TRAFFIC IMPACT ASSESSMENT

IN SUPPORT PLANNING PROPOSAL

PROPOSAL TO AMEND THE ORANGE LOCAL ENVIRONMENTAL PLAN 2011
IN RESPECT OF LAND AT LEEDS PARADE, CLERGATE

PREPARED FOR:

BOB HEALY AND COMPANY

FEBRUARY 2016

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The preparation of this report has been in accordance with the project brief provided by the client and has relied upon the information, data and results provided or collected from the sources and under the conditions outlined in the report.

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Introduction

1.1 BACKGROUND AND PROPOSED DEVELOPMENT

Bob Healy and Company intends to develop a staged large lot residential subdivision on land consisting of the former Orange abattoir at the northern end of Leeds Parade, Orange.

In order to facilitate the subdivision an amendment to the Orange Local Environmental Plan 2011 is required to rezone the subject land from RU1 – Primary Production and IN1 – General Industrial to R5 – Large Lot Residential and E4 – Environmental Living.

The subject land is described in **Section 1.2** and has an overall area of approximately 290 hectares.

The subject land would be developed with internal local roads and these would be accessed from Leeds Parade in the south. At this time no further connections to existing roads are proposed however it anticipated that development of adjacent land in the future would facilitate an alternate access to Ophir Road. This does not however form part of this assessment. Additionally, an access to Pearce Lane has been considered but discounted at this time due to the costs associated with upgrading Pearce Lane and the Pearce Lane/Clergate Road and Clergate Road/Northern Distributor Road intersections.

A master plan for the site has been developed generating approximately 450 lots with a minimum size of 4,000 square metres.

A staging plan is predicated on the development commencing at the Leeds Parade intersection (south) and the release of 10-20 lots per year, to account for demand requirements, without over saturation.

This assessment is conducted on the development at completion, that is, the impact of vehicles generated by all 450 lots on the operation of the local road system.

1.2 SUBJECT SITE

The subject site is formed of:

- Lot 15 DP6694, 390 Clergate Road, Orange
- Lot 3 DP255983, 440 Clergate Road, Orange
- Lot 2 DP255983, 440 Clergate Road, Orange
- Lot 14 DP6694, 440 Clergate Road, Orange
- Lot 25 DP6694, 440 Clergate Road, Orange

The site is located approximately 5 kilometres north of Orange central business district (CBD) and 1.8 kilometres (3.5 kilometres by road) from the North Orange shopping centre. The site has an area of approximately 290 hectares and is bounded to the north by Pearce Lane, to the west by the Main Western Railway Line and to the south and east by private late. The southern portion of the site (Lot 15) is currently zoned IN1 – General Industrial with the remainder of the currently zoned RU1 – Primary Production.

The site is depicted in **Figure 1**.

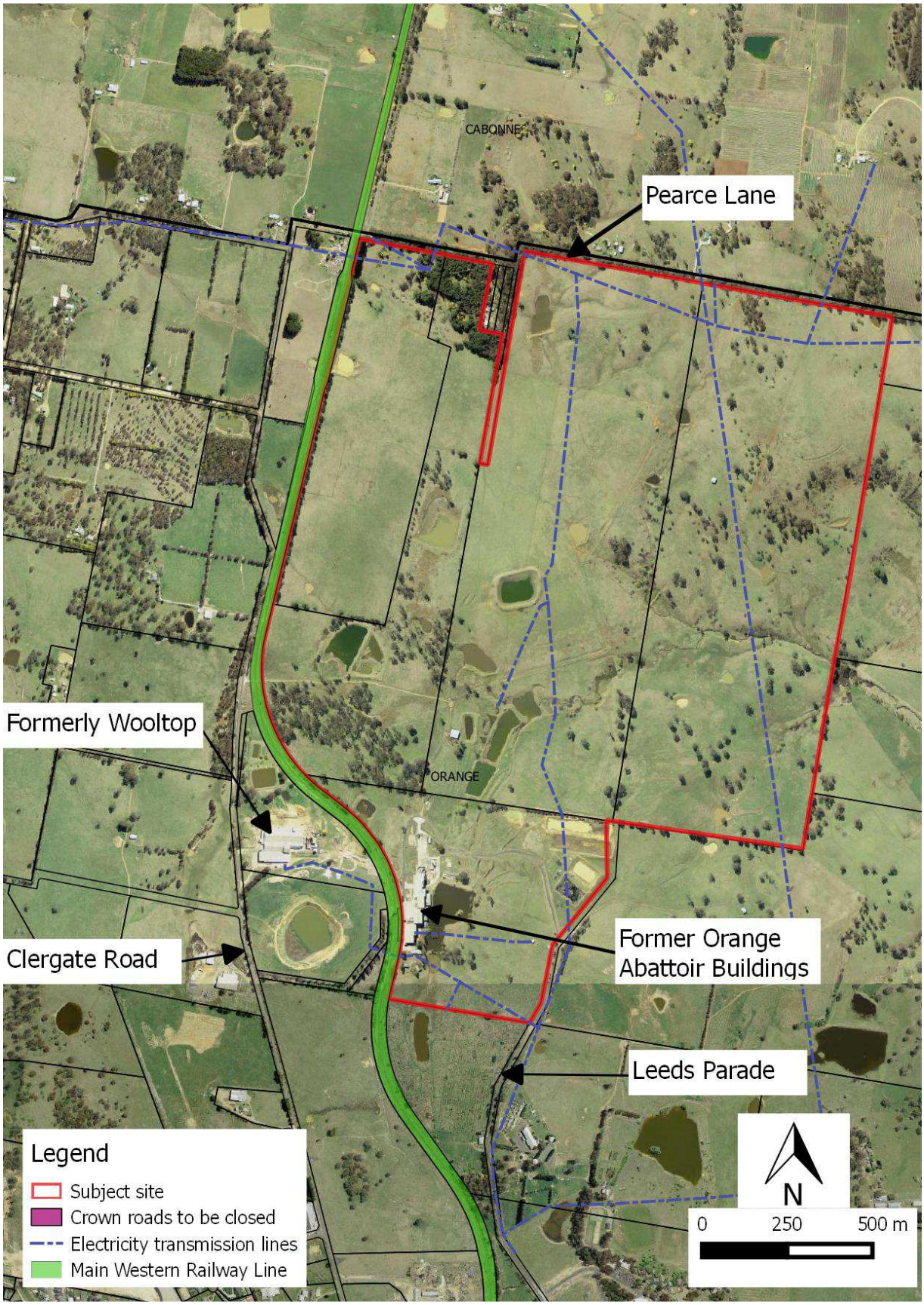

Figure 1: The subject site (Source: Six Maps)

1.3 METHODOLOGY

By reference to clause 104 of the *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP), the resulting proposed subdivision would be classified as a Schedule 1 traffic generating development in the basis that it proposes 300 or more lots. The matter is therefore referrable to the Roads and Maritime Services and a Traffic Impact Assessment (TIA) has been prepared to assist the development assessment process.

The proposal to rezone the land would result in the potential for the development of a large lot residential subdivision. This eventual subdivision would generate an increase in the volume of traffic movements onto the surrounding road network. The provision of safe and efficient means of access to the development will be necessary to ensure the satisfactory operation of the development.

This Traffic Impact Assessment (TIA) investigates the impact of the development on the surrounding road network. The TIA will determine if additional traffic management facilities are required to safely and efficiently control the movement of all vehicular traffic to and from the site.

This TIA will address the following specific issues:

- The potential levels of traffic generation as a result of the proposed rezoning;
- The capacity of the affected roads to accommodate additional traffic;
- Impact on safety and amenity of the surrounding road network; and
- Operation of specific affected intersections.

The methodology for preparing the TIA is outlined below:

i. Review of existing traffic volume data held by Council and available from external sources for roads surrounding the development site.

ii. Determination of the traffic generating potential of the rural residential subdivision development and calculation of the peak hour and peak daily traffic volumes to be added to the existing traffic volumes on the roads surrounding the development site.

iii. Determination/collation of traffic generation data for surrounding traffic generating developments (notably, the Bunnings hardware store and highway service centre both currently under development on Leeds Parade);

iv. Assessment of the impact of the additional traffic generated by the subdivision development on the surrounding road network through the use of SIDRA modelling, including the impacts associated with traffic generated by development in the surrounding area. The impact assessment will be carried out in terms of:

- Road capacity; and
- Level of Service.

In summary, this Traffic Impact Assessment will assess:

- the existing traffic movements on the existing road network, including Northern Distributor Road (both east and west of Leeds Parade) and Leeds Parade (both north and south of Northern Distributor Road);
- the expected traffic volumes generated by the proposed subdivision;
- the effect of the generated traffic on the surrounding roads; and
- review of the operation and design of existing intersections to determine whether anticipated volumes can be accommodated.

Existing Traffic Conditions

2.1 INTRODUCTION

Primary access to the site is from Leeds Parade in the south, with Leeds Parade transitioning into the sealed driveway that formerly provided heavy vehicle access to the abattoir buildings.

Historically abattoir staff are understood to have accessed the abattoir via a single lane bridge over the Main Western Railway Line, which staff used to walk over after parking on the land on the western side of the rail line. The bridge is accessed from private land owned by the applicant but not forming part of this application.

The site also currently benefits from a single lane rail crossing from Clergate Road and a number of gateway accesses to Pearce Lane in the north.

Figure 2 shows the south-western corner of the site and the three current (known) accesses into the property in this area.

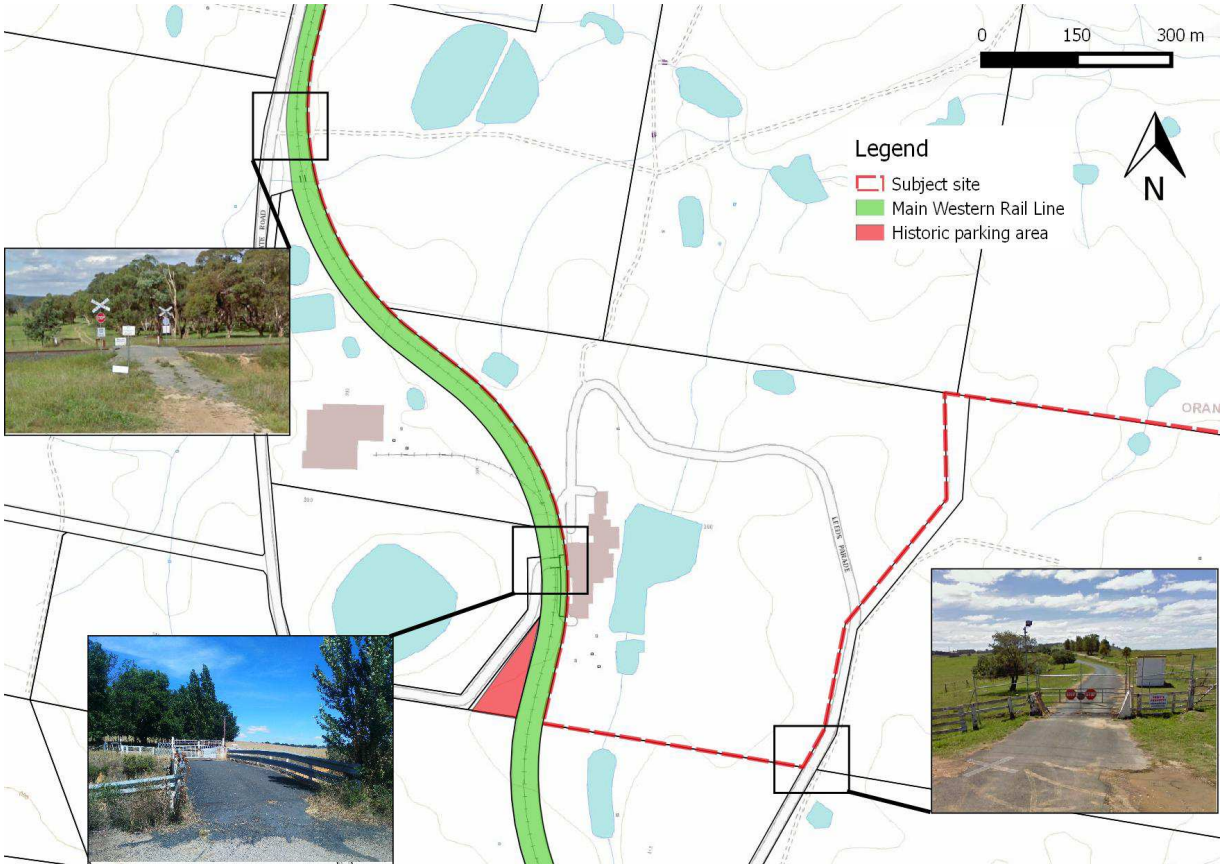

Figure 2: Existing site accesses in the southern extent

The connectivity provided by the alignment of Leeds Parade to Northern Distributor Road affords excellent links to the Orange CBD via Leeds Parade South, Bathurst and Sydney via Northern Distributor Road east and the North Orange Shopping Centre and onwards to Wellington, Dubbo, Parkes, Forbes and Cowra (and south to Melbourne) via Northern Distributor Road west.

As outlined in **Section 1.1** the design intention is to utilise Leeds Parade for all traffic into and out of the subdivision. Access to the site will be via an extension of Leeds Parade with a suitable gateway treatment to indicate the entry to the proposed subdivision. To assess the impact of the proposed subdivision on the surrounding road network the following roads and intersections will be studied:

- Leeds Parade – north of Northern Distributor Road;
- Leeds Parade – south of Northern Distributor Road;
- Northern Distributor Road – east of Leeds Parade.
- Northern Distributor Road – west of Leeds Parade.
- The Northern Distributor Road/Leeds Parade Intersection
- The University Access Intersection

2.2 ROAD NETWORK HIERARCHY

The Roads and Traffic Authority (2008) proposes four basic road classes as the basis for the functional hierarchy of a road network.

Functional classifications take into account the relative balance of the traffic mobility function and amenity/access functions of streets and roads and defines the purpose of a road within the context of an urban area.

The four road classes are motorways, arterial, sub-arterial and local roads and are defined below.

Motorways

This is the highest form of arterial road and is considered separately due primarily to traffic function and strict access control via grade separate interchanges. These roads provide for major inter-regional traffic movements in a safe and operationally efficient manner.

Arterial Roads

Roads whose main function is to carry through traffic from one region to another forming the principal means of communication for major traffic movements. Access to land should be limited.

Sub-Arterial Roads

Those roads which supplement the arterial roads in providing for through traffic movement to an individually determined limit that is sensitive to both roadway characteristics and adjoining land uses.

Local Roads

Roads that distribute traffic between the arterial roads and the local street system and provide access to adjoining property.

Based on the existing road network the functional classification of Leeds Parade and Northern Distributor Road (in the vicinity of the subject site) are:

Leeds Parade - south of NDR and from NDR to the University access:	Sub-Arterial Road.
Leeds Parade - north of the University access: Sub-Arterial Road:	Local Road.
Northern Distributor Road:	Sub-Arterial Road.

2.3 EXISTING ROADWAY CONDITIONS

2.3.1 LEEDS PARADE

Leeds Parade is a two way two lane bitumen sealed road with no kerb and guttering.

From the subject site to the University entrance Leeds Parade is approximately 6-6.5m wide with no line markings. The post speed limit is 50 km/hr

From the University Entrance to Northern Distributor Road, Leeds Parade is approximately 6.5–7.5m wide with line marked lanes approximately 3.2 m wide. The posted speed limit is 80 km/hr from Northern Distributor Road to approximately 200m south of the University Entrance where the posted speed limit drops down to 50 km/hr.

South of Northern Distributor Road, Leeds Parade is a two lane, two way road with line marking and a speed limit of 80km/hr for a distance of approximately 650 metres south of the Northern Distributor Road intersection, at which point the speed limit reduces to 50km/hr as it approaches residential and industrial areas of Orange.

There is a bicycle/pedestrian pathway running along the western side of Leeds Parade starting at the University entrance and running south to link into a path on Northern Distributor Road and then continuing south to link into the residential areas of Orange.

2.3.2 NORTHERN DISTRIBUTOR ROAD.

Northern Distributor Road is a two way, two lane bitumen sealed road. Northern Distributor Road has full line marking with average lane widths of 3.7m and sealed shoulders of variable widths

East of Leeds Parade the posted speed limit on Northern Distributor Road is 80 km/hr whilst the remainder has a posted speed limit of 70 km/hr.

There is a bicycle/pedestrian pathway on the southern side of Northern Distributor Road (west of Leeds Parade) that links up to the bicycle/pedestrian pathway in Leeds Parade and into the general urban bicycle/pedestrian pathway network to the west.

Northern Distributor Road acts as a distributor for traffic looking to access the areas of West Orange and North Orange, including the North Orange shopping centre, and the areas of East Orange, including homemaker centre, and onwards to Bathurst and Sydney.

2.4 EXISTING ROAD CAPACITY

Roads have varying capacities dependent on the function they are performing. The United States Highway Capacity Manual defines capacity as follows:

> *…the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under the prevailing roadway, traffic and control conditions.*

The physical characteristics of a roadway such as lane width, alignment, frequency of intersections etc. make up the prevailing roadway conditions.

Based upon its capacity and a driver's expectations of the operational characteristics of a traffic stream is a qualitative measure denoted as the level of service of a road.

Level of service definitions combine such factors as speed, travel time, safety, convenience and traffic interruptions and fall into six levels of service categories ranging from A down to F.

The *AUSTROADS Guide to Traffic Management, Part 3 – Traffic Studies and Analysis* describes Level of Service A as:

> *A condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.*

The categories are graduated from Level of Service A down through six levels to Level of Service F, being a zone of forced flow. The amount of traffic approaching the point under consideration exceeds that which can pass it. Flow breakdowns occur and queuing and delays result.

The *AUSTROADS Guide to Traffic Management, Part 3 – Traffic Studies and Analysis* sets out typical mid-block capacities for various types of urban road with interrupted flow. Based on the physical configuration of Leeds Parade and Northern Distributor Road together with the rates given in the Guide the capacity of the surrounding roads can be determined as:

- Leeds Parade – Capacity of 900 vehicles per hour per lane;
- Northern Distributor Road - Capacity of 1,200 vehicles per hour per lane.

2.5 EXISTING TRAFFIC

Site specific traffic data was not collected on individual roads surrounding the subdivision site for the preparation of this TIA. However, Geolyse has been able to access traffic data from the Traffic Impact Assessment prepared by Transport and Traffic Planning Associates (T&TPA) for the approved Orange Bunnings development, located on the corner of Leeds Parade and Northern Distributor Road. This report provides traffic data for both existing and post development conditions following the development of the proposed Bunnings development. A copy of this report is included in **Appendix A.**

Based on the report by T&TPA, heavy vehicles account for approximately 5% of traffic on Leeds Parade and Northern Distributor Road. These figures are used for modelling purposes across all traffic movements with the exception of Hanrahan Place (Hanrahan Place is a newly constructed fifth leg off the Northern Distributor Road/Leeds Parade roundabout that provides access to the Finemore Depot and for the purposes of the existing traffic scenario it has been assumed that 100% of vehicles on this leg are heavy).

2.5.1 ANNUAL AVERAGE DAILY TRAFFIC

Annual Average Daily Traffic (AADT) is defined as the total volume of traffic passing a roadside observation point over a period of a year divided by the number of days in a year.

AADT data on Leeds Parade north is not available, however it has been predicted based on the peak hour figures provided within the T&TPA report. Assuming the peak hour traffic (PHT) volume represents 10% of the annual average daily traffic (AADT) (based on the ratio of PHT to AADT for surrounding roads), the peak hour traffic can be calculated as:

Annual Average Daily Traffic = 111/10%

= 1,110 vehicles/day

Existing AADT for Northern Distributor Road and Leeds Parade south was obtained from the T&TPA report and **Table 2.1** contains a summary of the AADT on the roads surrounding the subject site.

Table 2.1 – Existing Annual Average Daily Traffic (AADT)

Road Location	AADT (vehicles/day)
Northern Distributor Road	8,400
Leeds Parade (south of Northern Distributor Road)	3,500
Leeds Parade (north of Northern Distributor Road)	1,110

Source: T&TPA Report – Refer Appendix A

2.5.2 PEAK HOUR TRAFFIC

The T&TPA report contains existing peak hour traffic for both the weekday PM and the weekend midday peaks based on traffic counts undertaken at the roundabout at the intersection of Leeds Parade and Northern Distributor Road. The weekday PM peak occurred at 16:15 to 17:15 and was greater than the weekend midday peak and hence will be adopted as the critical time period for peak hour traffic assessment for the roundabout and surrounding roads.

A summary of the peak hour traffic on the roads surrounding the subject site is contained in **Table 2.2.**

Table 2.2 – Existing Peak Hour Traffic

Road Location	Lane	Weekday PM Peak Hour Traffic (vehicles/hour)
Northern Distributor Road (east of Leeds Parade)	Eastbound	241
	Westbound	321
TOTAL		**562**
Northern Distributor Road (west of Leeds Parade)	Eastbound	362
	Westbound	580
TOTAL		**942**
Leeds Parade (north of Northern Distributor Road)	Northbound	28
	Southbound	83
TOTAL		**111**
Leeds Parade (south of Northern Distributor Road)	Northbound	322
	Southbound	242
TOTAL		**564**

Source: T&TPA Report – Refer Appendix A

2.6 EXISTING INTERSECTION CONDITIONS

2.6.1 INTRODUCTION

Intersections are critical points which often control the capacity of the road network. This is due to the need for conflicting traffic movements to share the same road space at these locations. The operation of the intersections in the vicinity of the site have been analysed using SIDRA Intersection. SIDRA Intersection is a computerised traffic evaluation tool which is used in the assessment and design of intersection treatments in terms of capacity and operation. The program provides outputs which include delays, queue lengths, total capacities, travel times, and average speeds. SIDRA Intersection is the preferred intersection analysis tool of Roads and Maritime and many Local Government Authorities.

As part of the intersection analysis, the SIDRA Intersection model provides an "Average Control Delay" for each approach of the intersection. This control delay is the average delay per vehicle over the peak hour as a result of the intersection and is grouped into six bands labelled A through to F (with 'A' being best and 'F' being over capacity), termed Level of Service (LOS). The overall LOS for a 'Give Way' intersection is the LOS result for the worst case turning movement.

2.6.2 LEEDS PARADE AND NORTHERN DISTRIBUTOR ROAD

The intersection of Leeds Parade and Northern Distributor Road features a two lane roundabout for all directions with a 36 metre diameter island.

An assessment of the Leeds Parade/Northern Distributor Road intersection under existing weekday PM peak hour conditions was undertaken using SIDRA.

The following assumptions were included in the SIDRA analysis:

- Intersection traffic and turning movements: refer **Figure 3**
- Heavy Vehicle percentage refer **Figure 3**
- Control type: Give Way – all legs
- Lane widths assumed: 3.7m – all lanes
- Approach lengths on Northern Distributor Road
  - 500m westbound through (120m inside lane)
  - 500m eastbound through (60m inside lane + 20m left turn slip lane)
- Approach lengths on Leeds Parade
  - 500m southbound through (100m inside lane)
  - 500m northbound through (60m inside lane)
- Approach lengths on Hanrahan Place – 190m
- Approach and exit cruise speeds:
  - Northern Distributor Road east 70 kph
  - Northern Distributor Road west 80 kph
  - Leeds Parade (north and south) 80 kph
  - Hanrahan Place 50 kph

Based on the above assumptions, a SIDRA Intersection analysis was carried out for the intersection for the existing weekday PM peak. The movement summary output from the SIDRA assessment is shown in **Figure 4**. Full results of the SIDRA analysis are provided in **Appendix B**.

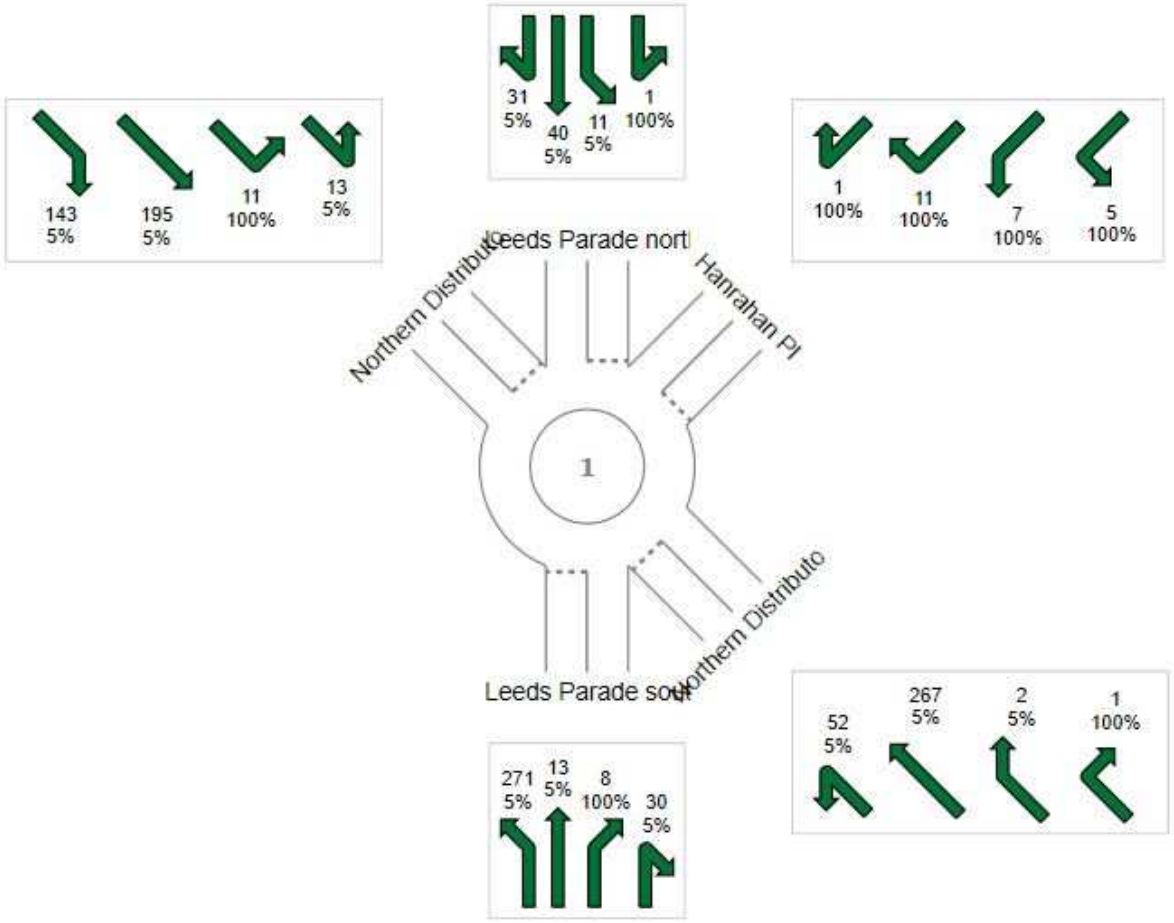

Figure 3: NDR/Leeds Prd Int – Existing weekday PM Peak hour traffic volumes

MOVEMENT SUMMARY

Site: WD PM (NDR/Leeds) - existing

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Leeds Parade south											
1a	L1	271	5.0	0.217	9.8	LOS A	1.0	7.4	0.41	1.19	58.8
2	T1	13	5.0	0.072	22.3	LOS B	0.3	2.3	0.45	1.50	51.2
3a	R1	8	100.0	0.072	22.3	LOS B	0.3	2.3	0.45	1.50	51.2
3b	R3	30	5.0	0.072	22.3	LOS B	0.3	2.3	0.45	1.50	51.2
Approach		322	7.4	0.217	11.8	LOS A	1.0	7.4	0.42	0.62	57.2
SouthEast: Northern Distributor east											
21b	L3	52	5.0	0.032	15.1	LOS B	0.1	1.0	0.26	1.28	58.6
22	T1	267	5.0	0.093	9.7	LOS A	0.4	3.0	0.32	1.10	59.5
23a	R1	2	5.0	0.093	10.0	LOS A	0.4	2.9	0.33	1.12	59.2
23	R2	1	100.0	0.093	10.0	LOS A	0.4	2.9	0.33	1.12	59.2
Approach		322	5.3	0.093	10.5	LOS A	0.4	3.0	0.31	0.56	59.3
NorthEast: Hanrahan Pl											
24	L2	5	100.0	0.042	37.8	LOS C	0.2	2.0	0.50	1.48	49.2
24a	L1	7	100.0	0.042	37.8	LOS C	0.2	2.0	0.50	1.48	49.2
26	R2	11	100.0	0.042	37.8	LOS C	0.2	2.0	0.50	1.48	49.2
26b	R3	1	100.0	0.042	37.8	LOS C	0.2	2.0	0.50	1.48	49.2
Approach		24	100.0	0.042	37.8	LOS C	0.2	2.0	0.50	0.74	49.2
North: Leeds Parade north											
7b	L3	1	100.0	0.037	12.8	LOS A	0.1	1.1	0.39	1.23	59.7
7a	L1	11	5.0	0.037	12.8	LOS A	0.1	1.1	0.39	1.23	59.7
8	T1	40	5.0	0.037	14.0	LOS A	0.1	1.1	0.40	1.27	58.1
9b	R3	31	5.0	0.037	19.0	LOS B	0.1	1.1	0.41	1.46	52.2
Approach		83	6.1	0.037	15.7	LOS B	0.1	1.1	0.40	0.67	56.0
NorthWest: Northern Distributor west											
27b	L3	13	5.0	0.128	11.0	LOS A	0.6	4.9	0.18	1.07	57.6
27	L2	11	100.0	0.128	11.0	LOS A	0.6	4.9	0.18	1.07	57.6
28	T1	195	5.0	0.128	12.1	LOS A	0.6	4.9	0.18	1.12	56.8
29a	R1	143	5.0	0.128	17.5	LOS B	0.6	4.7	0.19	1.37	53.4
Approach		362	7.9	0.128	14.1	LOS A	0.6	4.9	0.19	0.61	55.4
All Vehicles		1113	8.8	0.217	14.8	LOS B	1.0	7.4	0.31	0.60	56.3

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 is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Figure 4: NDR/Leeds Prd Int – Existing weekday PM Peak hour traffic movements

From the table in **Figure 4**, it can be seen that the current worst movement is for those vehicles exiting Hanrahan Place, with a LOS C and an average delay of 37.8 seconds. All other movements operate at a LOS A or B.

2.6.3 UNIVERSITY ENTRANCE

The intersection at the entrance to the University consists of a channelised right turn treatment with raised concrete medians.

An assessment of the Leeds Parade/University Entrance intersection under existing weekday PM peak hour conditions was undertaken using SIDRA. The following assumptions were included in the SIDRA analysis:

- Intersection traffic and turning movements: refer **Figures 5** (It was assumed only 1 vehicle per hour travelled past the University with all other traffic entering and leaving the University)
- Heavy Vehicle percentage refer **Figure 5**
- Control type: Give Way – University to Leeds Parade
- Lane widths assumed: 3m – all lanes
- Approach lengths on Leeds Parade
  - 500m northbound through (50m right turn lane)
- Approach length on University Entrance – 140m
- Approach and exit cruise speeds:
  - 50kph all roads

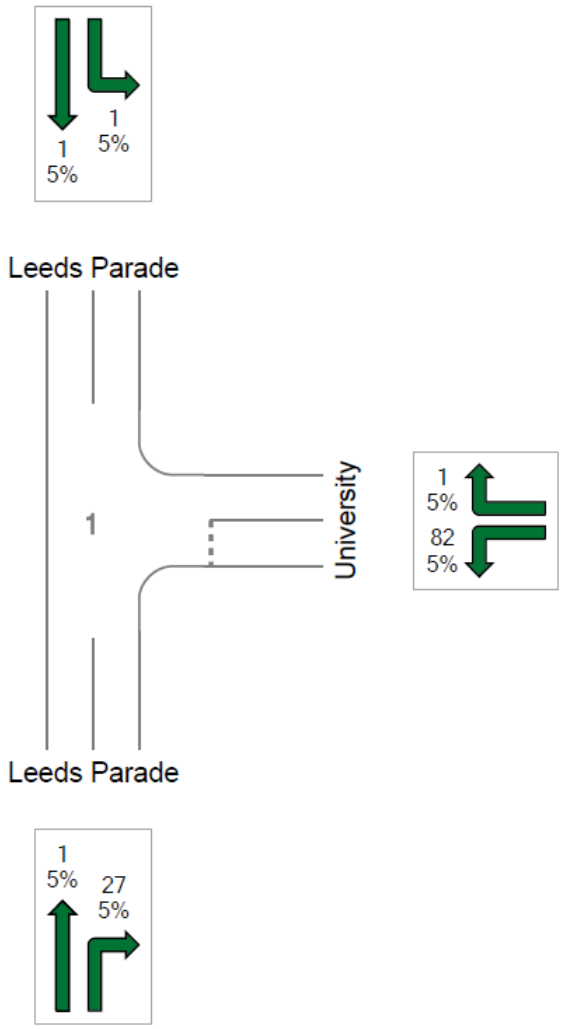

Figure 5: University Ent Int – Existing weekday PM Peak hour traffic volumes

Based on the above assumptions, a SIDRA Intersection analysis was carried out for the intersection for the existing weekday PM peak. The movement summary output from the SIDRA assessment is shown in **Figure 6**. Full results of the SIDRA analysis are provided in **Appendix B**.

MOVEMENT SUMMARY

Site: Uni existing PM

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Leeds Parade											
2	T1	1	5.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
3	R2	27	5.0	0.015	8.0	LOS A	0.1	0.5	0.02	0.67	42.8
Approach		28	5.0	0.015	7.7	NA	0.1	0.5	0.02	0.65	43.0
East: University											
4	L2	82	5.0	0.052	7.5	LOS A	0.2	1.6	0.01	0.63	43.1
6	R2	1	5.0	0.052	7.5	LOS A	0.2	1.6	0.01	0.63	43.1
Approach		83	5.0	0.052	7.5	LOS A	0.2	1.6	0.01	0.63	43.1
North: Leeds Parade											
7	L2	1	5.0	0.001	3.7	LOS A	0.0	0.0	0.00	0.40	46.3
8	T1	1	5.0	0.001	3.7	LOS A	0.0	0.0	0.00	0.40	46.3
Approach		2	5.0	0.001	3.7	NA	0.0	0.0	0.00	0.40	46.3
All Vehicles		113	5.0	0.052	7.5	NA	0.2	1.6	0.01	0.63	43.1

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 is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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SIDRA INTERSECTION 6

Figure 6: University Ent Int - Existing weekday PM Peak hour traffic movements

From the table in **Figure 6**, it can be seen that all movements operate at a LOS A, with the worst average delay of 8.0 seconds for the right turn movement off Leeds Parade into the University.

In assessing the performance of the University entrance intersection it is likely that the weekday AM peak hour will be the critical time period with more vehicles attempting the right turn into the University. The T&TPA report did not contain traffic data for the weekday AM peak. In the absence of AM peak data, the PM figures have been reversed to provide representative statistics as shown in **Figure 7**.

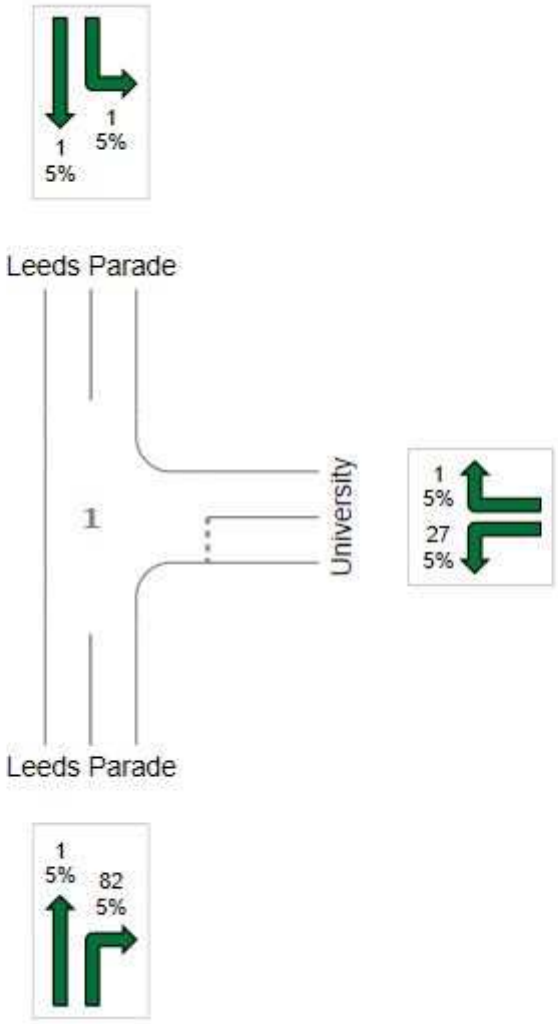

Figure 7: University Ent Int – Existing weekday AM Peak hour traffic volumes

Based on the above assumptions, a SIDRA Intersection analysis was carried out for the intersection for the existing weekday AM peak. The movement summary output from the SIDRA assessment is shown in **Figure 8**. Full results of the SIDRA analysis are provided in **Appendix B**.

MOVEMENT SUMMARY

Site: Uni existing AM

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Leeds Parade											
2	T1	1	5.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
3	R2	82	5.0	0.047	8.0	LOS A	0.2	1.6	0.02	0.67	42.7
Approach		83	5.0	0.047	7.9	NA	0.2	1.6	0.02	0.66	42.8
East: University											
4	L2	27	5.0	0.018	7.5	LOS A	0.1	0.5	0.01	0.63	43.1
6	R2	1	5.0	0.018	7.5	LOS A	0.1	0.5	0.01	0.63	43.1
Approach		28	5.0	0.018	7.5	LOS A	0.1	0.5	0.01	0.63	43.1
North: Leeds Parade											
7	L2	1	5.0	0.001	3.7	LOS A	0.0	0.0	0.00	0.40	46.3
8	T1	1	5.0	0.001	3.7	LOS A	0.0	0.0	0.00	0.40	46.3
Approach		2	5.0	0.001	3.7	NA	0.0	0.0	0.00	0.40	46.3
All Vehicles		113	5.0	0.047	7.7	NA	0.2	1.6	0.02	0.65	43.0

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 is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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SIDRA INTERSECTION 6

Figure 8: University Ent Int - Existing weekday AM Peak hour traffic movements

From the table in **Figure 8**, it can be seen that all movements operate at a LOS A, with the worst average delay of 8.0 seconds for the right turn movement off Leeds Parade into the University.

Whilst this is unchanged from the PM peak the overall average delay for all legs increased slightly from the PM peak confirming the AM peak is the critical time period.

Traffic Generation and Impacts

3.1 SURROUNDING DEVELOPMENT

Construction work is currently underway to provide widening to Leeds Parade immediately to the north of Northern Distributor Road to support the new Bunnings development on the western side of the road and a highway service centre on the eastern side of the road. Primary ingress and egress to the Bunnings development will be via Leeds Parade whilst egress only for the highway service centre will be via Leeds Parade (access via Hanrahan Place).

Traffic generated by these two developments will be included in the assessment of the future traffic generation and impacts on the surrounding road network.

3.2 TRAFFIC DISTRIBUTION ASSUMPTIONS

As noted elsewhere, the subject development is only one traffic generator in the locality that will affect the movement and distribution of traffic. Therefore, the assumptions determining how traffic would be distributed is set down in the following sections for each traffic generator.

3.2.1 PROPOSED SUBDIVISION

For the purposes of further assessment, the following assumptions have been made about traffic distribution from the proposed subdivision development:

For peak periods:

- Leeds Parade (north)
  - AM Peaks: 75% Southbound and 25% Northbound
  - PM Peaks: 75% Northbound and 25% Southbound

Traffic exiting and leaving the subdivision would be expected to distribute from the Leeds Parade/Northern Distributor Road intersection on the following basis:

- 60% of traffic travelling to/from the subdivision would originate from/travel to Leeds Parade south;
- 30% of the traffic would originate from/travel to Northern Distributor Road (west);
- 10% of traffic would originate from/travel to Northern Distributor Road (east); and

5% of traffic entering and leaving the university would originate from/travel to the new subdivision.

3.2.2 BUNNINGS

The distribution of traffic generated by the Bunnings development will be as detailed in the T&TPA report included in **Appendix A.**

3.2.3 HIGHWAY SERVICE CENTRE

For the purposes of further assessment, the following assumptions have been made about traffic distribution from the new service centre currently under construction:

For additional traffic generated:

- 25% of the traffic would originate from/travel to Northern Distributor Road (west);
- 25% of traffic would originate from/travel to Northern Distributor Road (east);

- 25% of traffic would originate from/travel to Leeds Parade (north); and
- 25% of traffic would originate from/travel to Leeds Parade (south)

For passing traffic (linked trips):

- 25% of the traffic would originate from Northern Distributor Road (west);
- 25% of traffic would originate from Northern Distributor Road (east);
- 25% of traffic would originate from Leeds Parade (north); and
- 25% of traffic would originate from Leeds Parade (south)

3.3 TRAFFIC GENERATION

3.3.1 PROPOSED SUBDIVISION

The Roads and Traffic Authority's *Guide to Traffic Generating Developments* publishes data on the traffic generating potential of various development ranging from residential subdivisions, commercial premises, retail premises and industrial developments.

The RTA first published the *Guide to Traffic Generating Developments* in 1991, before its revision in 2001. It is currently being further revised and as interim measure the Roads and Maritime has published updated traffic survey data for a range of development types. Of relevance to this TIA is data provided in relation to low density residential dwellings. The summary figures are provided for the Sydney area and regional areas. A total of five regional sites were surveyed, including one in the Calare area of Orange. The figures for regional areas are relevant to this TIA and are reproduced in **Table 3.1**.

Table 3.1 – Summary of land use traffic generation – low density residential

Rates	Regional Average (movements/dwelling)	Regional Range (movements/dwelling)
Daily vehicle trips per dwelling	6.34	5.16-7.12*
Peak- vehicle trips per dwelling	0.79	0.61-0.9

Source: RMS Guide to Traffic Generating Developments – updated traffic surveys August 2013

*** It is noted that the Orange (Calare) figures are the highest in the range at 7.12 but also that car occupancy for Orange was highest at 1.42 persons/vehicle (compared to average regional occupancy of 1.34) and also highest in the peak vehicle trips per dwelling at 0.9**

To be conservative, the Orange figures of 7.12/day and 0.9/peak hour have been used for the purposes of this TIA.

Based on the stated traffic generation rates and the assumed average yield, the traffic generated by the development of the proposed subdivision is:

Daily Vehicle Trips:

450 lots x 7.12 trips per lot per day = 3,204 vehicle trips per day

Peak Hour Trips:

450 lots x 0.9 trips per lot per hour = 405 vehicle trips per hour

3.3.2 BUNNINGS

Figures for the generation of traffic associated with the development of the Bunnings site on the corner of Leeds Parade and Northern Distributor Road will be as detailed in the T&TPA report included in **Appendix A.**

3.3.3 HIGHWAY SERVICE CENTRE

Traffic figures for the approved highway service centre have been determined by reference to the 2002 RTA *Guide to Traffic Generating Development*. The Guide identifies that peak hour traffic generation associated with a service station is determined by the formula:

0.04 A(S) + 0.3 A(F), where

A(S) = area of the site (m^2) and

A(F) = gross floor area of the convenience store

The area of the site is understood to be approximately 5,700m^2 and the area of the approved convenience store is 200m^2.

Therefore:

Peak Hour Trips (Service Station):

0.04*5700 + 0.3*200 = 288 vehicle trips per hour

The development also contains a drive in take away foot outlet. The Guide recommends adopting a figure of 100 vehicles for peak hour traffic generation for a KFC or equivalent. It is noted that MacDonalds has higher recommended rates however given the proximity of the North Orange MacDonalds, the likelihood that a MacDonalds would be developed here is low.

Therefore, the final traffic generation figure for the site becomes:

Peak Hour Trips (Service Centre Total):

288 + 100 = 388 vehicle trips per hour

The Guide notes the proportion of passing trade is typically 50%. Hence 194 vehicle trips per hour are new trips with the remaining 194 vehicle trips per hour coming from the existing traffic stream.

3.4 TRAFFIC IMPACTS

3.4.1 BASIS OF ASSESSMENT

The impact of the traffic generated by the development of the proposed subdivision on Leeds Parade and Northern Distributor Road will be assessed in terms of:

i. Traffic volume; and

ii. Intersection capacity.

The impact of the increased traffic on Leeds Parade and Northern Distributor Road will be assessed. The operational capacities of the roundabout at the intersection of Leeds Parade and Northern Distributor Road and the intersection on Leeds Parade at the University entrance will also be analysed and evaluated.

3.4.2 TRAFFIC VOLUME

The expected peak hour traffic volume generated from the subdivision will impact on the existing peak hour traffic volume on Leeds Parade and Northern Distributor Road. The increase in peak hour traffic volume on these two roads is summarised in **Table 3.2**.

Table 3.2 – Comparison of Existing & Post Development Weekday PM Peak Hour Traffic Volumes

Road Location	Lane	Weekday PM Peak Hour Traffic (vehicles/hour)		Increase
		Existing	Post Development	
Northern Distributor Road (east of Leeds Parade)	Eastbound	241	342	42%
	Westbound	321	459	43%
TOTAL		**562**	**801**	**43%**
Northern Distributor Road (west of Leeds Parade)	Eastbound	362	556	54%
	Westbound	580	768	32%
TOTAL		**942**	**1324**	**41%**
Leeds Parade (north of Northern Distributor Road)	Northbound	28	356	1,171%
	Southbound	83	208	151%
TOTAL		**111**	**564**	**408%**
Leeds Parade (south of Northern Distributor Road)	Northbound	322	652	102%
	Southbound	242	405	67%
TOTAL		**564**	**1057**	**87%**

As expected, the greatest percentage increase in the weekday PM peak hour traffic following the full development of the proposed subdivision occurs on the northbound lane of Leeds Parade (north) with an increase in traffic volume of approximately 1,171%.

Whilst the percentage increase in traffic volume on Leeds Parade (north) appears extremely excessive it should be noted that this increase is from a very low existing traffic volume and the final post development traffic volume includes the traffic generated from the proposed Service Centre. Furthermore reference to **Section 2.4** of this report indicated that Leeds Parade has an existing capacity of 900 vehicles per hour per lane that is significantly more than the predicted post development peak traffic of 356 vehicles per hour.

Table 3.3 lists the peak hour traffic volume of the surrounding roads when compared against the existing capacity of the road.

Table 3.3 – Comparison of Post Development Weekday PM Peak Hour Traffic Volumes to Capacity

Road Location	Lane	Weekday PM Peak Hour Traffic (vehicles/hour)		Percentage of Capacity
		Post Development	Capacity	
Northern Distributor Road (east of Leeds Parade)	Eastbound	342	1,200	29%
	Westbound	459	1,200	38%
Northern Distributor Road (west of Leeds Parade)	Eastbound	556	1,200	46%
	Westbound	768	1,200	64%
Leeds Parade (north of Northern Distributor Road)	Northbound	356	900	40%
	Southbound	208	900	23%
Leeds Parade (south of Northern Distributor Road)	Northbound	652	900	72%
	Southbound	405	900	45%

It can be seen from **Table 3.3** that all roads are well below their capacity with the northbound lane of Leeds Parade (south) closest to capacity at 72%. Hence all roads are able to accommodate the increased additional peak hour traffic generated by the proposed development.

3.4.3 INTERSECTION ANALYSIS

3.4.3.1 Leeds Parade and Northern Distributor Road

Based on the assumptions outlined in **Section 2.6.2**, a SIDRA analysis was carried out for the Leeds Parade and Northern Distributor Road intersection under post development conditions during the weekday PM peak hour. The post development traffic and turning movements used in the SIDRA analysis is shown in **Figure 9**.

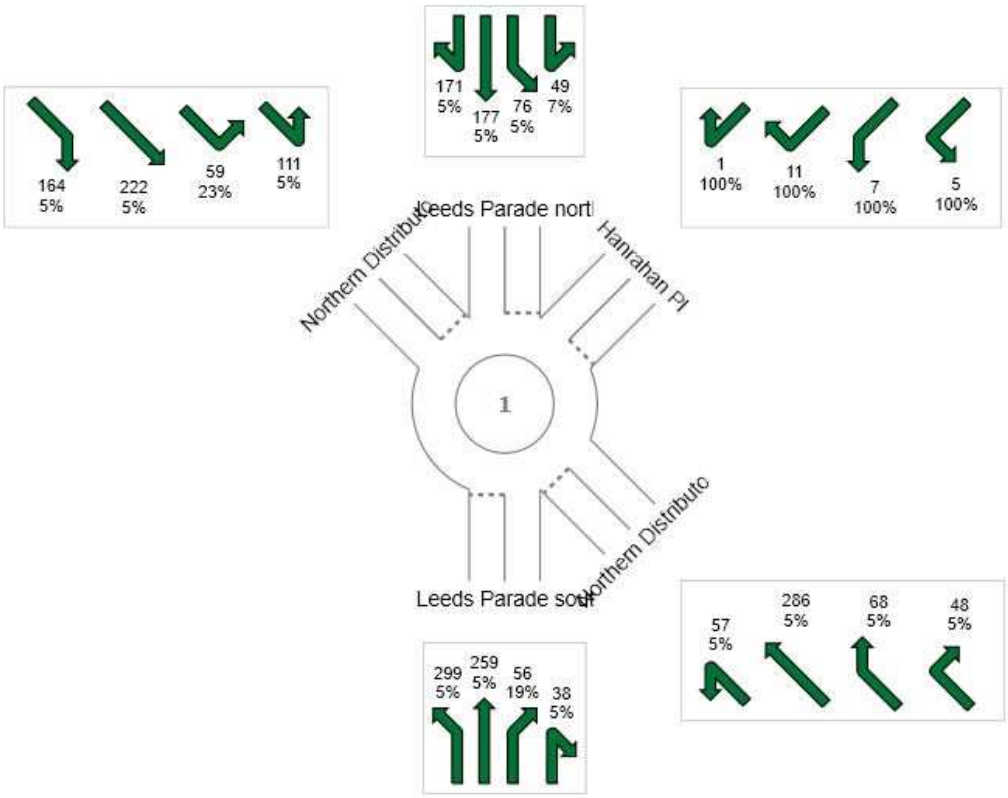


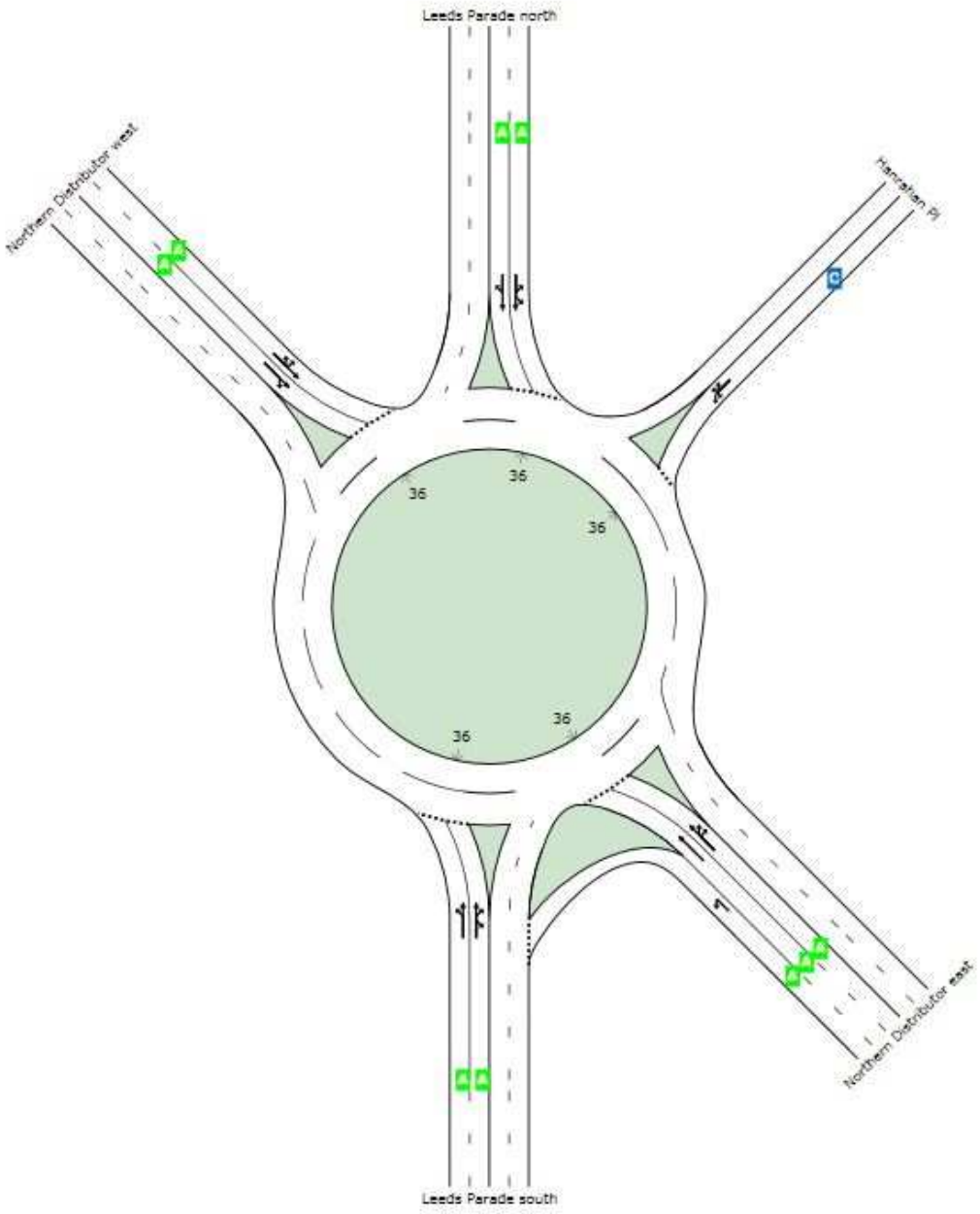
Figure 9: NDR/Leeds Prd Int – Post Development weekday PM Peak hour traffic volumes

Figure 10 illustrates the post development weekday PM peak hour Level of Service (LOS) for the Leeds Parade/Northern Distributor Road intersection and **Figure 11** provides the SIDRA movement summary. Full results of the SIDRA analysis are provided in **Appendix B**.

LEVEL OF SERVICE

Site: WD PM (NDR/Leeds) - proposed +bunnings + service centre

New Site
Roundabout



	South	Southeast	Northeast	North	Northwest	Intersection
LOS	A	A	C	A	A	A

Figure 10: NDR/Leeds Prd Int - Post Development weekday PM Peak LOS

MOVEMENT SUMMARY

Site: WD PM (NDR/Leeds) - proposed +bunnings + service centre

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Leeds Parade south											
1a	L1	299	5.0	0.330	6.6	LOS A	1.7	12.4	0.58	1.08	49.6
2	T1	259	5.0	0.330	9.5	LOS A	1.7	12.4	0.60	1.35	48.1
3a	R1	56	19.0	0.330	10.4	LOS A	1.6	12.1	0.60	1.43	47.7
3b	R3	38	5.0	0.330	10.4	LOS A	1.6	12.1	0.60	1.43	47.7
Approach		652	6.2	0.330	8.3	LOS A	1.7	12.4	0.59	0.62	48.7
SouthEast: Northern Distributor east											
21b	L3	57	5.0	0.037	8.0	LOS A	0.2	1.2	0.36	1.10	49.3
22	T1	286	5.0	0.163	7.0	LOS A	0.8	6.1	0.51	1.05	49.4
23a	R1	68	5.0	0.163	11.5	LOS A	0.8	5.7	0.53	1.43	46.7
23	R2	48	5.0	0.163	11.5	LOS A	0.8	5.7	0.53	1.43	46.7
Approach		459	5.0	0.163	8.3	LOS A	0.8	6.1	0.49	0.57	48.6
NorthEast: Hanrahan Pl											
24	L2	5	100.0	0.057	32.2	LOS C	0.2	2.7	0.62	1.50	42.2
24a	L1	7	100.0	0.057	32.2	LOS C	0.2	2.7	0.62	1.50	42.2
26	R2	11	100.0	0.057	32.2	LOS C	0.2	2.7	0.62	1.50	42.2
26b	R3	1	100.0	0.057	32.2	LOS C	0.2	2.7	0.62	1.50	42.2
Approach		24	100.0	0.057	32.2	LOS C	0.2	2.7	0.62	0.75	42.2
North: Leeds Parade north											
7b	L3	49	7.0	0.240	7.1	LOS A	1.2	8.5	0.56	1.13	49.4
7a	L1	76	5.0	0.240	7.1	LOS A	1.2	8.5	0.56	1.13	49.4
8	T1	177	5.0	0.240	8.9	LOS A	1.2	8.5	0.56	1.25	48.1
9b	R3	171	5.0	0.240	14.5	LOS A	1.1	8.2	0.58	1.60	45.0
Approach		473	5.2	0.240	10.4	LOS A	1.2	8.5	0.57	0.67	47.2
NorthWest: Northern Distributor west											
27b	L3	111	5.0	0.271	8.6	LOS A	1.5	11.0	0.56	1.24	48.8
27	L2	59	23.0	0.271	8.6	LOS A	1.5	11.0	0.56	1.24	48.8
28	T1	222	5.0	0.271	9.7	LOS A	1.5	11.0	0.56	1.33	47.9
29a	R1	164	5.0	0.271	11.3	LOS A	1.4	10.3	0.57	1.46	46.9
Approach		556	6.9	0.271	9.8	LOS A	1.5	11.0	0.56	0.67	47.9
All Vehicles		2164	7.0	0.330	9.4	LOS A	1.7	12.4	0.56	0.64	47.9

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 is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Figure 11: NDR/Leeds Prd Int – Post Development weekday PM Peak hour traffic movements

From the table in **Figure 11**, it can be seen that the worst movement remains as the movement for vehicles existing Hanrahan Place, with a LOS C and a slightly lower average delay of 32.2 seconds.

The increase in traffic from the proposed development provides for a more even distribution of traffic entering and leaving the roundabout that in turn results in an increase in the LOS on some legs with no decrease in the LOS on any legs. The overall average delay at the roundabout decreases from 14.8 seconds under existing conditions to 9.5 seconds under post development conditions.

3.4.3.2 Leeds Parade and University Access

Based on the assumptions outlined in **Section 2.6.3**, a SIDRA analysis was carried out for the Leeds Parade/University Entrance intersection under post development conditions during the weekday PM peak hour. The post development traffic and turning movements used in the SIDRA analysis is shown in **Figure 12**.

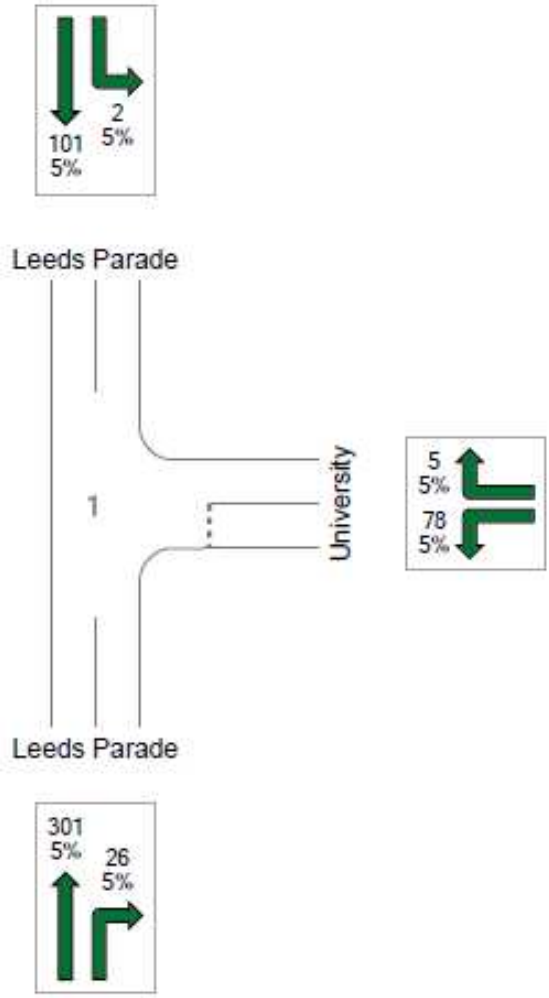


Figure 12: University Ent Int. – Post Development weekday PM Peak hour traffic volumes

Figure 13 illustrates the post development weekday PM peak hour Level of Service (LOS) for the Leeds Parade/University Entrance intersection and **Figure 14** provides the SIDRA movement summary. Full results of the SIDRA analysis are provided in **Appendix B**.

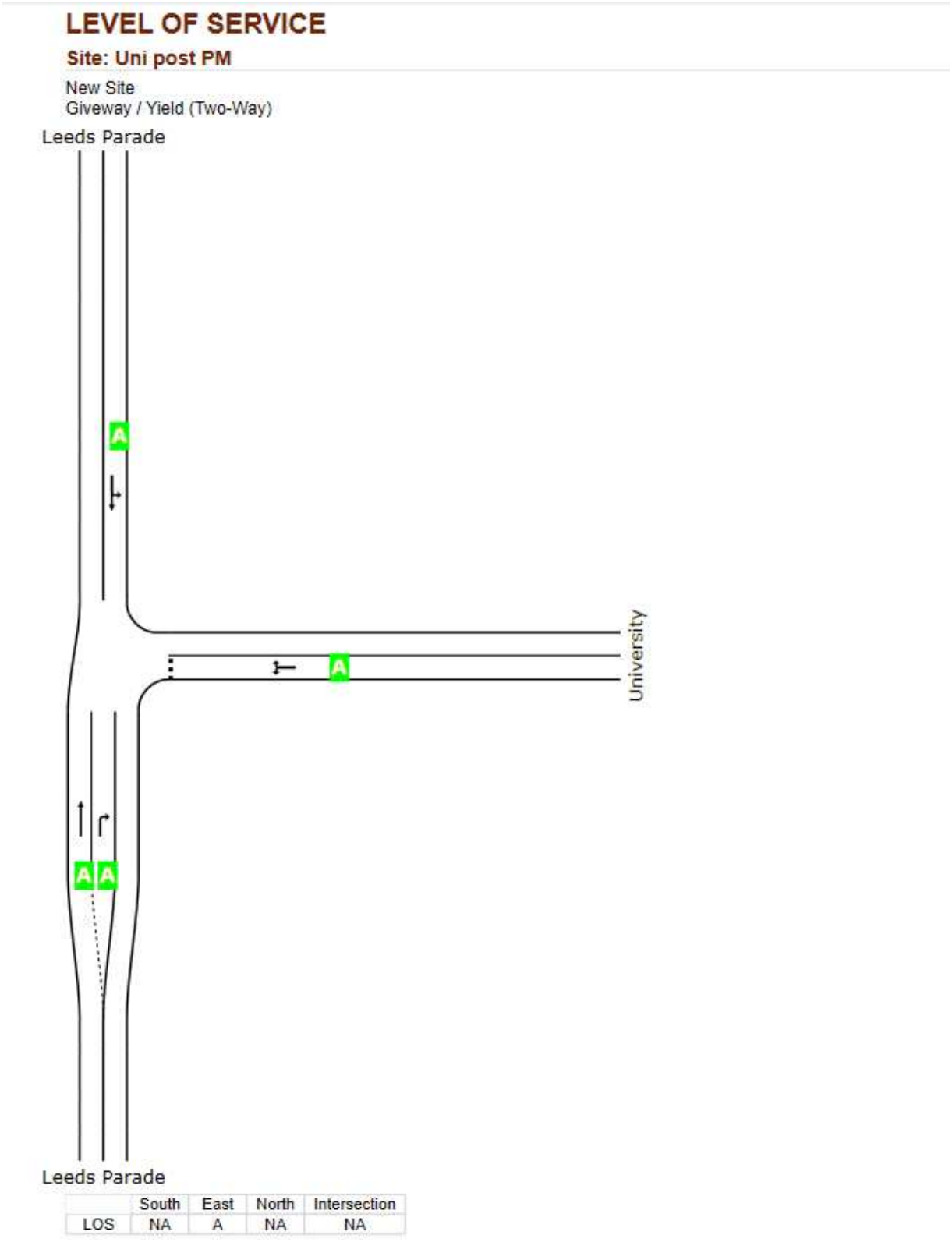


Figure 13: University Ent Int – Post Development weekday PM Peak LOS

MOVEMENT SUMMARY

Site: Uni post PM

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Leeds Parade											
2	T1	301	5.0	0.159	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
3	R2	26	5.0	0.016	8.3	LOS A	0.1	0.5	0.21	0.61	42.2
Approach		327	5.0	0.159	0.7	NA	0.1	0.5	0.02	0.05	49.2
East: University											
4	L2	78	5.0	0.061	8.0	LOS A	0.2	1.8	0.20	0.60	42.5
6	R2	5	5.0	0.061	8.0	LOS A	0.2	1.8	0.20	0.60	42.5
Approach		83	5.0	0.061	8.0	LOS A	0.2	1.8	0.20	0.60	42.5
North: Leeds Parade											
7	L2	2	5.0	0.055	0.2	LOS A	0.0	0.0	0.00	0.02	49.8
8	T1	101	5.0	0.055	0.2	LOS A	0.0	0.0	0.00	0.02	49.8
Approach		103	5.0	0.055	0.2	NA	0.0	0.0	0.00	0.02	49.8
All Vehicles		513	5.0	0.159	1.8	NA	0.2	1.8	0.04	0.13	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 is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Figure 14: University Ent Int – Post Development weekday PM Peak hour traffic movements

From the table in **Figure 14**, it can be seen that all movements still operate at a LOS A, with the worst average delay of 8.3 seconds for the right turn movement off Leeds Parade into the University. The 95% back of vehicles is less than 1 vehicle indicating the existing right turn lane length is adequate.

As stated in **Section 2.6.3** it is expected that the weekday AM peak hour movements will be the critical time period with more vehicles attempting the right turn into the University. Based on the assumptions outlined in **Section 2.6.3**, a SIDRA analysis was carried out for the Leeds Parade/University Entrance intersection under post development conditions during the weekday AM peak hour. The post development traffic and turning movements used in the SIDRA analysis is shown in **Figure 15**.

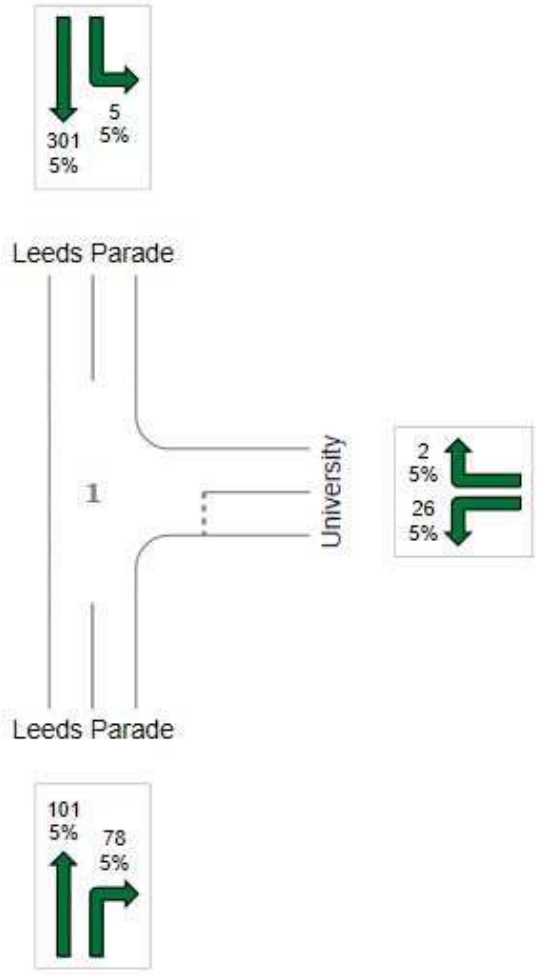
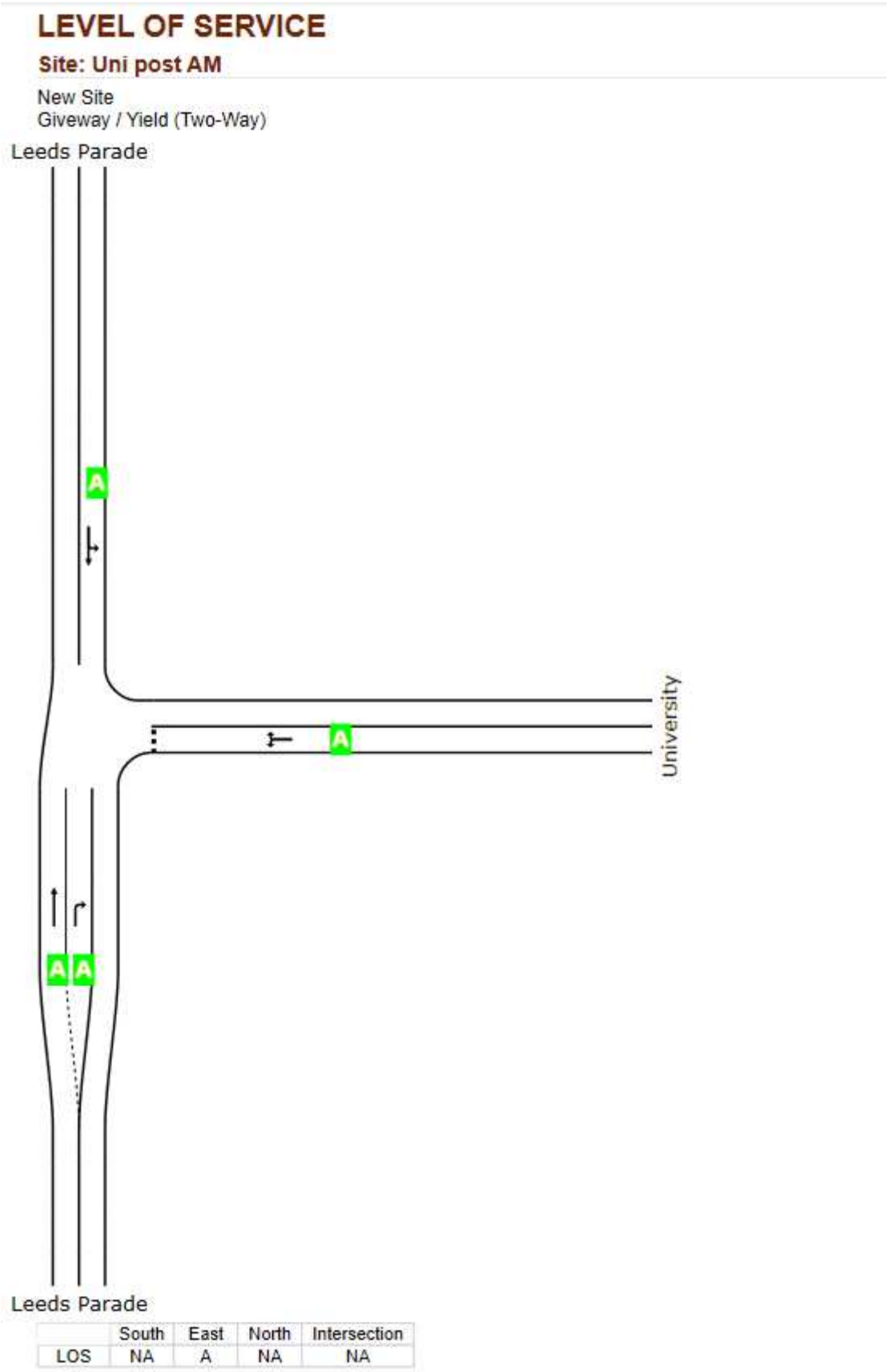


Figure 15: University Ent Int. – Post development weekday AM Peak hour traffic volumes

Figure 16 illustrates the post development weekday AM peak hour Level of Service (LOS) for the Leeds Parade/University Entrance intersection and **Figure 17** provides the SIDRA movement summary. Full results of the SIDRA analysis are provided in **Appendix B**.



	South	East	North	Intersection
LOS	NA	A	NA	NA

Figure 16: University Ent Int – Post Development weekday AM Peak LOS

MOVEMENT SUMMARY

Site: Uni post AM

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Leeds Parade											
2	T1	101	5.0	0.053	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
3	R2	78	5.0	0.060	9.1	LOS A	0.3	1.9	0.40	0.66	41.6
Approach		179	5.0	0.060	4.0	NA	0.3	1.9	0.17	0.29	45.9
East: University											
4	L2	26	5.0	0.025	8.7	LOS A	0.1	0.7	0.38	0.63	41.8
6	R2	2	5.0	0.025	8.7	LOS A	0.1	0.7	0.38	0.63	41.8
Approach		28	5.0	0.025	8.7	LOS A	0.1	0.7	0.38	0.63	41.8
North: Leeds Parade											
7	L2	5	5.0	0.162	0.1	LOS A	0.0	0.0	0.00	0.02	49.8
8	T1	301	5.0	0.162	0.1	LOS A	0.0	0.0	0.00	0.02	49.8
Approach		306	5.0	0.162	0.1	NA	0.0	0.0	0.00	0.02	49.8
All Vehicles		513	5.0	0.162	1.9	NA	0.3	1.9	0.08	0.15	47.9

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 is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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SIDRA INTERSECTION 6

Figure 17: University Ent Int – Post Development weekday AM Peak hour traffic movements

From the table in **Figure 17**, it can be seen that all movements still operate at a LOS A, with the worst average delay of 9.1 seconds for the right turn movement off Leeds Parade into the University. The 95% back of vehicles is less than 1 vehicle indicating the existing right turn lane length is adequate.

3.4.4 IMPACT SUMMARY

The assessment of the impact of the traffic generated by the development of the proposed subdivision on the surrounding road network has determined that the impact on:

i. Traffic Volume; and

ii. Intersection Capacity

The greatest increase in the weekday PM peak hour traffic following the development of the proposed subdivision occurred on the northbound lane of Leeds Parade (south) with an increase in traffic volume of approximately 1,171%.

Whilst the percentage increase in traffic volume on the northbound lane of Leeds Parade (north) appears extremely excessive, the total peak traffic volume of 356 vehicles per hour is significantly less than the existing capacity of 900 vehicles per hour per lane.

All roads assessed are well below their capacity with the northbound lane of Leeds Parade (south) closest to capacity at 72%. Hence all roads are able to accommodate the increased additional peak hour traffic generated by the proposed development.

The increase in traffic from the proposed development provides for a more even distribution of traffic entering and leaving the roundabout at the intersection of Leeds Parade and Northern Distributor Road. SIDRA analysis of the roundabout showed that this resulted in an increase in the LOS on some legs with no decrease in the LOS on any legs. The overall average delay at the roundabout decreased from 14.8 seconds under existing conditions to 9.5 seconds under post development conditions.

SIDRA analysis of the intersection on Leeds Parade at the University entrance showed that that all movements at the intersection operate at a LOS A under post development conditions, with the worst average delay of 9.1 seconds for the right turn movement off Leeds Parade into the University during the weekday AM peak hour. The 95% back of vehicles for this movement is less than 1 vehicle indicating the existing right turn lane length is adequate.

Whilst the expected increases in traffic volume are significant, the capacity of the existing surrounding roads and intersections analysed are sufficient to cater for the post development traffic volumes and to disperse such traffic into the surrounding road network.

Recommendations

This Traffic Impact Assessment has evaluated the traffic generating potential of a proposed 450 lot rural residential subdivision in North Orange and has assessed the impact of the additional traffic generated on the surrounding roads and intersections.

The TIA has found that whilst the expected increases in traffic volume are significant, the capacity of the existing surrounding roads and intersections analysed are sufficient to cater for the post development traffic volumes and to disperse such traffic into the surrounding road network.

In completing the assessment of the impact of the traffic generated by the proposed development, the following recommendations are made:

- The design of all internal roads within the proposed subdivision shall be carried out to appropriate standards and the requirements of Orange City Council;
- The design of the subdivision should include a threshold entry treatment on Leeds Parade to clearly indicate the beginning of the large lot residential subdivision;
- The existing bicycle/pedestrian path on Leeds Parade should be extended to and into the proposed subdivision;
- Consideration should be given to widening Leeds Parade to provide full line marking and sealed shoulders to improve road safety and minimise future maintenance costs.

References

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Appendix A

T&TPA TRAFFIC REPORT

Appendix B

SIDRA ANALYSIS DATA