5	0.89	1.22	33.7
Approach		255	0.8	0.737	28.3	LOS B	4.6	32.5	0.89	1.25	33.7
North: Bells Line Of Road N											
7	L	23	0.0	0.395	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
8	T	737	1.7	0.395	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		760	1.7	0.395	0.2	NA	0.0	0.0	0.00	0.03	59.6
All Vehicles		1648	2.0	0.737	7.5	NA	5.7	41.0	0.50	0.25	48.1

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

Site: AM With Dev With NRJV

Bells Line Of Road and Crooked Lane
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
2	T	576	2.9	0.379	7.1	LOS A	5.7	41.0	0.94	0.00	45.3
3	R	58	1.8	0.379	15.5	LOS B	5.7	41.0	0.94	1.11	45.5
Approach		634	2.8	0.379	7.9	NA	5.7	41.0	0.94	0.10	45.3
East: Crooked Lane											
4	L	235	0.9	0.770	29.7	LOS C	5.2	36.4	0.90	1.31	33.0
6	R	34	0.0	0.770	29.9	LOS C	5.2	36.4	0.90	1.26	33.0
Approach		268	0.8	0.770	29.7	LOS C	5.2	36.4	0.90	1.30	33.0
North: Bells Line Of Road N											
7	L	23	0.0	0.395	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
8	T	737	1.7	0.395	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		760	1.7	0.395	0.2	NA	0.0	0.0	0.00	0.03	59.6
All Vehicles		1662	2.0	0.770	7.9	NA	5.7	41.0	0.50	0.26	47.7

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

Site: AM With Dev With NRJV Banned Right at Terrace

Bells Line Of Road and Crooked Lane
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
2	T	576	2.9	0.539	9.5	LOS A	7.8	55.8	1.00	0.00	43.0
3	R	178	0.6	0.539	17.9	LOS B	7.8	55.8	1.00	1.18	42.9
Approach		754	2.4	0.539	11.5	NA	7.8	55.8	1.00	0.28	43.0
East: Crooked Lane											
4	L	235	0.9	0.833	36.5	LOS C	6.4	44.8	0.91	1.44	29.9
6	R	34	0.0	0.833	36.7	LOS C	6.4	44.8	0.91	1.36	29.9
Approach		268	0.8	0.833	36.6	LOS C	6.4	44.8	0.91	1.43	29.9
North: Bells Line Of Road N											
7	L	23	0.0	0.395	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
8	T	737	1.7	0.395	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		760	1.7	0.395	0.2	NA	0.0	0.0	0.00	0.03	59.6
All Vehicles		1782	1.8	0.833	10.5	NA	7.8	55.8	0.56	0.35	45.4

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

Site: PM Existing

Bells Line Of Road and Crooked Lane
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
2	T	700	0.6	0.521	5.0	LOS A	8.1	56.9	0.84	0.00	46.0
3	R	176	0.6	0.521	13.4	LOS A	8.1	56.9	0.84	1.09	46.7
Approach		876	0.6	0.521	6.7	NA	8.1	56.9	0.84	0.22	46.1
East: Crooked Lane											
4	L	120	1.8	0.207	12.5	LOS A	0.7	5.3	0.55	0.84	44.7
6	R	4	0.0	0.207	12.6	LOS A	0.7	5.3	0.55	0.87	44.6
Approach		124	1.7	0.207	12.5	LOS A	0.7	5.3	0.55	0.84	44.7
North: Bells Line Of Road N											
7	L	7	0.0	0.258	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
8	T	485	3.0	0.258	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		493	3.0	0.258	0.1	NA	0.0	0.0	0.00	0.02	59.8
All Vehicles		1493	1.5	0.521	5.0	NA	8.1	56.9	0.54	0.20	49.7

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

Site: PM With Dev

Bells Line Of Road and Crooked Lane
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
2	T	700	0.6	0.534	5.1	LOS A	8.4	59.4	0.86	0.00	45.7
3	R	189	0.6	0.534	13.5	LOS A	8.4	59.4	0.86	1.10	46.6
Approach		889	0.6	0.534	6.9	NA	8.4	59.4	0.86	0.23	45.9
East: Crooked Lane											
4	L	120	1.8	0.207	12.5	LOS A	0.7	5.3	0.55	0.84	44.7
6	R	4	0.0	0.207	12.6	LOS A	0.7	5.3	0.55	0.87	44.6
Approach		124	1.7	0.207	12.5	LOS A	0.7	5.3	0.55	0.84	44.7
North: Bells Line Of Road N											
7	L	7	0.0	0.258	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
8	T	485	3.0	0.258	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		493	3.0	0.258	0.1	NA	0.0	0.0	0.00	0.02	59.8
All Vehicles		1506	1.5	0.534	5.2	NA	8.4	59.4	0.55	0.21	49.6

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

Site: PM NRJV

Bells Line Of Road and Crooked Lane
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
2	T	700	0.6	0.524	5.1	LOS A	8.2	57.7	0.85	0.00	45.8
3	R	176	0.6	0.524	13.6	LOS A	8.2	57.7	0.85	1.11	46.6
Approach		876	0.6	0.524	6.8	NA	8.2	57.7	0.85	0.22	46.0
East: Crooked Lane											
4	L	120	1.8	0.210	12.6	LOS A	0.8	5.4	0.56	0.85	44.6
6	R	4	0.0	0.210	12.7	LOS A	0.8	5.4	0.56	0.87	44.5
Approach		124	1.7	0.210	12.6	LOS A	0.8	5.4	0.56	0.85	44.6
North: Bells Line Of Road N											
7	L	7	0.0	0.263	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
8	T	496	3.0	0.263	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		503	2.9	0.263	0.1	NA	0.0	0.0	0.00	0.02	59.8
All Vehicles		1503	1.5	0.524	5.1	NA	8.2	57.7	0.54	0.20	49.7

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

Site: PM With Dev With NRJV

Bells Line Of Road and Crooked Lane
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
2	T	700	0.6	0.536	5.3	LOS A	8.6	60.3	0.87	0.00	45.6
3	R	189	0.6	0.536	13.7	LOS A	8.6	60.3	0.87	1.11	46.4
Approach		889	0.6	0.536	7.1	NA	8.6	60.3	0.87	0.24	45.8
East: Crooked Lane											
4	L	120	1.8	0.211	12.6	LOS A	0.8	5.4	0.56	0.85	44.5
6	R	4	0.0	0.211	12.8	LOS A	0.8	5.4	0.56	0.87	44.5
Approach		124	1.7	0.211	12.6	LOS A	0.8	5.4	0.56	0.85	44.5
North: Bells Line Of Road N											
7	L	7	0.0	0.263	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
8	T	496	3.0	0.263	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		503	2.9	0.263	0.1	NA	0.0	0.0	0.00	0.02	59.8
All Vehicles		1517	1.5	0.536	5.2	NA	8.6	60.3	0.56	0.21	49.5

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

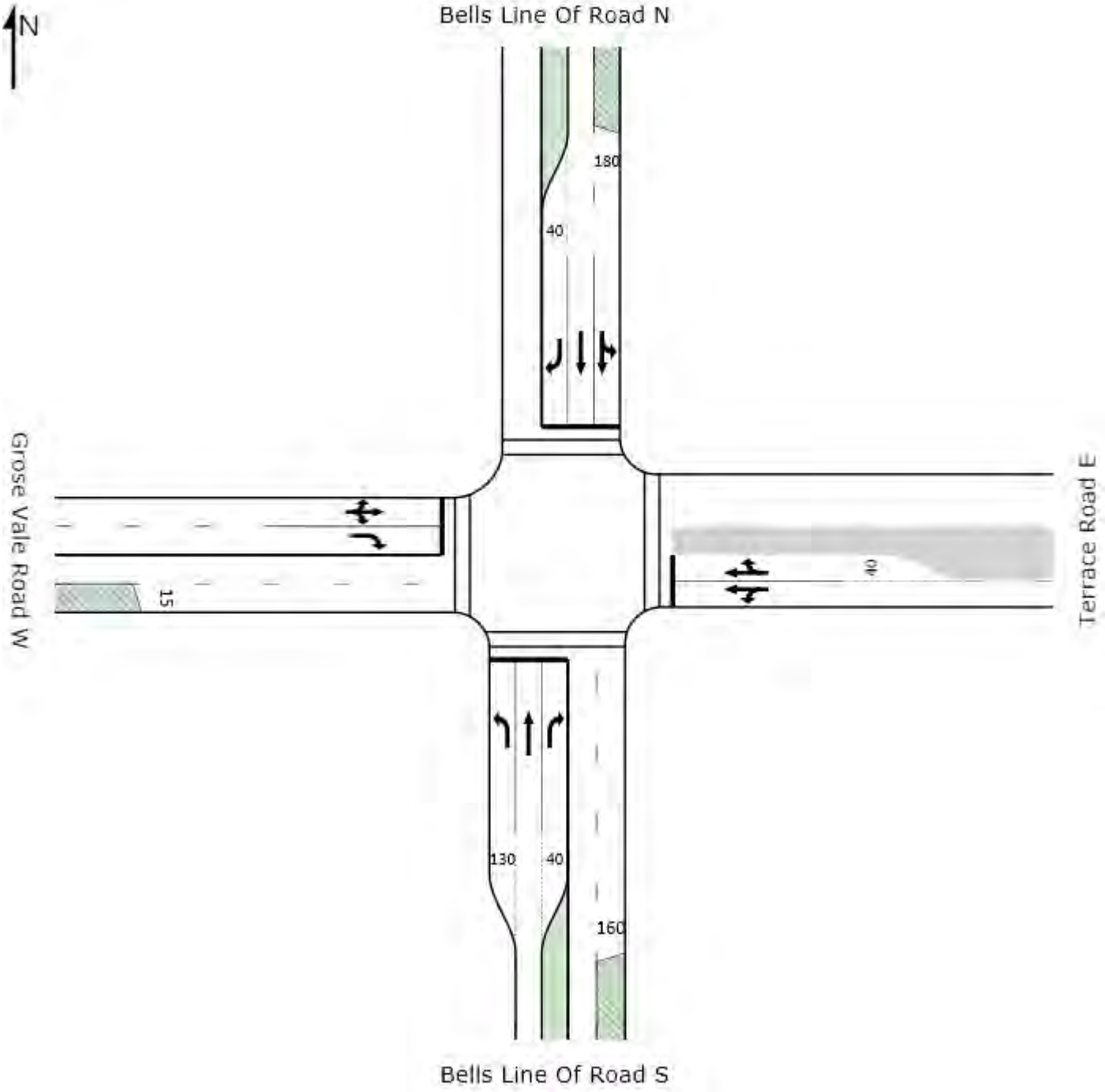
Site: PM With Dev With NRJV
Banned Right at GVR

Bells Line Of Road and Crooked Lane
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
2	T	700	0.6	0.851	13.7	LOS A	21.2	148.9	1.00	0.00	39.1
3	R	528	0.2	0.851	22.1	LOS B	21.2	148.9	1.00	1.58	38.9
Approach		1228	0.4	0.851	17.3	NA	21.2	148.9	1.00	0.68	39.0
East: Crooked Lane											
4	L	120	1.8	0.244	13.8	LOS A	0.9	6.2	0.59	0.87	43.5
6	R	4	0.0	0.244	14.0	LOS A	0.9	6.2	0.59	0.89	43.4
Approach		124	1.7	0.244	13.8	LOS A	0.9	6.2	0.59	0.87	43.5
North: Bells Line Of Road N											
7	L	7	0.0	0.263	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
8	T	496	3.0	0.263	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		503	2.9	0.263	0.1	NA	0.0	0.0	0.00	0.02	59.8
All Vehicles		1856	1.2	0.851	12.4	NA	21.2	148.9	0.70	0.51	43.4

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.


N
Bells Line Of Road N
180
40
Grose Vale Road W
15
40
Terrace Road E
130
40
160
Bells Line Of Road S

MOVEMENT SUMMARY

Site: AM Existing

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
1	L	138	1.5	0.163	16.5	LOS B	3.0	21.5	0.47	0.74	41.3
2	T	435	2.9	0.666	44.4	LOS D	26.8	192.0	0.91	0.80	26.0
3	R	124	3.4	0.673	46.2	LOS D	6.0	43.3	0.97	0.82	26.5
Approach		697	2.7	0.673	39.2	LOS C	26.8	192.0	0.83	0.79	28.1
East: Terrace Road E											
4	L	223	0.5	0.598	37.6	LOS C	8.5	59.8	0.93	0.83	29.5
5	T	69	1.5	0.764	62.1	LOS E	7.4	52.6	0.90	0.81	21.2
6	R	40	2.6	0.764	70.2	LOS E	7.4	52.6	0.90	0.89	21.0
Approach		333	0.9	0.764	46.6	LOS D	8.5	59.8	0.92	0.83	26.1
North: Bells Line Of Road N											
7	L	40	0.0	0.659	51.6	LOS D	23.8	168.1	0.89	0.89	25.8
8	T	855	1.5	0.759	45.1	LOS D	32.2	228.0	0.93	0.82	25.7
9	R	48	4.3	0.225	40.9	LOS C	2.2	15.7	0.86	0.74	28.3
Approach		943	1.6	0.759	45.2	LOS D	32.2	228.0	0.92	0.82	25.8
West: Grose Vale Road W											
10	L	22	0.0	0.664	63.0	LOS E	19.7	139.9	0.96	0.85	22.1
11	T	57	0.0	0.664	54.8	LOS D	19.7	139.9	0.96	0.82	22.3
12	R	561	2.4	0.759	64.8	LOS E	23.6	168.7	0.98	0.86	21.6
Approach		640	2.1	0.759	63.8	LOS E	23.6	168.7	0.98	0.86	21.7
All Vehicles		2613	1.9	0.764	48.3	LOS D	32.2	228.0	0.91	0.82	25.2

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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
P1	Across S approach	53	59.0	LOS E	0.2	0.2	0.89	0.89
P3	Across E approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P5	Across N approach	53	50.4	LOS E	0.2	0.2	0.82	0.82
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		212	61.7	LOS F			0.90	0.90

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.

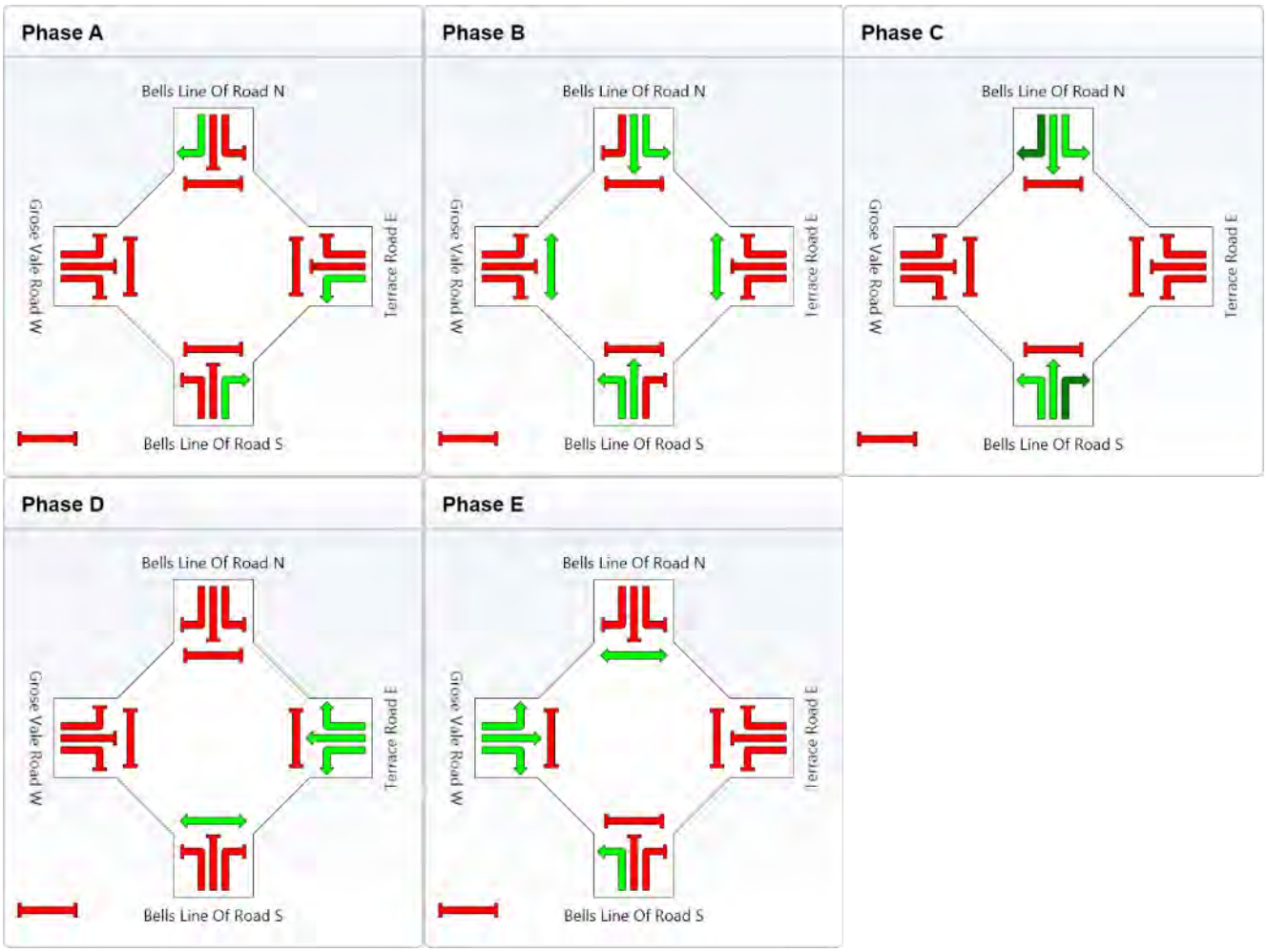
PHASING SUMMARY

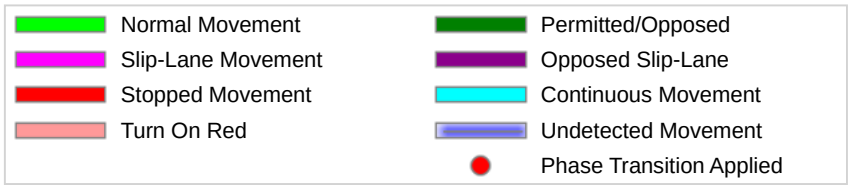
Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D, E
Output Sequence: A, B, C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	8	16	30	29	37
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	14	22	36	35	43
Phase Split	9 %	15 %	24 %	23 %	29 %





MOVEMENT SUMMARY

Site: PM Existing

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
1	L	217	2.4	0.260	14.5	LOS A	4.2	29.8	0.43	0.74	43.0
2	T	658	1.6	0.692	30.3	LOS C	36.2	256.7	0.83	0.75	31.3
3	R	246	1.3	0.923	35.7	LOS C	9.2	65.3	0.81	0.86	30.3
Approach		1121	1.7	0.923	28.4	LOS B	36.2	256.7	0.75	0.77	32.8
East: Terrace Road E											
4	L	159	2.0	0.651	46.3	LOS D	8.8	62.9	0.98	0.82	26.5
5	T	111	1.0	1.000[3]	60.9	LOS E	9.2	65.3	0.98	0.78	21.3
6	R	41	2.6	1.000[3]	73.4	LOS F	9.2	65.3	0.97	0.80	20.4
Approach		311	1.7	1.000	55.1	LOS D	9.2	65.3	0.98	0.80	23.5
North: Bells Line Of Road N											
7	L	44	2.4	0.296	30.6	LOS C	8.3	60.1	0.60	0.89	33.6
8	T	480	3.9	0.340	23.3	LOS B	13.8	99.5	0.63	0.54	35.1
9	R	51	4.2	0.234	31.7	LOS C	1.7	12.2	0.78	0.75	32.1
Approach		575	3.8	0.340	24.6	LOS B	13.8	99.5	0.64	0.59	34.7
West: Grose Vale Road W											
10	L	76	1.4	0.872	86.0	LOS F	18.8	132.5	1.00	0.97	18.0
11	T	94	0.0	0.872	77.8	LOS F	18.8	132.5	1.00	0.97	18.1
12	R	346	1.5	0.996	115.1	LOS F	27.7	196.7	1.00	1.06	14.4
Approach		516	1.2	0.996	104.0	LOS F	27.7	196.7	1.00	1.03	15.5
All Vehicles		2522	2.1	1.000	46.3	LOS D	36.2	256.7	0.80	0.79	25.9

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

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
P1	Across S approach	53	66.3	LOS F	0.2	0.2	0.94	0.94
P3	Across E approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P5	Across N approach	53	62.6	LOS F	0.2	0.2	0.91	0.91
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		212	66.5	LOS F			0.94	0.94

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.

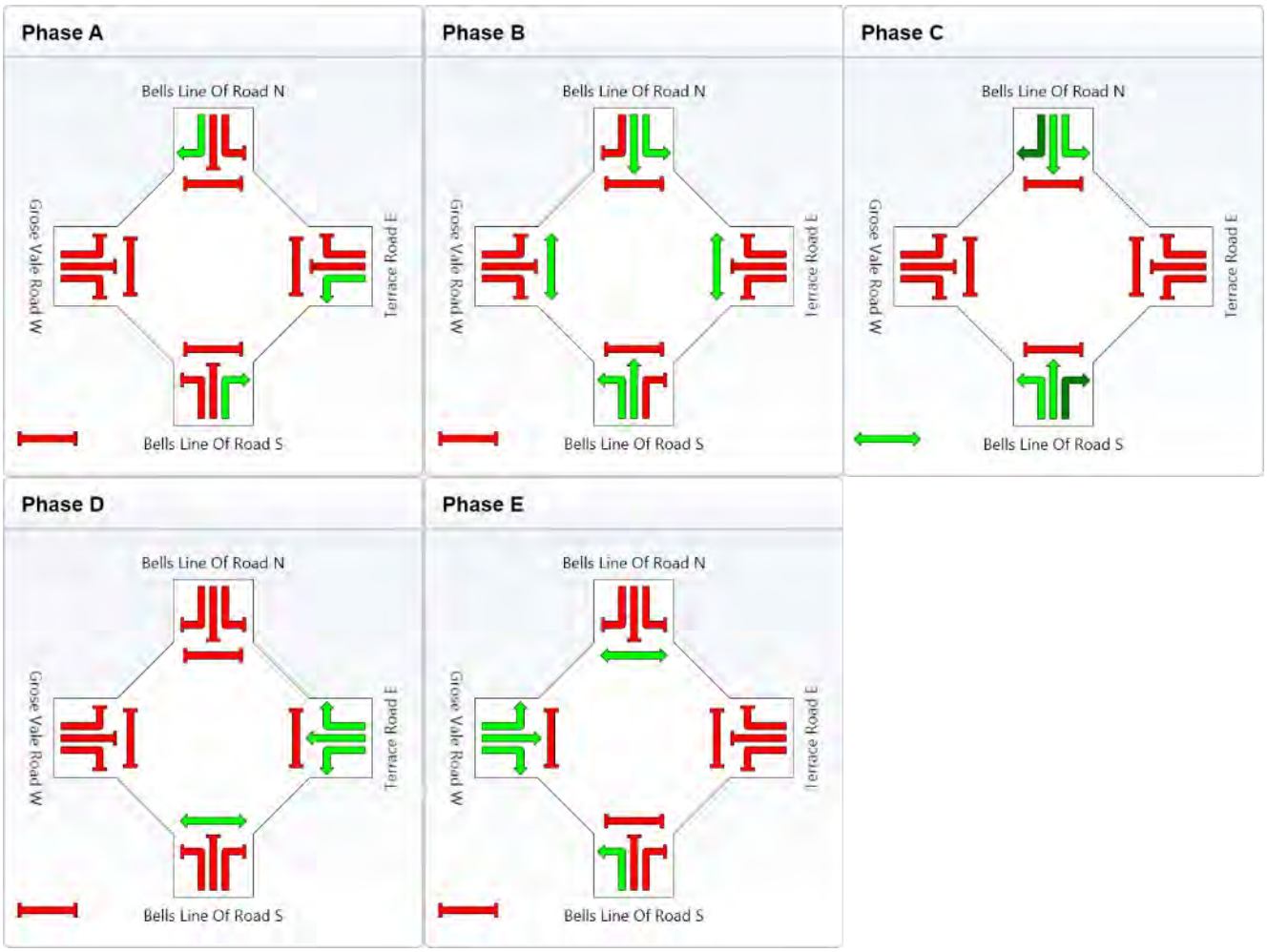
PHASING SUMMARY

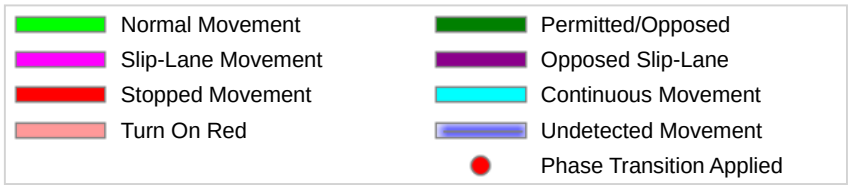
Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D, E
Output Sequence: A, B, C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	7	16	53	21	23
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	13	22	59	27	29
Phase Split	9 %	15 %	39 %	18 %	19 %





MOVEMENT SUMMARY

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
1	L	138	1.5	0.176	19.6	LOS B	3.7	26.4	0.53	0.75	39.0
2	T	435	2.9	0.736	49.2	LOS D	28.2	202.5	0.96	0.84	24.5
3	R	124	3.4	0.781	54.2	LOS D	6.8	48.8	1.00	0.87	24.1
Approach		697	2.7	0.781	44.2	LOS D	28.2	202.5	0.88	0.83	26.4
East: Terrace Road E											
4	L	319	0.3	0.703	45.1	LOS D	15.5	109.0	0.94	0.89	26.8
5	T	91	1.2	0.840	64.1	LOS E	9.1	64.3	0.85	0.84	20.9
6	R	40	2.6	0.840	72.2	LOS F	9.1	64.3	0.85	0.97	20.6
Approach		449	0.7	0.840	51.3	LOS D	15.5	109.0	0.92	0.89	24.7
North: Bells Line Of Road N											
7	L	40	0.0	0.706	56.8	LOS E	26.3	186.5	0.94	0.88	24.4
8	T	855	1.5	0.813	51.3	LOS D	33.6	238.1	0.97	0.87	23.9
9	R	48	4.3	0.255	45.5	LOS D	2.3	17.0	0.90	0.75	26.6
Approach		943	1.6	0.813	51.2	LOS D	33.6	238.1	0.97	0.87	24.1
West: Grose Vale Road W											
10	L	22	0.0	0.722	66.5	LOS E	20.4	144.8	0.98	0.86	21.3
11	T	57	0.0	0.722	58.3	LOS E	20.4	144.8	0.98	0.85	21.5
12	R	561	2.4	0.826	70.4	LOS E	25.3	181.0	0.99	0.89	20.5
Approach		640	2.1	0.826	69.2	LOS E	25.3	181.0	0.99	0.88	20.6
All Vehicles		2729	1.9	0.840	53.7	LOS D	33.6	238.1	0.94	0.86	23.8

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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
P1	Across S approach	53	51.3	LOS E	0.2	0.2	0.83	0.83
P3	Across E approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P5	Across N approach	53	52.9	LOS E	0.2	0.2	0.84	0.84
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		212	60.4	LOS F			0.90	0.90

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.

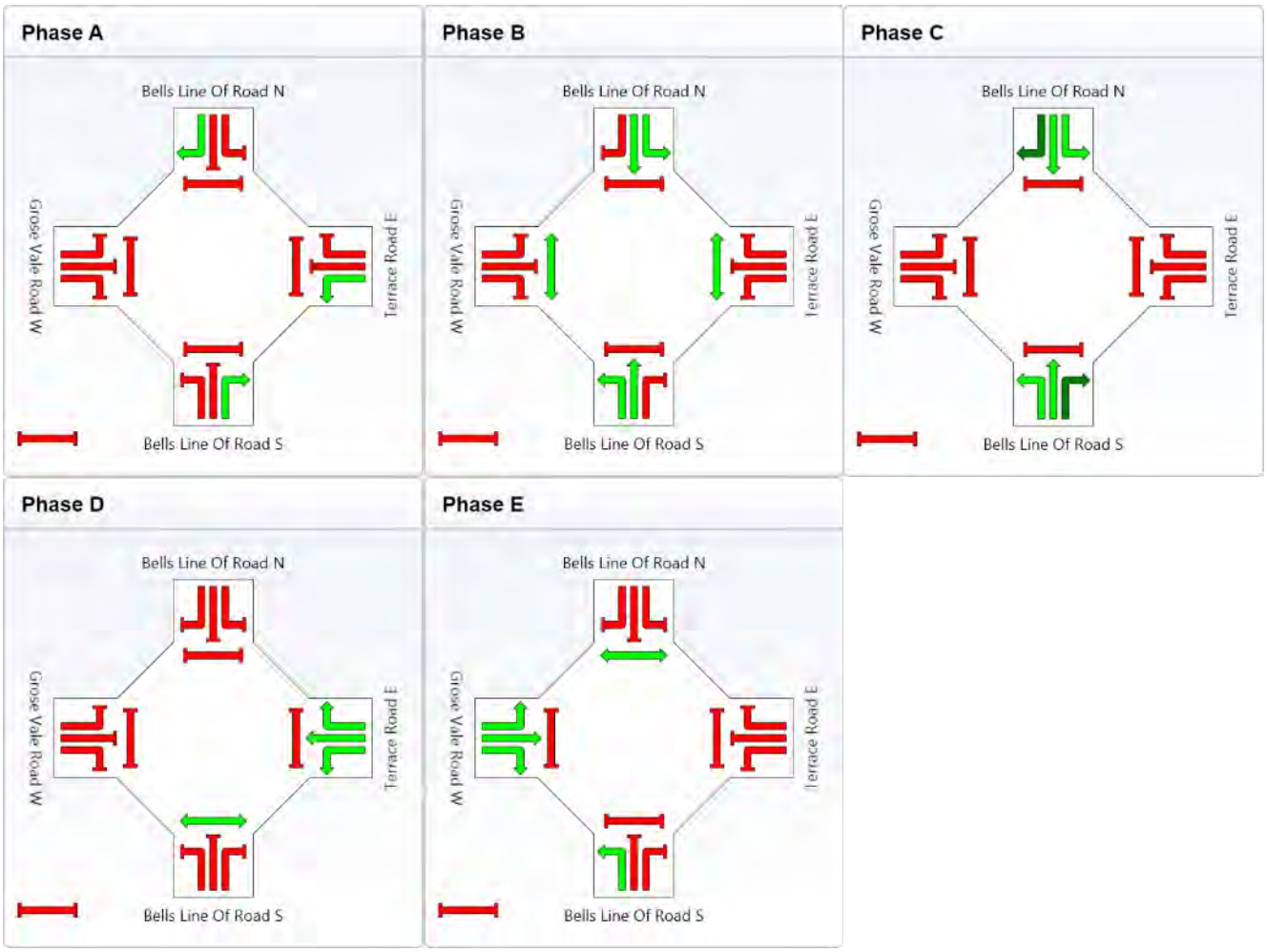
PHASING SUMMARY

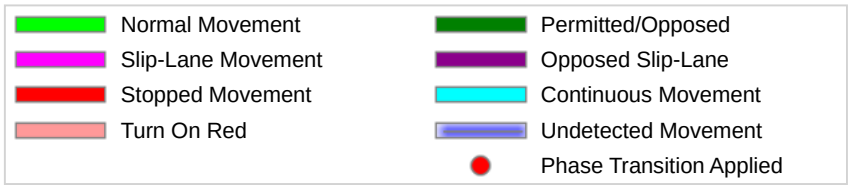
Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D, E
Output Sequence: A, B, C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	7	16	25	38	34
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	13	22	31	44	40
Phase Split	9 %	15 %	21 %	29 %	27 %





SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: PM With Dev

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
1	L	217	2.4	0.256	14.1	LOS A	3.9	28.0	0.42	0.74	43.3
2	T	717	1.6	0.758	31.9	LOS C	41.5	294.5	0.87	0.80	30.4
3	R	283	0.9	1.000[3]	36.0	LOS C	10.3	72.7	0.87	0.88	30.2
Approach		1217	1.6	1.000	29.7	LOS C	41.5	294.5	0.79	0.81	32.1
East: Terrace Road E											
4	L	159	2.0	0.697	47.8	LOS D	9.2	65.3	0.99	0.84	26.0
5	T	111	1.0	1.000[3]	62.4	LOS E	9.2	65.3	0.99	0.79	21.0
6	R	41	2.6	1.000[3]	75.6	LOS F	9.2	65.3	0.99	0.79	20.0
Approach		311	1.7	1.000	56.7	LOS E	9.2	65.3	0.99	0.82	23.1
North: Bells Line Of Road N											
7	L	44	2.4	0.296	30.6	LOS C	8.3	60.1	0.60	0.89	33.6
8	T	480	3.9	0.340	23.3	LOS B	13.8	99.5	0.63	0.54	35.1
9	R	51	4.2	0.224	31.9	LOS C	1.6	11.9	0.79	0.75	32.0
Approach		575	3.8	0.340	24.6	LOS B	13.8	99.5	0.64	0.59	34.7
West: Grose Vale Road W											
10	L	76	1.4	0.867	84.7	LOS F	19.5	137.3	1.00	0.97	18.3
11	T	115	0.0	0.867	76.4	LOS F	19.5	137.3	1.00	0.97	18.4
12	R	346	1.5	0.991	113.3	LOS F	28.5	201.8	1.00	1.05	14.6
Approach		537	1.2	0.991	101.4	LOS F	28.5	201.8	1.00	1.03	15.7
All Vehicles		2639	2.0	1.000	46.3	LOS D	41.5	294.5	0.82	0.80	25.9

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

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
P1	Across S approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P3	Across E approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P5	Across N approach	53	61.7	LOS F	0.2	0.2	0.91	0.91
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		212	66.8	LOS F			0.94	0.94

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.

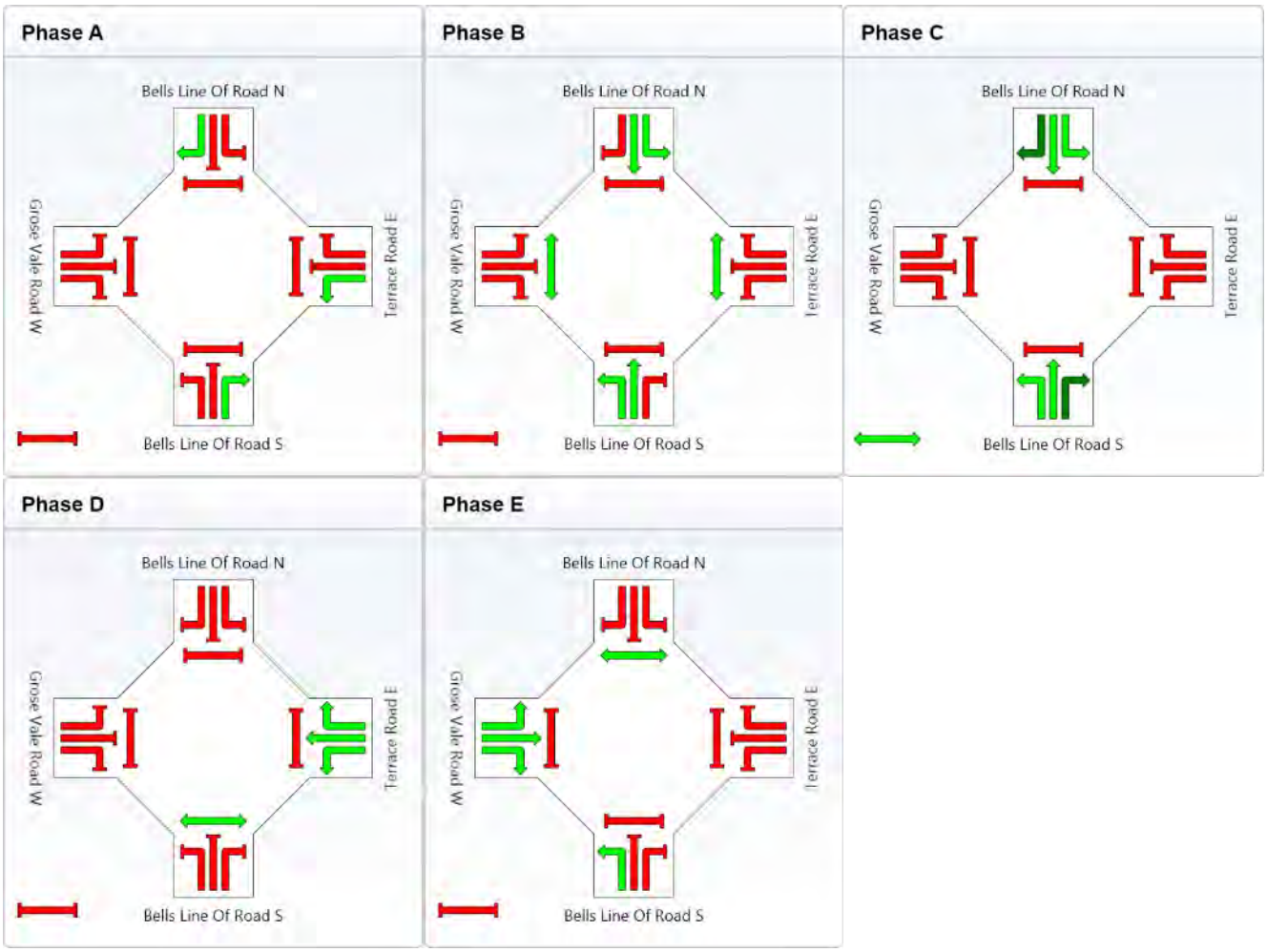
PHASING SUMMARY

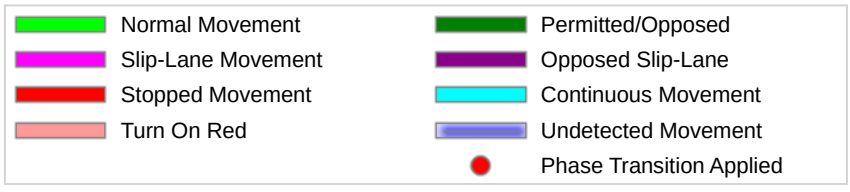
Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D, E
Output Sequence: A, B, C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	8	16	53	19	24
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	14	22	59	25	30
Phase Split	9 %	15 %	39 %	17 %	20 %





MOVEMENT SUMMARY

Site: AM NRJV

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
1	L	138	1.5	0.156	13.7	LOS A	2.2	15.6	0.40	0.73	43.6
2	T	435	2.9	0.752	50.2	LOS D	28.5	204.6	0.97	0.85	24.3
3	R	124	3.4	0.692	50.1	LOS D	6.2	44.5	1.00	0.82	25.3
Approach		697	2.7	0.752	42.9	LOS D	28.5	204.6	0.86	0.82	26.8
East: Terrace Road E											
4	L	223	0.5	0.786	47.7	LOS D	9.4	66.1	1.00	0.89	25.9
5	T	69	1.5	0.843	77.1	LOS F	8.3	59.3	0.98	0.92	18.4
6	R	40	2.6	0.843	85.2	LOS F	8.3	59.3	0.98	0.94	18.4
Approach		333	0.9	0.843	58.3	LOS E	9.4	66.1	0.99	0.90	22.8
North: Bells Line Of Road N											
7	L	40	0.0	0.722	57.8	LOS E	26.6	188.4	0.95	0.88	24.1
8	T	855	1.5	0.830	53.1	LOS D	34.5	244.4	0.98	0.89	23.4
9	R	48	4.3	0.264	46.8	LOS D	2.2	16.2	0.96	0.74	26.2
Approach		943	1.6	0.830	53.0	LOS D	34.5	244.4	0.98	0.88	23.6
West: Grose Vale Road W											
10	L	33	0.0	0.732	54.0	LOS D	29.6	209.0	0.94	0.88	24.3
11	T	88	0.0	0.732	45.8	LOS D	29.6	209.0	0.94	0.83	24.6
12	R	877	1.6	0.837	58.0	LOS E	37.6	266.6	0.97	0.90	23.2
Approach		998	1.4	0.837	56.8	LOS E	37.6	266.6	0.97	0.89	23.3
All Vehicles		2971	1.7	0.843	52.5	LOS D	37.6	266.6	0.95	0.87	24.1

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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
P1	Across S approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
P3	Across E approach	53	52.1	LOS E	0.2	0.2	0.83	0.83
P5	Across N approach	53	38.9	LOS D	0.2	0.2	0.72	0.72
P7	Across W approach	53	52.9	LOS E	0.2	0.2	0.84	0.84
All Pedestrians		212	53.3	LOS E			0.84	0.84

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.

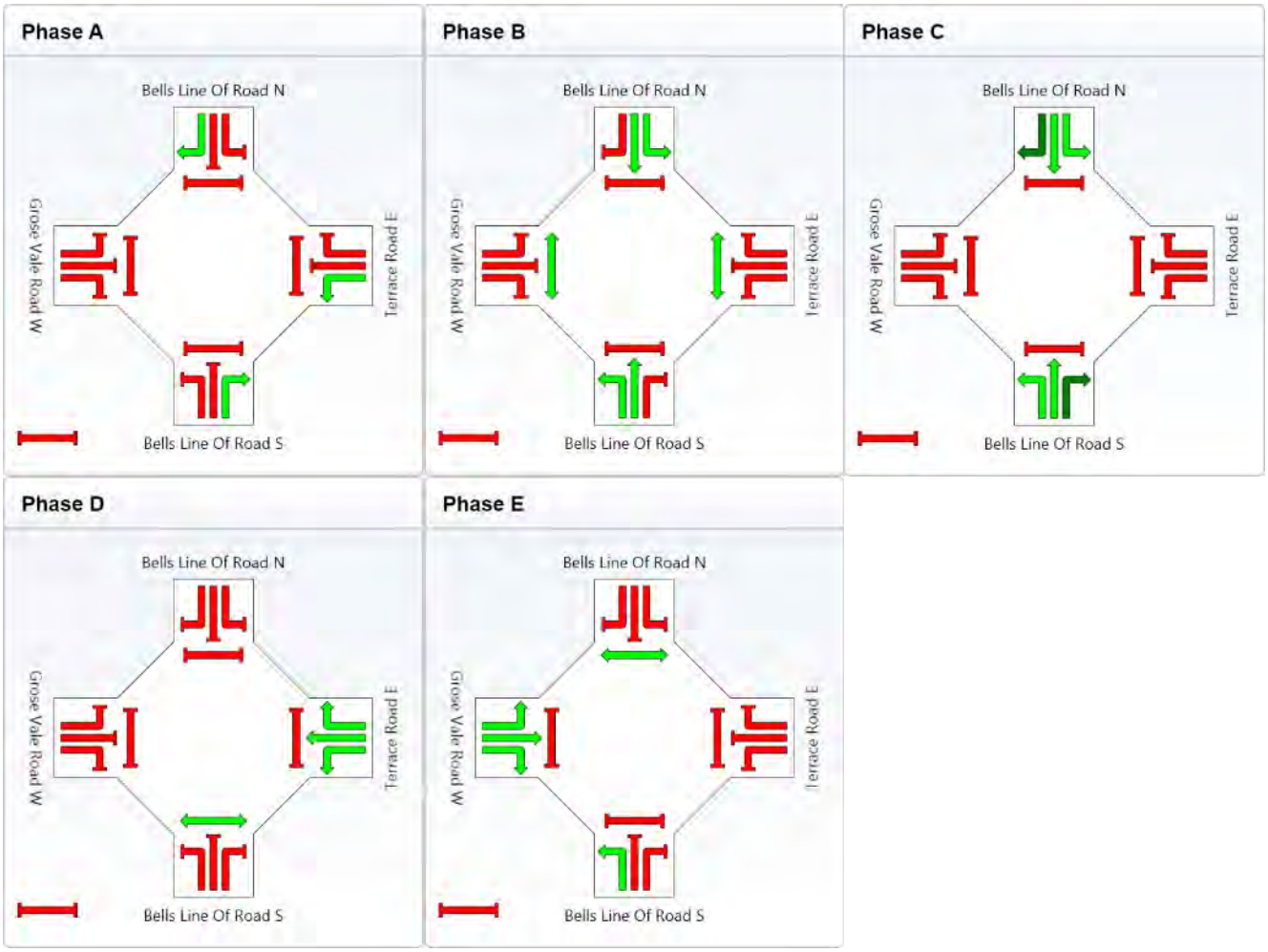
PHASING SUMMARY

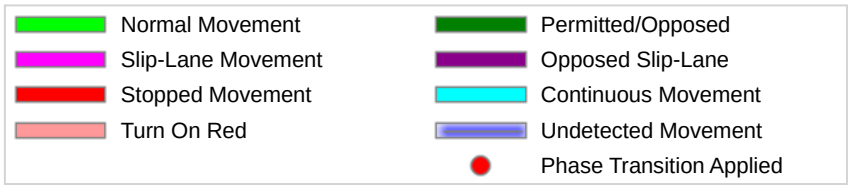
Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D, E
Output Sequence: A, B, C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	10	34	6	18	52
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	16	40	12	24	58
Phase Split	11 %	27 %	8 %	16 %	39 %





MOVEMENT SUMMARY

Site: PM NRJV

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
1	L	533	1.0	0.635	16.4	LOS B	13.6	95.7	0.57	0.79	41.4
2	T	658	1.6	0.692	30.3	LOS C	36.2	256.7	0.83	0.75	31.3
3	R	246	1.3	0.923	35.7	LOS C	9.2	65.3	0.81	0.86	30.3
Approach		1437	1.3	0.923	26.1	LOS B	36.2	256.7	0.73	0.79	34.2
East: Terrace Road E											
4	L	159	2.0	0.791	59.2	LOS E	12.5	89.0	1.00	0.91	23.0
5	T	142	0.7	1.000[3]	60.3	LOS E	12.5	89.0	0.98	0.82	21.3
6	R	41	2.6	1.000[3]	73.4	LOS F	9.2	65.3	0.97	0.80	20.4
Approach		342	1.5	1.000	61.4	LOS E	12.5	89.0	0.99	0.86	22.0
North: Bells Line Of Road N											
7	L	44	2.4	0.296	30.6	LOS C	8.3	60.2	0.60	0.89	33.6
8	T	480	3.9	0.340	23.3	LOS B	13.7	99.5	0.63	0.54	35.1
9	R	61	3.4	0.298	32.5	LOS C	2.0	14.8	0.80	0.76	31.7
Approach		585	3.8	0.340	24.8	LOS B	13.7	99.5	0.65	0.59	34.6
West: Grose Vale Road W											
10	L	76	1.4	0.872	86.0	LOS F	18.8	132.5	1.00	0.97	18.0
11	T	94	0.0	0.872	77.8	LOS F	18.8	132.5	1.00	0.97	18.1
12	R	346	1.5	0.996	115.1	LOS F	27.7	196.7	1.00	1.06	14.4
Approach		516	1.2	0.996	104.0	LOS F	27.7	196.7	1.00	1.03	15.5
All Vehicles		2880	1.8	1.000	44.0	LOS D	36.2	256.7	0.79	0.80	26.7

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

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
P1	Across S approach	53	66.3	LOS F	0.2	0.2	0.94	0.94
P3	Across E approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P5	Across N approach	53	62.6	LOS F	0.2	0.2	0.91	0.91
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		212	66.5	LOS F			0.94	0.94

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.

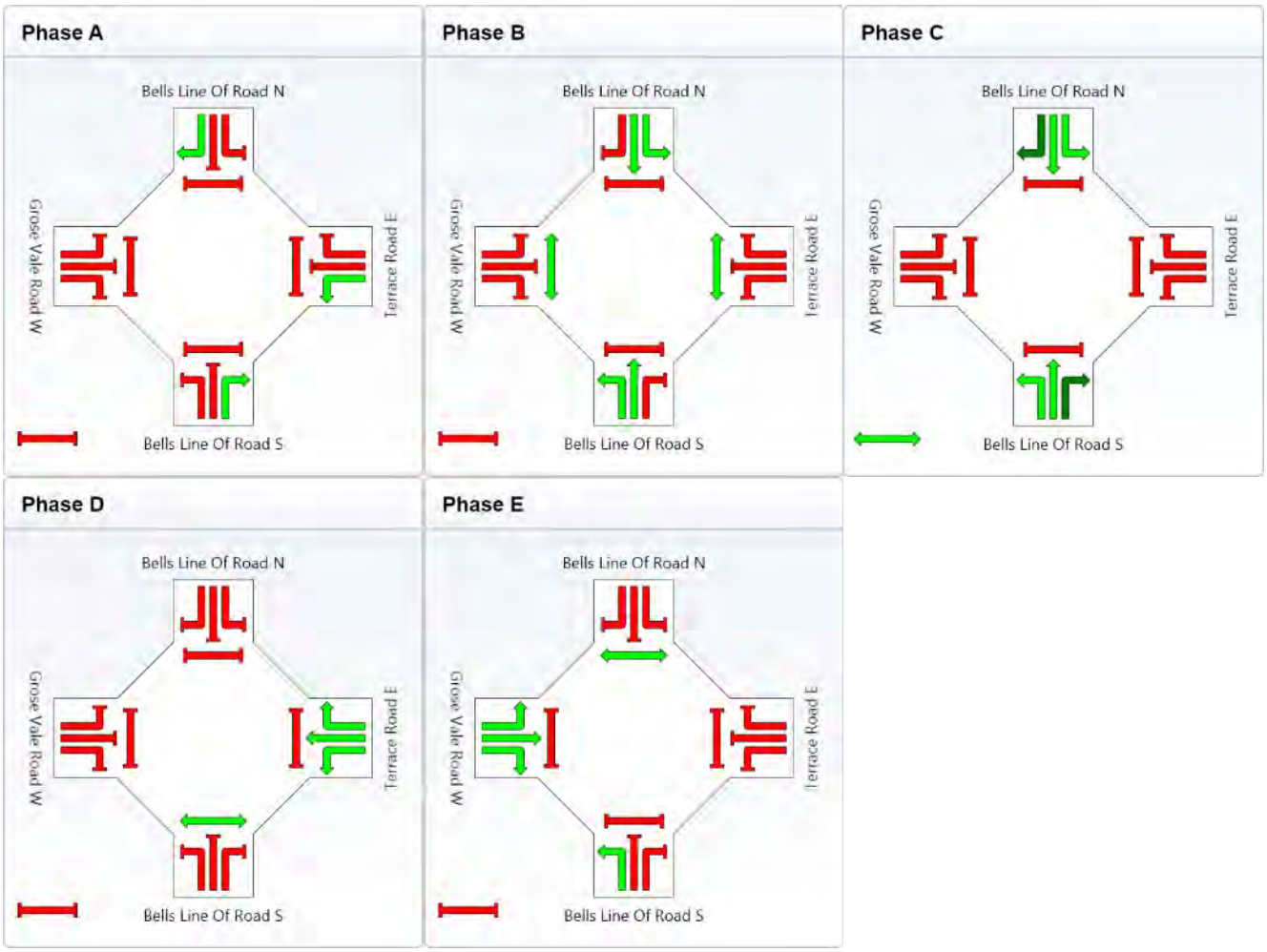
PHASING SUMMARY

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D, E
Output Sequence: A, B, C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	7	16	53	21	23
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	13	22	59	27	29
Phase Split	9 %	15 %	39 %	18 %	19 %



MOVEMENT SUMMARY

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
1	L	138	1.5	0.177	15.8	LOS B	2.9	20.3	0.46	0.74	41.9
2	T	435	2.9	0.805	55.8	LOS D	30.4	218.2	0.99	0.91	22.8
3	R	124	3.4	0.791	55.8	LOS D	6.9	49.5	1.00	0.87	23.7
Approach		697	2.7	0.805	47.9	LOS D	30.4	218.2	0.89	0.87	25.2
East: Terrace Road E											
4	L	319	0.3	0.902	71.6	LOS F	20.7	145.5	1.00	1.04	20.2
5	T	91	1.2	0.926	68.1	LOS E	9.2	65.3	0.93	0.82	20.0
6	R	40	2.6	0.926	76.2	LOS F	9.2	65.3	0.93	0.88	19.9
Approach		449	0.7	0.926	71.3	LOS F	20.7	145.5	0.98	0.98	20.1
North: Bells Line Of Road N											
7	L	40	0.0	0.772	61.8	LOS E	27.8	197.1	0.98	0.89	23.1
8	T	855	1.5	0.888	60.6	LOS E	37.9	269.0	0.99	0.95	21.7
9	R	48	4.3	0.269	48.0	LOS D	2.4	17.4	0.94	0.75	25.9
Approach		943	1.6	0.888	60.0	LOS E	37.9	269.0	0.99	0.94	21.9
West: Grose Vale Road W											
10	L	33	0.0	0.793	59.5	LOS E	31.5	222.9	0.98	0.89	22.9
11	T	88	0.0	0.793	51.4	LOS D	31.5	222.9	0.98	0.88	23.1
12	R	877	1.6	0.907	69.0	LOS E	43.0	305.4	0.99	0.94	20.8
Approach		998	1.4	0.907	67.1	LOS E	43.0	305.4	0.99	0.93	21.0
All Vehicles		3087	1.6	0.926	61.2	LOS E	43.0	305.4	0.97	0.92	22.0

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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
P1	Across S approach	53	60.8	LOS F	0.2	0.2	0.90	0.90
P3	Across E approach	53	67.2	LOS F	0.2	0.2	0.95	0.95
P5	Across N approach	53	41.8	LOS E	0.2	0.2	0.75	0.75
P7	Across W approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
All Pedestrians		212	59.5	LOS E			0.89	0.89

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.

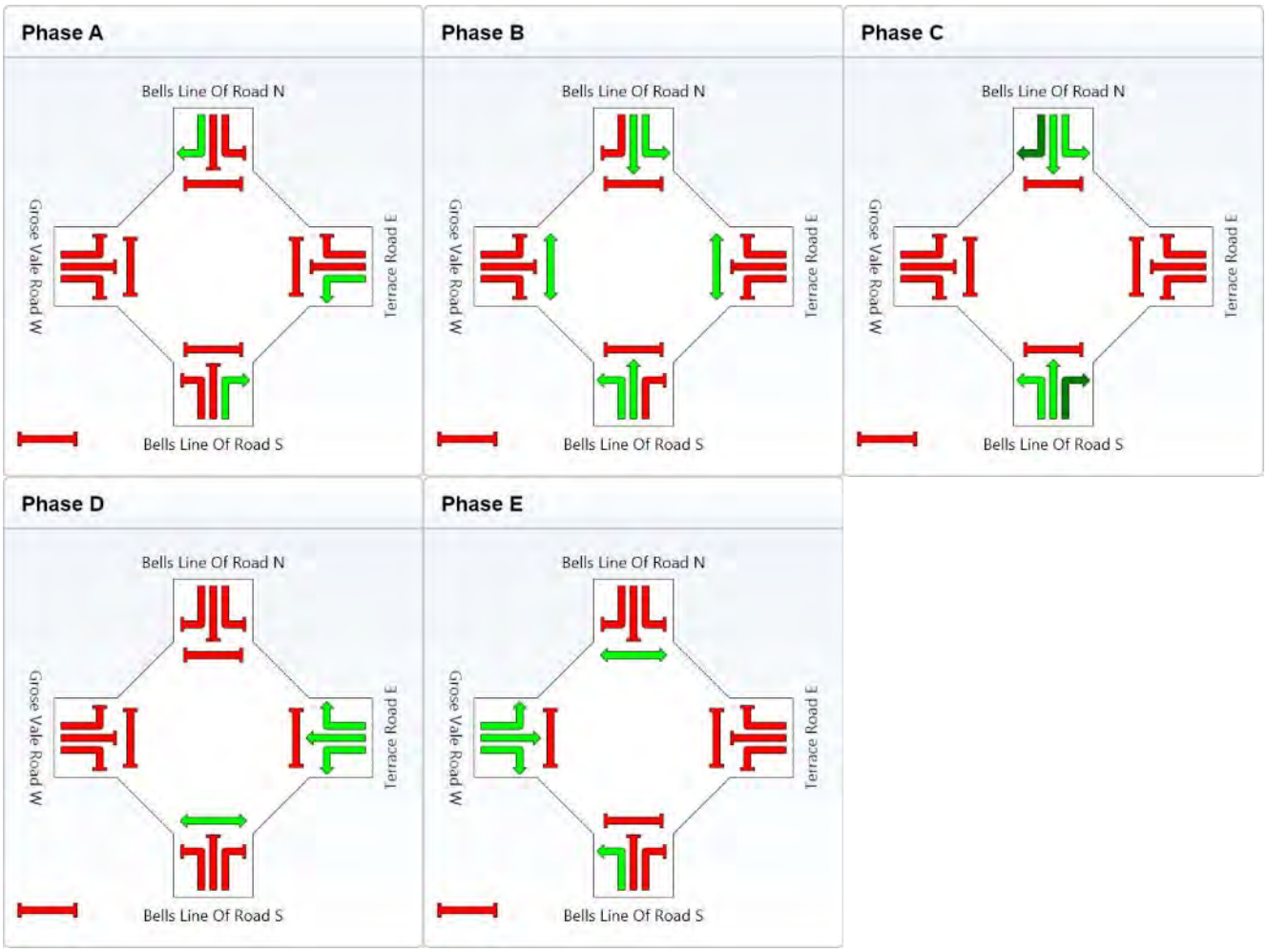
PHASING SUMMARY

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D, E
Output Sequence: A, B, C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	8	17	20	27	48
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	14	23	26	33	54
Phase Split	9 %	15 %	17 %	22 %	36 %



MOVEMENT SUMMARY

Site: PM With Dev With NRJV

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
1	L	533	1.0	0.988	46.3	LOS D	30.1	212.2	1.00	0.90	26.4
2	T	730	1.6	0.762	31.4	LOS C	42.2	299.4	0.87	0.80	30.6
3	R	270	0.9	1.000[3]	35.8	LOS C	9.8	69.0	0.83	0.87	30.3
Approach		1533	1.2	1.000	37.4	LOS C	42.2	299.4	0.91	0.85	28.9
East: Terrace Road E											
4	L	159	2.0	0.872	68.9	LOS E	14.0	99.7	1.00	0.97	20.9
5	T	142	0.7	1.000[3]	65.0	LOS E	14.0	99.7	0.99	0.85	20.4
6	R	41	2.6	1.000[3]	75.6	LOS F	9.2	65.3	0.99	0.79	20.0
Approach		342	1.5	1.000	68.1	LOS E	14.0	99.7	1.00	0.90	20.6
North: Bells Line Of Road N											
7	L	44	2.4	0.292	30.0	LOS C	8.2	59.1	0.59	0.89	33.9
8	T	480	3.9	0.336	22.7	LOS B	13.6	98.3	0.62	0.54	35.5
9	R	61	3.4	0.302	32.8	LOS C	2.0	14.5	0.81	0.76	31.6
Approach		585	3.8	0.336	24.3	LOS B	13.6	98.3	0.64	0.59	34.9
West: Grose Vale Road W											
10	L	76	1.4	0.867	84.7	LOS F	19.5	137.3	1.00	0.97	18.3
11	T	115	0.0	0.867	76.4	LOS F	19.5	137.3	1.00	0.97	18.4
12	R	346	1.5	0.991	113.3	LOS F	28.5	201.8	1.00	1.05	14.6
Approach		537	1.2	0.991	101.4	LOS F	28.5	201.8	1.00	1.03	15.7
All Vehicles		2997	1.8	1.000	49.8	LOS D	42.2	299.4	0.88	0.84	24.9

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

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
P1	Across S approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P3	Across E approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P5	Across N approach	53	61.7	LOS F	0.2	0.2	0.91	0.91
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		212	66.8	LOS F			0.94	0.94

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.

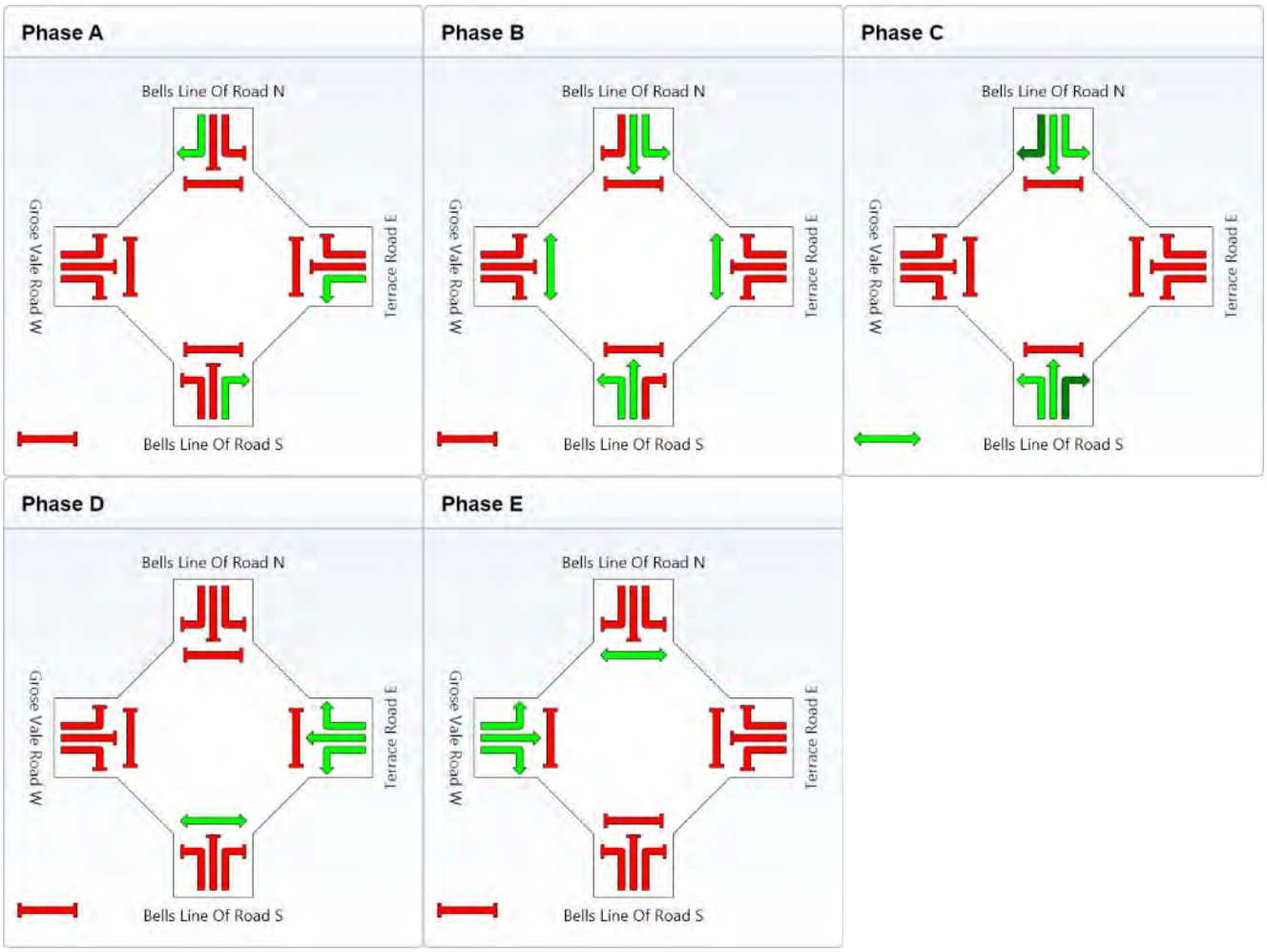
PHASING SUMMARY

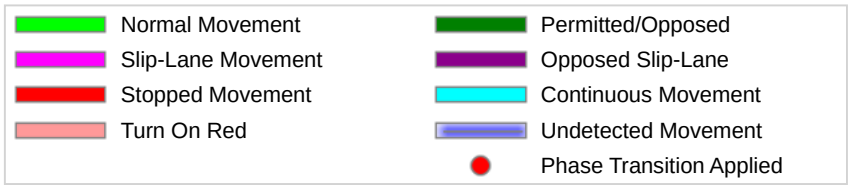
Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

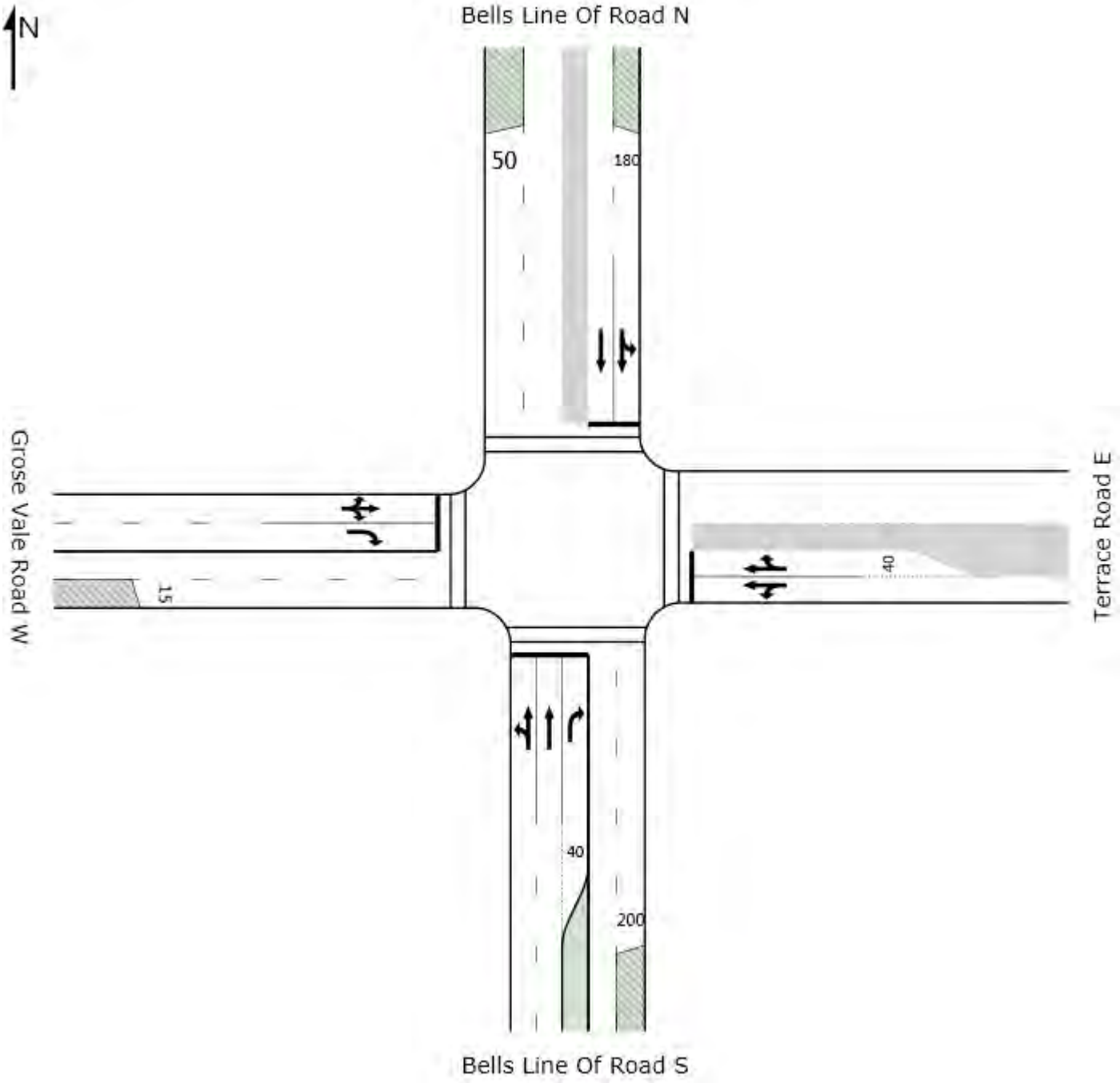
Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D, E
Output Sequence: A, B, C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	7	16	54	19	24
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	13	22	60	25	30
Phase Split	9 %	15 %	40 %	17 %	20 %






N
Bells Line Of Road N
50
180
Grose Vale Road W
15
Terrace Road E
40
40
200
Bells Line Of Road S

MOVEMENT SUMMARY

Site: AM Existing With Amendments

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
1	L	138	1.5	0.182	16.0	LOS B	3.2	22.8	0.35	0.72	41.7
2	T	435	2.9	0.549	34.8	LOS C	23.6	169.5	0.81	0.72	29.5
3	R	124	3.4	0.711	48.9	LOS D	6.4	46.0	0.97	0.83	25.6
Approach		697	2.7	0.711	33.6	LOS C	23.6	169.5	0.75	0.74	30.4
East: Terrace Road E											
4	L	223	0.5	0.554	38.6	LOS C	8.8	62.2	0.91	0.84	29.1
5	T	69	1.5	0.738	57.2	LOS E	7.1	50.3	0.87	0.77	22.3
6	R	40	2.6	0.738	65.4	LOS E	7.1	50.3	0.87	0.88	21.9
Approach		333	0.9	0.738	45.7	LOS D	8.8	62.2	0.90	0.83	26.3
North: Bells Line Of Road N											
7	L	40	0.0	0.731	54.6	LOS D	27.2	192.7	0.93	0.89	25.0
8	T	855	1.5	0.731	46.7	LOS D	29.6	210.1	0.94	0.83	25.2
Approach		895	1.4	0.731	47.1	LOS D	29.6	210.1	0.94	0.83	25.2
West: Grose Vale Road W											
10	L	22	0.0	0.731	65.3	LOS E	21.7	154.6	0.98	0.86	21.6
11	T	57	0.0	0.731	57.1	LOS E	21.7	154.6	0.98	0.85	21.7
12	R	561	2.4	0.731	65.3	LOS E	21.8	155.7	0.98	0.86	21.5
Approach		640	2.1	0.731	64.6	LOS E	21.8	155.7	0.98	0.86	21.6
All Vehicles		2564	1.9	0.738	47.6	LOS D	29.6	210.1	0.89	0.81	25.4

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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
P1	Across S approach	53	55.5	LOS E	0.2	0.2	0.86	0.86
P3	Across E approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P5	Across N approach	53	52.9	LOS E	0.2	0.2	0.84	0.84
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		212	61.4	LOS F			0.90	0.90

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.

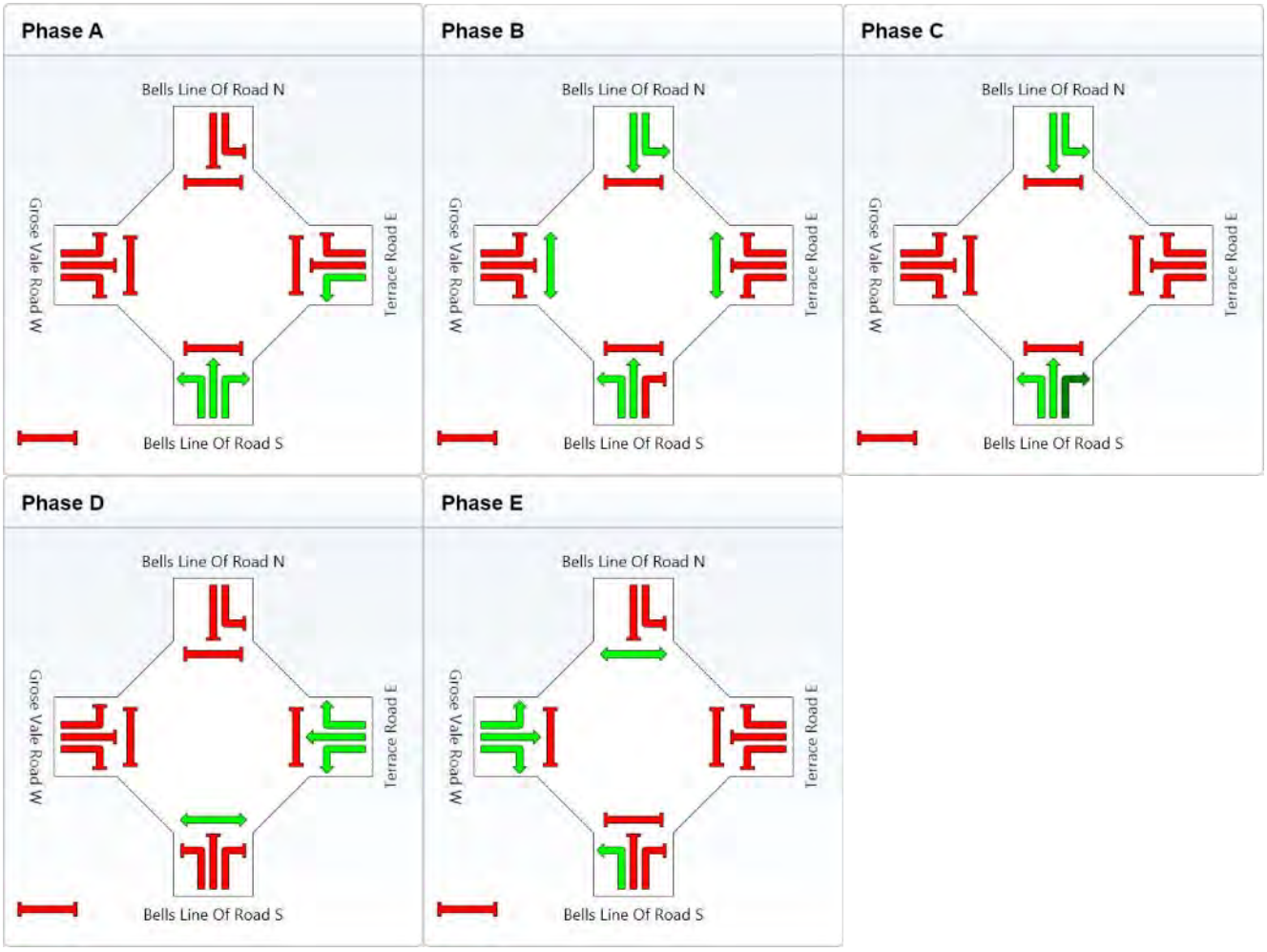
PHASING SUMMARY

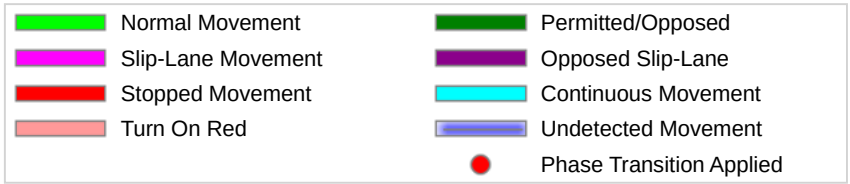
Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

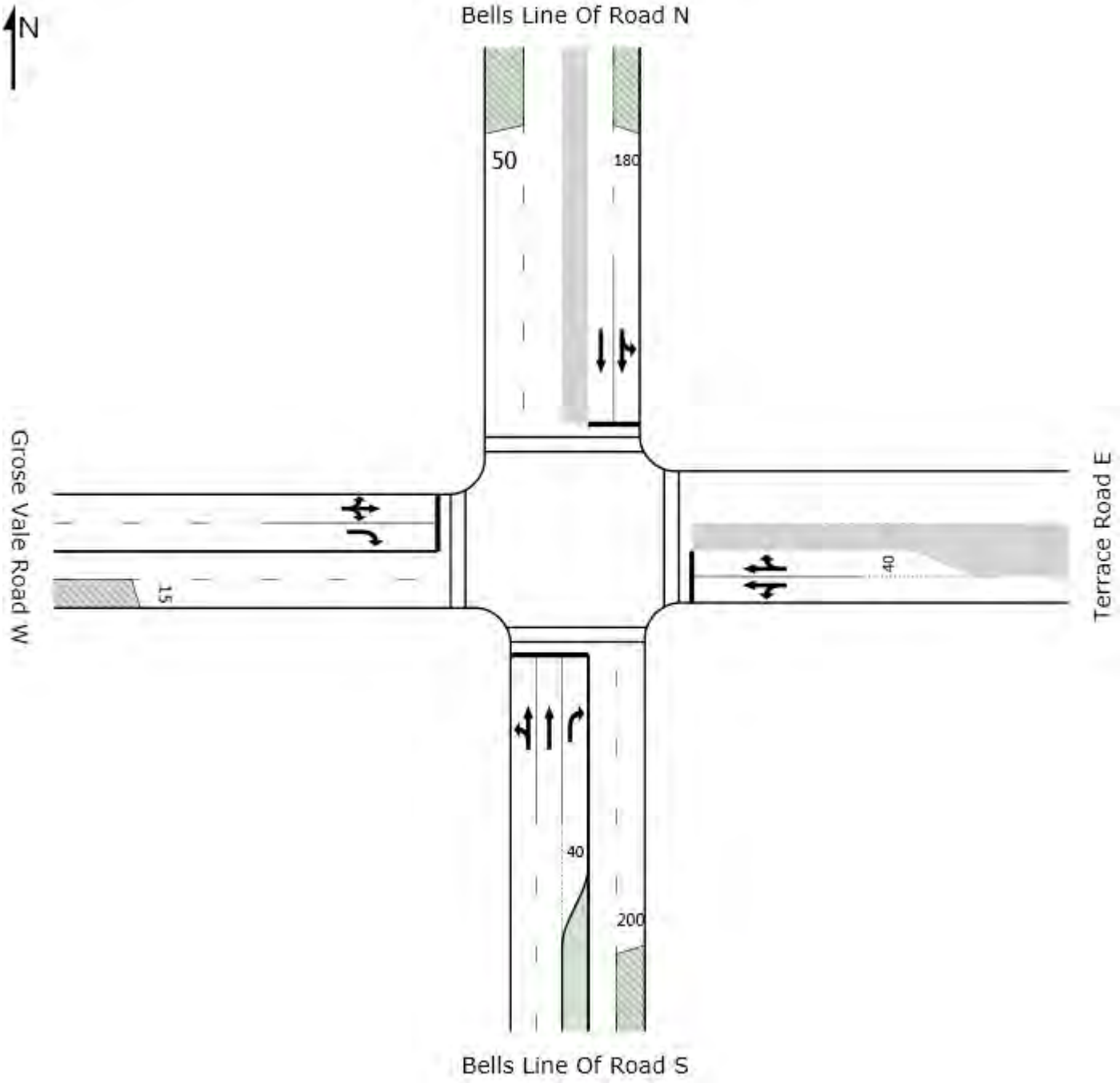
Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D, E
Output Sequence: A, B, C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	7	16	28	33	36
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	13	22	34	39	42
Phase Split	9 %	15 %	23 %	26 %	28 %






N
Bells Line Of Road N
50
180
Grose Vale Road W
15
Terrace Road E
40
40
200
Bells Line Of Road S

MOVEMENT SUMMARY

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
1	L	217	2.4	0.191	13.3	LOS A	4.4	31.6	0.30	0.72	44.0
2	T	658	1.6	0.586	20.5	LOS B	29.5	209.1	0.68	0.62	36.8
3	R	246	1.3	0.923	35.7	LOS C	9.2	65.3	0.81	0.86	30.3
Approach		1121	1.7	0.923	22.4	LOS B	29.5	209.1	0.63	0.69	36.2
East: Terrace Road E											
4	L	159	2.0	0.622	45.8	LOS D	8.7	62.2	0.97	0.82	26.7
5	T	111	1.0	1.000[3]	60.2	LOS E	9.2	65.3	0.97	0.77	21.4
6	R	41	2.6	1.000[3]	72.4	LOS F	9.2	65.3	0.97	0.80	20.6
Approach		311	1.7	1.000	54.5	LOS D	9.2	65.3	0.97	0.80	23.7
North: Bells Line Of Road N											
7	L	44	2.4	0.321	30.9	LOS C	9.2	66.1	0.61	0.90	33.5
8	T	480	3.9	0.321	23.2	LOS B	12.8	92.8	0.63	0.54	35.2
Approach		524	3.8	0.321	23.8	LOS B	12.8	92.8	0.63	0.57	35.1
West: Grose Vale Road W											
10	L	76	1.4	0.976	113.2	LOS F	23.9	168.7	1.00	1.13	14.7
11	T	94	0.0	0.976	105.0	LOS F	23.9	168.7	1.00	1.13	14.8
12	R	346	1.5	0.976	112.6	LOS F	24.8	175.8	1.00	1.07	14.7
Approach		516	1.2	0.976	111.3	LOS F	24.8	175.8	1.00	1.09	14.7
All Vehicles		2472	2.0	1.000	45.3	LOS D	29.5	209.1	0.75	0.76	26.3

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

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
P1	Across S approach	53	65.3	LOS F	0.2	0.2	0.93	0.93
P3	Across E approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P5	Across N approach	53	65.3	LOS F	0.2	0.2	0.93	0.93
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		212	67.0	LOS F			0.95	0.95

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.

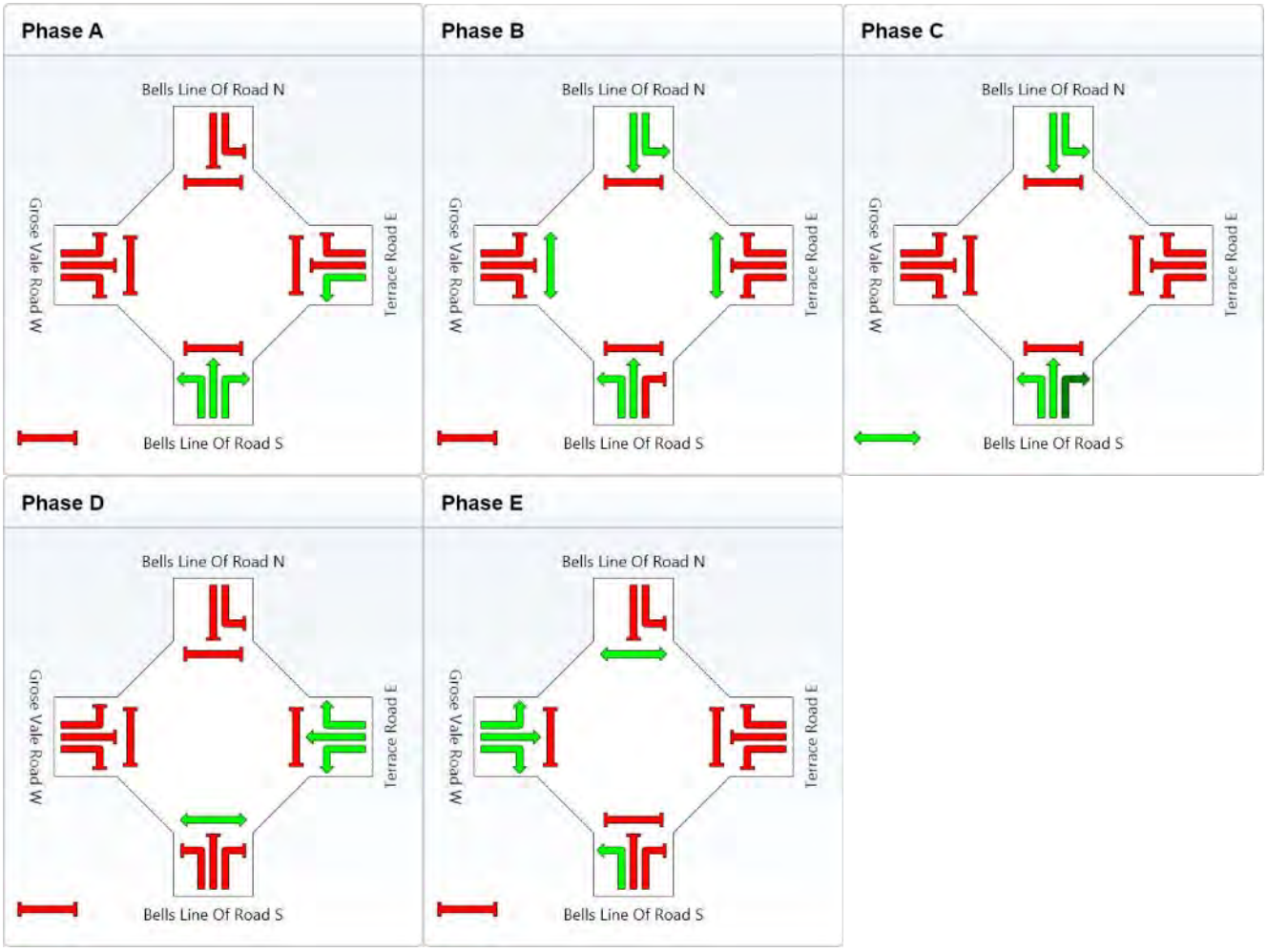
PHASING SUMMARY

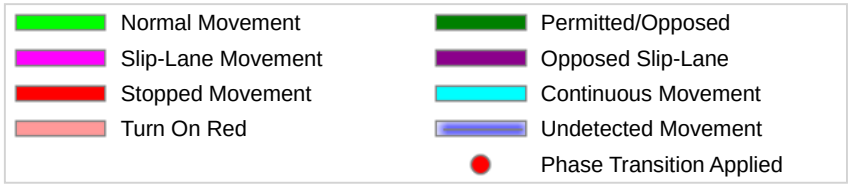
Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

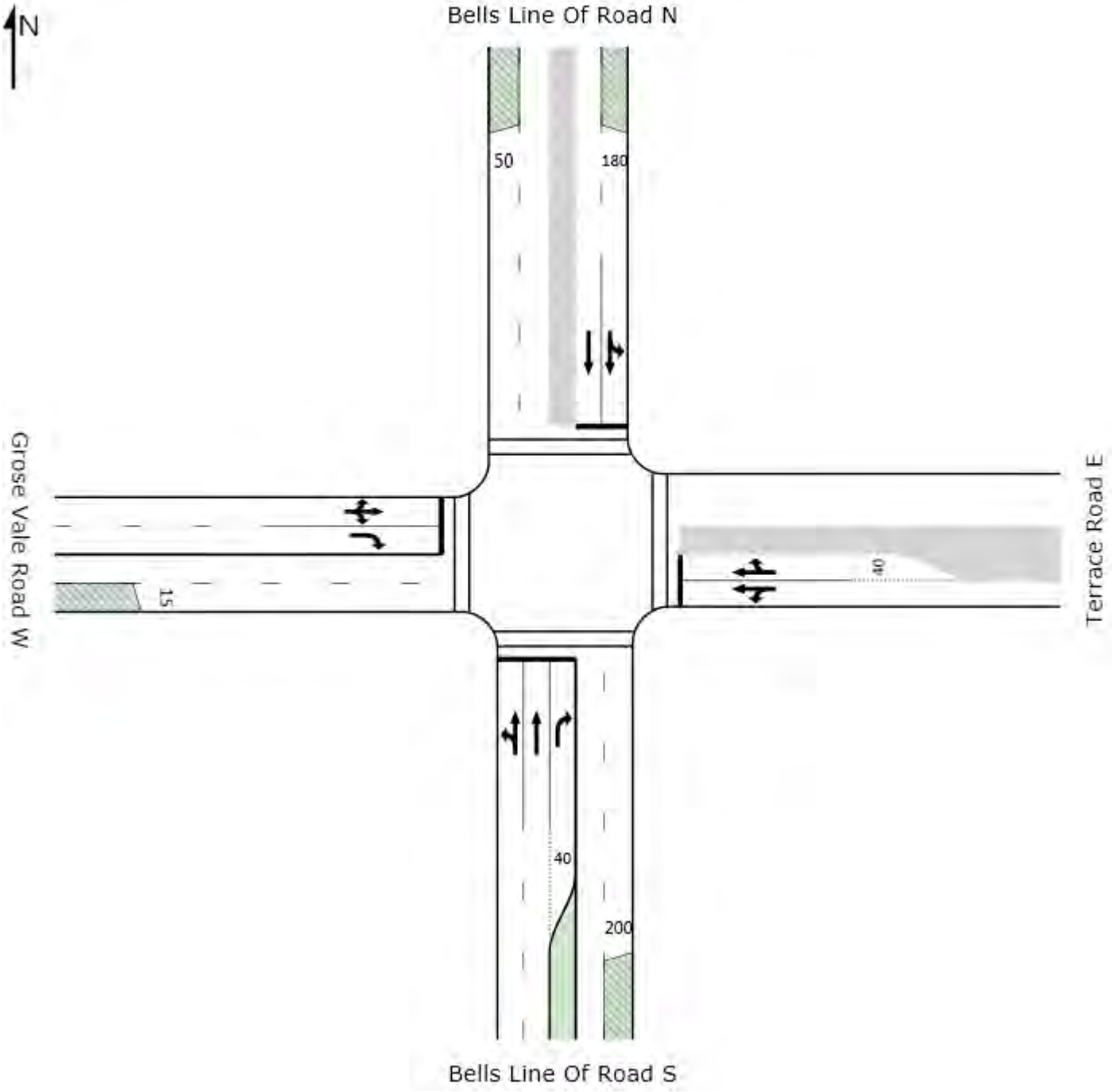
Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D, E
Output Sequence: A, B, C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	7	16	53	22	22
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	13	22	59	28	28
Phase Split	9 %	15 %	39 %	19 %	19 %






N
Bells Line Of Road N
50
180
Grose Vale Road W
15
Terrace Road E
40
40
200
Bells Line Of Road S

MOVEMENT SUMMARY

Site: AM With Dev

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
1	L	138	1.5	0.196	19.0	LOS B	3.8	26.9	0.41	0.73	39.4
2	T	435	2.9	0.597	39.0	LOS C	25.0	179.7	0.86	0.76	27.8
3	R	124	3.4	0.776	54.6	LOS D	6.9	49.8	1.00	0.87	24.0
Approach		697	2.7	0.776	37.8	LOS C	25.0	179.7	0.79	0.77	28.7
East: Terrace Road E											
4	L	319	0.3	0.659	42.6	LOS D	14.9	104.5	0.92	0.89	27.6
5	T	91	1.2	0.818	59.0	LOS E	8.7	61.5	0.82	0.80	21.9
6	R	40	2.6	0.818	67.2	LOS E	8.7	61.5	0.82	0.95	21.6
Approach		449	0.7	0.818	48.1	LOS D	14.9	104.5	0.89	0.88	25.6
North: Bells Line Of Road N											
7	L	40	0.0	0.793	61.7	LOS E	30.3	214.9	0.98	0.91	23.1
8	T	855	1.5	0.793	53.4	LOS D	31.0	219.6	0.98	0.89	23.3
Approach		895	1.4	0.793	53.8	LOS D	31.0	219.6	0.98	0.89	23.3
West: Grose Vale Road W											
10	L	22	0.0	0.798	71.4	LOS F	23.2	164.7	1.00	0.90	20.4
11	T	57	0.0	0.798	63.2	LOS E	23.2	164.7	1.00	0.90	20.5
12	R	561	2.4	0.798	71.4	LOS F	23.2	165.8	1.00	0.89	20.3
Approach		640	2.1	0.798	70.7	LOS F	23.2	165.8	1.00	0.89	20.3
All Vehicles		2681	1.8	0.818	52.7	LOS D	31.0	219.6	0.92	0.86	24.0

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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
P1	Across S approach	53	48.8	LOS E	0.2	0.2	0.81	0.81
P3	Across E approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P5	Across N approach	53	53.8	LOS E	0.2	0.2	0.85	0.85
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		212	60.0	LOS E			0.89	0.89

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.

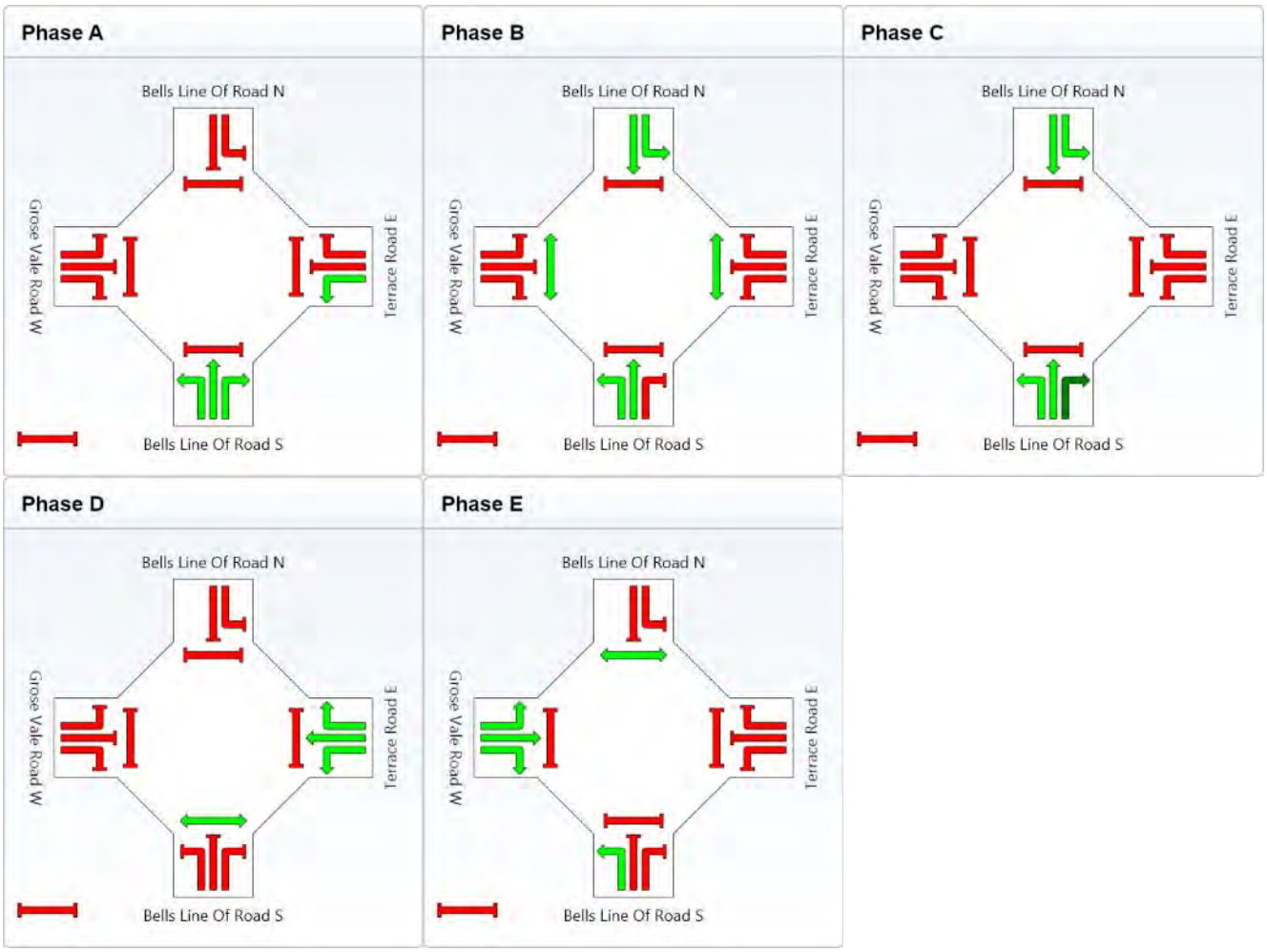
PHASING SUMMARY

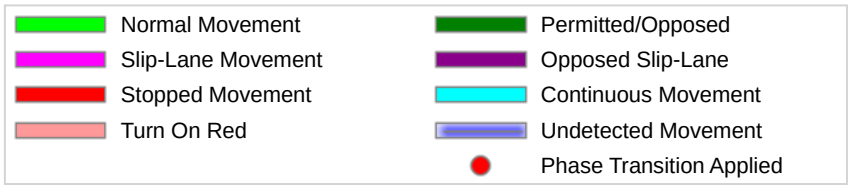
Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

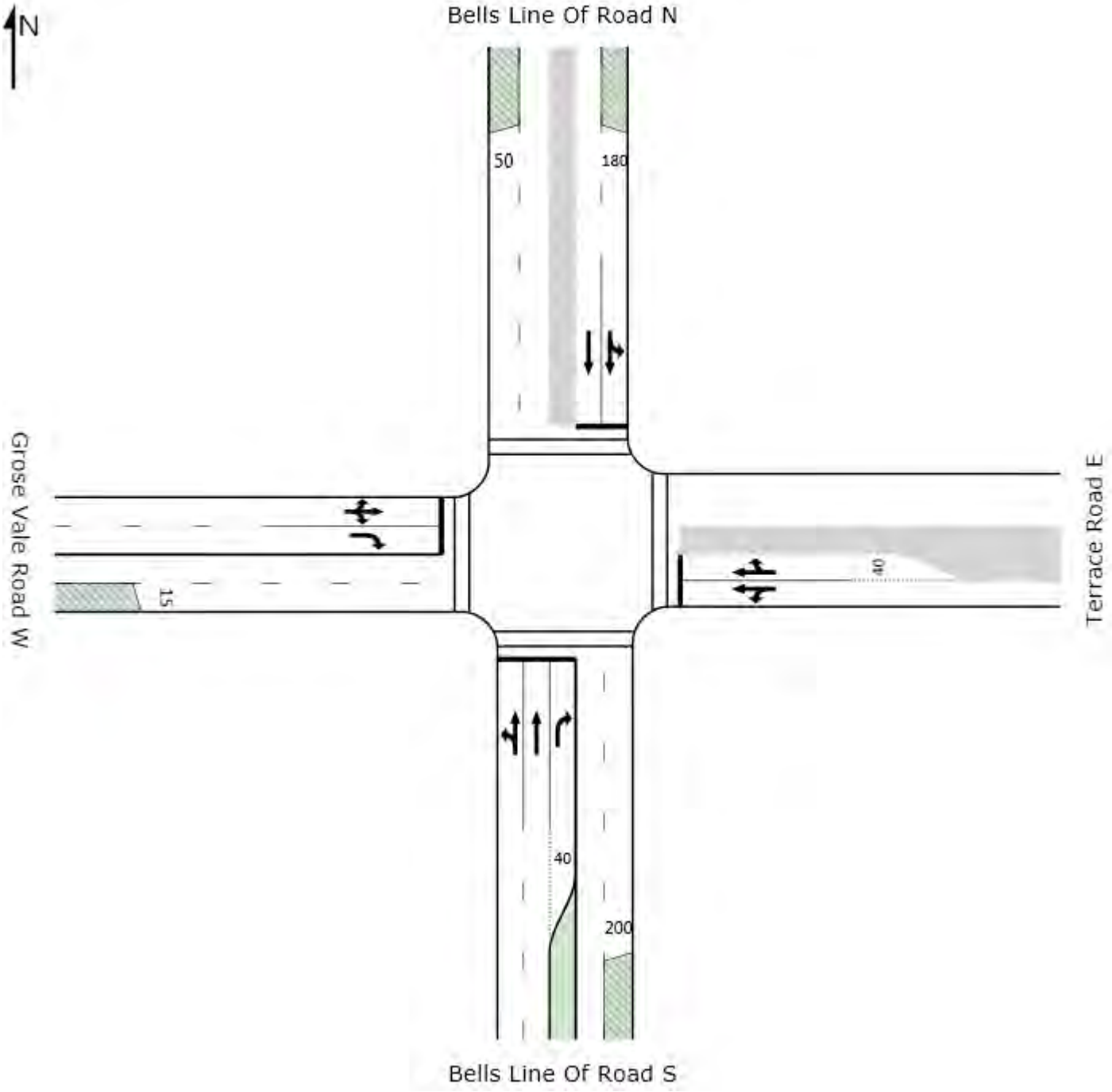
Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D, E
Output Sequence: A, B, C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	7	16	23	41	33
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	13	22	29	47	39
Phase Split	9 %	15 %	19 %	31 %	26 %






N
Bells Line Of Road N
50
180
Grose Vale Road W
15
Terrace Road E
40
40
200
Bells Line Of Road S

MOVEMENT SUMMARY

Site: PM With Dev

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
1	L	217	2.4	0.199	12.7	LOS A	4.2	30.0	0.32	0.73	44.6
2	T	704	1.6	0.610	19.7	LOS B	31.3	222.0	0.68	0.62	37.2
3	R	296	0.9	1.000[3]	35.5	LOS C	10.7	75.5	0.90	0.88	30.4
Approach		1217	1.6	1.000	22.3	LOS B	31.3	222.0	0.67	0.70	36.3
East: Terrace Road E											
4	L	159	2.0	0.681	47.7	LOS D	9.2	65.6	0.99	0.83	26.1
5	T	111	1.0	1.000[3]	62.4	LOS E	9.2	65.6	0.99	0.79	21.0
6	R	41	2.6	1.000[3]	75.8	LOS F	9.2	65.3	0.99	0.80	20.0
Approach		311	1.7	1.000	56.6	LOS E	9.2	65.6	0.99	0.81	23.1
North: Bells Line Of Road N											
7	L	44	2.4	0.321	30.9	LOS C	9.2	66.1	0.61	0.90	33.5
8	T	480	3.9	0.321	23.2	LOS B	12.8	92.8	0.63	0.54	35.2
Approach		524	3.8	0.321	23.8	LOS B	12.8	92.8	0.63	0.57	35.1
West: Grose Vale Road W											
10	L	76	1.4	0.969	109.7	LOS F	24.6	173.3	1.00	1.12	15.1
11	T	115	0.0	0.969	101.4	LOS F	24.6	173.3	1.00	1.12	15.2
12	R	346	1.5	0.969	109.2	LOS F	25.4	179.8	1.00	1.06	15.0
Approach		537	1.2	0.969	107.6	LOS F	25.4	179.8	1.00	1.08	15.1
All Vehicles		2588	2.0	1.000	44.4	LOS D	31.3	222.0	0.77	0.77	26.5

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

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
P1	Across S approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P3	Across E approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P5	Across N approach	53	62.6	LOS F	0.2	0.2	0.91	0.91
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		212	67.0	LOS F			0.95	0.95

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.

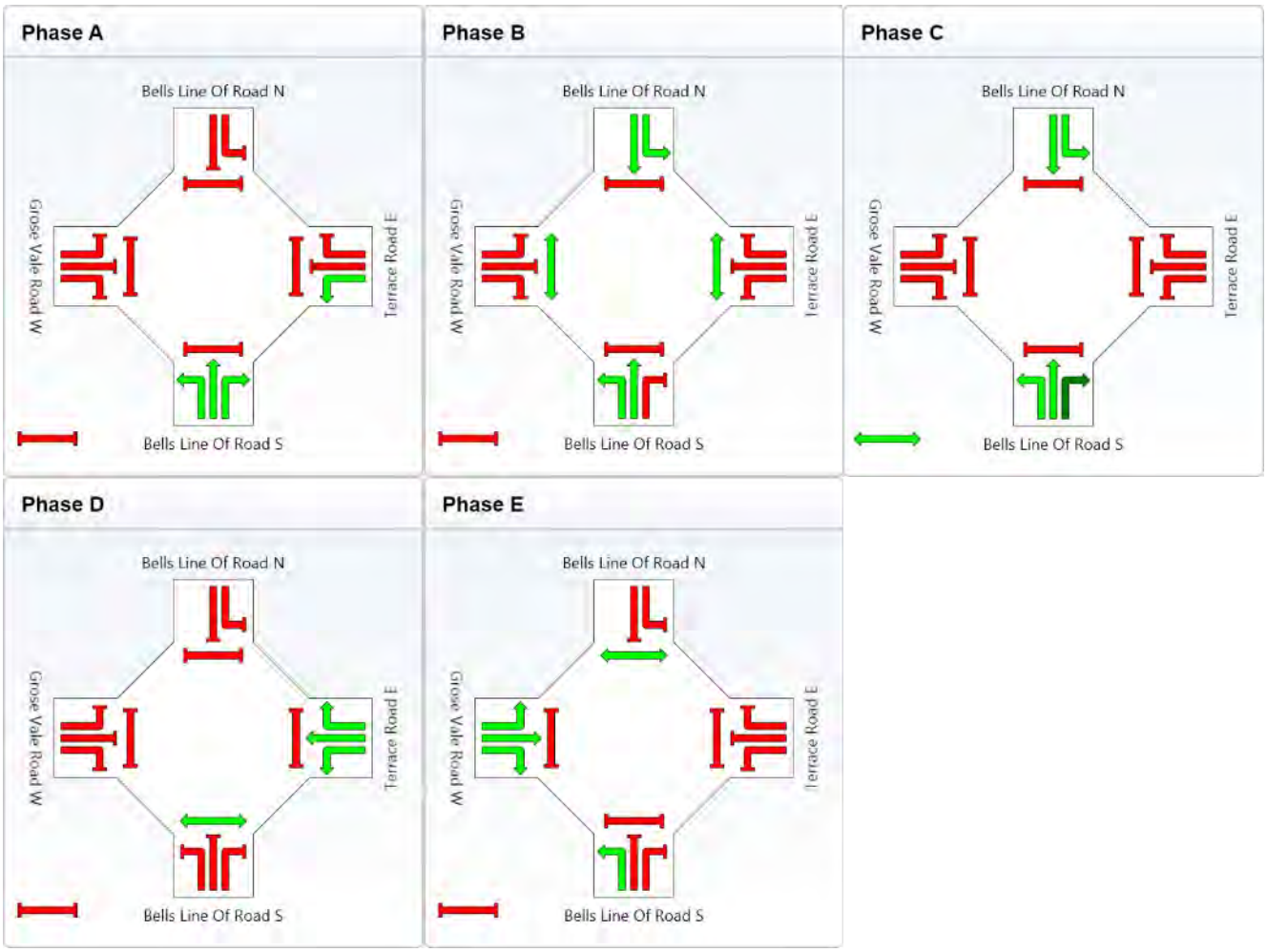
PHASING SUMMARY

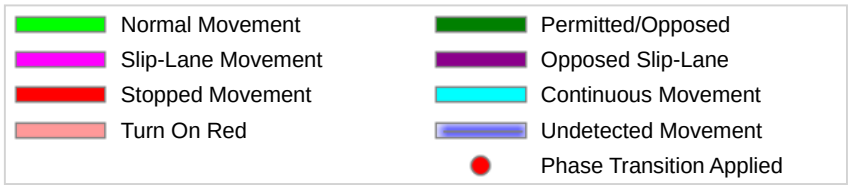
Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

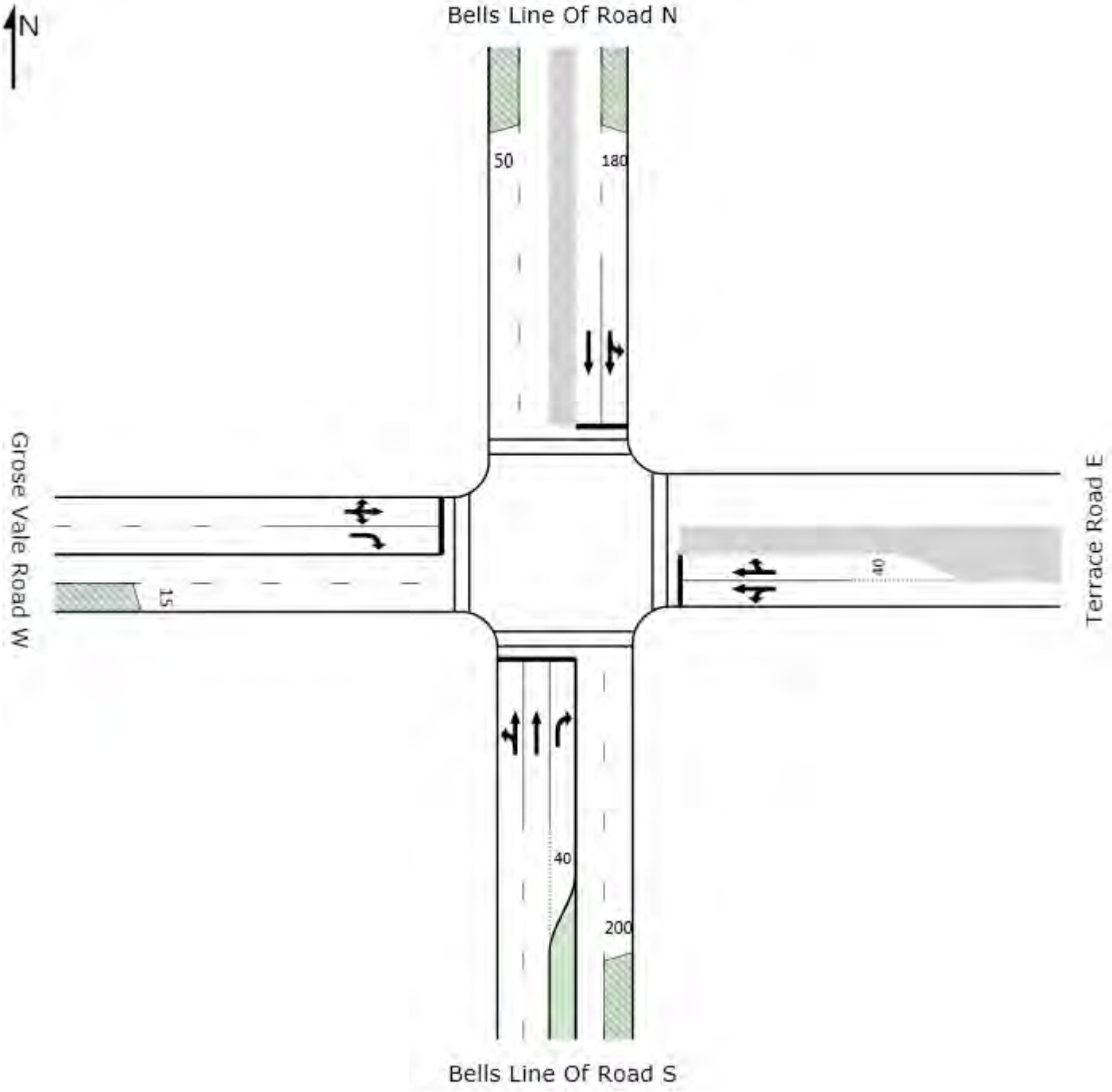
Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D, E
Output Sequence: A, B, C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	9	16	53	19	23
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	15	22	59	25	29
Phase Split	10 %	15 %	39 %	17 %	19 %






N
Bells Line Of Road N
50
180
Grose Vale Road W
15
Terrace Road E
40
40
200
Bells Line Of Road S

MOVEMENT SUMMARY

Site: AM NRJV

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
1	L	138	1.5	0.198	12.6	LOS A	2.4	17.2	0.26	0.71	44.5
2	T	435	2.9	0.587	38.1	LOS C	24.8	177.6	0.85	0.75	28.2
3	R	124	3.4	0.741	52.8	LOS D	6.5	47.0	1.00	0.84	24.5
Approach		697	2.7	0.741	35.7	LOS C	24.8	177.6	0.76	0.76	29.5
East: Terrace Road E											
4	L	223	0.5	0.712	45.4	LOS D	8.8	62.0	0.98	0.87	26.6
5	T	69	1.5	0.813	71.3	LOS F	8.0	56.8	0.95	0.88	19.4
6	R	40	2.6	0.813	79.6	LOS F	8.0	56.8	0.95	0.92	19.2
Approach		333	0.9	0.813	54.9	LOS D	8.8	62.0	0.97	0.88	23.7
North: Bells Line Of Road N											
7	L	40	0.0	0.811	63.9	LOS E	31.1	220.1	0.99	0.92	22.6
8	T	855	1.5	0.811	55.6	LOS D	31.7	224.9	0.99	0.91	22.8
Approach		895	1.4	0.811	56.0	LOS D	31.7	224.9	0.99	0.91	22.8
West: Grose Vale Road W											
10	L	33	0.0	0.800	57.8	LOS E	33.6	237.4	0.97	0.90	23.3
11	T	88	0.0	0.800	49.6	LOS D	33.6	237.4	0.97	0.88	23.5
12	R	877	1.6	0.800	57.8	LOS E	33.7	238.8	0.97	0.89	23.3
Approach		998	1.4	0.800	57.0	LOS E	33.7	238.8	0.97	0.89	23.3
All Vehicles		2922	1.7	0.813	51.4	LOS D	33.7	238.8	0.93	0.86	24.4

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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
P1	Across S approach	53	65.3	LOS F	0.2	0.2	0.93	0.93
P3	Across E approach	53	53.8	LOS E	0.2	0.2	0.85	0.85
P5	Across N approach	53	39.6	LOS D	0.2	0.2	0.73	0.73
P7	Across W approach	53	54.6	LOS E	0.2	0.2	0.85	0.85
All Pedestrians		212	53.3	LOS E			0.84	0.84

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.

PHASING SUMMARY

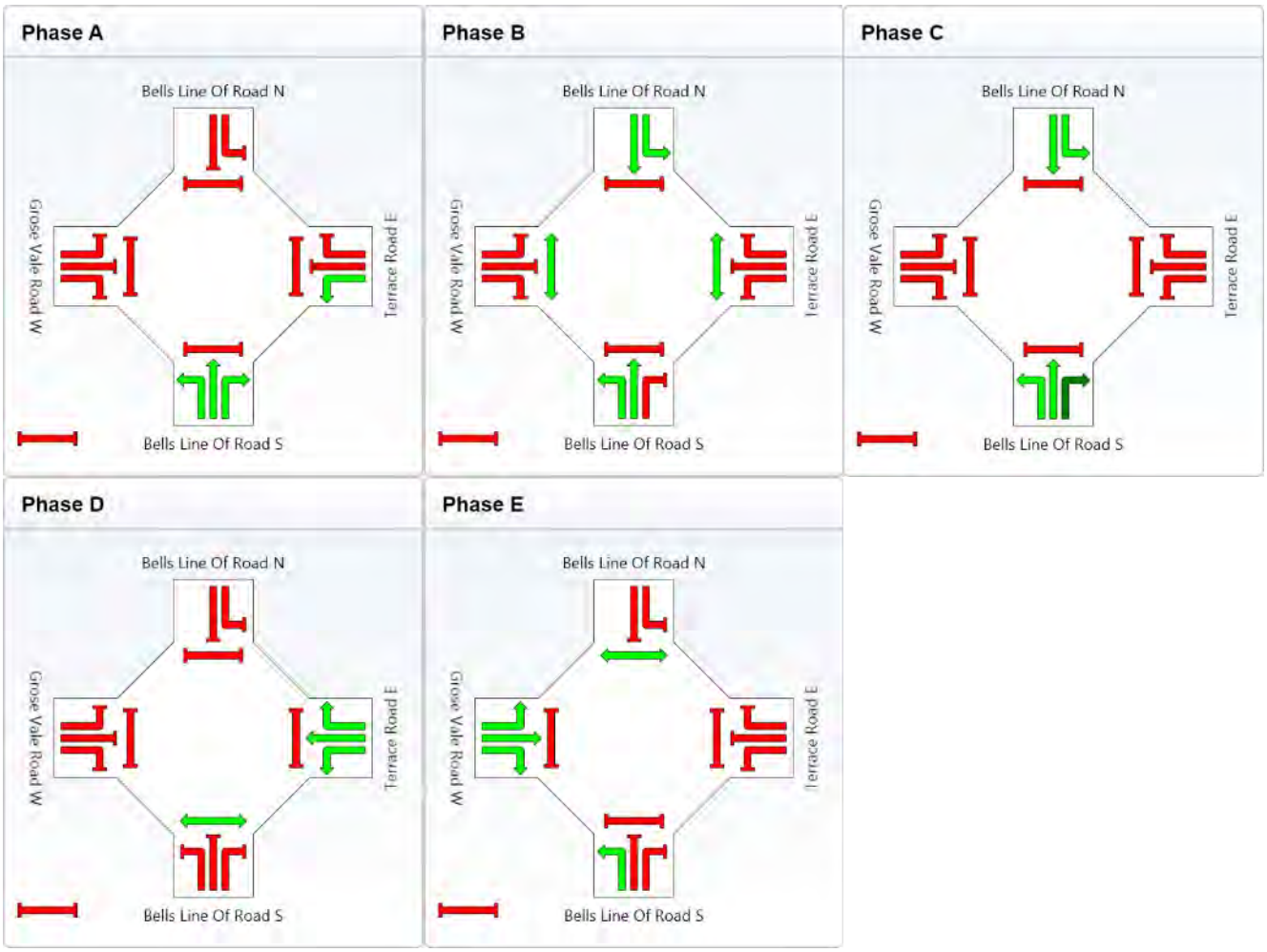
Site: AM NRJV

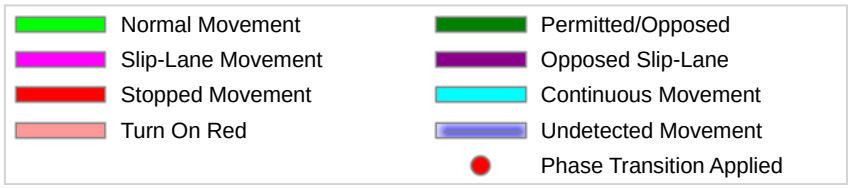
Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

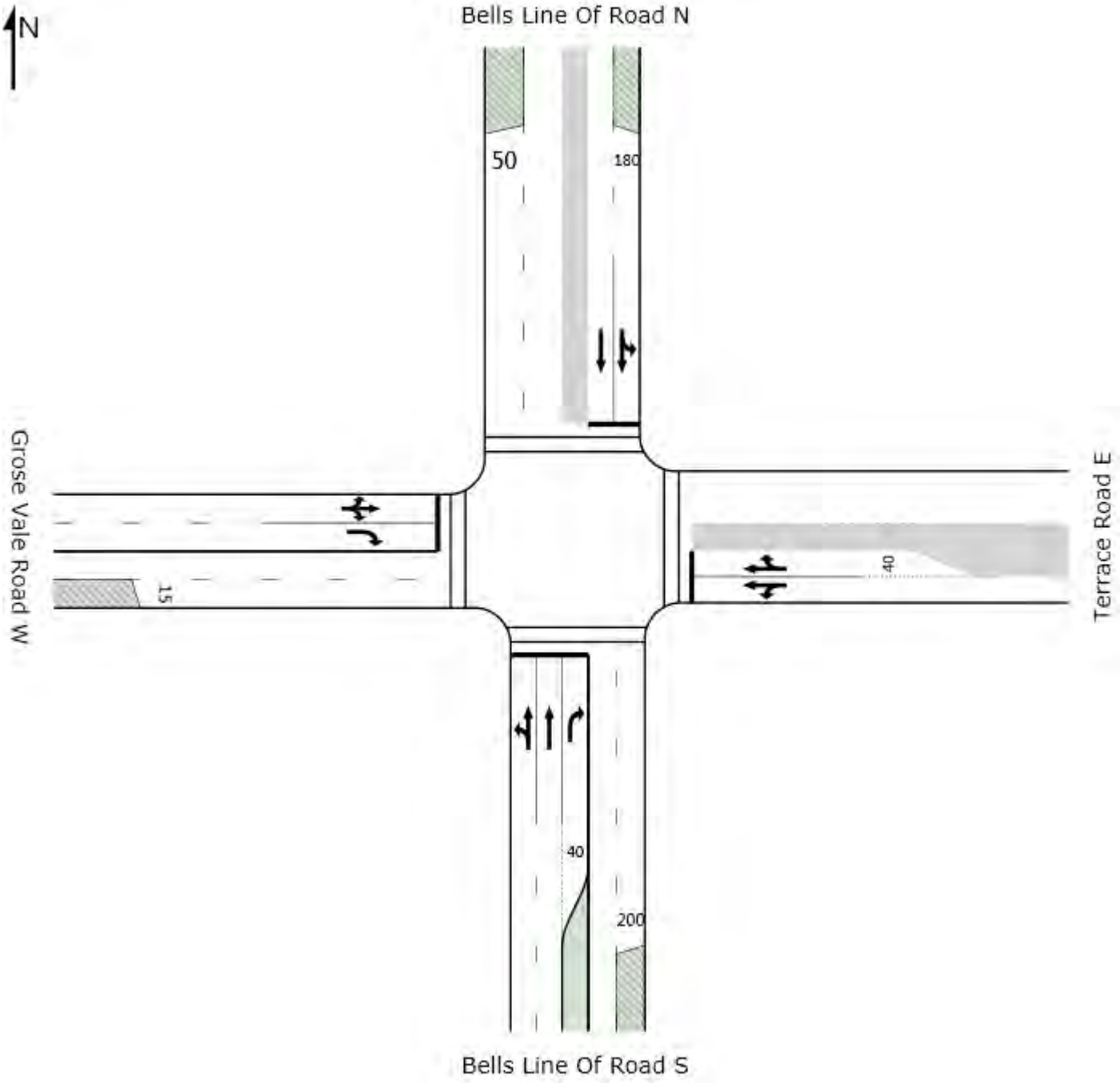
Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D, E
Output Sequence: A, B, C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	9	32	6	22	51
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	15	38	12	28	57
Phase Split	10 %	25 %	8 %	19 %	38 %






N
Bells Line Of Road N
50
180
Grose Vale Road W
15
Terrace Road E
40
40
200
Bells Line Of Road S

MOVEMENT SUMMARY

Site: PM NRJV

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
1	L	533	1.0	0.446	14.4	LOS A	13.2	93.0	0.37	0.76	43.0
2	T	658	1.6	0.590	20.6	LOS B	29.8	211.3	0.68	0.62	36.7
3	R	246	1.3	0.923	35.7	LOS C	9.2	65.3	0.81	0.86	30.3
Approach		1437	1.3	0.923	20.9	LOS B	29.8	211.3	0.59	0.71	37.4
East: Terrace Road E											
4	L	159	2.0	0.756	55.9	LOS D	12.0	85.2	1.00	0.88	23.9
5	T	142	0.7	1.000[3]	58.6	LOS E	12.0	85.2	0.98	0.81	21.7
6	R	41	2.6	1.000[3]	72.4	LOS F	9.2	65.3	0.97	0.80	20.6
Approach		342	1.5	1.000	59.0	LOS E	12.0	85.2	0.99	0.84	22.5
North: Bells Line Of Road N											
7	L	44	2.4	0.321	30.9	LOS C	9.2	66.2	0.61	0.90	33.5
8	T	480	3.9	0.321	23.2	LOS B	12.8	92.8	0.63	0.54	35.2
Approach		524	3.8	0.321	23.8	LOS B	12.8	92.8	0.63	0.57	35.1
West: Grose Vale Road W											
10	L	76	1.4	0.976	113.2	LOS F	23.9	168.7	1.00	1.13	14.7
11	T	94	0.0	0.976	105.0	LOS F	23.9	168.7	1.00	1.13	14.8
12	R	346	1.5	0.976	112.6	LOS F	24.8	175.8	1.00	1.07	14.7
Approach		516	1.2	0.976	111.3	LOS F	24.8	175.8	1.00	1.09	14.7
All Vehicles		2819	1.8	1.000	42.6	LOS D	29.8	211.3	0.72	0.77	27.2

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

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
P1	Across S approach	53	65.3	LOS F	0.2	0.2	0.93	0.93
P3	Across E approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P5	Across N approach	53	65.3	LOS F	0.2	0.2	0.93	0.93
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		212	67.0	LOS F			0.95	0.95

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.

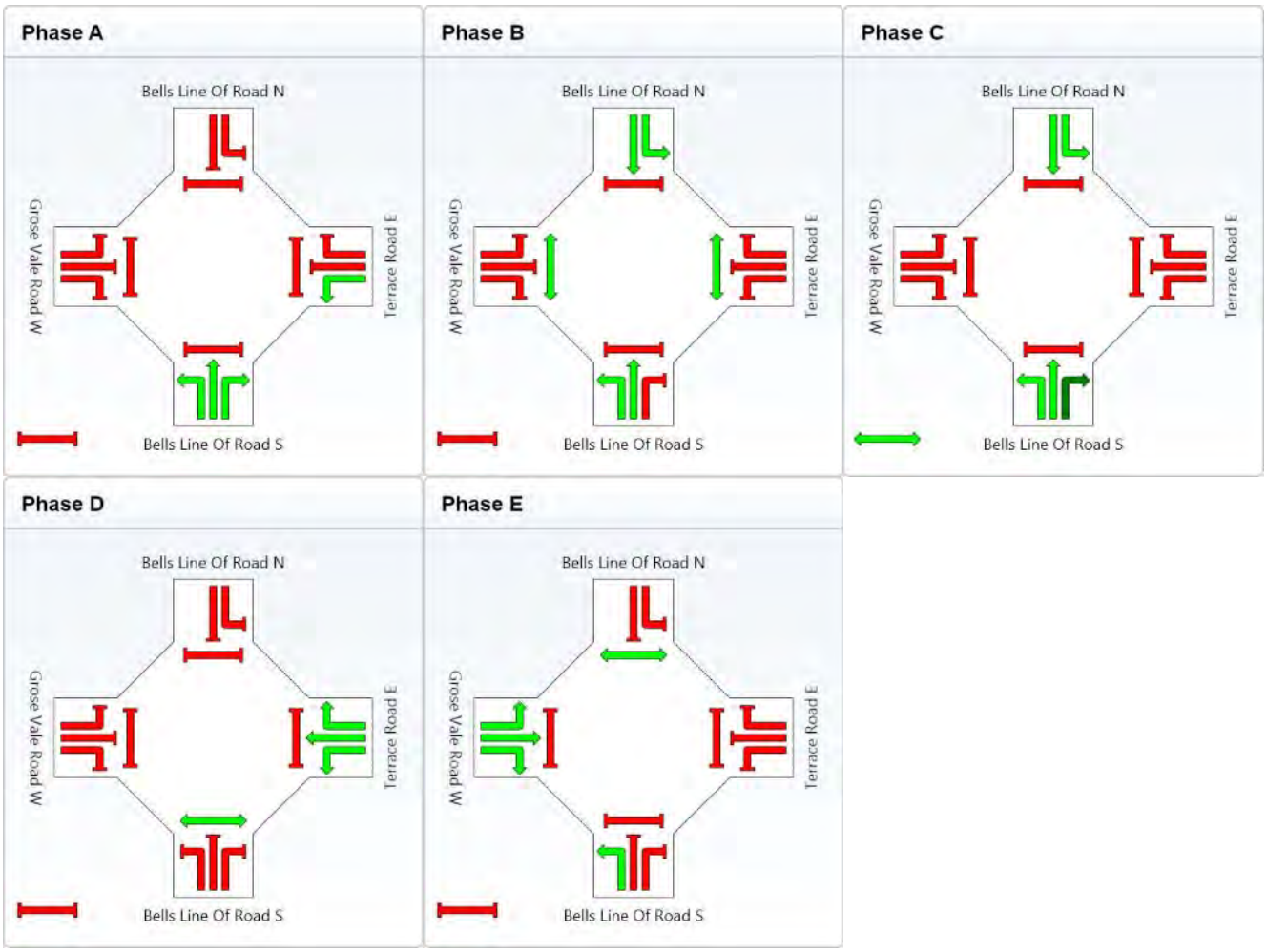
PHASING SUMMARY

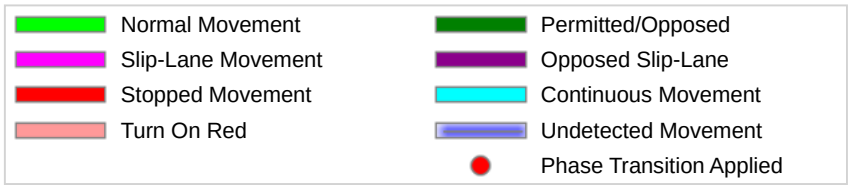
Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

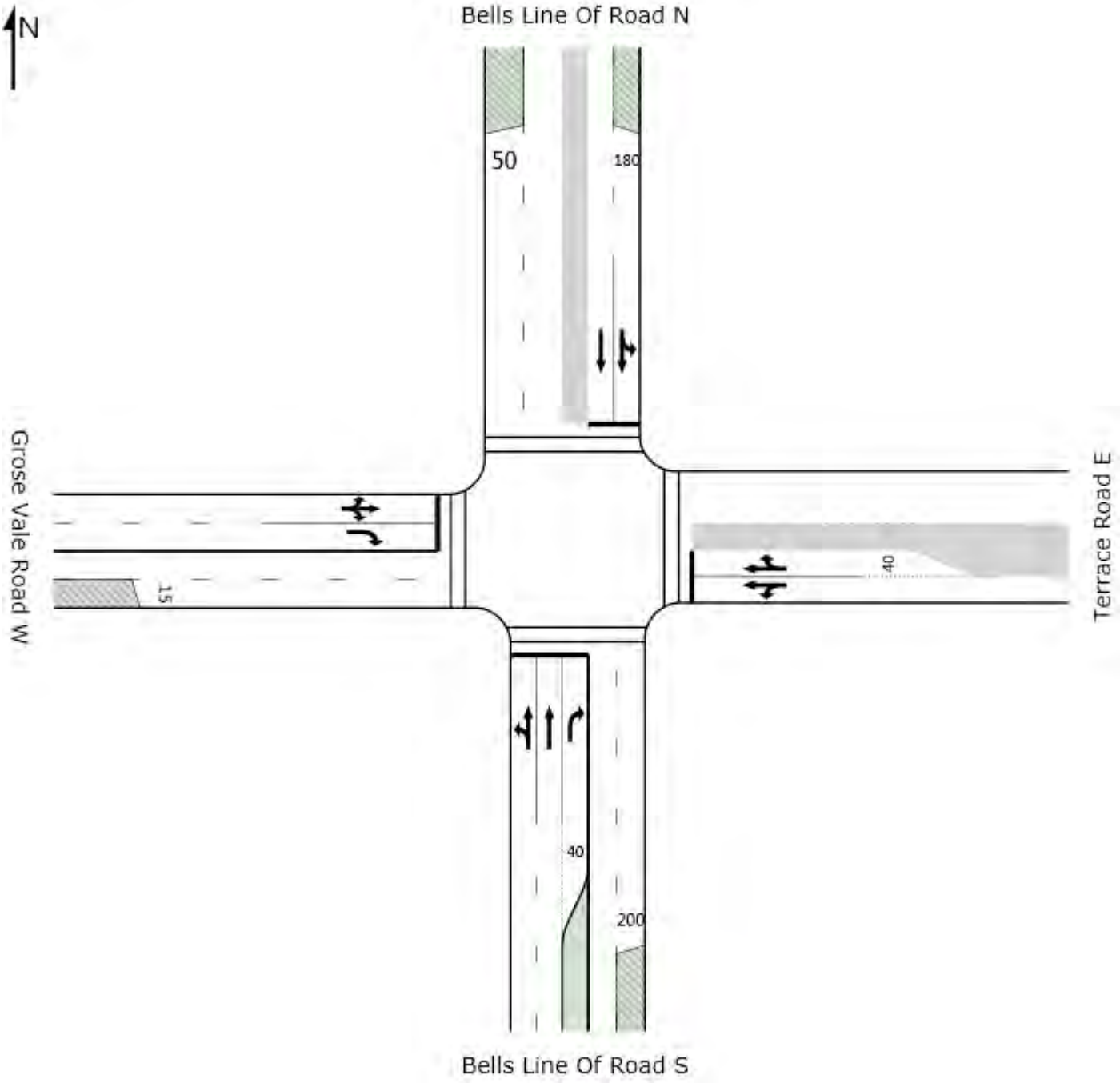
Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D, E
Output Sequence: A, B, C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	7	16	53	22	22
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	13	22	59	28	28
Phase Split	9 %	15 %	39 %	19 %	19 %






N
Bells Line Of Road N
50
180
Grose Vale Road W
15
Terrace Road E
40
40
200
Bells Line Of Road S

MOVEMENT SUMMARY

Site: AM With Dev With NRJV

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
1	L	138	1.5	0.219	15.6	LOS B	3.1	22.3	0.34	0.72	42.0
2	T	435	2.9	0.653	43.4	LOS D	26.5	190.0	0.90	0.79	26.3
3	R	124	3.4	0.924	77.2	LOS F	8.1	58.1	1.00	1.00	19.2
Approach		697	2.7	0.924	44.0	LOS D	26.5	190.0	0.81	0.82	26.5
East: Terrace Road E											
4	L	319	0.3	0.832	63.2	LOS E	19.6	137.4	1.00	0.99	21.9
5	T	91	1.2	0.886	67.1	LOS E	9.2	65.3	0.89	0.84	20.2
6	R	40	2.6	0.886	75.3	LOS F	9.2	65.3	0.89	0.93	20.0
Approach		449	0.7	0.886	65.0	LOS E	19.6	137.4	0.97	0.95	21.4
North: Bells Line Of Road N											
7	L	40	0.0	0.871	72.9	LOS F	33.9	240.3	1.00	0.98	20.7
8	T	855	1.5	0.871	64.6	LOS E	34.6	245.5	1.00	0.98	20.8
Approach		895	1.4	0.871	64.9	LOS E	34.6	245.5	1.00	0.98	20.8
West: Grose Vale Road W											
10	L	33	0.0	0.868	68.4	LOS E	37.6	265.6	1.00	0.94	20.9
11	T	88	0.0	0.868	60.2	LOS E	37.6	265.6	1.00	0.94	21.0
12	R	877	1.6	0.868	68.4	LOS E	37.6	267.0	1.00	0.94	20.9
Approach		998	1.4	0.868	67.7	LOS E	37.6	267.0	1.00	0.94	20.9
All Vehicles		3039	1.6	0.924	61.0	LOS E	37.6	267.0	0.95	0.93	22.0

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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
P1	Across S approach	53	56.3	LOS E	0.2	0.2	0.87	0.87
P3	Across E approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P5	Across N approach	53	44.1	LOS E	0.2	0.2	0.77	0.77
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		212	59.4	LOS E			0.89	0.89

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.

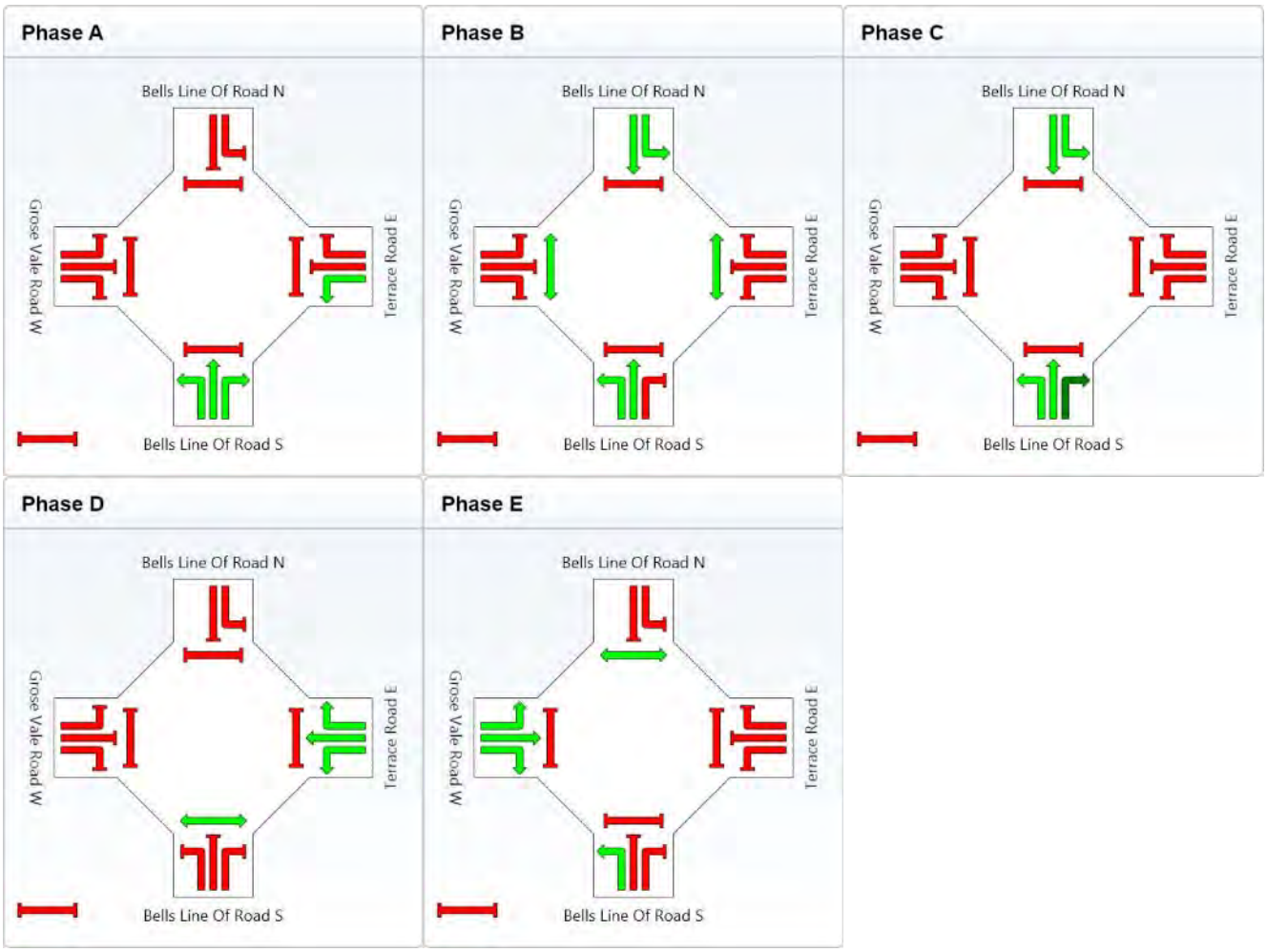
PHASING SUMMARY

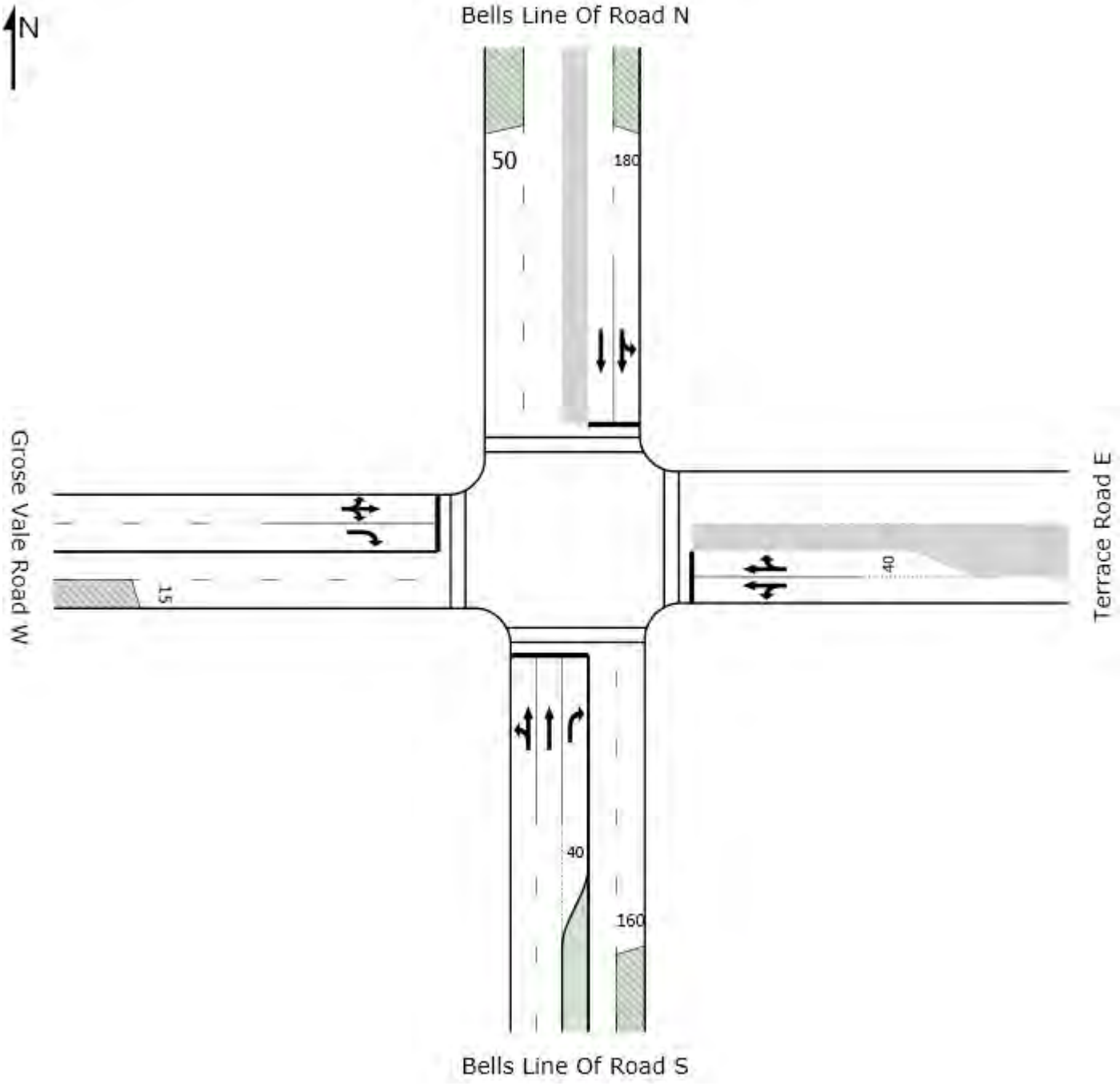
Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D, E
Output Sequence: A, B, C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	6	16	19	32	47
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	12	22	25	38	53
Phase Split	8 %	15 %	17 %	25 %	35 %




N
Bells Line Of Road N
50
180
Grose Vale Road W
15
Terrace Road E
40
40
160
Bells Line Of Road S

MOVEMENT SUMMARY

Site: PM With Dev With NRJV

Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Bells Line Of Road S											
1	L	533	1.0	0.581	28.3	LOS B	23.8	167.9	0.67	0.83	33.7
2	T	717	1.6	0.639	21.0	LOS B	33.6	238.5	0.71	0.65	36.3
3	R	283	0.9	1.000[3]	36.0	LOS C	10.3	72.7	0.87	0.88	30.2
Approach		1533	1.2	1.000	26.3	LOS B	33.6	238.5	0.73	0.75	34.1
East: Terrace Road E											
4	L	159	2.0	0.859	65.2	LOS E	13.5	95.9	1.00	0.95	21.7
5	T	142	0.7	1.000[3]	63.7	LOS E	13.5	95.9	0.99	0.85	20.6
6	R	41	2.6	1.000[3]	75.7	LOS F	9.2	65.3	0.99	0.80	20.0
Approach		342	1.5	1.000	65.8	LOS E	13.5	95.9	1.00	0.89	21.0
North: Bells Line Of Road N											
7	L	44	2.4	0.296	30.6	LOS C	8.3	60.1	0.60	0.89	33.6
8	T	480	3.9	0.340	23.3	LOS B	13.7	99.5	0.63	0.54	35.1
Approach		524	3.8	0.340	23.9	LOS B	13.7	99.5	0.63	0.57	35.0
West: Grose Vale Road W											
10	L	76	1.4	0.867	84.7	LOS F	19.5	137.3	1.00	0.97	18.3
11	T	115	0.0	0.867	76.4	LOS F	19.5	137.3	1.00	0.97	18.4
12	R	346	1.5	0.991	113.3	LOS F	28.5	201.8	1.00	1.05	14.6
Approach		537	1.2	0.991	101.4	LOS F	28.5	201.8	1.00	1.03	15.7
All Vehicles		2936	1.7	1.000	44.2	LOS D	33.6	238.5	0.79	0.79	26.6

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

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
P1	Across S approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P3	Across E approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
P5	Across N approach	53	63.5	LOS F	0.2	0.2	0.92	0.92
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		212	67.2	LOS F			0.95	0.95

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.

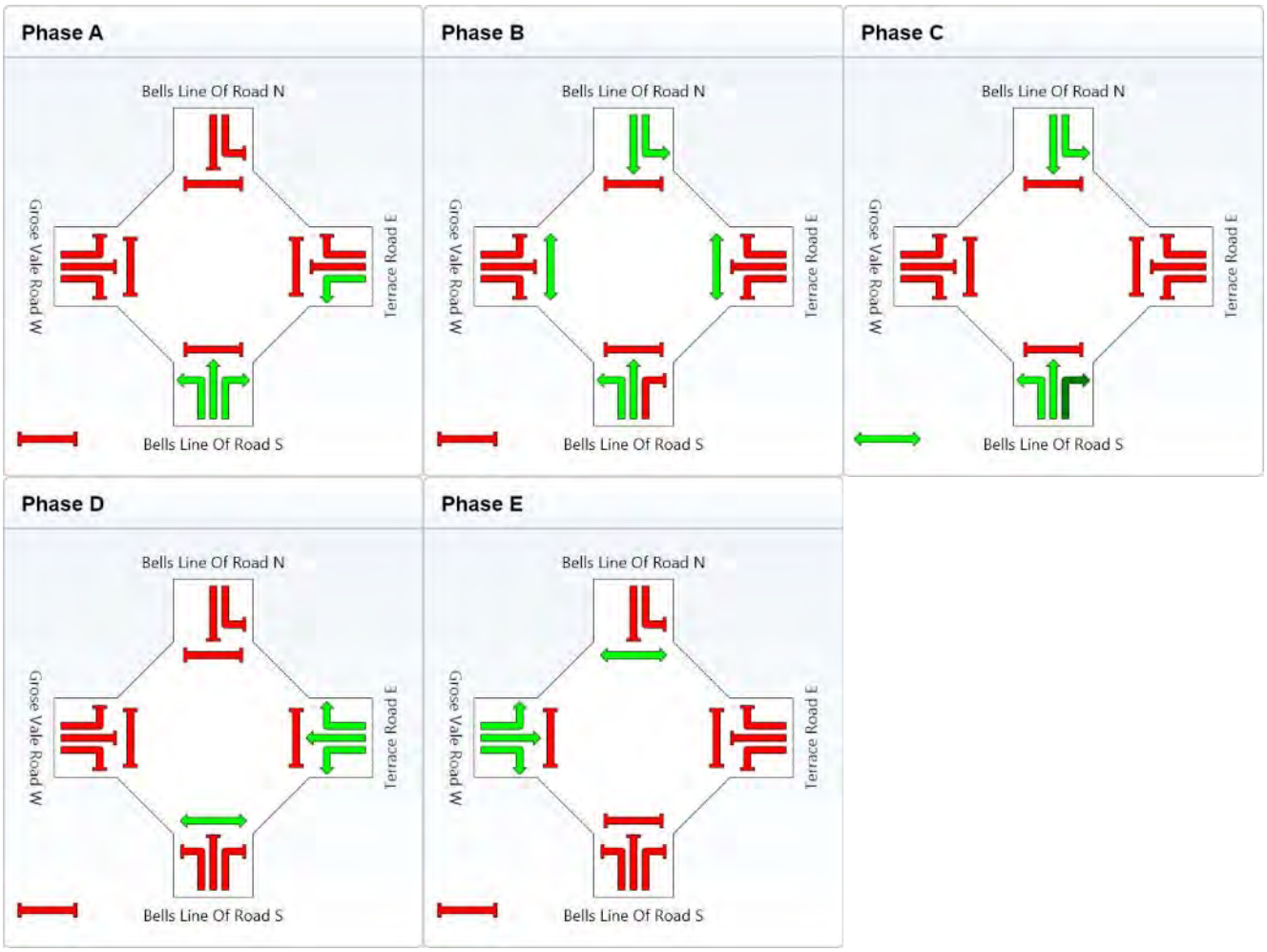
PHASING SUMMARY

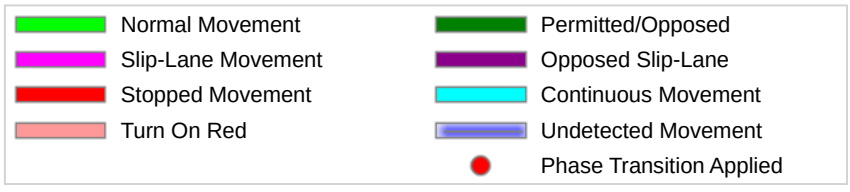
Bells Line Of Road, Terrace Road and Grose Vale Road Traffic Signal
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

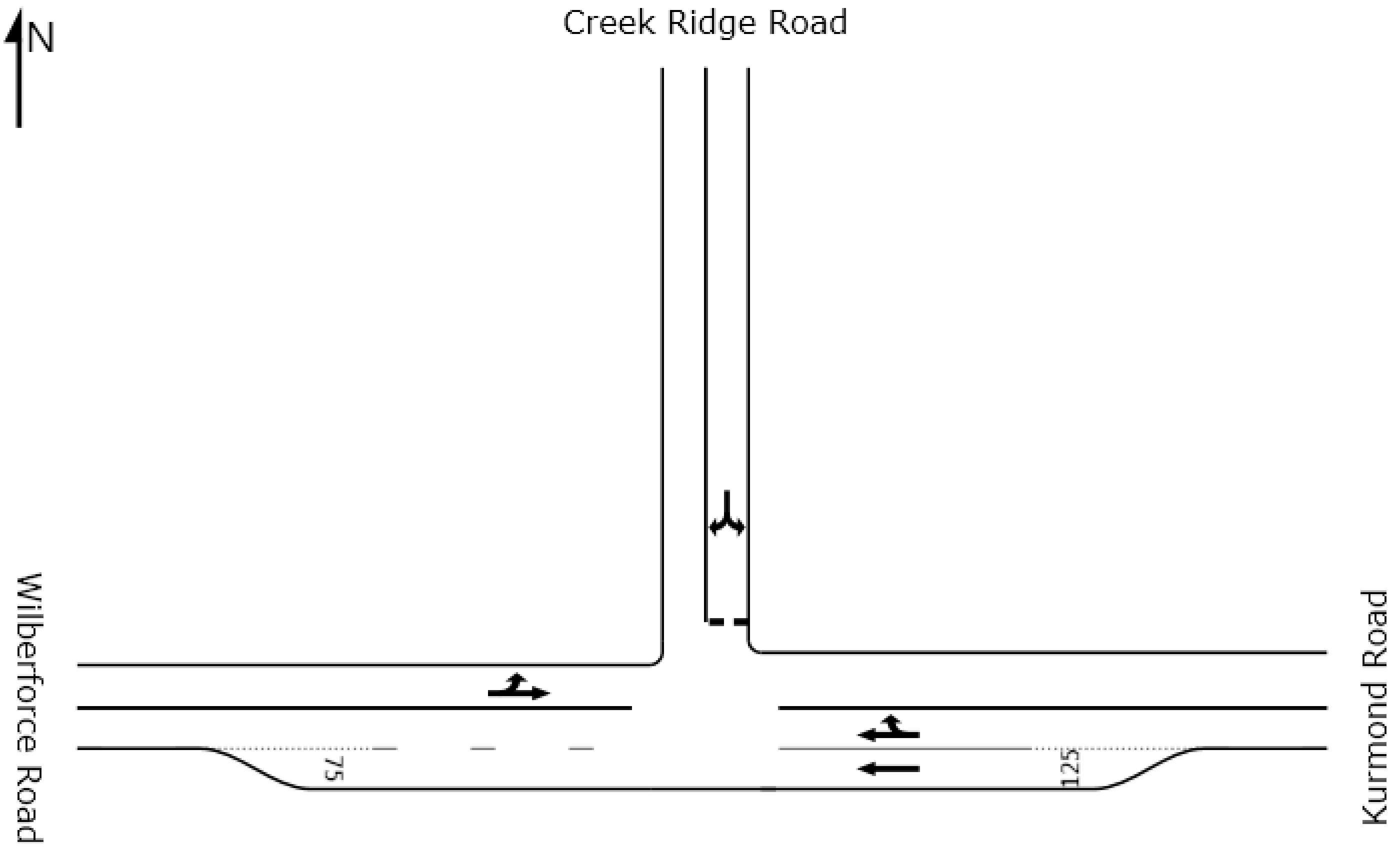
Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D, E
Output Sequence: A, B, C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	8	16	53	19	24
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	14	22	59	25	30
Phase Split	9 %	15 %	39 %	17 %	20 %






N
Creek Ridge Road
Wilberforce Road
Kurmond Road
75
125

MOVEMENT SUMMARY

Site: Existing AM

Creek Ridge Road, Wilberforce Road and Kurmond Road Give-way Intersection

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Kurmond Road											
5	T	182	6.4	0.099	0.7	LOS A	0.6	4.1	0.25	0.00	54.9
6	R	55	1.9	0.099	9.7	LOS A	0.6	4.1	0.42	0.83	48.5
Approach		237	5.3	0.099	2.8	NA	0.6	4.1	0.29	0.19	53.2
North: Creek Ridge Road											
7	L	164	3.8	0.323	11.5	LOS A	1.5	10.8	0.51	0.79	45.6
9	R	83	2.5	0.323	11.7	LOS A	1.5	10.8	0.51	0.88	45.5
Approach		247	3.4	0.323	11.5	LOS A	1.5	10.8	0.51	0.82	45.6
West: Wilberforce Road											
10	L	43	4.9	0.181	8.3	LOS A	0.0	0.0	0.00	1.01	49.0
11	T	299	3.2	0.181	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		342	3.4	0.181	1.1	NA	0.0	0.0	0.00	0.13	58.3
All Vehicles		826	3.9	0.323	4.7	NA	1.5	10.8	0.23	0.35	52.5

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: AM With Dev

Creek Ridge Road, Wilberforce Road and Kurmond Road Give-way Intersection

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Kurmond Road											
5	T	182	6.4	0.099	0.7	LOS A	0.6	4.1	0.25	0.00	54.9
6	R	55	1.9	0.099	9.7	LOS A	0.6	4.1	0.42	0.83	48.5
Approach		237	5.3	0.099	2.8	NA	0.6	4.1	0.29	0.19	53.2
North: Creek Ridge Road											
7	L	484	1.3	0.705	15.1	LOS B	7.6	54.2	0.70	1.09	42.4
9	R	83	2.5	0.705	15.4	LOS B	7.6	54.2	0.70	1.11	42.3
Approach		567	1.5	0.705	15.1	LOS B	7.6	54.2	0.70	1.09	42.4
West: Wilberforce Road											
10	L	43	4.9	0.181	8.3	LOS A	0.0	0.0	0.00	1.01	49.0
11	T	299	3.2	0.181	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		342	3.4	0.181	1.1	NA	0.0	0.0	0.00	0.13	58.3
All Vehicles		1146	2.8	0.705	8.4	NA	7.6	54.2	0.41	0.62	48.4

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: AM NRJV

Creek Ridge Road, Wilberforce Road and Kurmond Road Give-way Intersection

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Kurmond Road											
5	T	182	6.4	0.100	0.8	LOS A	0.6	4.2	0.26	0.00	54.7
6	R	55	1.9	0.100	9.8	LOS A	0.6	4.2	0.44	0.83	48.4
Approach		237	5.3	0.100	2.9	NA	0.6	4.2	0.30	0.19	53.1
North: Creek Ridge Road											
7	L	164	3.8	0.336	11.9	LOS A	1.6	11.5	0.53	0.82	45.2
9	R	83	2.5	0.336	12.1	LOS A	1.6	11.5	0.53	0.90	45.1
Approach		247	3.4	0.336	12.0	LOS A	1.6	11.5	0.53	0.85	45.2
West: Wilberforce Road											
10	L	43	4.9	0.197	8.3	LOS A	0.0	0.0	0.00	1.02	49.0
11	T	331	2.9	0.197	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		374	3.1	0.197	1.0	NA	0.0	0.0	0.00	0.12	58.5
All Vehicles		858	3.8	0.336	4.7	NA	1.6	11.5	0.24	0.35	52.6

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: AM With Dev With NRJV

Creek Ridge Road, Wilberforce Road and Kurmond Road Give-way Intersection

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Kurmond Road											
5	T	182	6.4	0.100	0.8	LOS A	0.6	4.2	0.26	0.00	54.7
6	R	55	1.9	0.100	9.8	LOS A	0.6	4.2	0.44	0.83	48.4
Approach		237	5.3	0.100	2.9	NA	0.6	4.2	0.30	0.19	53.1
North: Creek Ridge Road											
7	L	484	1.3	0.734	16.2	LOS B	8.2	58.4	0.74	1.18	41.5
9	R	83	2.5	0.734	16.5	LOS B	8.2	58.4	0.74	1.17	41.5
Approach		567	1.5	0.734	16.2	LOS B	8.2	58.4	0.74	1.17	41.5
West: Wilberforce Road											
10	L	43	4.9	0.197	8.3	LOS A	0.0	0.0	0.00	1.02	49.0
11	T	331	2.9	0.197	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		374	3.1	0.197	1.0	NA	0.0	0.0	0.00	0.12	58.5
All Vehicles		1178	2.8	0.734	8.7	NA	8.2	58.4	0.41	0.64	48.0

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Existing PM

Creek Ridge Road, Wilberforce Road and Kurmond Road Give-way Intersection

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Kurmond Road											
5	T	406	3.6	0.267	0.3	LOS A	1.6	11.7	0.15	0.00	56.4
6	R	257	3.3	0.267	9.0	LOS A	1.6	11.7	0.32	0.74	48.2
Approach		663	3.5	0.267	3.7	NA	1.6	11.7	0.22	0.29	52.9
North: Creek Ridge Road											
7	L	72	4.4	0.119	10.4	LOS A	0.4	3.1	0.28	0.63	46.8
9	R	24	0.0	0.119	10.5	LOS A	0.4	3.1	0.28	0.80	46.6
Approach		96	3.3	0.119	10.4	LOS A	0.4	3.1	0.28	0.67	46.7
West: Wilberforce Road											
10	L	34	0.0	0.081	8.2	LOS A	0.0	0.0	0.00	0.95	49.0
11	T	117	7.2	0.081	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		151	5.6	0.081	1.8	NA	0.0	0.0	0.00	0.21	57.1
All Vehicles		909	3.8	0.267	4.1	NA	1.6	11.7	0.19	0.31	52.8

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: PM With Dev

Creek Ridge Road, Wilberforce Road and Kurmond Road Give-way Intersection

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Kurmond Road											
5	T	406	3.6	0.412	0.2	LOS A	2.7	19.3	0.08	0.00	58.0
6	R	577	1.5	0.412	9.1	LOS A	2.7	19.3	0.36	0.67	47.5
Approach		983	2.4	0.412	5.4	NA	2.7	19.3	0.24	0.39	51.4
North: Creek Ridge Road											
7	L	72	4.4	0.146	11.7	LOS A	0.5	3.7	0.31	0.63	45.5
9	R	24	0.0	0.146	11.8	LOS A	0.5	3.7	0.31	0.81	45.3
Approach		96	3.3	0.146	11.7	LOS A	0.5	3.7	0.31	0.68	45.4
West: Wilberforce Road											
10	L	34	0.0	0.081	8.2	LOS A	0.0	0.0	0.00	0.95	49.0
11	T	117	7.2	0.081	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		151	5.6	0.081	1.8	NA	0.0	0.0	0.00	0.21	57.1
All Vehicles		1229	2.8	0.412	5.5	NA	2.7	19.3	0.22	0.39	51.5

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: PM NRJV

Creek Ridge Road, Wilberforce Road and Kurmond Road Give-way Intersection

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Kurmond Road											
5	T	438	3.4	0.279	0.3	LOS A	1.7	12.4	0.16	0.00	56.3
6	R	257	3.3	0.279	9.1	LOS A	1.7	12.4	0.32	0.74	48.2
Approach		695	3.3	0.279	3.5	NA	1.7	12.4	0.22	0.27	53.0
North: Creek Ridge Road											
7	L	72	4.4	0.121	10.5	LOS A	0.4	3.2	0.29	0.63	46.7
9	R	24	0.0	0.121	10.6	LOS A	0.4	3.2	0.29	0.80	46.5
Approach		96	3.3	0.121	10.5	LOS A	0.4	3.2	0.29	0.67	46.6
West: Wilberforce Road											
10	L	34	0.0	0.081	8.2	LOS A	0.0	0.0	0.00	0.95	49.0
11	T	117	7.2	0.081	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		151	5.6	0.081	1.8	NA	0.0	0.0	0.00	0.21	57.1
All Vehicles		941	3.7	0.279	4.0	NA	1.7	12.4	0.19	0.31	52.9

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: PM With Dev With NJRV

Creek Ridge Road, Wilberforce Road and Kurmond Road Give-way Intersection

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Kurmond Road											
5	T	438	3.4	0.423	0.2	LOS A	2.9	20.3	0.09	0.00	57.7
6	R	577	1.5	0.423	9.1	LOS A	2.9	20.3	0.37	0.67	47.6
Approach		1015	2.3	0.423	5.3	NA	2.9	20.3	0.25	0.38	51.5
North: Creek Ridge Road											
7	L	72	4.4	0.150	11.8	LOS A	0.5	3.8	0.31	0.63	45.3
9	R	24	0.0	0.150	11.9	LOS A	0.5	3.8	0.31	0.81	45.2
Approach		96	3.3	0.150	11.9	LOS A	0.5	3.8	0.31	0.68	45.3
West: Wilberforce Road											
10	L	34	0.0	0.081	8.2	LOS A	0.0	0.0	0.00	0.95	49.0
11	T	117	7.2	0.081	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		151	5.6	0.081	1.8	NA	0.0	0.0	0.00	0.21	57.1
All Vehicles		1261	2.8	0.423	5.4	NA	2.9	20.3	0.22	0.38	51.5

Level of Service (LOS) Method: Delay (RTA NSW).

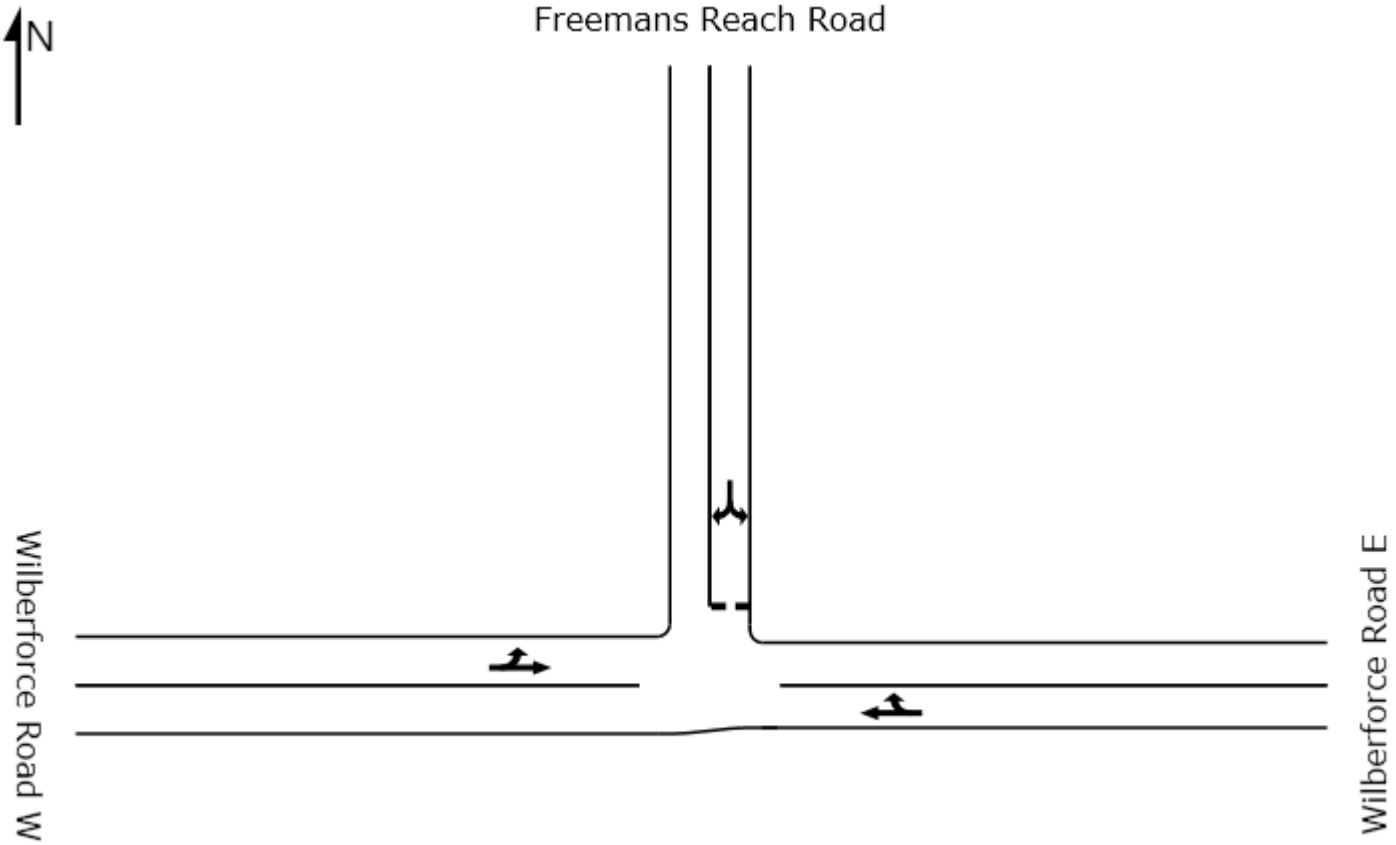
Vehicle movement LOS values are based on average delay per movement

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 used.

SIDRA INTERSECTION


N
Freemans Reach Road
Wilberforce Road W
Wilberforce Road E

MOVEMENT SUMMARY

Site: AM Existing

Wilberforce Road and Freemans Reach Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Wilberforce Road E											
5	T	760	1.4	0.394	2.5	LOS A	4.4	31.1	0.64	0.00	49.5
6	R	1	0.0	0.394	10.9	LOS A	4.4	31.1	0.64	0.99	49.3
Approach		761	1.4	0.394	2.5	NA	4.4	31.1	0.64	0.00	49.5
North: Freemans Reach Road											
7	L	2	0.0	1.581	554.6	LOS F	116.4	816.7	1.00	8.52	3.7
9	R	469	0.2	1.581	554.9	LOS F	116.4	816.7	1.00	6.36	3.7
Approach		472	0.2	1.581	554.9	LOS F	116.4	816.7	1.00	6.37	3.7
West: Wilberforce Road W											
10	L	127	9.1	0.201	8.4	LOS A	0.0	0.0	0.00	0.89	49.0
11	T	235	9.4	0.201	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		362	9.3	0.201	3.0	NA	0.0	0.0	0.00	0.31	55.6
All Vehicles		1595	2.8	1.581	165.9	NA	116.4	816.7	0.60	1.96	10.6

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

Site: AM With Dev

Wilberforce Road and Freemans Reach Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Wilberforce Road E											
5	T	760	1.4	0.394	2.5	LOS A	4.4	31.1	0.64	0.00	49.5
6	R	1	0.0	0.394	10.9	LOS A	4.4	31.1	0.64	0.99	49.3
Approach		761	1.4	0.394	2.5	NA	4.4	31.1	0.64	0.00	49.5
North: Freemans Reach Road											
7	L	2	0.0	2.583	1452.1	LOS F	305.2	2138.6	1.00	13.20	1.5
9	R	767	0.1	2.583	1452.3	LOS F	305.2	2138.6	1.00	9.69	1.5
Approach		769	0.1	2.583	1452.3	LOS F	305.2	2138.6	1.00	9.70	1.5
West: Wilberforce Road W											
10	L	127	9.1	0.201	8.4	LOS A	0.0	0.0	0.00	0.89	49.0
11	T	235	9.4	0.201	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		362	9.3	0.201	3.0	NA	0.0	0.0	0.00	0.31	55.6
All Vehicles		1893	2.4	2.583	592.0	NA	305.2	2138.6	0.66	4.01	3.5

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

Site: PM Existing

Wilberforce Road and Freemans Reach Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Wilberforce Road E											
5	T	346	7.9	0.203	25.0	LOS B	6.2	46.6	1.00	0.00	33.6
6	R	3	0.0	0.203	33.4	LOS C	6.2	46.6	1.00	1.03	33.4
Approach		349	7.8	0.203	25.1	NA	6.2	46.6	1.00	0.01	33.6
North: Freemans Reach Road											
7	L	2	0.0	1.400	419.9	LOS F	42.0	309.8	1.00	3.50	4.8
9	R	200	6.3	1.400	420.3	LOS F	42.0	309.8	1.00	3.45	4.7
Approach		202	6.3	1.400	420.3	LOS F	42.0	309.8	1.00	3.45	4.7
West: Wilberforce Road W											
10	L	526	4.0	0.708	8.3	LOS A	0.0	0.0	0.00	0.87	49.0
11	T	795	3.4	0.708	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		1321	3.7	0.708	3.3	NA	0.0	0.0	0.00	0.35	55.1
All Vehicles		1873	4.7	1.400	52.4	NA	42.0	309.8	0.29	0.62	24.4

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

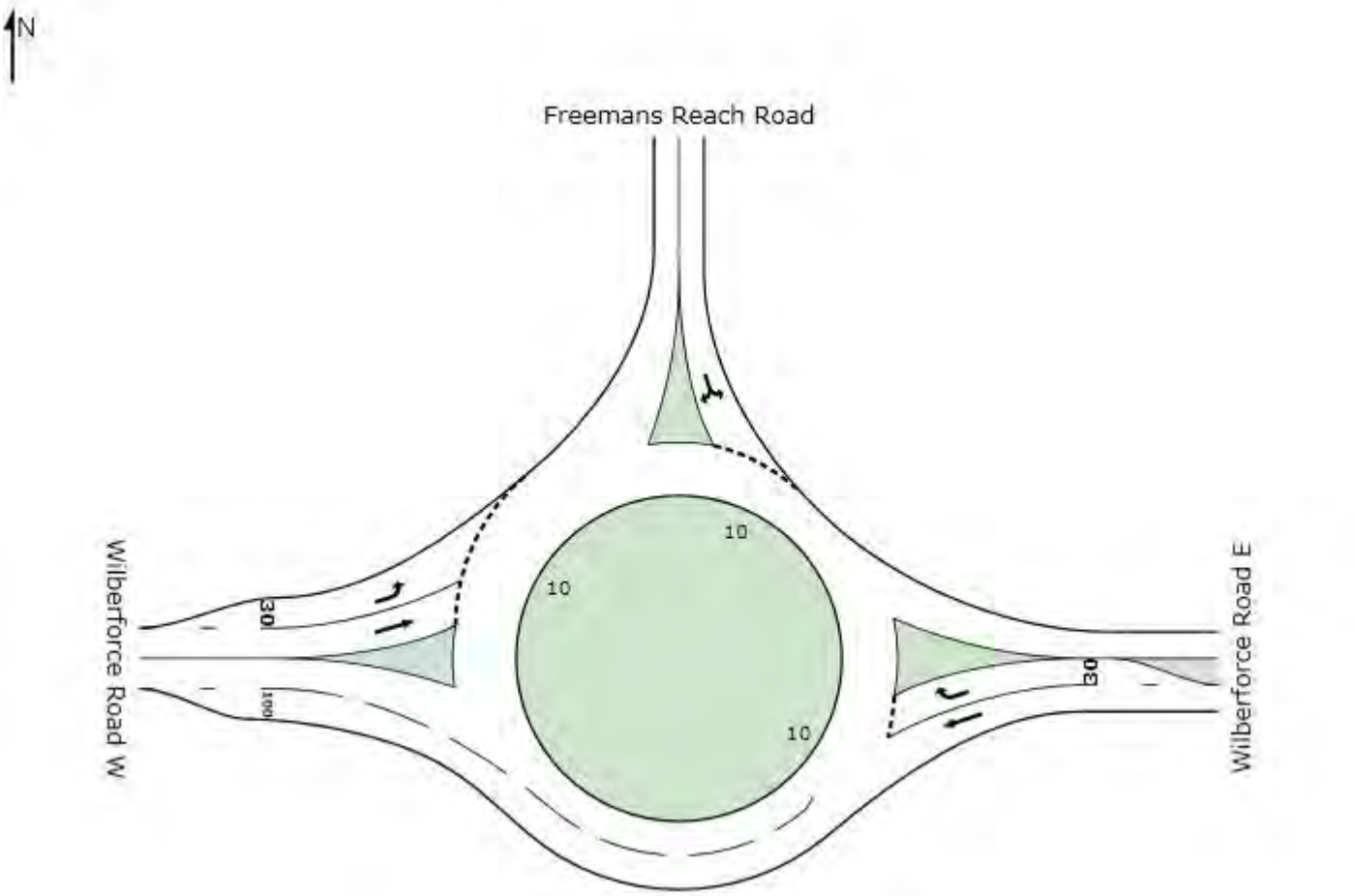
Site: PM With Dev

Wilberforce Road and Freemans Reach Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Wilberforce Road E											
5	T	346	7.9	0.254	107.3	LOS F	20.6	154.2	1.00	0.00	14.8
6	R	3	0.0	0.254	115.7	LOS F	20.6	154.2	1.00	1.05	14.7
Approach		349	7.8	0.254	107.4	NA	20.6	154.2	1.00	0.01	14.8
North: Freemans Reach Road											
7	L	2	0.0	1.967	935.2	LOS F	68.6	505.6	1.00	3.97	2.2
9	R	200	6.3	1.967	935.6	LOS F	68.6	505.6	1.00	3.98	2.2
Approach		202	6.3	1.967	935.6	LOS F	68.6	505.6	1.00	3.98	2.2
West: Wilberforce Road W											
10	L	824	2.6	0.869	8.3	LOS A	0.0	0.0	0.00	0.82	49.0
11	T	795	3.4	0.869	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		1619	3.0	0.869	4.2	NA	0.0	0.0	0.00	0.42	53.8
All Vehicles		2171	4.1	1.967	107.5	NA	68.6	505.6	0.25	0.68	15.1

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.


N
Freemans Reach Road
Wilberforce Road W
Wilberforce Road E
30
30
10
10
10

MOVEMENT SUMMARY

Site: AM Existing

Wilberforce Road and Freemans Reach Road
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Wilberforce Road E											
5	T	760	1.4	0.393	6.8	X	X	X	X	0.57	50.6
6	R	1	0.0	0.001	13.5	LOS A	0.0	0.1	0.61	0.59	43.9
Approach		761	1.4	0.393	6.8	LOS A	0.0	0.1	0.00	0.57	50.6
North: Freemans Reach Road											
7	L	2	0.0	0.460	9.9	LOS A	3.4	24.1	0.60	0.68	46.5
9	R	469	0.2	0.460	13.2	LOS A	3.4	24.1	0.60	0.74	44.2
Approach		472	0.2	0.460	13.2	LOS A	3.4	24.1	0.60	0.74	44.2
West: Wilberforce Road W											
10	L	127	9.1	0.138	8.6	LOS A	0.5	3.8	0.60	0.32	46.6
11	T	235	9.4	0.138	7.0	LOS A	0.8	6.3	0.02	0.56	50.5
Approach		362	9.3	0.138	7.5	LOS A	0.8	6.3	0.22	0.48	49.1
All Vehicles		1595	2.8	0.460	8.9	LOS A	3.4	24.1	0.23	0.60	48.2

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay (RTA NSW).
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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: AM With Dev

Wilberforce Road and Freemans Reach Road
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Wilberforce Road E											
5	T	760	1.4	0.393	6.8	X	X	X	X	0.57	50.6
6	R	1	0.0	0.002	16.1	LOS B	0.0	0.1	0.81	0.61	41.8
Approach		761	1.4	0.393	6.8	LOS A	0.0	0.1	0.00	0.57	50.5
North: Freemans Reach Road											
7	L	2	0.0	0.725	12.6	LOS A	9.5	66.5	0.82	0.77	44.0
9	R	767	0.1	0.725	16.0	LOS B	9.5	66.5	0.82	0.80	41.9
Approach		769	0.1	0.725	15.9	LOS B	9.5	66.5	0.82	0.80	42.0
West: Wilberforce Road W											
10	L	127	9.1	0.140	8.6	LOS A	0.5	4.0	0.62	0.30	46.5
11	T	235	9.4	0.138	7.0	LOS A	0.9	6.7	0.02	0.56	50.5
Approach		362	9.3	0.140	7.5	LOS A	0.9	6.7	0.23	0.47	49.0
All Vehicles		1893	2.4	0.725	10.7	LOS A	9.5	66.5	0.38	0.65	46.4

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay (RTA NSW).
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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: PM Existing

Wilberforce Road and Freemans Reach Road
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Wilberforce Road E											
5	T	346	7.9	0.187	6.9	X	X	X	X	0.57	50.6
6	R	3	0.0	0.004	11.9	LOS A	0.0	0.1	0.43	0.61	45.0
Approach		349	7.8	0.187	7.0	LOS A	0.0	0.1	0.00	0.57	50.5
North: Freemans Reach Road											
7	L	2	0.0	0.338	15.5	LOS B	2.1	15.8	0.82	0.90	41.6
9	R	200	6.3	0.338	19.0	LOS B	2.1	15.8	0.82	0.93	39.8
Approach		202	6.3	0.338	18.9	LOS B	2.1	15.8	0.82	0.93	39.8
West: Wilberforce Road W											
10	L	526	4.0	0.512	9.0	LOS A	2.5	18.5	1.00	0.13	45.1
11	T	795	3.4	0.448	6.8	LOS A	3.7	26.7	0.05	0.55	50.3
Approach		1321	3.7	0.512	7.7	LOS A	3.7	26.7	0.43	0.38	48.1
All Vehicles		1873	4.7	0.512	8.8	LOS A	3.7	26.7	0.39	0.48	47.5

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay (RTA NSW).
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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: PM With Dev

Wilberforce Road and Freemans Reach Road
Roundabout

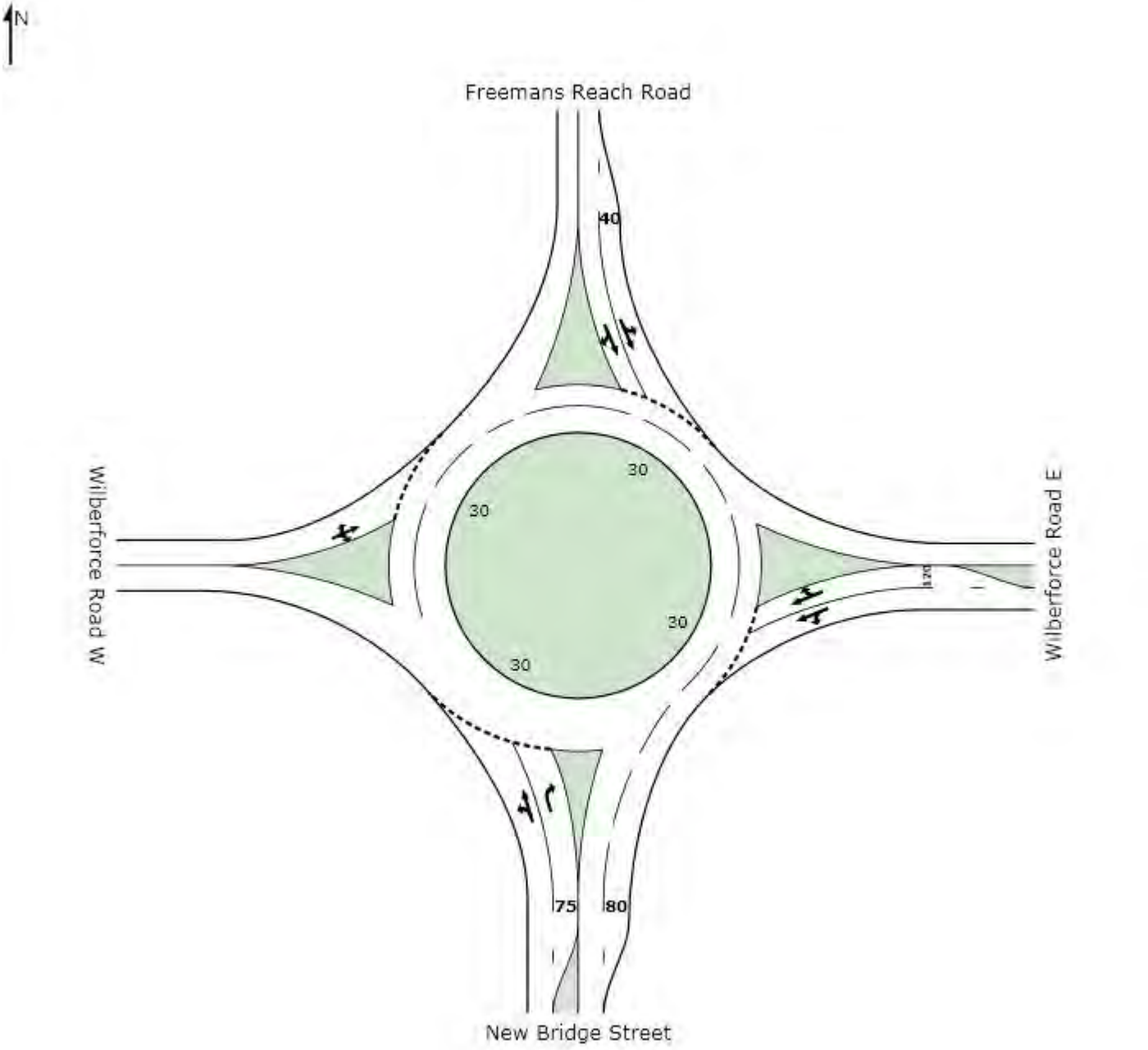
Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Wilberforce Road E											
5	T	346	7.9	0.187	6.9	X	X	X	X	0.57	50.6
6	R	3	0.0	0.004	11.9	LOS A	0.0	0.1	0.43	0.61	45.0
Approach		349	7.8	0.187	7.0	LOS A	0.0	0.1	0.00	0.57	50.5
North: Freemans Reach Road											
7	L	2	0.0	0.339	15.5	LOS B	2.2	15.9	0.82	0.90	41.6
9	R	200	6.3	0.339	19.0	LOS B	2.2	15.9	0.82	0.93	39.8
Approach		202	6.3	0.339	18.9	LOS B	2.2	15.9	0.82	0.93	39.8
West: Wilberforce Road W											
10	L	824	2.6	0.666	9.2	LOS A	3.9	28.2	1.00	0.13	45.1
11	T	795	3.4	0.514	6.8	LOS A	4.7	34.2	0.06	0.55	50.3
Approach		1619	3.0	0.666	8.1	LOS A	4.7	34.2	0.54	0.33	47.5
All Vehicles		2171	4.1	0.666	8.9	LOS A	4.7	34.2	0.48	0.43	47.1

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay (RTA NSW).
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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

SIDRA INTERSECTION


N
Freemans Reach Road
40
30
30
30
30
Wilberforce Road W
Wilberforce Road E
120
75
80
New Bridge Street

MOVEMENT SUMMARY

Site: AM Existing

Wilberforce Road and Freemans Reach Road
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: New Bridge Street											
1	L	1	0.0	0.089	5.8	LOS A	0.5	3.5	0.03	0.57	51.6
2	T	127	9.1	0.089	4.3	LOS A	0.5	3.5	0.03	0.37	53.6
3	R	235	9.4	0.158	11.4	LOS A	0.7	5.6	0.24	0.55	45.6
Approach		363	9.3	0.158	8.9	LOS A	0.7	5.6	0.17	0.49	48.0
East: Wilberforce Road E											
4	L	760	1.4	0.726	10.9	LOS A	7.7	54.6	0.82	0.93	46.2
5	T	1	0.0	0.003	7.1	LOS A	0.0	0.1	0.53	0.48	48.8
6	R	1	0.0	0.003	14.1	LOS A	0.0	0.1	0.53	0.73	44.7
Approach		762	1.4	0.726	10.9	LOS A	7.7	54.6	0.82	0.93	46.2
North: Freemans Reach Road											
7	L	2	0.0	0.161	7.4	LOS A	0.8	5.3	0.45	0.63	49.6
8	T	469	0.2	0.284	5.5	LOS A	1.7	11.8	0.45	0.51	50.2
9	R	1	0.0	0.284	12.5	LOS A	1.7	11.8	0.45	0.88	46.6
Approach		473	0.2	0.284	5.6	LOS A	1.7	11.8	0.45	0.51	50.2
West: Wilberforce Road W											
10	L	1	0.0	0.003	6.7	LOS A	0.0	0.1	0.38	0.50	49.4
11	T	1	0.0	0.003	5.3	LOS A	0.0	0.1	0.38	0.41	50.1
12	R	1	0.0	0.003	12.4	LOS A	0.0	0.1	0.38	0.74	46.0
Approach		3	0.0	0.003	8.1	LOS A	0.0	0.1	0.38	0.55	48.4
All Vehicles		1601	2.8	0.726	8.9	LOS A	7.7	54.6	0.56	0.71	47.7

Level of Service (LOS) Method: Delay (RTA NSW).
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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: AM With Dev

Wilberforce Road and Freemans Reach Road
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: New Bridge Street											
1	L	1	0.0	0.089	5.8	LOS A	0.5	3.6	0.04	0.57	51.6
2	T	127	9.1	0.089	4.3	LOS A	0.5	3.6	0.04	0.37	53.6
3	R	235	9.4	0.158	11.4	LOS A	0.8	5.7	0.25	0.55	45.6
Approach		363	9.3	0.158	8.9	LOS A	0.8	5.7	0.17	0.49	48.0
East: Wilberforce Road E											
4	L	760	1.4	0.876	19.4	LOS B	13.4	94.7	0.99	1.33	39.2
5	T	1	0.0	0.004	8.5	LOS A	0.0	0.1	0.63	0.56	47.7
6	R	1	0.0	0.004	15.6	LOS B	0.0	0.1	0.63	0.76	43.5
Approach		762	1.4	0.876	19.4	LOS B	13.4	94.7	0.99	1.33	39.2
North: Freemans Reach Road											
7	L	2	0.0	0.258	7.6	LOS A	1.3	9.2	0.48	0.65	49.5
8	T	767	0.1	0.456	5.8	LOS A	3.2	22.4	0.52	0.53	49.7
9	R	1	0.0	0.456	12.7	LOS A	3.2	22.4	0.53	0.87	46.5
Approach		771	0.1	0.456	5.8	LOS A	3.2	22.4	0.52	0.53	49.7
West: Wilberforce Road W											
10	L	1	0.0	0.003	6.7	LOS A	0.0	0.1	0.38	0.50	49.4
11	T	1	0.0	0.003	5.3	LOS A	0.0	0.1	0.38	0.41	50.1
12	R	1	0.0	0.003	12.4	LOS A	0.0	0.1	0.38	0.74	46.0
Approach		3	0.0	0.003	8.1	LOS A	0.0	0.1	0.38	0.55	48.4
All Vehicles		1899	2.4	0.876	11.8	LOS A	13.4	94.7	0.64	0.84	44.6

Level of Service (LOS) Method: Delay (RTA NSW).
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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: PM Existing

Wilberforce Road and Freemans Reach Road
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: New Bridge Street											
1	L	1	0.0	0.343	5.8	LOS A	2.4	17.2	0.06	0.56	51.5
2	T	526	4.0	0.343	4.2	LOS A	2.4	17.2	0.06	0.37	53.4
3	R	795	3.4	0.499	11.6	LOS A	3.3	23.9	0.85	0.23	43.2
Approach		1322	3.7	0.499	8.7	LOS A	3.3	23.9	0.54	0.28	46.6
East: Wilberforce Road E											
4	L	346	7.9	0.296	6.9	LOS A	1.9	14.2	0.47	0.57	48.8
5	T	1	0.0	0.006	5.6	LOS A	0.0	0.2	0.42	0.40	49.5
6	R	3	0.0	0.006	12.6	LOS A	0.0	0.2	0.42	0.67	45.5
Approach		351	7.8	0.296	6.9	LOS A	1.9	14.2	0.46	0.57	48.7
North: Freemans Reach Road											
7	L	2	0.0	0.138	12.7	LOS A	0.8	6.1	0.83	0.86	45.6
8	T	200	6.3	0.243	10.1	LOS A	1.8	13.0	0.87	0.84	46.7
9	R	1	0.0	0.243	16.6	LOS B	1.8	13.0	0.88	0.92	43.9
Approach		203	6.2	0.243	10.2	LOS A	1.8	13.0	0.87	0.84	46.7
West: Wilberforce Road W											
10	L	1	0.0	0.139	19.8	LOS B	0.5	5.9	0.80	0.91	39.5
11	T	23	95.5	0.139	20.0	LOS B	0.5	5.9	0.80	0.87	39.8
12	R	1	0.0	0.139	25.4	LOS B	0.5	5.9	0.80	1.01	37.5
Approach		25	87.5	0.139	20.3	LOS B	0.5	5.9	0.80	0.88	39.7
All Vehicles		1901	5.8	0.499	8.6	LOS A	3.3	23.9	0.56	0.40	46.9

Level of Service (LOS) Method: Delay (RTA NSW).
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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

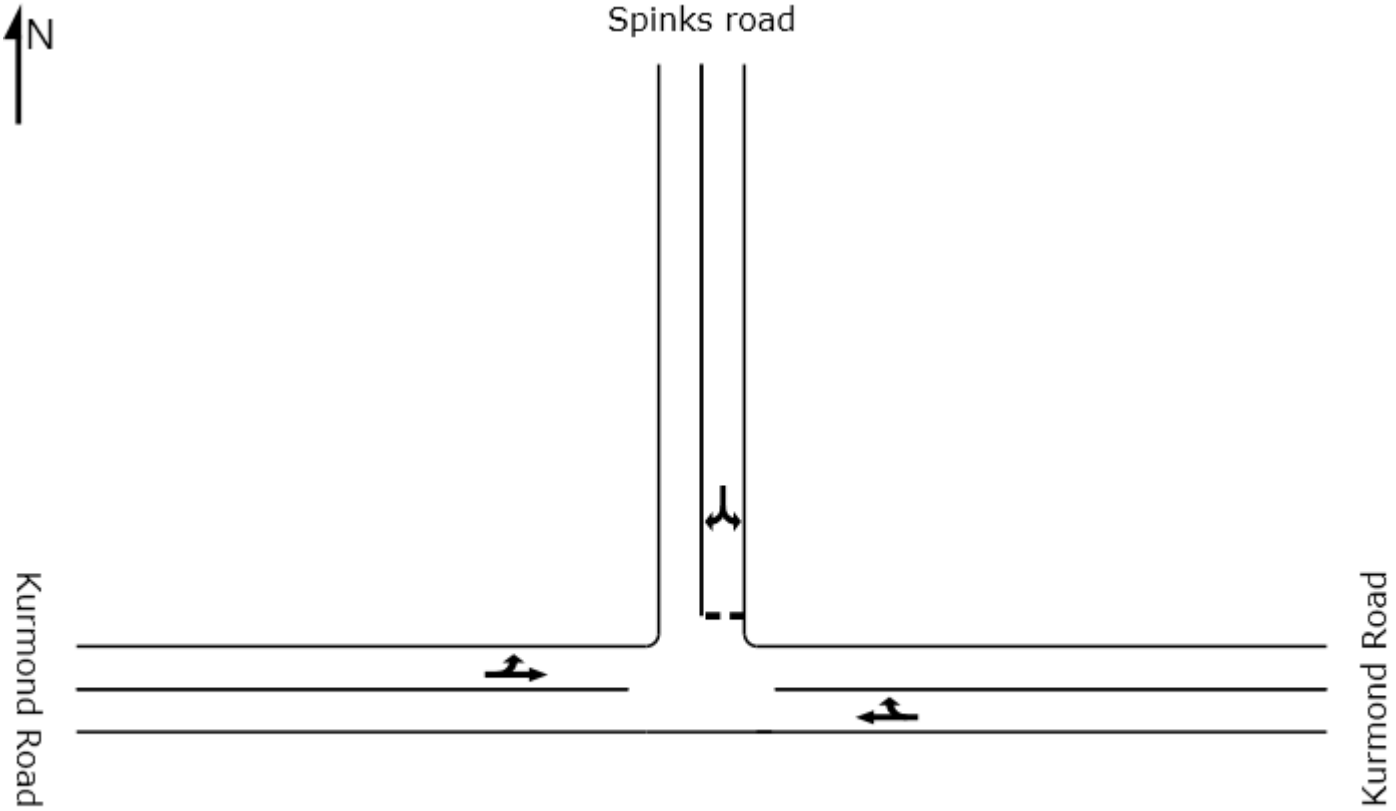
Site: PM With Dev

Wilberforce Road and Freemans Reach Road
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: New Bridge Street											
1	L	1	0.0	0.443	5.8	LOS A	3.5	25.2	0.06	0.56	51.4
2	T	824	2.6	0.443	4.2	LOS A	3.5	25.2	0.06	0.37	53.4
3	R	795	3.4	0.586	11.8	LOS A	4.4	31.9	1.00	0.16	42.6
Approach		1620	3.0	0.586	7.9	LOS A	4.4	31.9	0.52	0.27	47.3
East: Wilberforce Road E											
4	L	346	7.9	0.297	6.9	LOS A	1.9	14.3	0.47	0.57	48.7
5	T	1	0.0	0.006	5.6	LOS A	0.0	0.2	0.42	0.40	49.5
6	R	3	0.0	0.006	12.6	LOS A	0.0	0.2	0.42	0.66	45.4
Approach		351	7.8	0.297	6.9	LOS A	1.9	14.3	0.47	0.57	48.7
North: Freemans Reach Road											
7	L	2	0.0	0.146	12.7	LOS A	0.9	6.6	0.86	0.87	45.6
8	T	200	6.3	0.257	10.1	LOS A	1.9	14.1	0.90	0.86	46.6
9	R	1	0.0	0.257	16.6	LOS B	1.9	14.1	0.91	0.92	44.0
Approach		203	6.2	0.257	10.2	LOS A	1.9	14.1	0.90	0.86	46.6
West: Wilberforce Road W											
10	L	1	0.0	0.164	22.0	LOS B	0.5	6.7	0.85	0.93	38.0
11	T	23	95.5	0.164	22.3	LOS B	0.5	6.7	0.85	0.90	38.3
12	R	1	0.0	0.164	27.7	LOS B	0.5	6.7	0.85	1.00	36.3
Approach		25	87.5	0.164	22.5	LOS B	0.5	6.7	0.85	0.90	38.1
All Vehicles		2199	5.0	0.586	8.1	LOS A	4.4	31.9	0.55	0.38	47.3

Level of Service (LOS) Method: Delay (RTA NSW).
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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.


N
Spinks road
Kurmond Road
Kurmond Road

MOVEMENT SUMMARY

Site: AM Existing

Kurmond Road and Spinks Road Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Kurmond Road											
5	T	52	12.2	0.042	0.5	LOS A	0.2	1.6	0.26	0.00	70.1
6	R	21	5.0	0.042	11.5	LOS A	0.2	1.6	0.26	0.96	59.5
Approach		73	10.1	0.042	3.7	NA	0.2	1.6	0.26	0.28	66.7
North: Spinks road											
7	L	99	0.0	0.121	11.8	LOS A	0.5	3.2	0.28	0.68	57.3
9	R	24	0.0	0.121	11.6	LOS A	0.5	3.2	0.28	0.74	57.8
Approach		123	0.0	0.121	11.7	LOS A	0.5	3.2	0.28	0.69	57.4
West: Kurmond Road											
10	L	16	6.7	0.081	11.2	LOS A	0.0	0.0	0.00	1.26	58.9
11	T	139	2.3	0.081	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		155	2.7	0.081	1.1	NA	0.0	0.0	0.00	0.13	77.2
All Vehicles		351	3.3	0.121	5.4	NA	0.5	3.2	0.15	0.36	67.0

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

Site: AM With Dev

Kurmond Road and Spinks Road Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Kurmond Road											
5	T	52	12.2	0.042	0.5	LOS A	0.2	1.6	0.26	0.00	70.1
6	R	21	5.0	0.042	11.5	LOS A	0.2	1.6	0.26	0.96	59.5
Approach		73	10.1	0.042	3.7	NA	0.2	1.6	0.26	0.28	66.7
North: Spinks road											
7	L	217	0.0	0.271	11.9	LOS A	1.2	8.3	0.32	0.69	57.1
9	R	58	0.0	0.271	11.8	LOS A	1.2	8.3	0.32	0.75	57.6
Approach		275	0.0	0.271	11.9	LOS A	1.2	8.3	0.32	0.70	57.2
West: Kurmond Road											
10	L	16	6.7	0.081	11.2	LOS A	0.0	0.0	0.00	1.26	58.9
11	T	139	2.3	0.081	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		155	2.7	0.081	1.1	NA	0.0	0.0	0.00	0.13	77.2
All Vehicles		502	2.3	0.271	7.4	NA	1.2	8.3	0.21	0.46	63.7

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

Site: PM Existing

Kurmond Road and Spinks Road Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Kurmond Road											
5	T	211	2.0	0.174	0.2	LOS A	1.0	7.0	0.19	0.00	72.5
6	R	109	1.0	0.174	11.1	LOS A	1.0	7.0	0.19	0.95	59.3
Approach		320	1.6	0.174	3.9	NA	1.0	7.0	0.19	0.32	67.5
North: Spinks road											
7	L	59	3.6	0.080	11.9	LOS A	0.3	2.1	0.16	0.67	57.7
9	R	20	10.5	0.080	12.2	LOS A	0.3	2.1	0.16	0.77	58.0
Approach		79	5.3	0.080	12.0	LOS A	0.3	2.1	0.16	0.70	57.8
West: Kurmond Road											
10	L	13	8.3	0.037	11.3	LOS A	0.0	0.0	0.00	1.18	58.9
11	T	57	3.7	0.037	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		69	4.5	0.037	2.1	NA	0.0	0.0	0.00	0.21	75.2
All Vehicles		468	2.7	0.174	5.0	NA	1.0	7.0	0.15	0.37	66.6

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

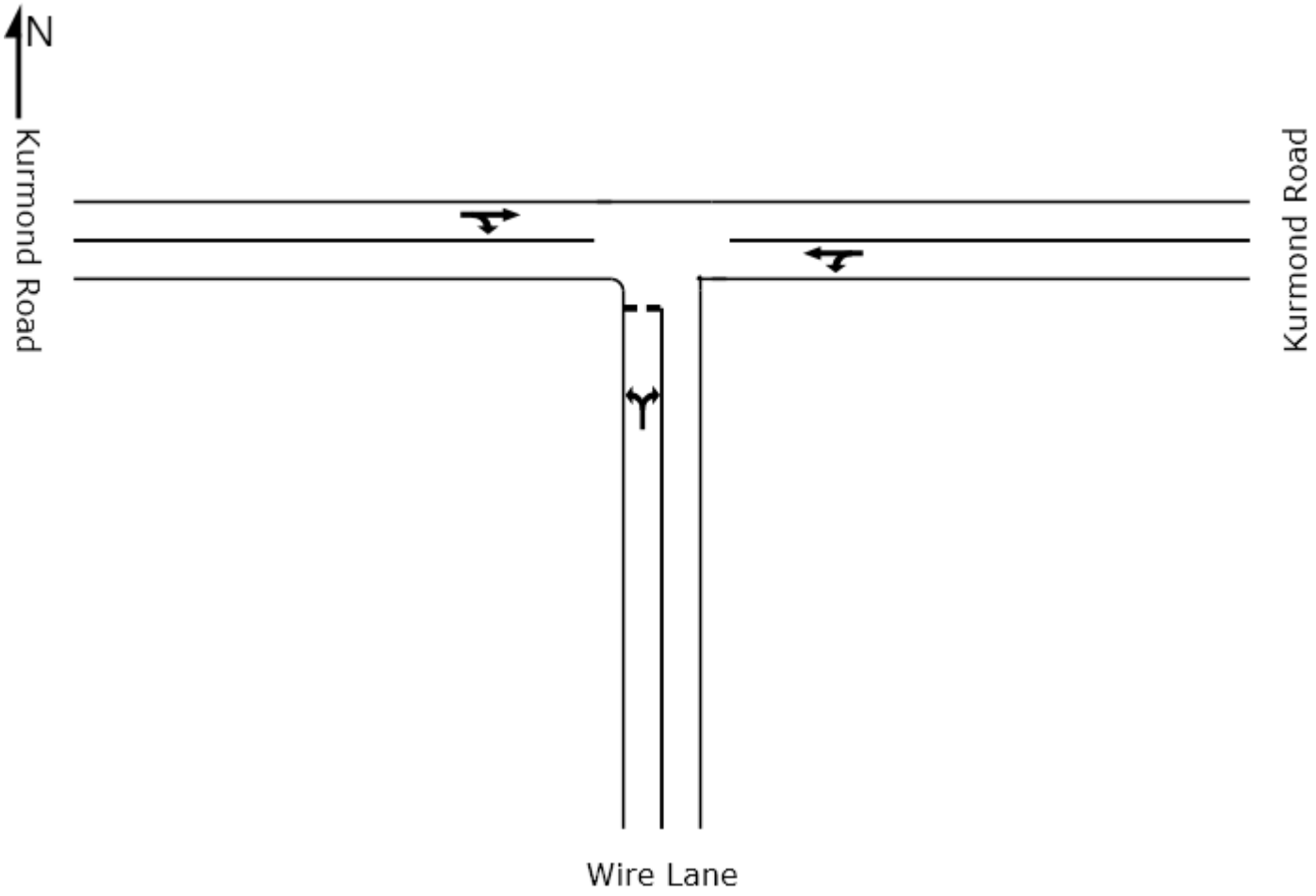
Site: PM With Dev

Kurmond Road and Spinks Road Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Kurmond Road											
5	T	211	2.0	0.246	0.4	LOS A	1.5	10.4	0.23	0.00	70.2
6	R	227	0.5	0.246	11.2	LOS A	1.5	10.4	0.23	0.84	58.9
Approach		438	1.2	0.246	6.0	NA	1.5	10.4	0.23	0.43	63.9
North: Spinks road											
7	L	59	3.6	0.085	12.3	LOS A	0.3	2.3	0.18	0.67	57.2
9	R	20	10.5	0.085	12.6	LOS A	0.3	2.3	0.18	0.79	57.5
Approach		79	5.3	0.085	12.4	LOS A	0.3	2.3	0.18	0.70	57.3
West: Kurmond Road											
10	L	36	2.9	0.050	11.1	LOS A	0.0	0.0	0.00	1.00	58.9
11	T	57	3.7	0.050	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		93	3.4	0.050	4.3	NA	0.0	0.0	0.00	0.39	70.4
All Vehicles		609	2.1	0.246	6.5	NA	1.5	10.4	0.19	0.46	63.9

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.


N
Kurmond Road
Kurmond Road
Wire Lane

MOVEMENT SUMMARY

Site: AM Existing

Kurmond Road and Wire Lane
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Wire Lane											
1	L	24	4.3	0.039	12.3	LOS A	0.1	1.1	0.16	0.66	57.3
3	R	9	44.4	0.039	14.4	LOS A	0.1	1.1	0.16	0.78	57.6
Approach		34	15.6	0.039	12.9	LOS A	0.1	1.1	0.16	0.69	57.4
East: Kurmond Road											
4	L	16	20.0	0.036	11.9	LOS A	0.0	0.0	0.00	1.15	58.9
5	T	48	8.7	0.036	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		64	11.5	0.036	2.9	NA	0.0	0.0	0.00	0.28	73.6
West: Kurmond Road											
11	T	171	3.7	0.142	0.2	LOS A	0.8	5.5	0.18	0.00	72.8
12	R	88	1.2	0.142	11.0	LOS A	0.8	5.5	0.18	0.96	59.3
Approach		259	2.8	0.142	3.9	NA	0.8	5.5	0.18	0.33	67.7
All Vehicles		357	5.6	0.142	4.6	NA	0.8	5.5	0.14	0.35	67.5

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

Site: AM With Dev

Kurmond Road and Wire Lane
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Wire Lane											
1	L	24	4.3	0.043	12.8	LOS A	0.2	1.2	0.16	0.66	56.6
3	R	9	44.4	0.043	14.9	LOS B	0.2	1.2	0.16	0.79	56.9
Approach		34	15.6	0.043	13.4	LOS A	0.2	1.2	0.16	0.70	56.7
East: Kurmond Road											
4	L	16	20.0	0.036	11.9	LOS A	0.0	0.0	0.00	1.15	58.9
5	T	48	8.7	0.036	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		64	11.5	0.036	2.9	NA	0.0	0.0	0.00	0.28	73.6
West: Kurmond Road											
11	T	171	3.7	0.211	0.2	LOS A	1.2	8.5	0.19	0.00	71.9
12	R	206	0.5	0.211	11.0	LOS A	1.2	8.5	0.19	0.84	58.9
Approach		377	2.0	0.211	6.1	NA	1.2	8.5	0.19	0.46	64.2
All Vehicles		475	4.2	0.211	6.2	NA	1.2	8.5	0.16	0.45	64.8

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

Site: PM Existing

Kurmond Road and Wire Lane
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow 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: Wire Lane											
1	L	99	1.1	0.115	12.3	LOS A	0.4	3.0	0.35	0.71	56.9
3	R	7	14.3	0.115	12.9	LOS A	0.4	3.0	0.35	0.79	57.5
Approach		106	2.0	0.115	12.3	LOS A	0.4	3.0	0.35	0.72	57.0
East: Kurmond Road											
4	L	22	0.0	0.124	10.9	LOS A	0.0	0.0	0.00	1.24	58.9
5	T	215	2.5	0.124	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		237	2.2	0.124	1.0	NA	0.0	0.0	0.00	0.12	77.5
West: Kurmond Road											
11	T	56	3.8	0.069	0.8	LOS A	0.4	2.5	0.34	0.00	66.8
12	R	57	3.7	0.069	11.7	LOS A	0.4	2.5	0.34	0.84	59.0
Approach		113	3.7	0.069	6.3	NA	0.4	2.5	0.34	0.42	62.6
All Vehicles		456	2.5	0.124	5.0	NA	0.4	3.0	0.16	0.33	67.9

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

MOVEMENT SUMMARY

Site: PM With Dev

Kurmond Road and Wire Lane
Giveway / Yield (Two-Way)

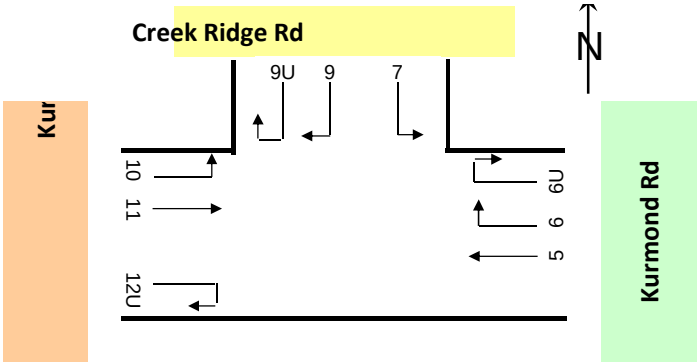
Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Wire Lane											
1	L	217	0.5	0.240	12.4	LOS A	1.0	7.0	0.38	0.73	56.8
3	R	7	14.3	0.240	13.0	LOS A	1.0	7.0	0.38	0.81	57.3
Approach		224	0.9	0.240	12.4	LOS A	1.0	7.0	0.38	0.73	56.8
East: Kurmond Road											
4	L	22	0.0	0.124	10.9	LOS A	0.0	0.0	0.00	1.24	58.9
5	T	215	2.5	0.124	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		237	2.2	0.124	1.0	NA	0.0	0.0	0.00	0.12	77.5
West: Kurmond Road											
11	T	56	3.8	0.069	0.8	LOS A	0.4	2.5	0.34	0.00	66.8
12	R	57	3.7	0.069	11.7	LOS A	0.4	2.5	0.34	0.84	59.0
Approach		113	3.7	0.069	6.3	NA	0.4	2.5	0.34	0.42	62.6
All Vehicles		574	2.0	0.240	6.5	NA	1.0	7.0	0.21	0.42	65.2

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

Job No. : N3814
Client : Arup
Suburb : Kurmond Road
Location : 1. Kurmond Rd / Creek Ridge Rd

Day/Date : Tue, 5th Dec 2017
Weather : Fine
Description : Classified Intersection Count
: Peak Hour Summary

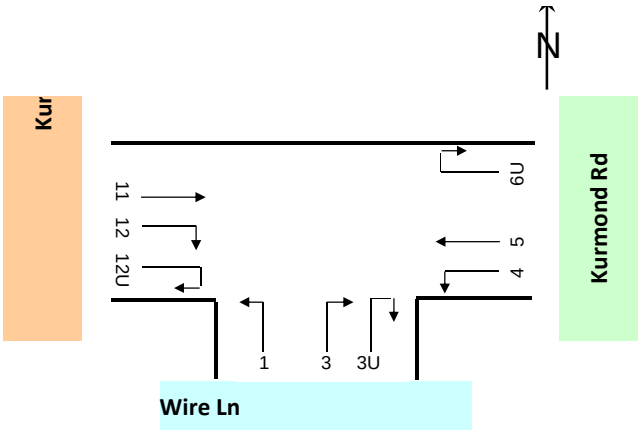


Approach		Kurmond Rd			Creek Ridge Rd			Kurmond Rd			Grand Total
Time Period		Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	
8:00 to 9:00		238	12	**250**	248	12	**260**	284	13	**297**	**807**
17:00 to 18:00		625	5	**630**	117	4	**121**	174	2	**176**	**927**

Approach		Kurmond Rd			Creek Ridge Rd			Kurmond Rd			Grand Total
Time Period		Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	
7:30 to 8:30		188	15	**203**	218	10	**228**	273	8	**281**	**712**
7:45 to 8:45		220	14	**234**	223	12	**235**	270	12	**282**	**751**
8:00 to 9:00		238	12	**250**	248	12	**260**	284	13	**297**	**807**
8:15 to 9:15		242	12	**254**	248	9	**257**	264	13	**277**	**788**
8:30 to 9:30		244	12	**256**	225	10	**235**	232	8	**240**	**731**
AM Totals		**432**	**27**	**459**	**443**	**20**	**463**	**505**	**16**	**521**	**1,443**
16:30 to 17:30		590	8	**598**	116	4	**120**	163	6	**169**	**887**
16:45 to 17:45		607	8	**615**	115	3	**118**	169	4	**173**	**906**
17:00 to 18:00		625	5	**630**	117	4	**121**	174	2	**176**	**927**
17:15 to 18:15		581	6	**587**	118	1	**119**	176	2	**178**	**884**
17:30 to 18:30		534	6	**540**	111	2	**113**	158	2	**160**	**813**
PM Totals		**1,124**	**14**	**1,138**	**227**	**6**	**233**	**321**	**8**	**329**	**1,700**

Job No. : N3814
Client : Arup
Suburb : Kurmond Road
Location : 2. Kurmond Rd / Wire Ln

Day/Date : Tue, 5th Dec 2017
Weather : Fine
Description : Classified Intersection Count
: Peak Hour Summary

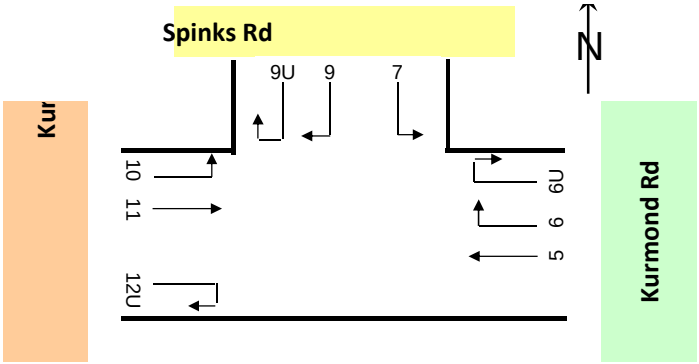


Approach	Wire Ln			Kurmond Rd				Kurmond Rd			Grand Total
Time Period	Lights	Heavies	Total	Lights	Heavies	Total		Lights	Heavies	Total	
7:30 to 8:30	33	0	**33**	53	4	**57**		249	4	**253**	**343**
17:00 to 18:00	109	1	**110**	197	0	**197**		104	0	**104**	**411**

Approach	Wire Ln			Kurmond Rd				Kurmond Rd			Grand Total
Time Period	Lights	Heavies	Total	Lights	Heavies	Total		Lights	Heavies	Total	
7:30 to 8:30	33	0	**33**	53	4	**57**		249	4	**253**	**343**
7:45 to 8:45	27	1	**28**	54	4	**58**		226	3	**229**	**315**
8:00 to 9:00	28	1	**29**	58	4	**62**		217	2	**219**	**310**
8:15 to 9:15	29	1	**30**	60	5	**65**		186	3	**189**	**284**
8:30 to 9:30	36	1	**37**	59	4	**63**		182	4	**186**	**286**
AM Totals	**69**	**1**	**70**	**112**	**8**	**120**		**431**	**8**	**439**	**629**
16:30 to 17:30	98	1	**99**	182	1	**183**		94	1	**95**	**377**
16:45 to 17:45	103	1	**104**	187	1	**188**		94	1	**95**	**387**
17:00 to 18:00	109	1	**110**	197	0	**197**		104	0	**104**	**411**
17:15 to 18:15	111	1	**112**	176	0	**176**		88	0	**88**	**376**
17:30 to 18:30	109	1	**110**	157	0	**157**		92	0	**92**	**359**
PM Totals	**207**	**2**	**209**	**339**	**1**	**340**		**186**	**1**	**187**	**736**

Job No. : N3814
Client : Arup
Suburb : Kurmond Road
Location : 3. Kurmond Rd / Spinks Rd

Day/Date : Tue, 5th Dec 2017
Weather : Fine
Description : Classified Intersection Count
: Peak Hour Summary

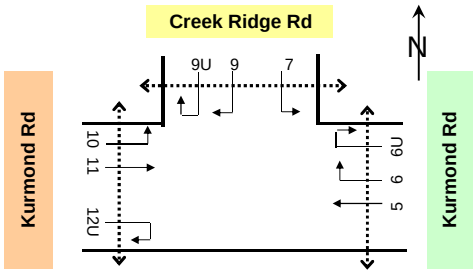


Approach		Kurmond Rd			Spinks Rd			Kurmond Rd			Grand Total
Time Period		Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	
7:30 to 8:30		77	2	**79**	129	1	**130**	144	5	**149**	**358**
17:00 to 18:00		293	2	**295**	69	0	**69**	64	1	**65**	**429**

Approach		Kurmond Rd			Spinks Rd			Kurmond Rd			Grand Total
Time Period		Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	
7:30 to 8:30		77	2	**79**	129	1	**130**	144	5	**149**	**358**
7:45 to 8:45		75	2	**77**	123	1	**124**	130	4	**134**	**335**
8:00 to 9:00		76	3	**79**	112	0	**112**	135	4	**139**	**330**
8:15 to 9:15		78	4	**82**	101	0	**101**	115	3	**118**	**301**
8:30 to 9:30		80	5	**85**	116	1	**117**	103	3	**106**	**308**
AM Totals		**157**	**7**	**164**	**245**	**2**	**247**	**247**	**8**	**255**	**666**
16:30 to 17:30		273	1	**274**	63	0	**63**	50	2	**52**	**389**
16:45 to 17:45		279	1	**280**	60	0	**60**	60	2	**62**	**402**
17:00 to 18:00		293	2	**295**	69	0	**69**	64	1	**65**	**429**
17:15 to 18:15		270	3	**273**	60	0	**60**	58	0	**58**	**391**
17:30 to 18:30		244	3	**247**	55	0	**55**	69	0	**69**	**371**
PM Totals		**517**	**4**	**521**	**118**	**0**	**118**	**119**	**2**	**121**	**760**

Job No. : N901
Client : Arup
Suburb : Glossodia
Location : 1. Kurmond Rd / Creek Ridge Rd

Day/Date : Wed, 29th August 2012
Weather : Fine
Description : Classified Intersection Count
: Peak Hour Summary



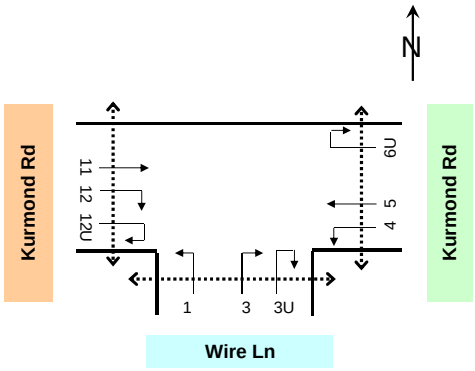
SKYHIGH - T

	Approach		Kurmond Rd					Creek Ridge Rd					Kurmond Rd					Grand Total
	Time Period		Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total	
AM	8:00	to 9:00	213	7	5	0	**225**	227	6	2	0	**235**	314	6	5	0	**325**	**785**
PM	17:00	to 18:00	608	21	1	0	**630**	88	2	1	0	**91**	135	8	0	0	**143**	**864**

Approach		Kurmond Rd					Creek Ridge Rd					Kurmond Rd					Grand Total
Time Period		Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total	
6:00	to 7:00	81	13	4	0	**98**	224	11	2	0	**237**	189	7	0	0	**196**	**531**
6:15	to 7:15	96	16	4	0	**116**	226	10	3	0	**239**	182	7	0	0	**189**	**544**
6:30	to 7:30	101	13	4	0	**118**	198	6	5	0	**209**	206	5	1	0	**212**	**539**
6:45	to 7:45	102	13	6	0	**121**	211	4	5	0	**220**	210	5	2	0	**217**	**558**
7:00	to 8:00	105	8	5	0	**118**	220	4	5	0	**229**	219	4	5	0	**228**	**575**
7:15	to 8:15	119	7	5	0	**131**	229	5	6	0	**240**	259	2	5	0	**266**	**637**
7:30	to 8:30	145	7	9	0	**161**	240	6	3	0	**249**	274	5	8	0	**287**	**697**
7:45	to 8:45	187	6	6	0	**199**	227	6	3	0	**236**	302	6	8	0	**316**	**751**
8:00	to 9:00	213	7	5	0	**225**	227	6	2	0	**235**	314	6	5	0	**325**	**785**
AM Totals		399	28	14	0	**441**	671	21	9	0	**701**	722	17	10	0	**749**	**1891**
15:00	to 16:00	380	26	4	0	**410**	102	4	2	1	**109**	183	11	11	0	**205**	**724**
15:15	to 16:15	434	22	3	0	**459**	92	7	2	1	**102**	145	10	4	0	**159**	**720**
15:30	to 16:30	475	25	4	0	**504**	98	5	3	1	**107**	146	7	4	0	**157**	**768**
15:45	to 16:45	498	24	4	0	**526**	99	6	3	1	**109**	146	5	4	0	**155**	**790**
16:00	to 17:00	523	15	5	0	**543**	100	6	4	0	**110**	148	4	3	0	**155**	**808**
16:15	to 17:15	540	13	3	0	**556**	111	3	4	0	**118**	148	5	1	0	**154**	**828**
16:30	to 17:30	588	14	1	0	**603**	94	2	3	0	**99**	142	6	0	0	**148**	**850**
16:45	to 17:45	591	17	2	0	**610**	89	2	2	0	**93**	137	5	0	0	**142**	**845**
17:00	to 18:00	608	21	1	0	**630**	88	2	1	0	**91**	135	8	0	0	**143**	**864**
PM Totals		1511	62	10	0	**1583**	290	12	7	1	**310**	466	23	14	0	**503**	**2396**

Job No. : N901
Client : Arup
Suburb : Glossodia
Location : 2. Kurmond Rd / Wire Ln

Day/Date : Wed, 29th August 2012
Weather : Fine
Description : Classified Intersection Count
: Peak Hour Summary



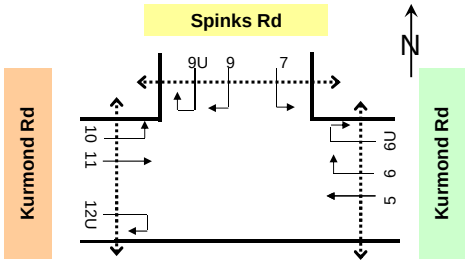
SKYHIGH - T

	Approach	Wire Ln					Kurmond Rd						Kurmond Rd					Grand Total
	Time Period	Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total		Cars	Trucks	Buses	Cyclists	Total	
AM	7:45 to 8:45	27	4	1	0	**32**	54	7	0	0	**61**		239	5	2	0	**246**	**339**
PM	17:00 to 18:00	99	2	0	0	**101**	220	5	0	0	**225**		103	4	0	0	**107**	**433**

Approach	Wire Ln					Kurmond Rd						Kurmond Rd					Grand Total
Time Period	Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total		Cars	Trucks	Buses	Cyclists	Total	
6:00 to 7:00	11	4	0	0	**15**	22	13	0	0	**35**		135	7	0	1	**143**	**193**
6:15 to 7:15	15	2	0	0	**17**	24	12	0	0	**36**		142	6	0	1	**149**	**202**
6:30 to 7:30	19	4	1	0	**24**	24	8	0	0	**32**		149	4	0	0	**153**	**209**
6:45 to 7:45	22	5	1	0	**28**	28	5	0	0	**33**		173	2	0	0	**175**	**236**
7:00 to 8:00	26	6	1	0	**33**	31	4	0	0	**35**		190	4	1	0	**195**	**263**
7:15 to 8:15	28	6	1	0	**35**	39	5	0	0	**44**		210	3	2	0	**215**	**294**
7:30 to 8:30	26	5	0	0	**31**	41	6	0	0	**47**		231	4	2	0	**237**	**315**
7:45 to 8:45	27	4	1	0	**32**	54	7	0	0	**61**		239	5	2	0	**246**	**339**
8:00 to 9:00	19	3	1	0	**23**	60	9	0	0	**69**		232	3	1	0	**236**	**328**
AM Totals	56	13	2	0	**71**	113	26	0	0	**139**		557	14	2	1	**574**	**784**
15:00 to 16:00	89	9	0	0	**98**	141	8	2	0	**151**		106	9	1	0	**116**	**365**
15:15 to 16:15	97	6	0	0	**103**	146	11	1	0	**158**		114	6	1	0	**121**	**382**
15:30 to 16:30	97	4	0	0	**101**	162	14	2	0	**178**		115	5	2	0	**122**	**401**
15:45 to 16:45	99	1	0	0	**100**	177	13	1	0	**191**		104	1	2	0	**107**	**398**
16:00 to 17:00	95	0	0	0	**95**	184	12	1	0	**197**		92	6	1	0	**99**	**391**
16:15 to 17:15	95	2	0	0	**97**	193	8	1	0	**202**		104	7	1	0	**112**	**411**
16:30 to 17:30	88	2	0	0	**90**	198	6	0	0	**204**		94	7	0	0	**101**	**395**
16:45 to 17:45	95	2	0	0	**97**	212	6	0	0	**218**		97	7	0	0	**104**	**419**
17:00 to 18:00	99	2	0	0	**101**	220	5	0	0	**225**		103	4	0	0	**107**	**433**
PM Totals	283	11	0	0	**294**	545	25	3	0	**573**		301	19	2	0	**322**	**1189**

Job No. : N901
Client : Arup
Suburb : Glossodia
Location : 3. Kurmond Rd / Spinks Rd

Day/Date : Wed, 29th August 2012
Weather : Fine
Description : Classified Intersection Count
: Peak Hour Summary



SKYHIGH - T

	Approach		Kurmond Rd					Spinks Rd					Kurmond Rd					Grand Total
	Time Period		Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total	
AM	7:45	to 8:45	60	7	1	0	**68**	115	1	0	0	**116**	159	3	1	0	**163**	**347**
PM	17:00	to 18:00	299	5	0	0	**304**	71	4	0	0	**75**	63	4	0	0	**67**	**446**

Approach		Kurmond Rd					Spinks Rd					Kurmond Rd					Grand Total
Time Period		Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total	Cars	Trucks	Buses	Cyclists	Total	
6:00	to 7:00	25	7	1	0	**33**	81	2	0	1	**84**	78	2	0	0	**80**	**197**
6:15	to 7:15	29	4	1	0	**34**	79	2	0	1	**82**	84	1	0	0	**85**	**201**
6:30	to 7:30	33	2	1	0	**36**	88	2	0	0	**90**	90	1	0	0	**91**	**217**
6:45	to 7:45	41	2	1	0	**44**	103	1	1	0	**105**	95	0	0	0	**95**	**244**
7:00	to 8:00	48	4	1	0	**53**	110	2	1	0	**113**	113	0	0	0	**113**	**279**
7:15	to 8:15	52	6	1	0	**59**	115	1	1	0	**117**	128	1	0	0	**129**	**305**
7:30	to 8:30	55	6	1	0	**62**	119	1	1	0	**121**	147	2	0	0	**149**	**332**
7:45	to 8:45	60	7	1	0	**68**	115	1	0	0	**116**	159	3	1	0	**163**	**347**
8:00	to 9:00	62	7	0	0	**69**	117	0	0	0	**117**	143	3	1	0	**147**	**333**
AM Totals		135	18	2	0	**155**	308	4	1	1	**314**	334	5	1	0	**340**	**809**
15:00	to 16:00	207	8	0	0	**215**	80	4	2	0	**86**	65	2	0	0	**67**	**368**
15:15	to 16:15	208	11	0	0	**219**	78	1	2	0	**81**	72	2	0	0	**74**	**374**
15:30	to 16:30	227	9	0	0	**236**	76	0	3	0	**79**	76	3	0	0	**79**	**394**
15:45	to 16:45	252	8	0	0	**260**	60	1	3	0	**64**	74	4	0	0	**78**	**402**
16:00	to 17:00	254	9	0	0	**263**	49	1	2	0	**52**	75	6	0	0	**81**	**396**
16:15	to 17:15	273	7	0	0	**280**	57	2	1	0	**60**	77	7	0	0	**84**	**424**
16:30	to 17:30	269	7	0	0	**276**	63	3	0	0	**66**	61	6	0	0	**67**	**409**
16:45	to 17:45	273	7	0	0	**280**	66	4	0	0	**70**	64	4	0	0	**68**	**418**
17:00	to 18:00	299	5	0	0	**304**	71	4	0	0	**75**	63	4	0	0	**67**	**446**
PM Totals		760	22	0	0	**782**	200	9	4	0	**213**	203	12	0	0	**215**	**1210**

Job No	N901
Client	ARUP
Road	Freemans Reach Rd - north of Wilberforce Rd
Location	Glossodia
Site No.	1
Start Date	29-Aug-12
Description	Volume Summary
Direction	Combined

Average Weekday	7,256
7 Day Average	6,802

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	3-Sep	4-Sep	29-Aug	30-Aug	31-Aug	1-Sep	2-Sep		
AM Peak	518	506	536	534	509	495	449		
PM Peak	745	720	741	744	783	521	442		
0:00	15	20	23	19	33	47	74	22	33
1:00	7	6	7	9	16	24	47	9	17
2:00	13	17	23	17	17	19	34	17	20
3:00	22	18	22	24	18	23	14	21	20
4:00	64	78	87	83	89	31	18	80	64
5:00	263	301	272	283	252	81	42	274	213
6:00	469	490	476	454	438	181	107	465	374
7:00	463	506	480	483	493	255	117	485	400
8:00	518	505	536	534	509	365	222	520	456
9:00	366	386	377	383	400	438	316	382	381
10:00	335	315	331	303	355	495	346	328	354
11:00	316	260	280	300	332	486	449	298	346
12:00	338	271	282	283	351	476	418	305	346
13:00	332	329	313	331	380	521	341	337	364
14:00	420	385	388	443	524	466	408	432	433
15:00	539	575	564	734	686	447	373	620	560
16:00	647	692	666	744	750	424	433	700	622
17:00	745	720	741	709	783	425	442	740	652
18:00	503	495	495	452	590	330	287	507	450
19:00	216	252	290	316	253	241	177	265	249
20:00	163	184	192	210	182	163	148	186	177
21:00	121	130	124	182	135	150	112	138	136
22:00	58	79	68	86	110	115	64	80	83
23:00	28	21	41	49	81	114	27	44	52
Total	6961	7035	7078	7431	7777	6317	5016	7256	6802

7-19	5522	5439	5453	5699	6153	5128	4152	5653	5364
6-22	6491	6495	6535	6861	7161	5863	4696	6709	6300
6-24	6577	6595	6644	6996	7352	6092	4787	6833	6435
0-24	6961	7035	7078	7431	7777	6317	5016	7256	6802

Job No	N3814
Client	Arup
Site	Freemans Reach Road
Location	north of Wilberforce Road
Site No	1
Start Date	4-Dec-17
Description	Volume Summary
Direction	Combined

MATRIX Traffic and Transport Data

Hour Starting	Day of Week							W'Day Ave	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	4-Dec	5-Dec	6-Dec	7-Dec	8-Dec	9-Dec	10-Dec		
AM Peak	555	566	545	571	527	548	526		
PM Peak	704	749	717	748	709	531	461	**8025**	**7530**
0:00	29	33	18	28	43	46	77	30	39
1:00	15	15	15	20	27	42	60	18	28
2:00	7	10	12	12	10	41	22	10	16
3:00	39	28	32	33	29	24	9	32	28
4:00	96	111	120	115	103	46	27	109	88
5:00	297	331	344	395	360	164	48	345	277
6:00	494	502	543	488	460	207	89	497	398
7:00	527	566	535	571	505	278	154	541	448
8:00	555	522	545	419	527	424	269	514	466
9:00	435	433	406	404	436	534	394	423	435
10:00	388	341	356	377	373	520	400	367	394
11:00	383	345	374	401	398	548	526	380	425
12:00	367	339	352	361	392	531	461	362	400
13:00	406	382	384	388	460	473	390	404	412
14:00	523	471	507	477	558	467	393	507	485
15:00	594	634	640	639	640	454	413	629	573
16:00	663	679	708	676	691	419	417	683	608
17:00	704	749	717	748	709	422	432	725	640
18:00	500	519	562	586	497	389	337	533	484
19:00	263	307	328	340	308	236	252	309	291
20:00	203	232	306	361	237	182	230	268	250
21:00	114	125	204	240	188	161	170	174	172
22:00	65	94	89	139	143	138	90	106	108
23:00	36	41	45	62	95	139	45	56	66
Total	7703	7809	8142	8280	8189	6885	5705	8025	7530
7-19	6045	5980	6086	6047	6186	5459	4586	6069	5770
6-22	7119	7146	7467	7476	7379	6245	5327	7317	6880
6-24	7220	7281	7601	7677	7617	6522	5462	7479	7054
0-24	7703	7809	8142	8280	8189	6885	5705	8025	7530

Job No	N901
Client	ARUP
Road	Spinks Rd - north of Kurmond Rd
Location	Glossodia
Site No.	4
Start Date	29-Aug-12
Description	Volume Summary
Direction	SB

Average Weekday	1,116
7 Day Average	1,074

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	3-Sep	4-Sep	29-Aug	30-Aug	31-Aug	1-Sep	2-Sep		
AM Peak	122	130	115	139	137	94	103		
PM Peak	87	81	81	125	77	84	78		
0:00	2	0	2	1	0	3	5	1	2
1:00	2	1	1	0	1	4	3	1	2
2:00	3	2	1	0	2	0	6	2	2
3:00	7	3	3	3	4	2	1	4	3
4:00	9	10	7	11	8	5	3	9	8
5:00	39	48	41	32	43	16	11	41	33
6:00	71	76	80	78	82	33	17	77	62
7:00	122	106	112	107	119	55	39	113	94
8:00	121	130	115	139	137	81	44	128	110
9:00	83	108	95	90	102	92	75	96	92
10:00	67	57	62	67	73	85	75	65	69
11:00	47	51	56	76	59	94	103	58	69
12:00	56	38	35	44	44	55	78	43	50
13:00	46	46	49	51	51	69	56	49	53
14:00	61	52	59	38	49	67	57	52	55
15:00	87	63	81	84	77	68	58	78	74
16:00	75	72	52	80	67	55	77	69	68
17:00	76	81	71	125	67	84	77	84	83
18:00	56	61	50	58	70	64	53	59	59
19:00	32	32	19	22	53	38	23	32	31
20:00	20	16	23	28	41	22	22	26	25
21:00	13	15	15	21	19	12	16	17	16
22:00	7	6	8	13	15	12	2	10	9
23:00	5	4	3	0	5	15	2	3	5
Total	1107	1078	1040	1168	1188	1031	903	1116	1074
7-19	897	865	837	959	915	869	792	895	876
6-22	1033	1004	974	1108	1110	974	870	1046	1010
6-24	1045	1014	985	1121	1130	1001	874	1059	1024
0-24	1107	1078	1040	1168	1188	1031	903	1116	1074

Job No	N3814
Client	Arup
Site	Spinks Road
Location	north of Kurmond Road
Site No	2
Start Date	4-Dec-17
Description	Volume Summary
Direction	Combined

Hour Starting	Day of Week							W'Day Ave	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	4-Dec	5-Dec	6-Dec	7-Dec	8-Dec	9-Dec	10-Dec		
AM Peak	159	164	198	184	182	166	152		
PM Peak	196	222	221	225	242	161	172	**2409**	**2314**
0:00	3	4	6	5	10	27	28	6	12
1:00	5	0	1	1	4	7	24	2	6
2:00	1	4	4	2	1	9	9	2	4
3:00	6	7	9	7	11	8	6	8	8
4:00	13	14	24	24	20	9	6	19	16
5:00	62	63	78	70	73	32	11	69	56
6:00	116	132	132	110	117	61	32	121	100
7:00	152	164	160	163	157	97	62	159	136
8:00	156	164	198	184	171	136	108	175	160
9:00	159	159	138	149	182	159	138	157	155
10:00	125	111	124	112	111	141	139	117	123
11:00	126	146	127	127	129	166	152	131	139
12:00	122	105	91	100	131	161	172	110	126
13:00	105	107	115	104	129	148	125	112	119
14:00	158	148	141	111	134	153	134	138	140
15:00	174	222	162	201	209	159	116	194	178
16:00	188	183	221	225	203	147	146	204	188
17:00	196	193	178	202	242	146	133	202	184
18:00	149	157	162	160	153	138	106	156	146
19:00	98	133	112	104	117	98	78	113	106
20:00	81	78	87	103	93	84	82	88	87
21:00	53	65	93	85	75	77	47	74	71
22:00	23	28	35	27	56	60	21	34	36
23:00	17	5	15	24	25	47	7	17	20
Total	2288	2392	2413	2400	2553	2270	1882	2409	2314

7-19	1810	1859	1817	1838	1951	1751	1531	1855	1794
6-22	2158	2267	2241	2240	2353	2071	1770	2252	2157
6-24	2198	2300	2291	2291	2434	2178	1798	2303	2213
0-24	2288	2392	2413	2400	2553	2270	1882	2409	2314

Job No	N901
Client	ARUP
Road	Creek Ridge Rd - north of Kurmond Rd
Location	Glossodia
Site No.	2
Start Date	29-Aug-12
Description	Volume Summary
Direction	Combined

Average Weekday	4,114
7 Day Average	3,908

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	3-Sep	4-Sep	29-Aug	30-Aug	31-Aug	1-Sep	2-Sep		
AM Peak	323	316	327	326	326	308	263		
PM Peak	369	347	354	374	404	295	244		
0:00	12	9	16	14	12	34	61	13	23
1:00	2	4	5	8	9	10	34	6	10
2:00	11	14	11	11	9	16	19	11	13
3:00	12	13	13	14	14	10	11	13	12
4:00	46	46	41	50	48	25	17	46	39
5:00	162	188	167	172	162	53	25	170	133
6:00	289	316	289	290	253	113	69	287	231
7:00	246	283	281	252	268	141	81	266	222
8:00	323	307	327	326	326	199	151	322	280
9:00	213	221	231	230	254	257	194	230	229
10:00	179	183	168	176	191	289	215	179	200
11:00	171	153	170	147	186	308	263	165	200
12:00	174	154	162	173	218	280	244	176	201
13:00	195	196	197	188	213	295	191	198	211
14:00	232	260	230	207	302	249	240	246	246
15:00	310	347	329	367	404	271	227	351	322
16:00	344	334	335	367	363	253	243	349	320
17:00	369	330	354	374	363	267	241	358	328
18:00	290	263	311	270	301	208	178	287	260
19:00	156	169	189	207	170	168	118	178	168
20:00	102	93	122	121	114	103	93	110	107
21:00	66	74	57	96	71	72	55	73	70
22:00	38	40	53	56	60	68	31	49	49
23:00	16	14	29	39	50	81	11	30	34
Total	3958	4011	4087	4155	4361	3770	3012	4114	3908

7-19	3046	3031	3095	3077	3389	3017	2468	3128	3018
6-22	3659	3683	3752	3791	3997	3473	2803	3776	3594
6-24	3713	3737	3834	3886	4107	3622	2845	3855	3678
0-24	3958	4011	4087	4155	4361	3770	3012	4114	3908

Job No	N3814
Client	Arup
Site	Creek Ridge Road
Location	north of Kurmond Road
Site No	4
Start Date	4-Dec-17
Description	Volume Summary
Direction	Combined

Hour Starting	Day of Week							W'Day Ave	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	4-Dec	5-Dec	6-Dec	7-Dec	8-Dec	9-Dec	10-Dec		
AM Peak	342	349	319	360	309	299	283		
PM Peak	359	406	399	417	394	268	253	**4633**	**4284**
0:00	14	15	12	15	31	25	48	17	23
1:00	8	6	7	13	15	23	34	10	15
2:00	7	6	7	9	7	22	13	7	10
3:00	25	20	16	20	16	16	12	19	18
4:00	67	70	81	72	81	37	19	74	61
5:00	198	192	217	228	228	72	23	213	165
6:00	281	331	318	281	277	131	66	298	241
7:00	286	291	316	330	283	160	104	301	253
8:00	342	349	319	360	309	214	143	336	291
9:00	275	266	268	257	248	299	226	263	263
10:00	203	197	208	207	182	275	236	199	215
11:00	239	216	230	215	224	292	283	225	243
12:00	211	179	208	210	239	255	253	209	222
13:00	228	197	207	210	254	250	213	219	223
14:00	286	256	287	235	267	211	173	266	245
15:00	341	357	391	353	394	264	204	367	329
16:00	359	392	399	387	343	268	216	376	338
17:00	357	406	377	417	369	256	226	385	344
18:00	274	302	361	281	293	187	173	302	267
19:00	141	182	193	195	174	126	129	177	163
20:00	108	152	193	222	140	113	133	163	152
21:00	73	111	118	158	99	84	97	112	106
22:00	41	37	56	70	93	73	50	59	60
23:00	21	21	32	36	59	69	26	34	38
Total	4385	4551	4821	4781	4625	3722	3100	4633	4284

7-19	3401	3408	3571	3462	3405	2931	2450	3449	3233
6-22	4004	4184	4393	4318	4095	3385	2875	4199	3893
6-24	4066	4242	4481	4424	4247	3527	2951	4292	3991
0-24	4385	4551	4821	4781	4625	3722	3100	4633	4284

Job No	N901
Client	ARUP
Road	Kurmond Rd - btw Marlene St and Shepherds Rd
Location	Glossodia
Site No.	3
Start Date	29-Aug-12
Description	Volume Summary
Direction	WB

Average Weekday	2,757
7 Day Average	2,534

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	3-Sep	4-Sep	29-Aug	30-Aug	31-Aug	1-Sep	2-Sep		
AM Peak	192	192	175	199	189	184	159		
PM Peak	353	405	398	396	438	184	188		
0:00	5	6	3	5	11	19	21	6	10
1:00	2	0	3	2	7	9	12	3	5
2:00	4	1	5	3	5	5	9	4	5
3:00	3	3	2	3	2	9	10	3	5
4:00	8	8	9	11	8	5	7	9	8
5:00	19	17	15	20	24	12	7	19	16
6:00	58	69	72	69	70	41	25	68	58
7:00	97	102	87	88	104	66	26	96	81
8:00	192	192	175	199	189	119	63	189	161
9:00	130	109	122	121	131	159	101	123	125
10:00	109	96	100	101	120	184	95	105	115
11:00	118	118	102	121	118	166	159	115	129
12:00	120	130	111	127	123	183	163	122	137
13:00	107	111	118	139	136	184	125	122	131
14:00	165	160	182	168	201	159	128	175	166
15:00	300	329	288	329	375	153	155	324	276
16:00	353	359	367	377	438	178	188	379	323
17:00	352	405	398	396	418	163	158	394	327
18:00	217	246	217	200	264	124	123	229	199
19:00	86	102	95	110	110	77	53	101	90
20:00	53	82	71	93	60	49	51	72	66
21:00	34	47	57	61	45	50	42	49	48
22:00	23	31	27	37	51	48	25	34	35
23:00	11	14	17	18	33	32	12	19	20
Total	2566	2737	2643	2798	3043	2194	1758	2757	2534

7-19	2260	2357	2267	2366	2617	1838	1484	2373	2170
6-22	2491	2657	2562	2699	2902	2055	1655	2662	2432
6-24	2525	2702	2606	2754	2986	2135	1692	2715	2486
0-24	2566	2737	2643	2798	3043	2194	1758	2757	2534

Job No	N3814
Client	Arup
Site	Kurmond Road
Location	west of Shepherds Road
Site No	3
Start Date	4-Dec-17
Description	Volume Summary
Direction	Combined

Hour Starting	Day of Week							W'Day Ave	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	4-Dec	5-Dec	6-Dec	7-Dec	8-Dec	9-Dec	10-Dec		
AM Peak	444	465	482	522	466	395	378		
PM Peak	561	567	540	565	577	396	351	**5888**	**5520**
0:00	15	18	14	16	26	35	61	18	26
1:00	3	11	7	9	8	37	41	8	17
2:00	5	8	6	4	10	20	11	7	9
3:00	11	12	12	7	12	6	8	11	10
4:00	34	42	43	57	44	28	7	44	36
5:00	144	141	149	163	149	80	35	149	123
6:00	300	292	294	285	265	109	55	287	229
7:00	360	412	394	373	385	232	96	385	322
8:00	444	465	482	522	466	317	194	476	413
9:00	347	314	330	325	337	382	295	331	333
10:00	272	262	216	259	280	357	296	258	277
11:00	286	267	347	332	314	395	378	309	331
12:00	312	262	298	278	317	396	351	293	316
13:00	296	310	253	321	353	366	304	307	315
14:00	371	365	338	404	416	361	302	379	365
15:00	518	536	503	537	577	349	345	534	481
16:00	561	522	540	565	560	297	315	550	480
17:00	486	567	535	545	510	327	345	529	474
18:00	366	399	417	385	371	288	244	388	353
19:00	173	221	219	235	225	170	184	215	204
20:00	125	154	197	215	149	139	154	168	162
21:00	94	125	145	154	123	105	109	128	122
22:00	51	73	70	94	96	106	59	77	78
23:00	22	32	22	51	73	92	21	40	45
Total	5596	5810	5831	6136	6066	4994	4210	5888	5520

7-19	4619	4681	4653	4846	4886	4067	3465	4737	4460
6-22	5311	5473	5508	5735	5648	4590	3967	5535	5176
6-24	5384	5578	5600	5880	5817	4788	4047	5652	5299
0-24	5596	5810	5831	6136	6066	4994	4210	5888	5520