LYON GROUP

Seniors Living Development

795 to 821 Old Northern Road, South Dural

DECEMBER 2017

Question today
Imagine tomorrow
Create for the future

Seniors Living Development
795 to 821 Old Northern Road, South Dural

Lyon Group

WSP
Level 27, 680 George Street
Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001

Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
wsp.com

REV	DATE	DETAILS
A	2/11/2017	Draft for review
B	21/12/2017	Final

	NAME	DATE	SIGNATURE
Prepared by:	Amol Kingaonkar	20/12/2017	
Reviewed by:	Tom van Drempt	20/12/2017	
Approved by:	John Webster	20/12/2017	

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABBREVIATIONS

vpd	Vehicles per day
Vph	Vehicles per hour
AADT	Average Annual Daily Traffic
AM peak	Morning peak hour during 7:00–9:30 am
PM peak	Afternoon peak hour during 4:00–6:00 pm
TMAP	Transport Management and Accessibility Plan

1 INTRODUCTION

The Lyon Group is proposing to develop a seniors living facility on Lot X DP 399017 (795-803 Old Northern Road) and Lot 3 DP 576771 (805–821 Old Northern Road) in Dural (the Study Site). WSP Australia has been commissioned by APP Corporation Pty Limited, on behalf of the Lyon Group to prepare a transport impact assessment (TIA) for the proposed development. These lots currently contain three residences and vacant land.

This report will be submitted to Hornsby Shire Council (Council) in support of a Site Compatibility Certificate (SCC) application.

1.1 SOUTH DURAL TRANSPORT MANAGEMENT AND ACCESSIBILITY PLAN

In October 2013, a planning proposal was submitted to Hornsby Shire Council on behalf of landowners to rezone 240 hectares of land in South Dural for urban residential development. This planning proposal resulted in a Gateway Determination on 12 March 2014. The Gateway Determination summarised the additional work required to precede the rezoning at South Dural.

On 12 September 2016, an application for the rezoning of the land was submitted. WSP prepared a Transport Management and Accessibility Plan in support of the planning proposal for the rezoning on behalf of the South Dural Resident and Ratepayers' Association, including the Folkestone-Lyon Joint Venture. This TMAP:

— Assessed the traffic impact of the rezoning site on the surrounding road network.

— Sought to maximise the use of public transport, walking and cycling and reduce reliance on the private car.

— Identified a package of infrastructure and non-infrastructure measures to help manage the travel demand from the development and mitigate the impacts on the surrounding road network.

On 8 February 2017, Hornsby Shire Council halted its evaluation of the proposed rezoning until an infrastructure plan could be prepared that had the support of the NSW Government.

The rezoning proposed a mixture of land uses, mainly including low and medium density residential and open space. The proposed seniors living facility proposed for this application represents a lower-intensity land use from a traffic generation perspective than the land use assessed for the rezoning. The currently proposed development would reduce pressure on the surrounding road network by reducing the total number of trips. The peak period of traffic generation is also likely to occur after the typical AM peak period on the road network.

1.2 DEVELOPMENT LOCATION

The proposed Seniors Living development site is located to the east of the Round Corner on the southern side of Old Northern Road in South Dural, as shown in Figure 1.1. It is located in Hornsby Shire Council area adjacent to its boundary with The Hills Shire Council. It is approximately 34-kilometres north-west of Sydney CBD. The site is 400 metres from Round Corner in the west, and 6.3 km from the Castle Hill Town Centre in the south.

Figure 1.1 South Dural Senior Living site location

1.3 SCOPE OF THIS REPORT

This report is structured as follows:

- Section 2 provides an overview of existing transport conditions in the area around the development
- Section 3 details the proposed development
- Section 4 analyses the trip generation of the proposed development as well as the impact of the development on the surrounding road network and on public transport, pedestrians and cyclists
- Section 5 assesses the site access and parking within the site
- Section 6 presents the conclusions of the assessment and lists the recommendations.

2 EXISTING CONDITIONS

The Study Site is located with frontage access to the southern side of Old Northern Road. This section describes the existing transport conditions in order to quantify the potential impacts of the proposed development.

2.1 TRAVEL BEHAVIOUR

The travel behaviour of existing nearby residents varies widely, and the seniors living demographic will have different travel behaviour than other residents. However, mode share and travel direction are useful when considering the proposed development.

TRANSPORT MODE SHARE

The choice of travel mode varies depending on the range of transport services available, car availability, need for predictable arrival, the length of the journey and the reason for travelling. The Journey to Work mode share for trips originating in 2011 Traffic Zones 4558, 4529, 4312, 4546, 4311, 4557, 4310 (covering study site) during the AM peak are shown in Table 2.1. They indicate a typical dominance of trips made by car driver. However, with the opening of the North West Metro Line, improvements to the bus network and pedestrian and cycle infrastructure, this mode share is expected to change in the future.

Table 2.1 AM peak period mode split examples for journey to work trips by residents

Transport mode	Mode share
Vehicle driver	82%
Vehicle passenger	6%
Train	3%
Bus	6%
Walked only	1%
Other mode	1%
Mode not stated	1%
Total	**100%**

Source: Transport for NSW Transport Performance and Analytics, Journey to Work, 2011

DIRECTION OF TRAVEL

The trip distribution for journey to work trips (all modes) in the AM peak to and from the area are listed in Table 2.2. Trips within Baulkham Hills represent the largest share of all destinations/origins (more than one quarter). For trips by residents to work, areas within The Dural and Sydney Inner City are also important.

Table 2.2 Destination and origin council area for commute trips to/from seven Traffic Zones

Destination LGA	% of trips from zone
Baulkham Hills	30%
Dural–Wisemans Ferry	17%
Sydney Inner City	7%
Parramatta	5%
Ryde–Hunters Hill	4%
Blacktown	3%

Destination LGA	% of trips from zone
Hornsby	3%
Other areas	31%
Total	100%

Source: Transport for NSW Transport Performance and Analytics, 2011 Journey to Work (BTS, 2013), Traffic Zones 4558, 4529, 4312, 4546, 4311, 4557, 4310, all modes

2.2 PEDESTRIANS

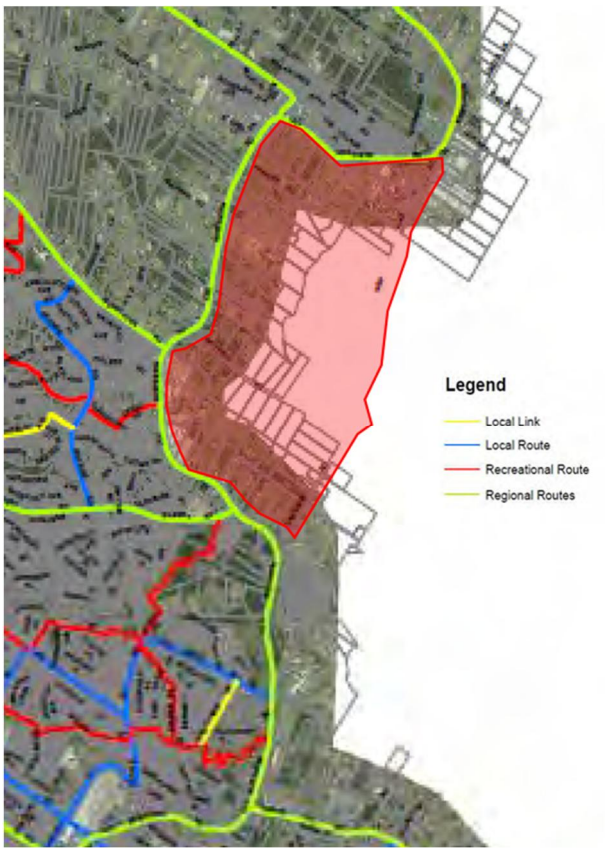
The semi-rural nature of the area surrounding the site, means that pedestrian demand is low. As a consequence, pedestrian facilities are currently limited. However, improvements in the pedestrian network are planned to increase in the number of walking trips generated by the Site. Existing facilities include:

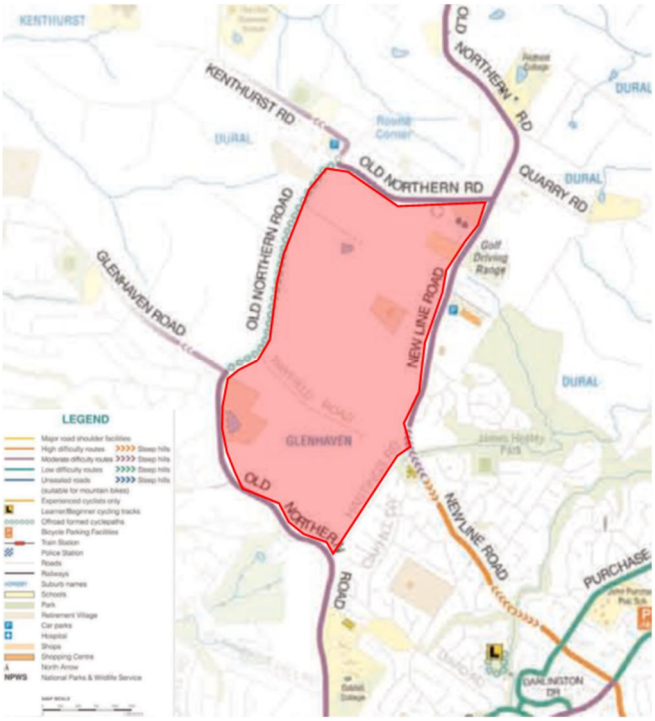
— Signalised pedestrian crossing at the intersection of Old Northern Road and Kenthurst Road; and

— Shared pedestrian and cycle path on the western and northern side of Old Northern Road.

2.3 CYCLES

An extract from the Hornsby Shire Council Cycling Map 2013 in Figure 2.1, shows the existing routes. The surrounding roads currently have no bike facilities.





Source: Hornsby Shire Council Cycling Map Routes

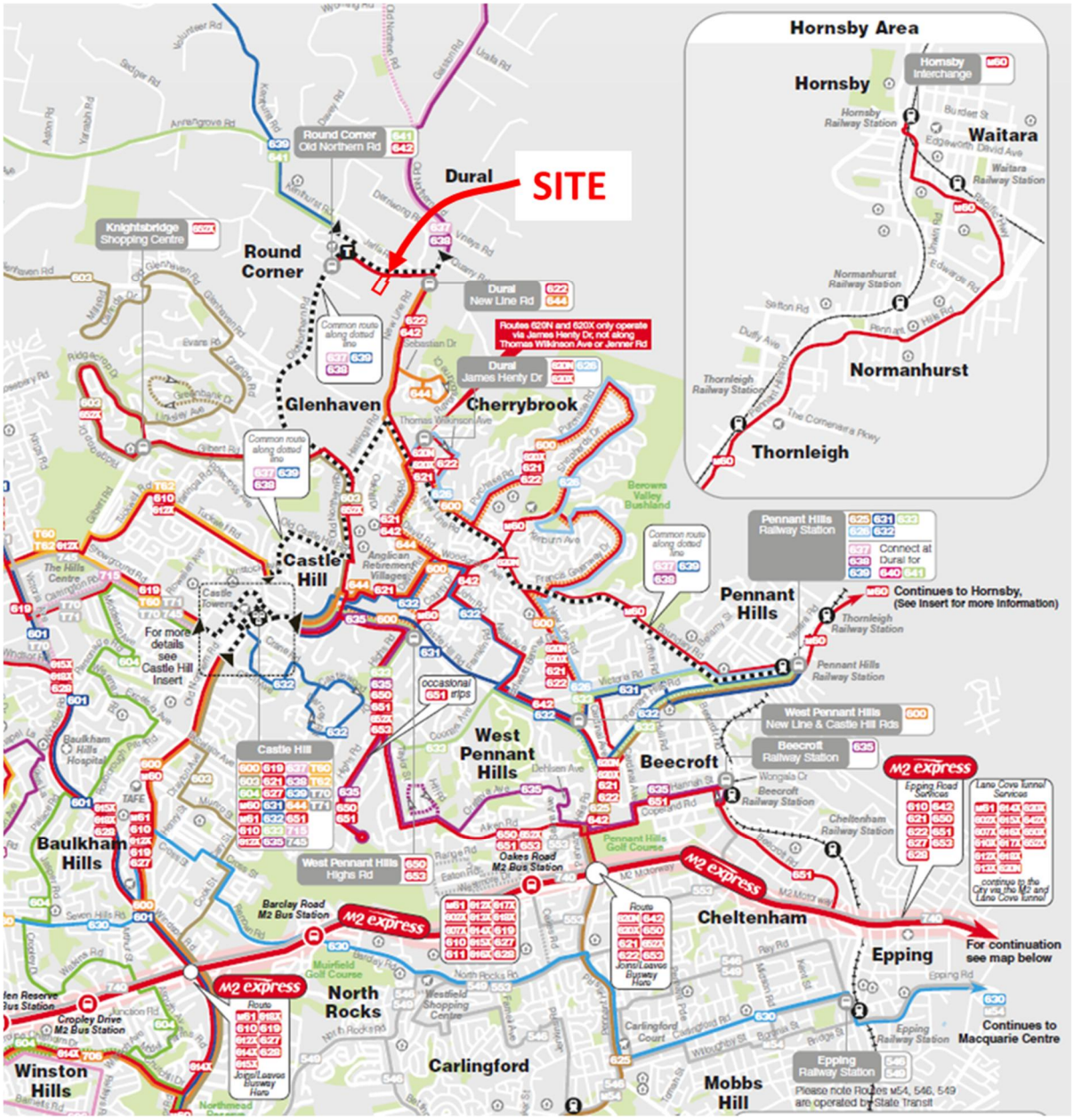
Source: The Hills Shire Council Bike Plan Review, 2009

Figure 2.1 Existing bike route on surrounding road network of the development site

2.4 BUS

The study site is within Region 4 of the Sydney bus network. The Region 4 bus network is shown in Figure 2.2. The development site is located in the less developed rural area, and it is served by nine bus routes, with four bus routes (620, 622, 642 and 644) on New Line Road and five bus routes (603, 652X (south of Gilbert Road only), 637, 638 and 639) on Old Northern Road. All of these bus routes are operated by Hills Bus Company.

Route 637 runs from Glenorie to Castle Hill via Galston, Round Corner and Rogans Hill, and its occasional peak hour services extend to Pennant Hills Station. Route 638 runs from Castle Hill towards Berrilee via Galston, Round Corner and New Line Rd, and its occasional peak hour services operate to Castle Hill. Routes 639 runs from Castle Hill towards Pitt Town Road via Dural, Round Corner and Rogans Hill. These three bus routes all pass by the study site along Old Northern Road. Routes 638 and 639 provide direct connection between the study site and Pennant Hills Station.



Source: *Region 4 Bus Network Map Effective 19 February 2017*

Figure 2.2 South Dural bus network

Table 2.3 provides an overview of the bus service frequency and operating hours on the surrounding streets.

Table 2.3 Current bus services at surrounding roads of the development site

Line	Direction	AM peak frequency	PM peak frequency	Daily services	First/Last bus
637	Glenorie to Castle Hill	30 min	30 min	14	5:28 to 19:43
	Castle Hill to Glenorie	45 min	25 min	15	7:09 to 21:48
638	Berrilee to Castle Hill and Pennant Hills	40 min	35 min	8	6:16 to 17:44
	Castle Hill and Pennant Hills to Berrilee	40 min	60 min	7	7:44 to 18:18
642	Dural to City	6–20 min	-	29	5:20 to 14:30
	City to Dural	-	4–10 min	30	12:20 to 19:01

Source: TfNSW website, as of October 2017

2.5 RAIL

The closest active railway station to the study site is Pennant Hills Station on the T1 North Shore and Northern Line (shown on Figure 2.3. From the centre of the study site to Pennant Hills Station, the route distance is around 10 km and accessed less than 30 mins via bus routes 637, 638 and 639. Trains on the T1 line operate between Central and Hornsby, with options to interchange at Epping Station to trains on the T1 Northern Line (via Strathfield) and the Central Coast and Newcastle Line.

Figure 2.3 Pennant Hills connection to Sydney Trains suburban network

Table 2.4 provides an overview of the train service frequency and operating hours at Pennant Hills Station.

Table 2.4 Train services at Pennant Hills Station

Line	Direction	AM peak frequency	PM peak frequency	Daily services	First/Last bus
T1 North Shore and Northern Line	Hornsby to Central	15 min	15 min	73	4:48 to 23:33
	Central to Hornsby	15 min	15 min	71	5:54 to 00:36

Source: Sydney Trains timetable, effective from October 2013

2.6 ROAD NETWORK

The Study Site is bordered on its northern boundary by Old Northern Road. To the east is New Line Road while to the west at Round Corner is the nearby intersection with Kenthurst Road. A description of the roads in the study area and their characteristics are shown in Table 2.5.

Table 2.5 Description of key roads in the local network

Road name	Classification	Carriageway	Speed limit	Truck load restriction	Role in network
Old Northern Road	Management hierarchy 4U	Undivided one lane in each direction	60 km/h	No restriction	Provides access to the south, west and north of the site
New Line Road	Management hierarchy 4U	Undivided, one lane in each direction	60 km/h	No restriction	Provides access to the site from eastern direction.
Kenthurst Road	Connector Road	Undivided, one lane each way	60 km/h	8 tonne limit	Connects the northwest of the development site to Kellyville

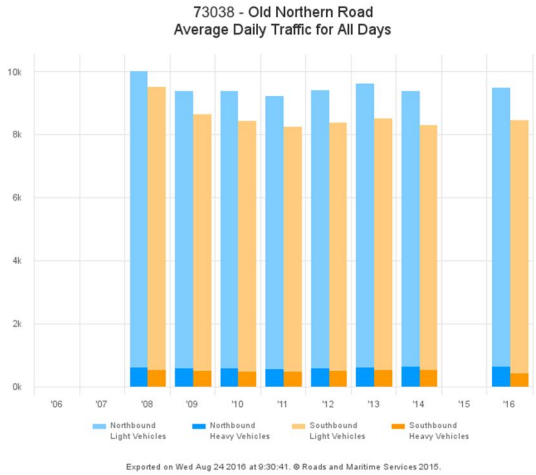
Notes: Old Northern Road and New Line Road information is from Roads and Maritime (Last update January 2014).'Schedule of Classified Roads and State and Regional Roads' http://www.rms.nsw.gov.au. *2. Information of other roads is from Street Directory*

DAILY TRAFFIC VOLUMES

Roads and Maritime Services collects traffic volume data at a number of locations on the arterial road network, including on Old Northern Road and New Line Road near the site. Table 2.6 shows the daily traffic volume and percentage of heavy vehicles at the Old Northern Road site, while Figure 2.4 shows the weekday y hourly profile of traffic in each direction.

Table 2.6 2016 Average Daily Traffic volume on Old Northern Road, south of Malabar Road

Direction	Daily traffic volume	Percentage of heavy vehicles
Northbound	9,496	6.82%
Southbound	8,475	5.36%
Combined	17,971	6.13%



Source: Roads and Maritime Services Traffic volume viewer, 2016

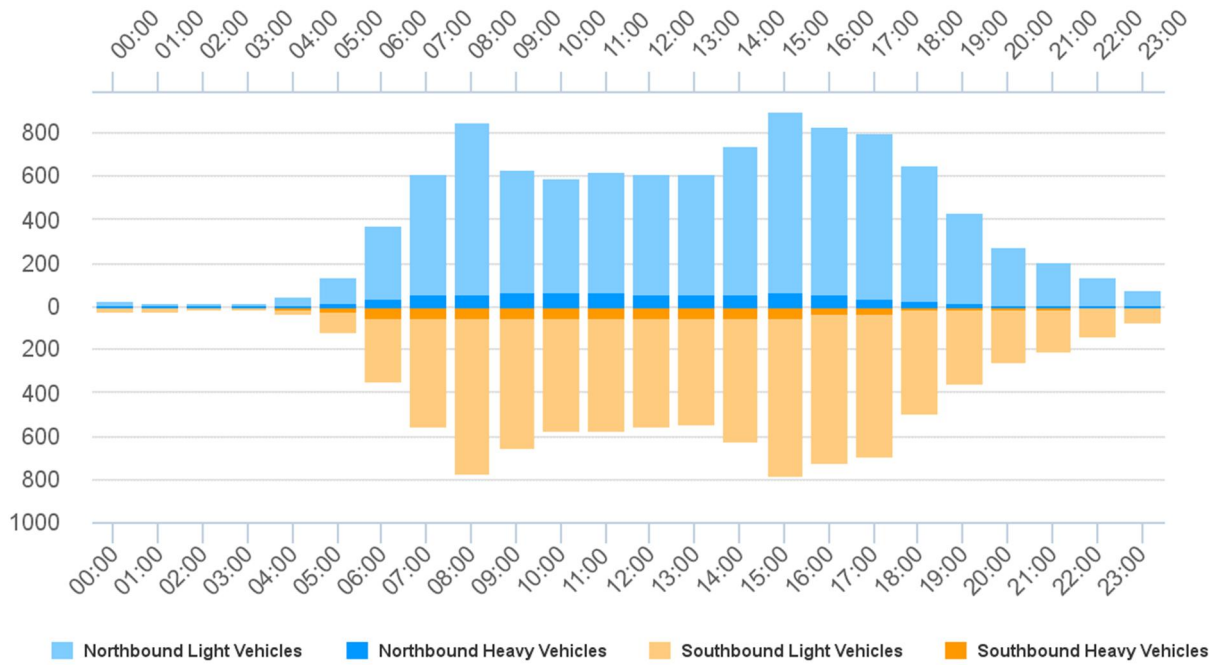


Figure 2.4 Hourly profile of traffic on Old Northern Road, south of Malabar Road

The hourly pattern shows a balanced peak in traffic in each direction in both the AM and PM peak periods. The PM peak is more protracted, while the AM peak is relatively short.

PEAK HOUR TRAFFIC VOLUMES

Traffic surveys were undertaken on Wednesday 6 April 2016 between 6:30 am and 9:30 am during the AM peak and 3:00 pm to 7:00 pm during the PM peak at the intersections below. The results of the surveys are included in Appendix A:

— Old Northern Road and Kenthurst Road

— Old Northern Road and New Line Road.

Figure 2.5 and Figure 2.6 show the intersection turning movement volumes in vehicle per hour (vph) during the analysed AM and PM peak hour respectively. These are considered representative of the existing volumes for the assessment of the existing conditions and model calibration.

TRAFFIC NETWORK OPERATION

The performance of each of the following intersections was analysed under existing conditions:

— Old Northern Road and Kenthurst Road

— Old Northern Road and Site Access.

The analysis was undertaken using the SIDRA Intersection software package. This package provides several useful parameters to determine the level of intersection performance. Explanations of the criteria used are provided in Appendix B.

Typically acceptable intersection performance is defined as follows:

— LoS D or better (the worst case scenario of vehicle delay was less than or equal to 56 seconds)

— Degree of Saturation (DoS) less than equal to 0.8 at priority controlled intersection, and 0.90 at a signalised controlled intersection

— 95th percentile back of queue does not interfere with other traffic movements.

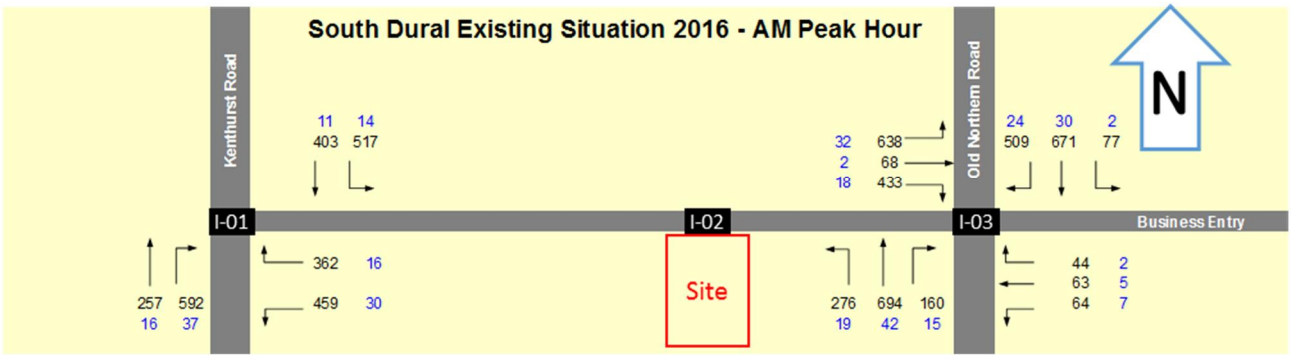


Figure 2.5 Existing AM peak hour (7:45 am to 8:45 am) intersection turning volumes – Year 2016

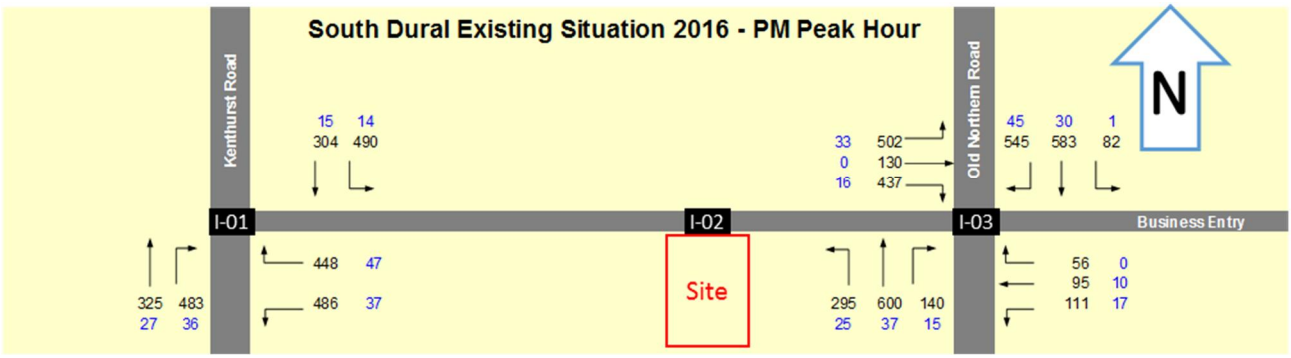


Figure 2.6 Existing PM peak hour (3:00 pm to 4:00 pm) intersection turning volumes – Year 2016

The performance of each of the key intersections was analysed for existing year 2016. The assessment of existing intersection performance was based on the existing surveyed traffic volumes for the AM and PM peak periods shown in Figure 2.5 and Figure 2.6. The results from the analysis are presented in Table 2.7. SIDRA model output containing more detail is provided in Appendix C.

Table 2.7 Summary of existing intersection performance

Site id	Intersection	Peak period	Degree of Saturation	Average Delay (s)	Level of Service	95th percentile queue (m)
I-01	Old Northern Road and Kenthurst Road	AM	0.98	37	C	252
		PM	0.97	30	C	224
I-03	Old Northern Road and New Line Road	AM	1.06	96	F	411
		PM	0.94	34	C	154

At present, the intersection of New Line Road with Old Northern Road is running with an unacceptable Level of Service (LoS) F both in the AM peak, but LoS C during PM peak. All other intersections are operating at an acceptable level of service.

3 PROPOSED DEVELOPMENT

The consolidated site has a total area of 36,318.7 m^2. The five land parcels are zoned as rural landscape (RU2) as part of the Hornsby Local Environmental Plan 2013.

3.1 DEVELOPMENT PROPOSAL

The proposed development site is anticipated to have a total of 21,228 m^2, including:

— 7,494 m^2 Residential Care Facility (RCF) with 120 beds;

— 24 free-standing seniors living houses (approximately 5,280 m^2); and

— 8,454 m^2 apartments.

Based on similar facilities, it has been estimated that there would be 94 apartments within the space allocated. homes and 120 high-care residential aged care facilities, as outlined in Figure 3.1 and Table 3.1 outline the number and location of dwellings and beds.

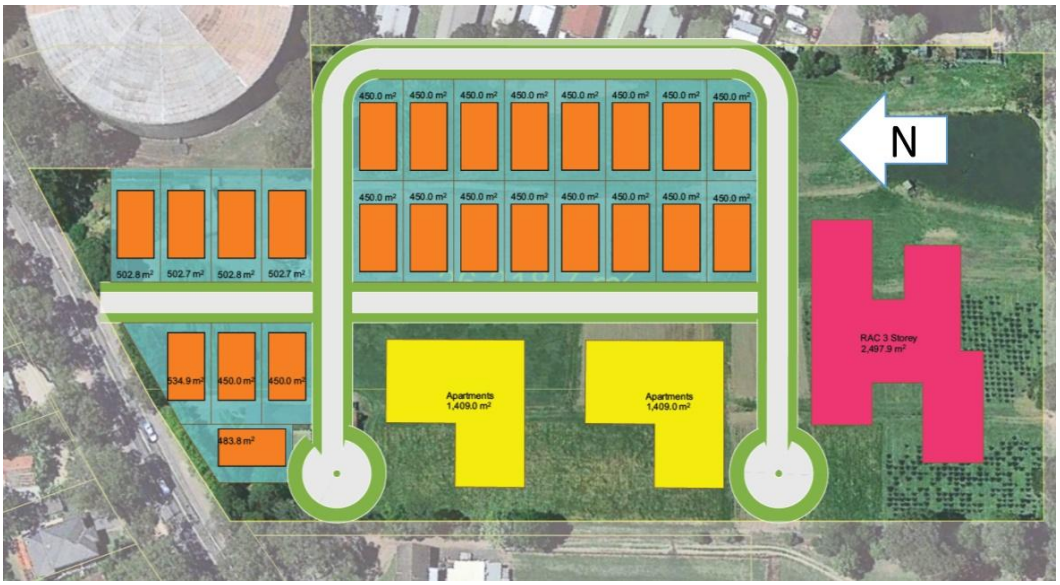


Figure 3.1 Development Layout (for information only)

Table 3.1 Estimated development yields

	Area (m^2)	Number of dwellings
Apartment	8,454	94
House	5,280	24
RACF	7,494	120
Total (excludes green area to the east)	**21,228**	**238**

3.2 STREET LAYOUT

The proposed road layout is shown in Figure 3.1. It consists of:

— One intersection on Old North Road with a development access road

— Main loop street through the site

— Minor streets connected to the main loop street

— Pedestrian access to Old Northern Road at the intersection with the development access road.

The roads within the development would be designed based on the requirements of Hornsby Shire Council Development Design Specification 0041 Geometric Road Layout (July 2016), where applicable.

The street network has been designed to locate the first access intersections on the development access road a sufficient distance away from Old Northern Road to avoid westbound queuing from blocking the intersection. The distance of approximately 90 m longer than the forecast queue length. The internal streets would be designed to facilitate two-way flow with some on-street parking (7.5 m carriageway).

3.3 ACCESS

Vehicle access into the Site will be via a new access road intersection with Old Northern Road. Streets and driveways to apartments and RCF would be able to be accessed by service vehicles such as fire tankers, ambulances and bushfire tankers.

Pedestrian access would be via a new footpath on the southern side of Old Northern Road. Streets within the development would have a footpath on one or both sides.

It is proposed that the intersection of Old Northern Road and development access road be an unsignalised intersection, with a pedestrian refuge adjacent to the eastbound bus stop on the northern side of Old Northern Road (approximately 45 metres to the west of access road).

3.4 PARKING

Parking for houses and apartments within the development would be provided on the basis of the following rates from State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004.

Houses:[1]

— two spaces per three self-contained houses plus one visitor space for every five houses

Apartments:

— 0.5 car spaces for each bedroom where the development application is made by a person other than a social housing provider, or one car space for each five dwellings where the development application is made by, or is made by a person jointly with, a social housing provider.

RCF:

— One parking space for each 10 beds in the residential care facility, and

— Visitor spaces of 0.5 spaces per bedroom for the residential care facility.

[1] Ku-ring-gai Development Control Plan (2016)

— One parking space for each two persons to be employed in connection with the development and on duty at any one time, and

— One parking space suitable for an ambulance.

On-street visitor parking would generally be provided in 90-degree parking bays.

Parking would be designed in accordance with *Australian Standard AS2890.1-2004 Parking Facilities Part 1 Off-street car parking*. Loading facilities would be required for the RCF, designed to the requirements of *Australian Standard AS2890.2-2002 Parking Facilities Part 2: Off-street commercial vehicle facilities.*

4 IMPACT ASSESSMENT

The residential development will result in an increase in trips over the existing land uses. This section estimates the amount of additional travel and assesses its impact on the transport network.

4.1 TRIP GENERATION

Roads and Maritime Services *Technical Direction TDT2013/04a Guide to Traffic Generating Developments Updated traffic surveys (Appendix C1 – Seniors Living)* was used as the basis of the trip generation estimate for the proposed development. Of the twelve sites surveyed in the Roads and Maritime document, Site SH3 (*Courtlands Village* in North Parramatta) was considered to most closely match the proposed development at South Dural. These figures were used to estimate vehicular trip generation during morning and afternoon peak hours. The Roads and Maritime trip generation rates used for estimating traffic from the proposed seniors living development are summarised in Table 4.1below.

Table 4.1 RTA Trip Generation rates

Parameter	Relevant value (Site SH3)
Total Units	238
No. of occupied Units	228
Daily Trip Rate (vpd)	1.44
Site Peak Hour Trip Rate (vpd)	0.23
PM Peak Hour Trip Rate (vpd)	0.05

As described in the Roads and Maritime Technical direction, the seniors living sites surveyed did not have morning peak hour coinciding with that of the wider road network. The seniors living sites were observed to have peak traffic generation after 9:00 am.

The forecasts presented below in Table 4.2 outline the expected vehicle movements during this sole peak period. There is a significantly greater number of vehicle movements during this period than in the peak period of the wider network.

Table 4.2 Trip generation forecasts for proposed development

	No. of occupied units	Site peak hour traffic (vph)	Assumed AM peak hour traffic (vph)*	PM peak hour traffic (vph)	Weekday daily traffic (VPD)
Apartment	90	21	21	5	130
House	23	5	5	1	33
RACF	115	26	26	6	166
Total	228	52	52	12	329

Notes * AM peak hour traffic = Site peak hour traffic

Adopting a conservative approach, it was assumed that the morning peak hour traffic generated by the proposed development will be equal to that of Site peak hour (not coinciding with the network morning peak hour).

4.2 TRIP DISTRIBUTION

The trip directions listed in Table 2.2 were adjusted for trip purposes other than commuting using the TfNSW Household Travel Survey (HTS). The adjusted trip directions for total trips are summarised in Table 4.3 below.

Table 4.3 Assumed trip directions based on HTS and JTW

Direction	Residential HTS
West	5.0%
North-West	35.0%
North	7.5%
North-East	5.0%
East	5.0%
South-East	5.0%
South	30.0%
South-West	5.0%
Internal	2.5%
Total	100.0%

The Roads and Maritime Technical Direction did not provide any guidance regarding directional split of development traffic. The proposed Seniors Living development was assumed to have the directional split in Table 4.4.

Table 4.4 Directional Split for Development Generated Traffic

	Entering Traffic (%)	Departing Traffic (%)	Total (%)
AM peak	20	80	100
PM peak	80	20	100

4.3 MODE CHOICE

The North West Metro Line (currently under construction) and the associated bus service changes are expected to provide good levels of access public transport services in the future. This combined with plans for improved pedestrian facilities to Round Corner and bus services/cycle paths to Castle Hill, is expected to result in lower levels of car usage than the existing semi-rural residences.

Given proximity of Round Corner Shopping Centre (approximately 600m from the development), it is anticipated that a significant number of the trips from the development will be on foot (pedestrian trips) and on public transport (bus service). For those residents maintaining a license and vehicle, visitors and staff, there will also be some private vehicular trips generated by the development.

Roads and Maritime survey data indicated that some of the seniors living developments had up to 10 weekly bus services resulting in up to two services on a day. In other words a morning service (to drop off) and an afternoon service (pick up). For this development, access to the public bus network is assumed to facilitate a similar level of bus use. Therefore, the traffic generation rates from the Roads and Maritime Technical Direction were considered appropriate.

4.4 TRIP ASSIGNMENT

The traffic volume estimated for the development was assigned to the road network assuming one access to Old Northern Road and the trip directional splits shown in Table 4.3. Development generated traffic heading south-west, west and north-west was assumed to turn left out of the development access road, and development traffic heading to north-east, north, east, south-east and south was assumed to turn right out of the development access on Old Northern Road.

Trips generated from the proposed development were assigned to key intersections within immediate vicinity of the development site. These key intersections include:

— New Line Road/Old Northern Road

— Kenthurst Road/Old Northern Road.

Comparing these volumes to the observed volume of traffic on Old Northern Road, it was assessed that the morning and afternoon peak hour traffic from the development would contribute less than 0.5% of observed peak hour traffic on the road network.

Figure 4.1 Development Traffic Assignment – AM peak hour (PM peak hour)

4.5 FINDINGS AND MITIGATION MEASURES

A preliminary analysis was undertaken using SIDRA intersection modelling. Traffic survey data from previous South Dural TMAP study was used as basis data for this assessment.

4.5.1 FUTURE WITHOUT DEVELOPMENT

The South Dural TMAP report indicated that, by 2026 the majority of the road network surrounding the proposed development will require upgrading in one or both directions regardless of whether the development proceeds. The proposed development, representing 0.5% of through traffic on Old Northern Road is not expected to materially change the timing of these upgrades.

The South Dural TMAP assessment assumed upgrading of Old Northern Road and New Line Road to two lanes in each direction, which improves the performance of many intersections. However, this is not sufficient in some locations, where additional upgrades are required. Table 4.5 shows the performance improvements due to the road widening and additional upgrades at Kenthurst Road intersection with Old Northern Road.

Table 4.5 Summary of 2026 future without development intersection performance with road widening

Site ID	Intersection	Peak period	Degree of Saturation	Average Delay (s)	Level of Service	95th percentile queue (m)
I-01	Old Northern Road and Kenthurst Road	AM	1.20	68	E	599
		PM	1.11	55	D	439
I-01	Old Northern Road and Kenthurst Road (with upgrades due to background traffic growth)	AM	0.90	24	B	138
		PM	0.91	28	B	195
I-03	Old Northern Road and New Line Road	AM	1.28	138	F	943
		PM	1.18	126	F	661
I-03	Old Northern Road and New Line Road (with upgrades due to background traffic growth)	AM	0.89	40	C	171
		PM	0.89	51	D	206

Source: South Dural TMAP report

The intersection of Old Northern Road and Kenthurst Road is likely to require upgrades by 2026 to meet the background traffic demand without the proposed development. SIDRA intersection assessment summaries are included in Appendix C.

4.5.2 FUTURE WITH SENIORS LIVING DEVELOPMENT

SIDRA Modelling analysis was undertaken to assess impact of development generated traffic on the surrounding road network. The results of the SIDRA Intersection modelling are summarised in Table 4.6. The indicate that the intersection of Old Northern Road and the development access road can operate as either with a right turn bay into the site and an acceleration lane for the right-turn out of the site.

The results shown below indicate that the development would have a small impact on average delay in the AM peak at the intersection of Old Northern Road and Kenthurst Road, and negligible impact in the PM peak. It would also have a negligible impact at the intersection of Old Northern Road and New Line Road (one second in the AM and PM peaks).

Table 4.6 SIDRA Modelling Output Summary – 2026

Site ID	Intersection	Peak period	Degree of Saturation	Average Delay (s)	Level of Service	95th percentile queue (m)
I-01	Old Northern Road and Kenthurst Road (with upgrades due to background traffic growth)	AM	0.84	29	C	195
		PM	0.95	28	B	215
I-02	Site Access to Old Northern Road (upgraded to with right turn bay and acceleration lane)*	AM	0.40	32	D	2
		PM	0.38	54	D	1
I-03	Old Northern Road and New Line Road (with upgrades due to background traffic growth)	AM	0.91	41	C	185
		PM	0.90	52	D	202

** Average delay and LOS for worst movement presented at the main intersection, small (<6 second delay at secondary merge).*

As shown in Table 4.6 above, site access road intersection with Old Northern Road can operate acceptably in 2026 with full movements. The proposed layout of the intersection of Old Northern Road and the development access road is shown in Figure 4.2.

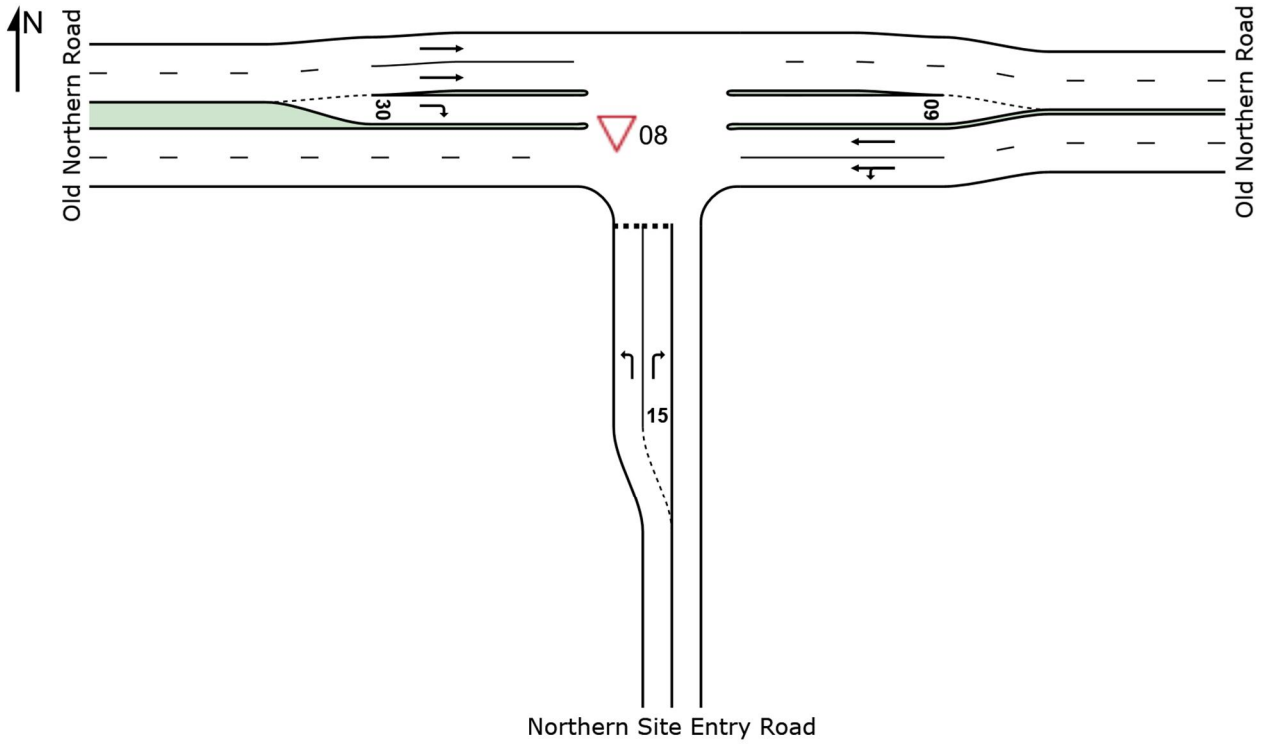


Figure 4.2 Proposed intersection layout

This intersection can also operate with the right-turn out of the site prohibited. However, this would require vehicles making this movement to turn west instead, then turn right into Kenthurst Road, make a U-turn at the Maple Street roundabout, then turn left back onto Old Northern Road (a diversion of approximately 1,650 metres). Further discussion regarding the preferred layout can be undertaken with Roads and Maritime Services and Council, if required.

In the interim until Old Northern Road is widened (i.e. in its current state), the proposed access intersection would have the configuration shown in Figure 4.3.

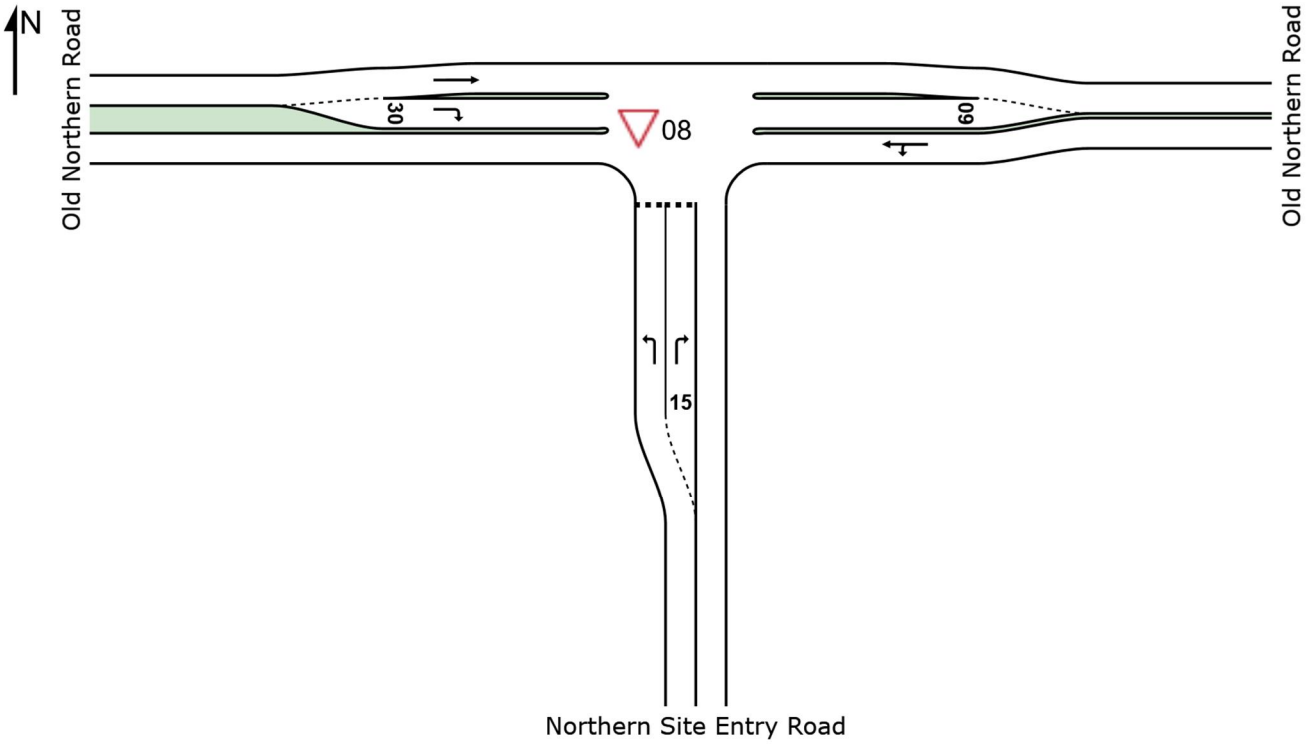


Figure 4.3 Proposed intersection layout – interim

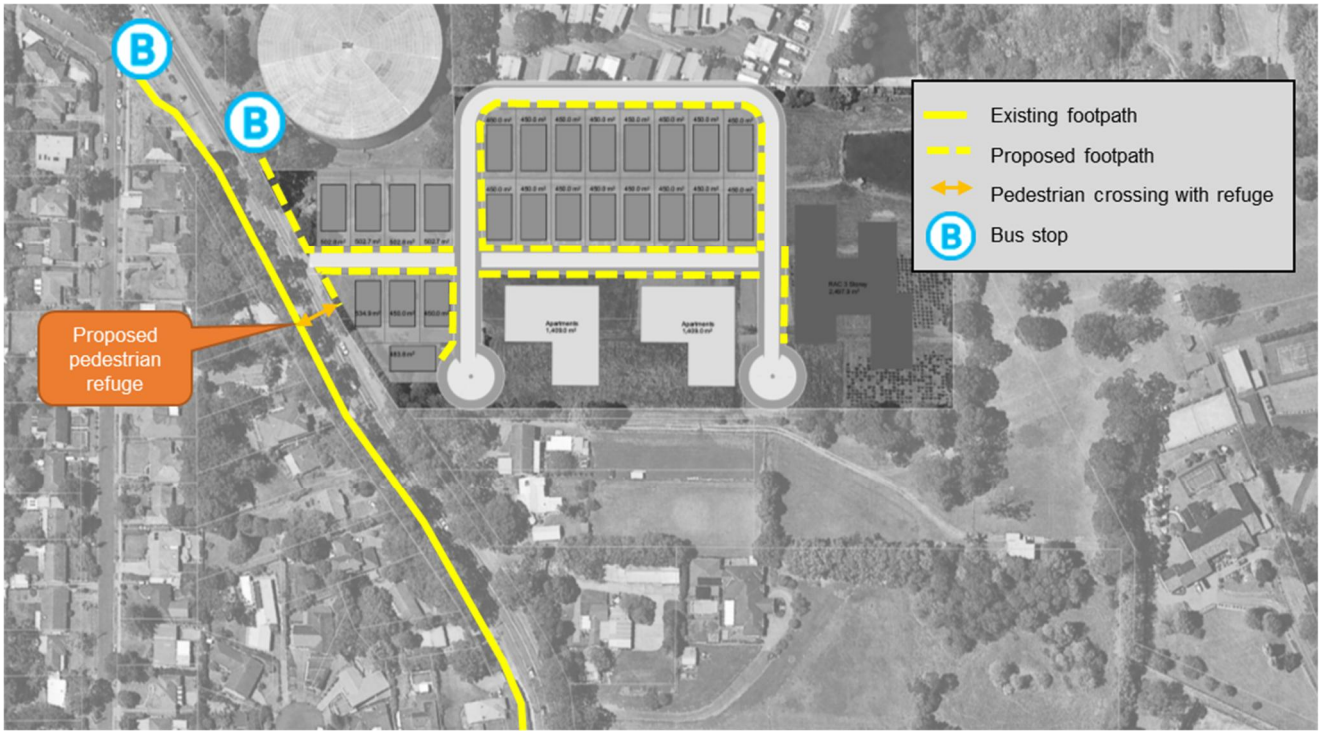
5 PEDESTRIANS AND PUBLIC TRANSPORT ACCESS

Access to the Study Site is consistent with the principles of the TMAP. On-site parking is proposed for residents and visitors. This section outlines the parking and assesses arrangements of the proposed development.

5.1 PEDESTRIANS

The pedestrian network includes footpaths to connect residences to each other and the network along Old Northern Road. Improvements to the network on Old Northern Road are also proposed to connect the Study Site to the Round Corner Shopping Centre. These improvements include:

- A footpath along the southern side of Old Northern Road to bus stop opposite Derriwong Road.
- A pedestrian refuge at the intersection of Old Northern Road and the development access road for pedestrian safety.



Base Image Source: APP and Calder Flower Architects, 2017

Figure 5.1 Proposed pedestrian and public transport network

It is assumed that when Old Northern Road is upgraded to four lanes, this upgrade would include a footpath on the southern side of Old Northern Road, which would connect the site to the traffic signals at the intersection with Kenthurst Road. With this footpath, the refuge west of the site access would no longer be required for this development.

An example of a pedestrian refuge is shown in Figure 5.2. The refuge would include paved footpaths on approach with sufficient width to accommodate wheelchairs, dropped kerbs and tactile paving

Image Source: *Road Safety Toolkit, http://toolkit.irap.org*

Figure 5.2 Proposed pedestrian and public transport network

5.1.1 PEDESTRIAN REFUGE WARRANT ANALYSIS

The inclusion of a pedestrian refuge adjacent to the development access road requires the approval of Roads and Maritime based on warrants. The Austroads publication, *Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings* and the Australian Standard, *AS1742.10-2009: Pedestrian control and protection* were used as the basis for an assessment of whether a pedestrian refuge is warranted. The Australian Standard publication states that a pedestrian refuge can be of benefit if any of the following scenarios applies.

(i) Where four or more traffic lanes have to be crossed, or at signalized crossings where the pedestrian interval is insufficient to guarantee all pedestrians time to cross the full width of the roadway; or

(ii) Where overtaking and speeding can put pedestrians at risk; or

(iii) Where two-way traffic volumes are so high that they make crossing the road difficult or dangerous; or

(iv) Where there are concentrations of pedestrians crossing; or

(v) Where pedestrian signals are poorly used; or

(vi) Where persons with mobility impairment are known to cross the road.

As the intersection of the development access road and Old Northern Road is the only access point for the entire site, pedestrians will be concentrated at this location. There is currently no footpath located on the southern side of Old Northern Road and providing one is difficult given the narrow road reservation, location of property boundaries and the location of trees on the southern side of Old Northern Road between the site and the signalized pedestrian crossing at Kenthurst Road.

Furthermore, the residents of the development may have impaired mobility, and will therefore require a longer time to cross Old Northern Road than other pedestrians.

The Austroads publication states that a pedestrian refuge can be applied where any of the following instances apply:

(i) There are moderate volumes of crossing traffic

(ii) Pronounced desire line or cycle path route

(iii) There is difficulty crossing full width of road in one stage due to:

- *Long delays or unsafe gap selection*
- *Long crossing length of multiple lanes*
- *High vehicle flows or speed*
- *Insufficient sight distance to enable a crossing length of both directions of traffic*

(iv) Need exists to cater for people with disability or mobility difficulty

(v) Pedestrian or cyclist crossings are not expected by motorist

(vi) There are poor crossing options at other locations, or best location to cross is unclear

(vii) There are crossings at numerous locations along short section of road.

In addition to the possible limited mobility of the residents and the lack of other suitable facilities near the development, motorists may not expect any pedestrian crossing facilities (e.g. a marked pedestrian crossing) due to the semi-rural nature of the road. The installation of a pedestrian refuge with appropriate signage would provide the following benefits outlined in the Austroads publication:

(i) Improves accessibility for pedestrians and cyclists

(ii) Users cross one direction of traffic at a time making gap selection easier

(iii) Provides physical protection from vehicles.

Observed traffic volumes on Old Northern Road as part of TMAP assessment were:

- In excess of 1,100 vehicles in peak direction east of Kenthurst Road intersection during AM peak period between 7:00 and 9:00 am
- In excess of 1,000 vehicles in both direction east of Kenthurst Road during afternoon period between 3:00 and 5:30 pm

The Austroads publication advises that the following characteristics are considered for pedestrian refuge islands:

- *The width of refuge islands or other islands or medians used by pedestrians is desirably not less than 3m where there are high pedestrian volumes or significant numbers of cyclists or disabled persons, or 2m in other cases*
- *A refuge island should be sufficiently long to accommodate the pedestrian crosswalk and necessary signs*
- *Approach line marking is needed to ensure that vehicles are safely guided past the island*
- *Refuge islands should not unexpectedly constrict the road width*
- *The number of traffic lanes should be maintained past the island wherever possible, by modifying line marking and banning parking if necessary to provide space for a smooth lane transition around the island*

Given the type of development (seniors living), the lack of alternative infrastructure, and classification of the Old Northern Road, a pedestrian refuge should be provided adjacent to the intersection with the Access Road to provide safer access to the development and to improve pedestrian connectivity from the development to pedestrian footpath along the northern side of Old Northern Road. This upgrade should be timed to suit the timeframe of the opening of the development. It is advisable that appropriate treatments are implemented along the approach to the pedestrian refuge to alert drivers.

5.1.2 SIGHT DISTANCE

The sight distance from the proposed site access and pedestrian refuge location is 220 m to the west and 440 m to the east. Assuming an 85th percentile speed of 70 km/h (10 km/h higher than the posted speed limit) to be conservatively high, the sight distance requirements for the pedestrian refuge and intersection based on the requirements of Austroads *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* (2017) are:

- Crossing Sight Distance = 78 m (assuming a slow walk speed of 1.0 m per second and 4.0 m crossing distance)
- Minimum Gap Sight Distance = 97 m (assuming a critical gap of 5 seconds)
- Safe Intersection Sight Distance = 151 m (assuming a reaction time of 2.0 seconds)
- Approach Sight Distance = 92 m (assuming a reaction time of 2.0 seconds).

Sufficient sight distance in both directions for these proposed access is deemed available.

5.2 BUSES

Bus stops exist on both sides of Old Northern Road served by bus routes 637, 638 and 642. These bus routes operate along Old Northern Road near the site on their way between Castle Hill and Glenorie, Galston, Round Corner, Rogans Hill, Pennant Hills Station (occasional), Berrilee and Dural. To improve the accessibility of the site to these services, and to improve pedestrian safety, the following changes are recommended.

- Eastbound stop (215816) located 150–170 m west of the development access road consists of a bus stop sign attached to a pole.\
- Westbound stop (ID 215817) to the west of development access includes a shelter and U-pole bus stand sign. It is recommended that the stop be improved with a concrete pad for embarking/disembarking low floor accessible buses and a connecting footpath to the development.

These bus stops are also shown on Figure 5.1.

6 CONCLUSIONS

WSP has undertaken a preliminary traffic assessment to support a Site Compatibility Certificate application for the proposed seniors living development within the South Dural precinct. The study has concluded that:

- The site transport arrangements will be able to cater the development traffic
- There will be minimal impacts on the adjacent intersections and road network.

Improved transport facilities proposed to facilitate access to the proposed development for vehicles and pedestrians include:

- A give-way controlled access intersection with a right turn bay into the site and an acceleration lane for the right turn out of the site.
- The proposed upgrading of pedestrian crossing facilities at the intersection of Old Northern Road and the development access road to include a pedestrian refuge. The timing of this upgrade should to match the timeframe of the opening of the development.
- The upgrading of the westbound bus stop on Old Northern Road opposite Derriwong Road with a concrete pad for embarking/disembarking low floor accessible buses and a connecting footpath to the development.

In addition, it is recommended that the development have:

- Parking rates based on the requirements of State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004.
- Parking spaces shall be designed to comply with the requirements of:
  - Australian Standard AS2890.1-2004 Parking Facilities Part 1 Off-street car parking; and
  - Australian Standard AS2890.6-2009 Parking Facilities Part 6 Off-street car parking for people with disabilities.
- Streets within the proposed development site shall be designed to comply with the requirements of:
  - Hornsby Shire Council DCP
  - Hornsby Shire Council Civil Works Specification (AUS-SPEC)
  - Austroads Road Design Guide
  - Australian Standard AS2890.5: On-street parking.
- All internal streets and intersections designed to permit NSW Fire Brigade aerial appliances, Hornsby Shire Council's nominated garbage truck and ambulances.

APPENDIX A

TRAFFIC SURVEYS

South Dural - Traffic Flows

MATRIX Traffic and Transport Data

Search By Time and Classfication

AM / PM	Start Time	End Time	Classification
AM	7:45	8:45	All vehicles

1 Site No.

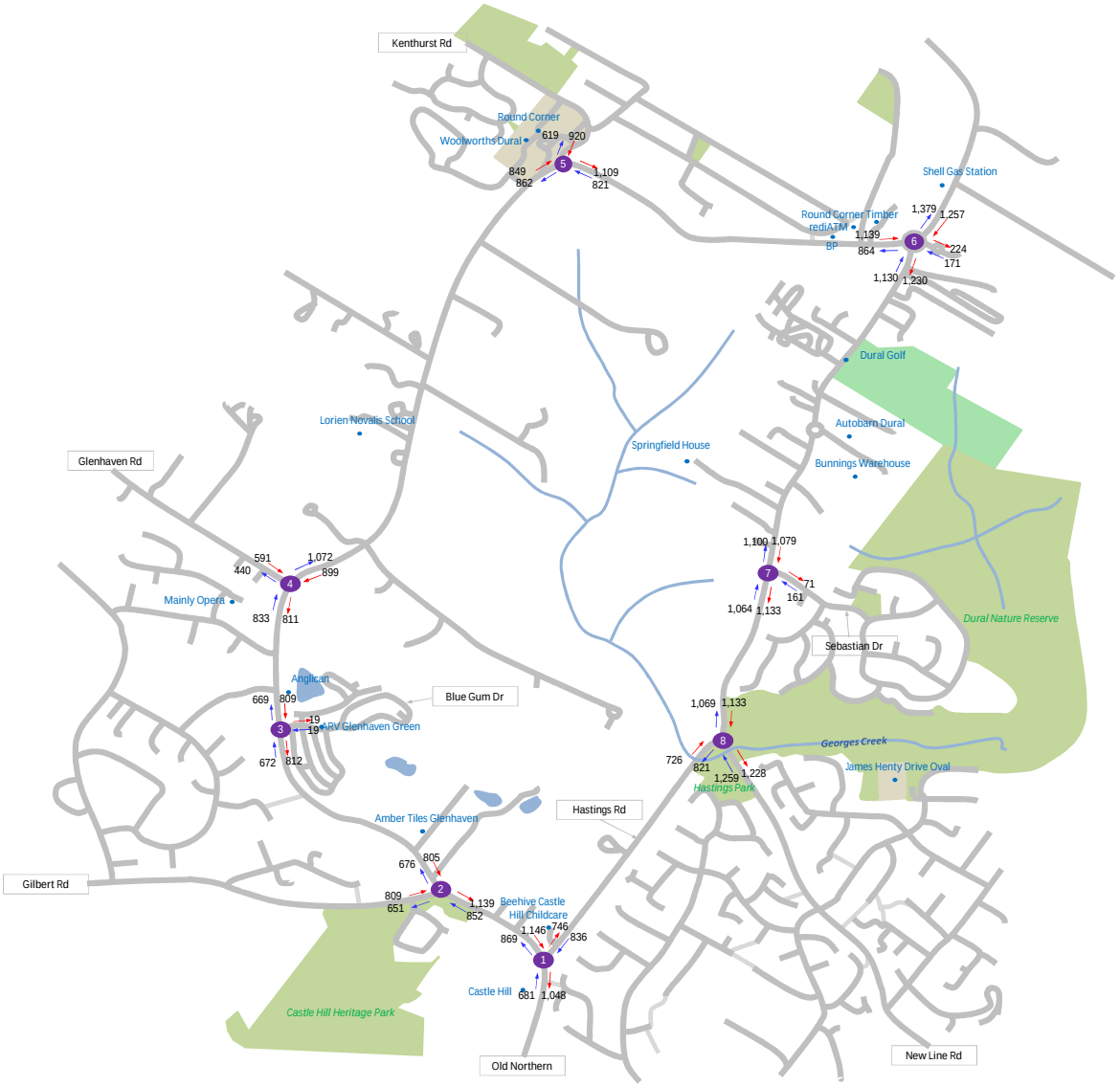
South Dural - Traffic Flows

MATRIX Traffic and Transport Data

Search By Time and Classfication

AM / PM	Start Time	End Time	Classification
AM	7:45	8:45	Cars

1 Site No.



South Dural - Traffic Flows

MATRIX Traffic and Transport Data

Search By Time and Classfication

AM / PM	Start Time	End Time	Classification
AM	7:45	8:45	Buses

1 Site No.

South Dural - Traffic Flows

MATRIX Traffic and Transport Data

Search By Time and Classfication

AM / PM	Start Time	End Time	Classification
AM	7:45	8:45	Trucks

1 Site No.

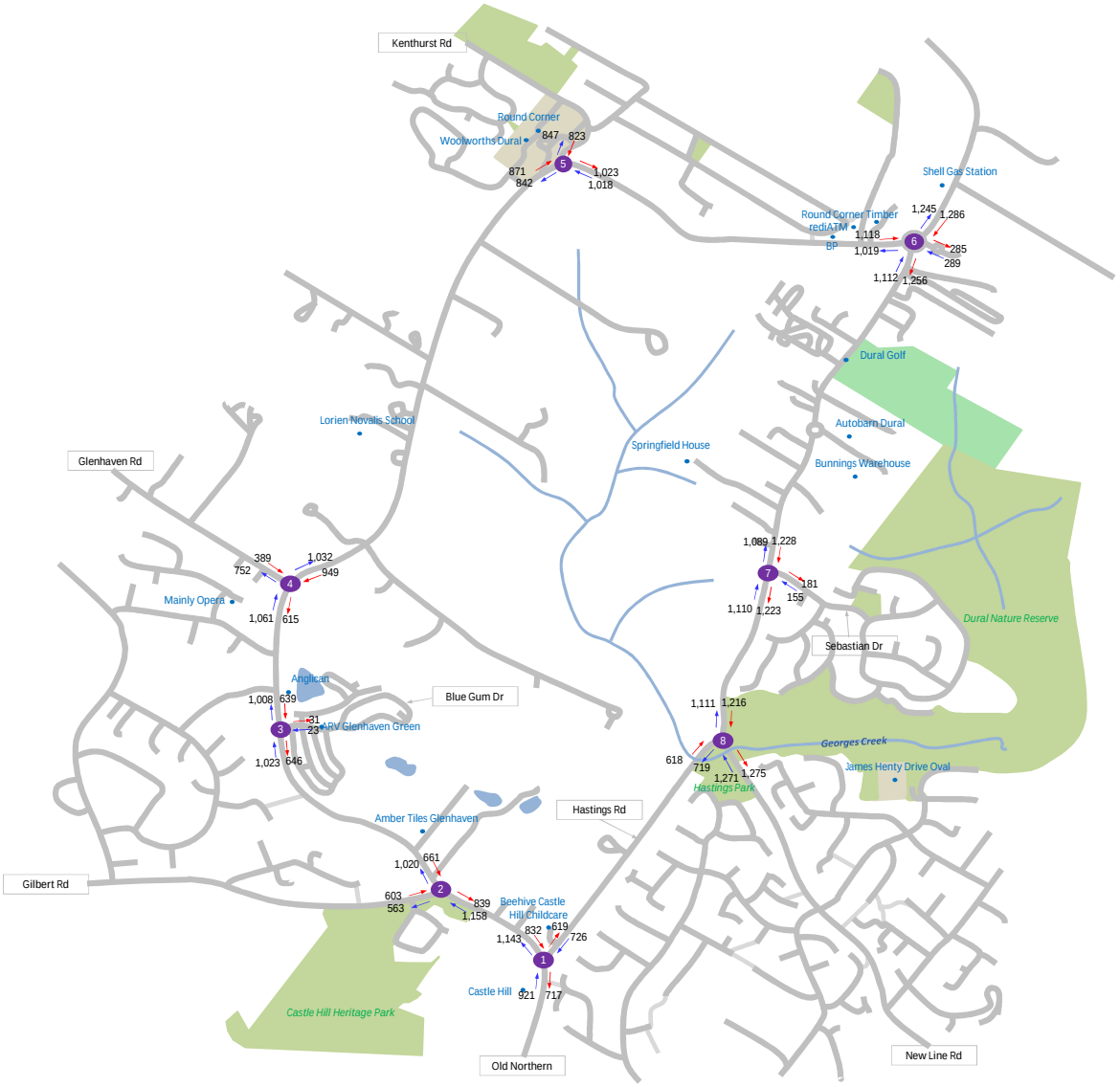
South Dural - Traffic Flows

MATRIX Traffic and Transport Data

Search By Time and Classfication

AM / PM	Start Time	End Time	Classification
PM	15:00	16:00	All vehicles

1 Site No.



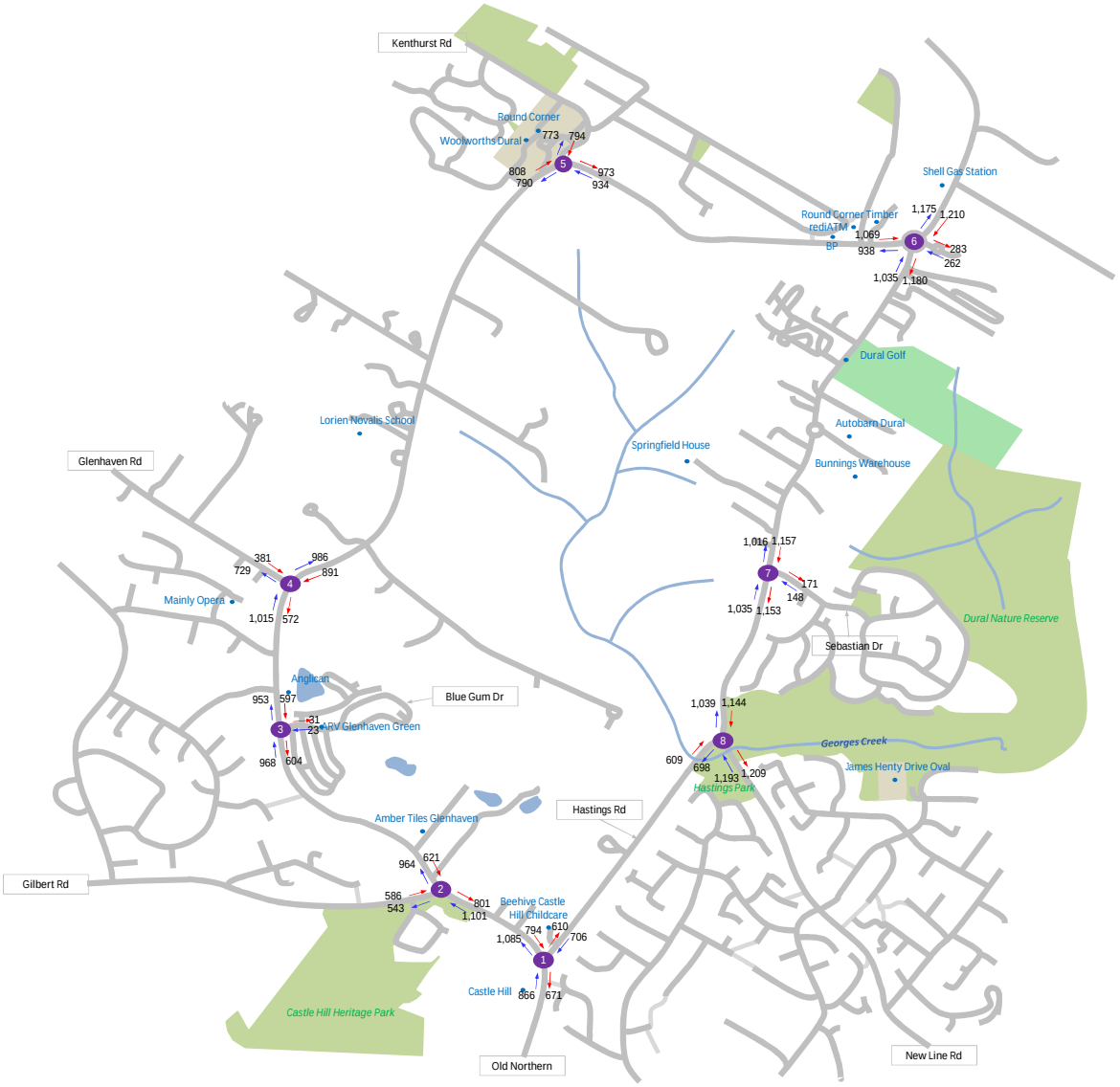
South Dural - Traffic Flows

MATRIX Traffic and Transport Data

Search By Time and Classfication

AM / PM	Start Time	End Time	Classification
PM	15:00	16:00	Cars

1 Site No.



South Dural - Traffic Flows

MATRIX Traffic and Transport Data

Search By Time and Classfication

AM / PM	Start Time	End Time	Classification
PM	15:00	16:00	Buses

1 Site No.

South Dural - Traffic Flows

MATRIX Traffic and Transport Data

Search By Time and Classfication

AM / PM	Start Time	End Time	Classification
PM	15:00	16:00	Trucks

1 Site No.

APPENDIX B

INTERSECTION PERFORMANCE CRITERIA

B1 INTERSECTION PERFORMANCE CRITERIA

LEVEL OF SERVICE (LOS)

Level of Service (Los) is a basic performance parameter used to describe the operation of an intersection. Levels of service range from A (indicating good intersection operation) to F (indicating over-saturated conditions with long delays and queues). At signalised intersections, the LoS criteria are related to average intersection delay (seconds per vehicle). At priority controlled (give-way and stop controlled) and roundabout intersections, the LoS is based on the modelled delay (seconds per vehicle) for the most delayed movement.

Table B.1 Level of Service criteria for intersections

Level of Service	Average Delay (sec/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity. At signals, incidents would cause excessive delays. Roundabouts require other control mode.	At capacity; requires other control mode
F	Greater than 71	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing; requires other control mode

Source: Roads and Maritime Services Guide to Traffic Generating Developments, 2002

DEGREE OF SATURATION (DOS)

The Degree of Saturation (DoS) is the ratio of demand flow to capacity, and therefore has no unit. As it approaches 1.0, extensive queues and delays could be expected. For a satisfactory situation, DoS should be less than the nominated practical degree of saturation, usually 0.9. The intersection DoS is based on the movement with the highest value.

AVERAGE VEHICLE DELAY

This is the difference between interrupted and uninterrupted travel times through the intersection and is measured in seconds per vehicle. At signalised intersections and roundabouts, the average intersection delay is usually reported. At priority controlled intersections, the average delay for the most delayed movement is usually reported.

QUEUE LENGTH

Queue length is measured in metres reflecting the number of vehicles waiting at the stop line and is usually quoted as the 95th percentile back of queue, which is the value below which 95% of all observed queue lengths fall. It reflects the number of vehicles per traffic lane at the start of the green period, when traffic starts moving again after a red signal. The intersection queue length is usually taken from the movement with the longest queue length.

APPENDIX C

SIDRA MODEL RESULTS

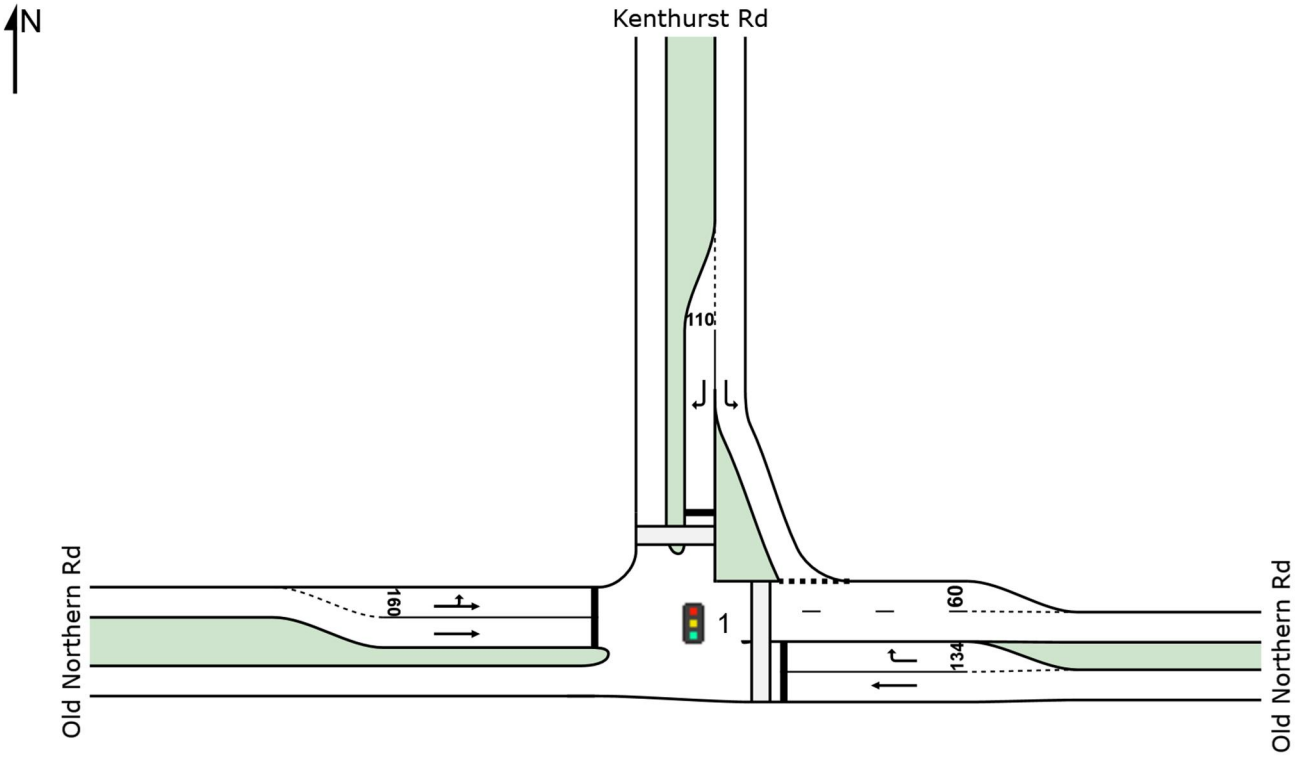
C1 2016 EXISTING SITUATION

C1.1 OLD NORTHERN ROAD AND KENTHURST ROAD

SITE LAYOUT

Site: 1 [I-01-Old Northern Rd/Kenthurst Rd AM]

Old Northern Rd/Kenthurst Rd
Signals - Fixed Time Coordinated



Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Created: Wednesday, 20 December 2017 2:22:26 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural base case 2016_Temp.sip7

MOVEMENT SUMMARY

Site: 1 [I-01-Old Northern Rd/Kenthurst Rd AM]

Old Northern Rd/Kenthurst Rd
Signals - Fixed Time Coordinated Cycle Time = 139 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Old Northern Rd											
5	T1	519	6.1	0.458	15.8	LOS B	18.8	138.7	0.59	0.53	47.6
6	R2	417	4.0	0.973	102.7	LOS F	34.7	251.4	1.00	1.23	22.1
Approach		936	5.2	0.973	54.5	LOS D	34.7	251.4	0.77	0.84	31.4
North: Kenthurst Rd											
7	L2	564	2.6	0.549	17.8	LOS B	20.3	145.3	0.62	0.76	45.9
9	R2	442	2.6	0.803	54.7	LOS D	28.3	202.4	0.97	0.89	31.0
Approach		1006	2.6	0.803	34.0	LOS C	28.3	202.4	0.78	0.82	37.9
West: Old Northern Rd											
10	L2	308	5.5	0.274	30.8	LOS C	14.4	105.3	0.61	0.73	39.5
11	T1	674	5.8	0.772	20.0	LOS B	26.7	196.2	0.70	0.65	44.9
Approach		982	5.7	0.772	23.4	LOS B	26.7	196.2	0.67	0.67	43.0
All Vehicles		2924	4.5	0.973	37.0	LOS C	34.7	251.4	0.74	0.78	37.0

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	0	40.4	LOS E	0.0	0.0	0.76	0.76
P3	North Full Crossing	1	27.9	LOS C	0.0	0.0	0.63	0.63
All Pedestrians		1	32.4	LOS D			0.68	0.68

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.

Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Wednesday, 20 December 2017 2:22:14 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural base case 2016_Temp.sip7

MOVEMENT SUMMARY

Site: 1 [I-01-Old Northern Rd/Kenthurst Rd PM]

Old Northern Rd/Kenthurst Rd
Signals - Fixed Time Coordinated Cycle Time = 90 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Old Northern Rd											
5	T1	557	7.0	0.455	8.1	LOS A	11.9	88.1	0.53	0.47	52.9
6	R2	523	9.5	0.945	65.2	LOS E	26.5	200.8	1.00	1.24	28.5
Approach		1080	8.2	0.945	35.8	LOS C	26.5	200.8	0.76	0.85	37.4
North: Kenthurst Rd											
7	L2	539	2.7	0.548	13.4	LOS A	11.8	84.5	0.63	0.76	48.5
9	R2	345	4.6	0.923	61.3	LOS E	19.2	139.4	1.00	1.04	29.3
Approach		884	3.5	0.923	32.1	LOS C	19.2	139.4	0.77	0.87	38.7
West: Old Northern Rd											
10	L2	374	7.6	0.341	6.1	LOS A	0.5	3.6	0.03	0.58	52.9
11	T1	549	6.9	0.855	23.2	LOS B	22.1	163.7	0.90	0.86	43.4
Approach		923	7.2	0.855	16.3	LOS B	22.1	163.7	0.55	0.75	46.8
All Vehicles		2887	6.4	0.945	28.4	LOS B	26.5	200.8	0.70	0.82	40.4

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	0	36.5	LOS D	0.0	0.0	0.90	0.90
P3	North Full Crossing	2	23.5	LOS C	0.0	0.0	0.72	0.72
All Pedestrians		2	25.2	LOS C			0.75	0.75

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.

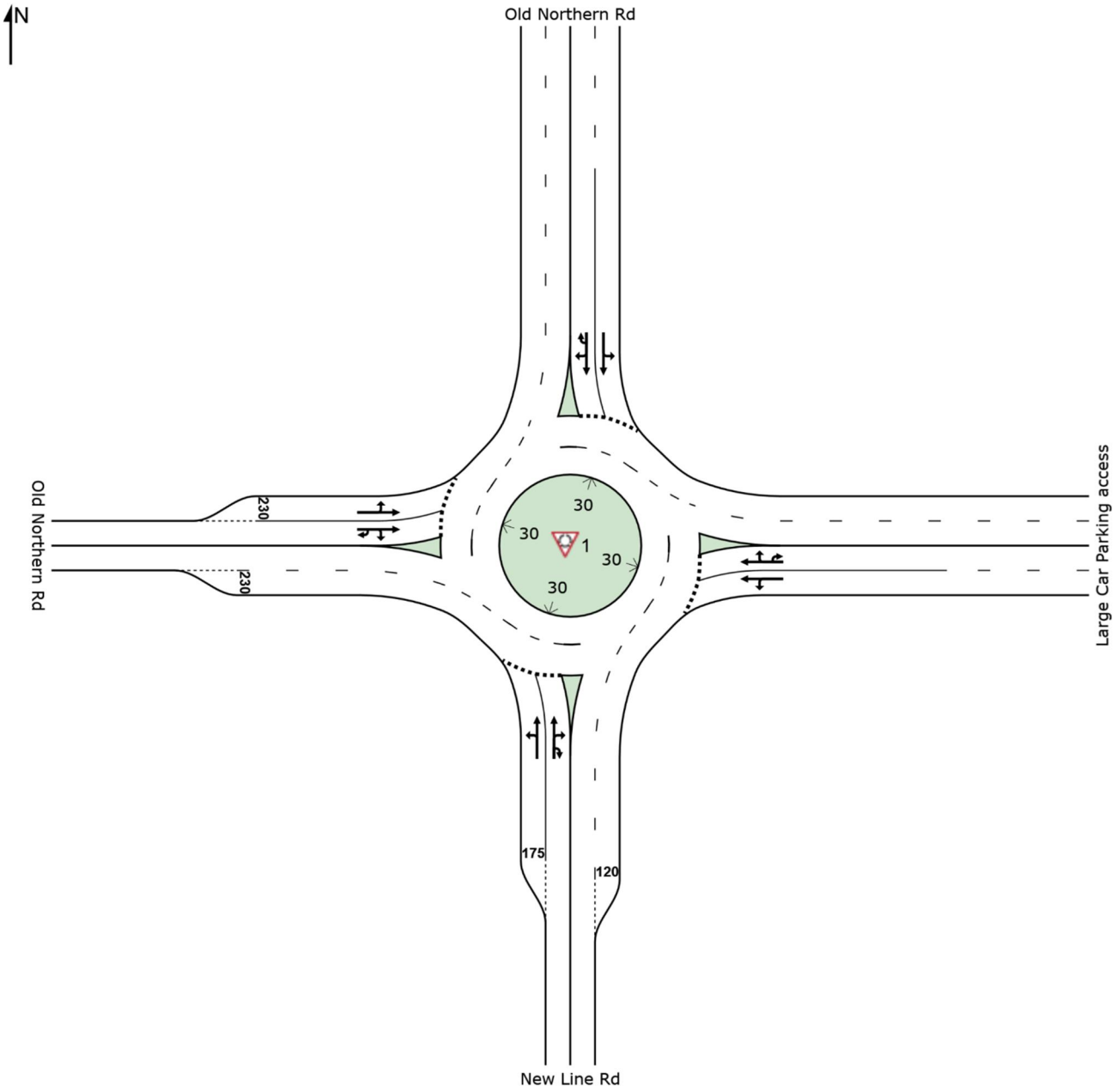
Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Wednesday, 20 December 2017 2:22:18 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural base case 2016_Temp.sip7

C1.2 OLD NORTHERN ROAD AND NEW LINE ROAD

SITE LAYOUT

Site: 1 [I-03-Old Northern Rd/New Line Rd AM]

Old Northern Rd/New Line Rd Roundabout
Roundabout



Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Created: Wednesday, 20 December 2017 2:24:28 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural base case 2016_Temp.sip7

MOVEMENT SUMMARY

Site: 1 [I-03-Old Northern Rd/New Line Rd AM]

Old Northern Rd/New Line Rd Roundabout
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: New Line Rd											
1	L2	311	6.4	0.786	12.1	LOS A	9.8	72.2	0.97	1.14	50.0
2	T1	775	5.7	0.786	12.7	LOS A	9.8	72.2	0.97	1.16	50.5
3	R2	84	1.3	0.786	18.9	LOS B	9.1	67.3	0.97	1.17	35.6
3u	U	100	14.7	0.786	21.8	LOS B	9.1	67.3	0.97	1.17	50.5
Approach		1269	6.3	0.786	13.7	LOS A	9.8	72.2	0.97	1.15	49.6
East: Large Car Parking access											
4	L2	75	9.9	0.298	11.8	LOS A	1.9	14.5	0.96	0.98	43.8
5	T1	72	7.4	0.298	13.5	LOS A	1.9	14.5	0.94	0.98	43.7
6	R2	48	4.3	0.298	19.9	LOS B	1.7	12.2	0.92	0.97	41.5
6u	U	1	0.0	0.298	22.0	LOS B	1.7	12.2	0.92	0.97	16.6
Approach		196	7.5	0.298	14.5	LOS A	1.9	14.5	0.94	0.98	43.1
North: Old Northern Rd											
7	L2	83	2.5	0.865	24.1	LOS B	13.9	100.3	1.00	1.37	28.2
8	T1	738	4.3	1.057	47.3	LOS D	56.5	410.8	1.00	1.90	34.4
9	R2	558	4.5	1.057	93.3	LOS F	56.5	410.8	1.00	2.83	25.0
9u	U	3	0.0	1.057	95.5	LOS F	56.5	410.8	1.00	2.83	25.3
Approach		1382	4.3	1.057	64.6	LOS E	56.5	410.8	1.00	2.25	29.5
West: Old Northern Rd											
10	L2	705	4.8	0.946	25.0	LOS B	16.5	120.3	1.00	1.54	42.5
11	T1	74	2.9	0.926	24.8	LOS B	12.8	92.8	1.00	1.44	28.6
12	R2	455	4.2	0.926	30.6	LOS C	12.8	92.8	1.00	1.44	42.0
12u	U	20	0.0	0.926	32.7	LOS C	12.8	92.8	1.00	1.44	42.9
Approach		1254	4.4	0.946	27.1	LOS B	16.5	120.3	1.00	1.50	41.6
All Vehicles		4101	5.1	1.057	35.0	LOS C	56.5	410.8	0.99	1.62	38.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
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.

Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Wednesday, 20 December 2017 2:22:20 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural base case 2016_Temp.sip7

MOVEMENT SUMMARY

Site: 1 [I-03-Old Northern Rd/New Line Rd PM]

Old Northern Rd/New Line Rd Roundabout
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: New Line Rd											
1	L2	337	7.8	0.832	16.7	LOS B	11.6	86.0	1.00	1.27	47.1
2	T1	671	5.8	0.832	17.6	LOS B	11.6	86.0	1.00	1.27	47.3
3	R2	76	1.4	0.832	23.9	LOS B	10.5	77.9	1.00	1.27	32.8
3u	U	87	16.9	0.832	27.1	LOS B	10.5	77.9	1.00	1.27	47.3
Approach		1171	6.9	0.832	18.4	LOS B	11.6	86.0	1.00	1.27	46.5
East: Large Car Parking access											
4	L2	135	13.3	0.475	17.3	LOS B	3.5	27.0	0.99	1.08	39.0
5	T1	111	9.5	0.475	20.0	LOS B	3.5	27.0	0.96	1.07	38.4
6	R2	59	0.0	0.475	25.7	LOS B	3.0	21.9	0.94	1.06	37.6
6u	U	1	0.0	0.475	28.1	LOS B	3.0	21.9	0.94	1.06	13.5
Approach		305	9.3	0.475	19.9	LOS B	3.5	27.0	0.97	1.07	38.5
North: Old Northern Rd											
7	L2	87	1.2	0.772	13.9	LOS A	8.1	59.1	0.94	1.15	32.8
8	T1	645	4.9	0.943	17.7	LOS B	21.0	154.1	0.96	1.29	47.2
9	R2	593	6.2	0.943	31.8	LOS C	21.0	154.1	1.00	1.60	41.7
9u	U	18	0.0	0.943	34.0	LOS C	21.0	154.1	1.00	1.60	42.6
Approach		1343	5.2	0.943	23.9	LOS B	21.0	154.1	0.98	1.42	43.8
West: Old Northern Rd											
10	L2	563	6.2	0.819	12.8	LOS A	9.1	66.3	0.97	1.18	49.4
11	T1	137	0.0	0.819	13.2	LOS A	9.1	66.3	0.96	1.19	34.6
12	R2	455	3.5	0.819	20.2	LOS B	8.3	59.8	0.96	1.19	47.3
12u	U	22	4.8	0.819	22.7	LOS B	8.3	59.8	0.96	1.19	48.3
Approach		1177	4.4	0.819	15.9	LOS B	9.1	66.3	0.96	1.19	47.1
All Vehicles		3996	5.8	0.943	19.6	LOS B	21.0	154.1	0.98	1.28	45.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
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.

Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Wednesday, 20 December 2017 2:22:22 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural base case 2016_Temp.sip7

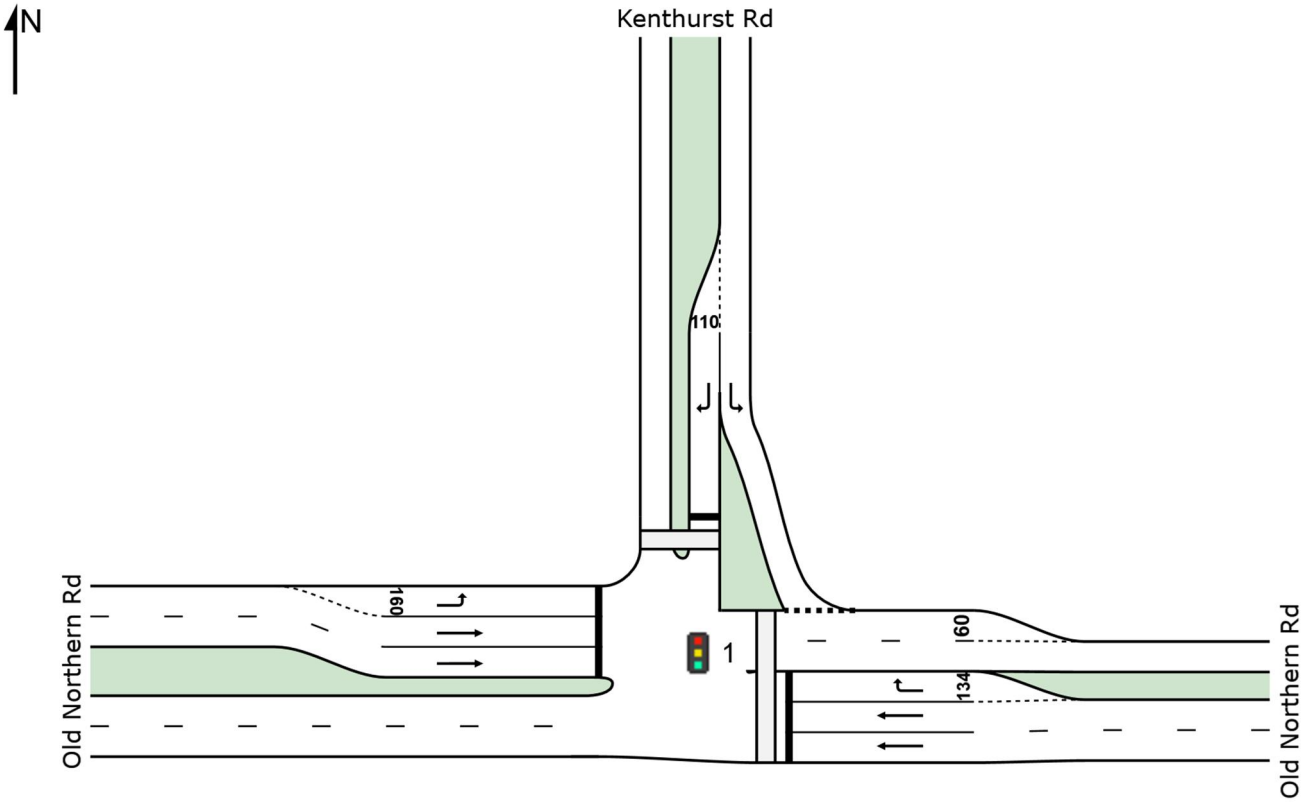
C2 2026 WITHOUT DEVELOPMENT

C2.1 OLD NORTHERN ROAD AND KENTHURST ROAD WITH ROAD WIDENING

SITE LAYOUT

Site: 1 [I-01-Old Northern Rd/Kenthurst Rd AM-upgrade1]

Old Northern Rd/Kenthurst Rd
Signals - Fixed Time Coordinated



Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Created: Wednesday, 20 December 2017 2:38:26 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026Base_RevA_from TMAP.sip7

MOVEMENT SUMMARY

Site: 1 [I-01-Old Northern Rd/Kenthurst Rd AM-upgrade1]

Old Northern Rd/Kenthurst Rd
Signals - Fixed Time Coordinated Cycle Time = 150 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Old Northern Rd											
5	T1	627	6.1	0.270	13.6	LOS A	10.2	75.2	0.49	0.43	49.0
6	R2	485	4.2	0.950	94.2	LOS F	38.1	276.6	1.00	1.22	23.3
Approach		1113	5.3	0.950	48.8	LOS D	38.1	276.6	0.71	0.77	33.1
North: Kenthurst Rd											
7	L2	682	2.6	0.672	20.2	LOS B	29.0	207.8	0.68	0.79	44.6
9	R2	532	2.7	1.198	261.0	LOS F	83.7	598.9	1.00	1.40	11.0
Approach		1214	2.6	1.198	125.6	LOS F	83.7	598.9	0.82	1.06	19.1
West: Old Northern Rd											
10	L2	351	5.9	0.281	7.9	LOS A	2.3	16.6	0.10	0.61	51.7
11	T1	807	5.9	0.898	33.9	LOS C	40.8	300.0	0.83	0.79	38.5
Approach		1158	5.9	0.898	26.1	LOS B	40.8	300.0	0.61	0.73	41.7
All Vehicles		3484	4.6	1.198	68.0	LOS E	83.7	598.9	0.72	0.86	27.9

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	0	45.6	LOS E	0.0	0.0	0.78	0.78
P3	North Full Crossing	1	35.4	LOS D	0.0	0.0	0.69	0.69
All Pedestrians		1	39.1	LOS D			0.72	0.72

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.

Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Tuesday, 19 December 2017 7:00:28 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026Base_RevA_from TMAP.sip7

MOVEMENT SUMMARY

Site: 1 [I-01-Old Northern Rd/Kenthurst Rd PM-upgrade1]

Old Northern Rd/Kenthurst Rd
Signals - Fixed Time Coordinated Cycle Time = 150 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Old Northern Rd											
5	T1	692	7.1	0.270	9.5	LOS A	9.5	70.3	0.41	0.36	51.9
6	R2	655	9.5	0.974	96.5	LOS F	58.0	439.1	1.00	1.22	22.9
Approach		1346	8.3	0.974	51.8	LOS D	58.0	439.1	0.70	0.78	32.1
North: Kenthurst Rd											
7	L2	666	2.8	0.626	17.9	LOS B	25.5	182.5	0.64	0.78	45.8
9	R2	422	4.7	1.111	192.3	LOS F	55.6	405.1	1.00	1.26	14.0
Approach		1088	3.5	1.111	85.5	LOS F	55.6	405.1	0.78	0.96	24.4
West: Old Northern Rd											
10	L2	465	7.7	0.461	7.7	LOS A	2.6	19.7	0.09	0.60	51.8
11	T1	686	6.9	0.905	42.2	LOS C	36.7	272.3	0.89	0.84	35.4
Approach		1152	7.2	0.905	28.3	LOS B	36.7	272.3	0.56	0.74	40.6
All Vehicles		3586	6.5	1.111	54.5	LOS D	58.0	439.1	0.68	0.82	31.2

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	0	54.6	LOS E	0.0	0.0	0.85	0.85
P3	North Full Crossing	2	41.1	LOS E	0.0	0.0	0.74	0.74
All Pedestrians		2	42.8	LOS E			0.75	0.75

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.

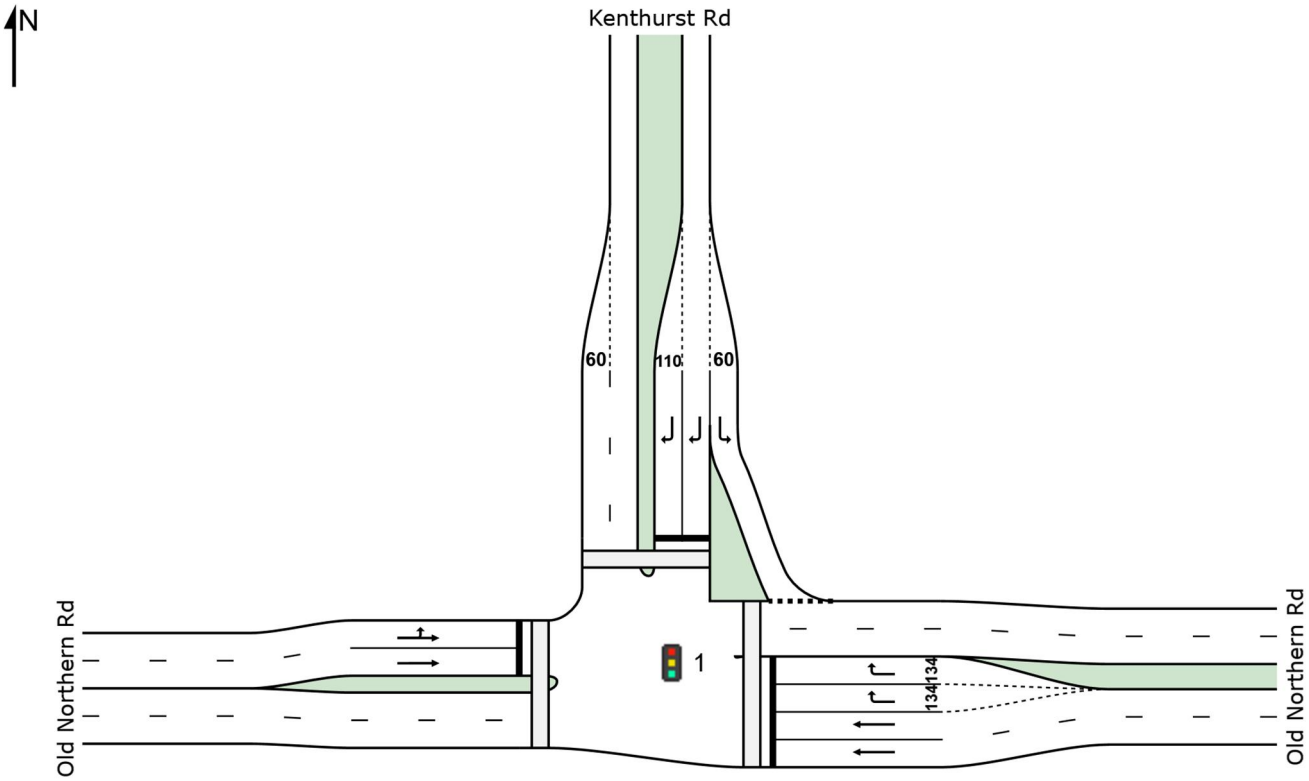
Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Tuesday, 19 December 2017 6:59:26 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026Base_RevA_from TMAP.sip7

C2.2 OLD NORTHERN ROAD AND KENTHURST ROAD WITH ROAD WIDENING AND INTERSECTION UPGRADE

SITE LAYOUT

Site: 1 [I-01-Old Northern Rd/Kenthurst Rd AM-upgrade2]

Old Northern Rd/Kenthurst Rd
Signals - Fixed Time Coordinated



SIDRA INTERSECTION 7.0 | Copyright © 2000-2017 Akcelik and Associates Pty Ltd | sidrasolutions.com
Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Created: Wednesday, 20 December 2017 2:39:36 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026Base_RevA_from TMAP.sip7

MOVEMENT SUMMARY

Site: 1 [I-01-Old Northern Rd/Kenthurst Rd AM-upgrade2]

Old Northern Rd/Kenthurst Rd
Signals - Fixed Time Coordinated Cycle Time = 60 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Old Northern Rd											
5	T1	627	6.1	0.251	4.3	LOS A	3.7	27.0	0.43	0.37	56.1
6	R2	485	4.2	0.902	39.0	LOS C	13.2	96.0	0.97	1.00	36.0
Approach		1113	5.3	0.902	19.5	LOS B	13.2	96.0	0.66	0.64	45.1
North: Kenthurst Rd											
7	L2	682	2.6	0.734	14.3	LOS A	13.5	96.3	0.81	0.84	48.0
9	R2	532	2.7	0.888	42.7	LOS D	9.6	69.1	1.00	1.06	34.7
Approach		1214	2.6	0.888	26.7	LOS B	13.5	96.3	0.89	0.94	41.1
West: Old Northern Rd											
10	L2	351	5.9	0.895	30.9	LOS C	18.8	138.0	0.96	1.02	39.9
11	T1	807	5.9	0.895	21.0	LOS B	18.8	138.0	0.94	0.98	44.2
Approach		1158	5.9	0.895	24.0	LOS B	18.8	138.0	0.95	0.99	42.8
All Vehicles		3484	4.6	0.902	23.5	LOS B	18.8	138.0	0.84	0.86	42.9

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	0	24.3	LOS C	0.0	0.0	0.90	0.90
P3	North Full Crossing	1	18.4	LOS B	0.0	0.0	0.78	0.78
P4	West Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90
All Pedestrians		54	24.3	LOS C			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.

Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Wednesday, 1 November 2017 8:27:51 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026Base_RevA_from TMAP.sip7

MOVEMENT SUMMARY

Site: 1 [I-01-Old Northern Rd/Kenthurst Rd PM-upgrade2]

Old Northern Rd/Kenthurst Rd
Signals - Fixed Time Coordinated Cycle Time = 90 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Old Northern Rd											
5	T1	692	7.1	0.253	4.2	LOS A	4.9	36.3	0.35	0.31	56.2
6	R2	655	9.5	0.911	48.9	LOS D	25.8	195.3	0.95	0.96	32.8
Approach		1346	8.3	0.911	25.9	LOS B	25.8	195.3	0.64	0.63	41.7
North: Kenthurst Rd											
7	L2	666	2.8	0.782	17.7	LOS B	19.2	137.5	0.76	0.84	46.0
9	R2	422	4.7	0.894	59.5	LOS E	11.0	80.3	1.00	1.01	29.9
Approach		1088	3.5	0.894	33.9	LOS C	19.2	137.5	0.86	0.91	38.1
West: Old Northern Rd											
10	L2	465	7.7	0.862	27.7	LOS B	22.5	167.4	0.88	0.89	40.8
11	T1	686	6.9	0.862	21.8	LOS B	23.4	173.8	0.88	0.86	43.9
Approach		1152	7.2	0.862	24.2	LOS B	23.4	173.8	0.88	0.87	42.6
All Vehicles		3586	6.5	0.911	27.8	LOS B	25.8	195.3	0.78	0.79	40.8

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	0	39.2	LOS D	0.0	0.0	0.93	0.93
P3	North Full Crossing	2	23.5	LOS C	0.0	0.0	0.72	0.72
P4	West Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		55	38.7	LOS D			0.93	0.93

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.

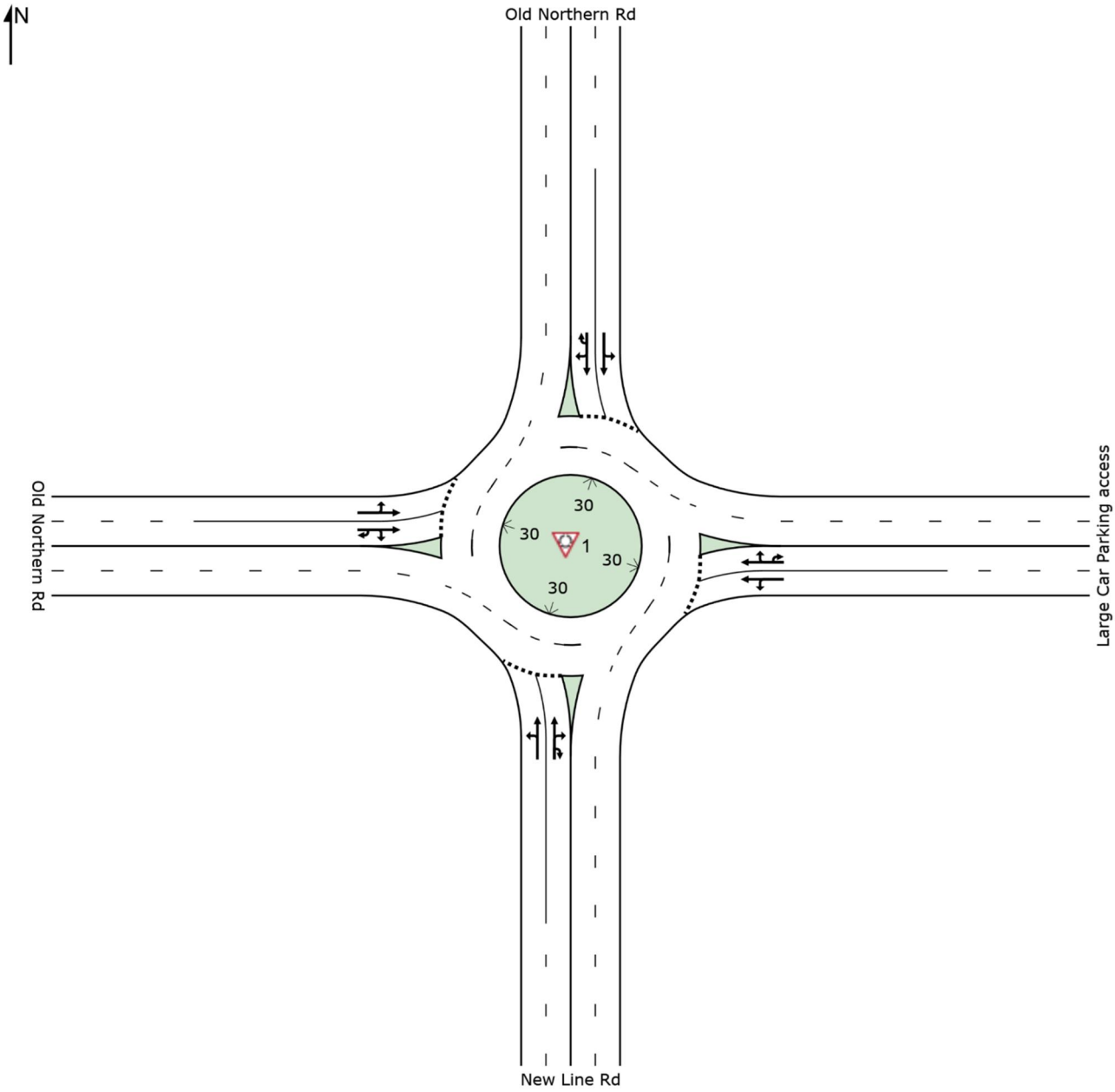
Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Wednesday, 1 November 2017 8:28:42 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026Base_RevA_from TMAP.sip7

C2.3 OLD NORTHERN ROAD AND NEW LINE ROAD WITH ROAD WIDENING

SITE LAYOUT

Site: 1 [I-03-Old Northern Rd/New Line Rd AM - Copy]

Old Northern Rd/New Line Rd Roundabout
Roundabout



Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Created: Wednesday, 20 December 2017 2:41:39 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026Base_RevA_from TMAP.sip7

MOVEMENT SUMMARY

Site: 1 [I-03-Old Northern Rd/New Line Rd AM - Copy]

Old Northern Rd/New Line Rd Roundabout
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: New Line Rd											
1	L2	379	6.4	1.032	63.2	LOS E	43.9	323.5	1.00	2.46	29.6
2	T1	945	5.7	1.032	64.8	LOS E	43.9	323.5	1.00	2.41	29.7
3	R2	103	1.3	1.032	71.9	LOS F	38.1	282.2	1.00	2.37	18.8
3u	U	122	14.7	1.032	75.0	LOS F	38.1	282.2	1.00	2.37	29.6
Approach		1549	6.3	1.032	65.7	LOS E	43.9	323.5	1.00	2.42	29.0
East: Large Car Parking access											
4	L2	85	9.9	0.317	9.5	LOS A	1.9	14.5	0.93	0.96	46.2
5	T1	87	7.4	0.317	10.9	LOS A	1.9	14.5	0.91	0.97	46.3
6	R2	59	4.3	0.317	17.4	LOS B	1.7	12.3	0.89	0.97	43.6
6u	U	1	0.0	0.317	19.5	LOS B	1.7	12.3	0.89	0.97	18.2
Approach		233	7.5	0.317	12.1	LOS A	1.9	14.5	0.91	0.97	45.4
North: Old Northern Rd											
7	L2	101	2.5	1.082	101.7	LOS F	69.1	500.8	1.00	3.25	13.7
8	T1	900	4.3	1.082	101.9	LOS F	69.1	500.8	1.00	3.23	23.0
9	R2	680	4.5	1.082	110.1	LOS F	59.6	433.1	1.00	3.07	22.4
9u	U	4	0.0	1.082	112.2	LOS F	59.6	433.1	1.00	3.07	22.7
Approach		1685	4.3	1.082	105.2	LOS F	69.1	500.8	1.00	3.17	22.3
West: Old Northern Rd											
10	L2	860	4.8	1.277	263.2	LOS F	129.4	942.7	1.00	5.90	11.3
11	T1	89	2.9	1.275	263.8	LOS F	101.6	734.7	1.00	5.12	6.9
12	R2	555	4.2	1.275	269.5	LOS F	101.6	734.7	1.00	5.12	11.6
12u	U	24	0.0	1.275	271.7	LOS F	101.6	734.7	1.00	5.12	11.7
Approach		1528	4.4	1.277	265.6	LOS F	129.4	942.7	1.00	5.56	11.2
All Vehicles		4996	5.1	1.277	137.7	LOS F	129.4	942.7	1.00	3.57	18.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
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.

Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Tuesday, 19 December 2017 7:02:36 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026Base_RevA_from TMAP.sip7

MOVEMENT SUMMARY

Site: 1 [I-03-Old Northern Rd/New Line Rd PM - Copy]

Old Northern Rd/New Line Rd Roundabout
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: New Line Rd											
1	L2	423	7.8	1.102	118.3	LOS F	67.4	499.8	1.00	3.46	20.5
2	T1	842	5.8	1.102	119.8	LOS F	67.4	499.8	1.00	3.32	20.7
3	R2	95	1.4	1.102	126.6	LOS F	56.3	418.0	1.00	3.20	12.6
3u	U	109	16.9	1.102	129.8	LOS F	56.3	418.0	1.00	3.20	20.7
Approach		1469	6.9	1.102	120.5	LOS F	67.4	499.8	1.00	3.34	20.2
East: Large Car Parking access											
4	L2	169	13.3	0.553	16.5	LOS B	4.1	31.4	0.97	1.10	39.6
5	T1	139	9.5	0.553	19.2	LOS B	4.1	31.4	0.95	1.09	39.0
6	R2	74	0.0	0.553	25.0	LOS B	3.5	25.2	0.93	1.08	38.0
6u	U	1	0.0	0.553	27.4	LOS B	3.5	25.2	0.93	1.08	13.8
Approach		383	9.3	0.553	19.2	LOS B	4.1	31.4	0.96	1.09	39.0
North: Old Northern Rd											
7	L2	109	1.2	1.131	138.6	LOS F	85.8	623.7	1.00	4.09	11.0
8	T1	811	4.9	1.131	138.7	LOS F	85.8	623.7	1.00	4.09	18.8
9	R2	758	6.2	1.178	186.1	LOS F	89.7	660.7	1.00	4.41	15.5
9u	U	22	0.0	1.178	188.2	LOS F	89.7	660.7	1.00	4.41	15.7
Approach		1700	5.2	1.178	160.5	LOS F	89.7	660.7	1.00	4.24	16.7
West: Old Northern Rd											
10	L2	707	6.2	1.107	116.9	LOS F	65.8	481.3	1.00	3.61	20.6
11	T1	172	0.0	1.107	117.6	LOS F	65.8	481.3	1.00	3.50	12.5
12	R2	572	3.5	1.107	125.5	LOS F	54.5	391.9	1.00	3.29	20.6
12u	U	27	4.8	1.107	127.9	LOS F	54.5	391.9	1.00	3.29	20.8
Approach		1478	4.4	1.107	120.5	LOS F	65.8	481.3	1.00	3.47	19.7
All Vehicles		5031	5.8	1.178	126.3	LOS F	89.7	660.7	1.00	3.51	19.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
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.

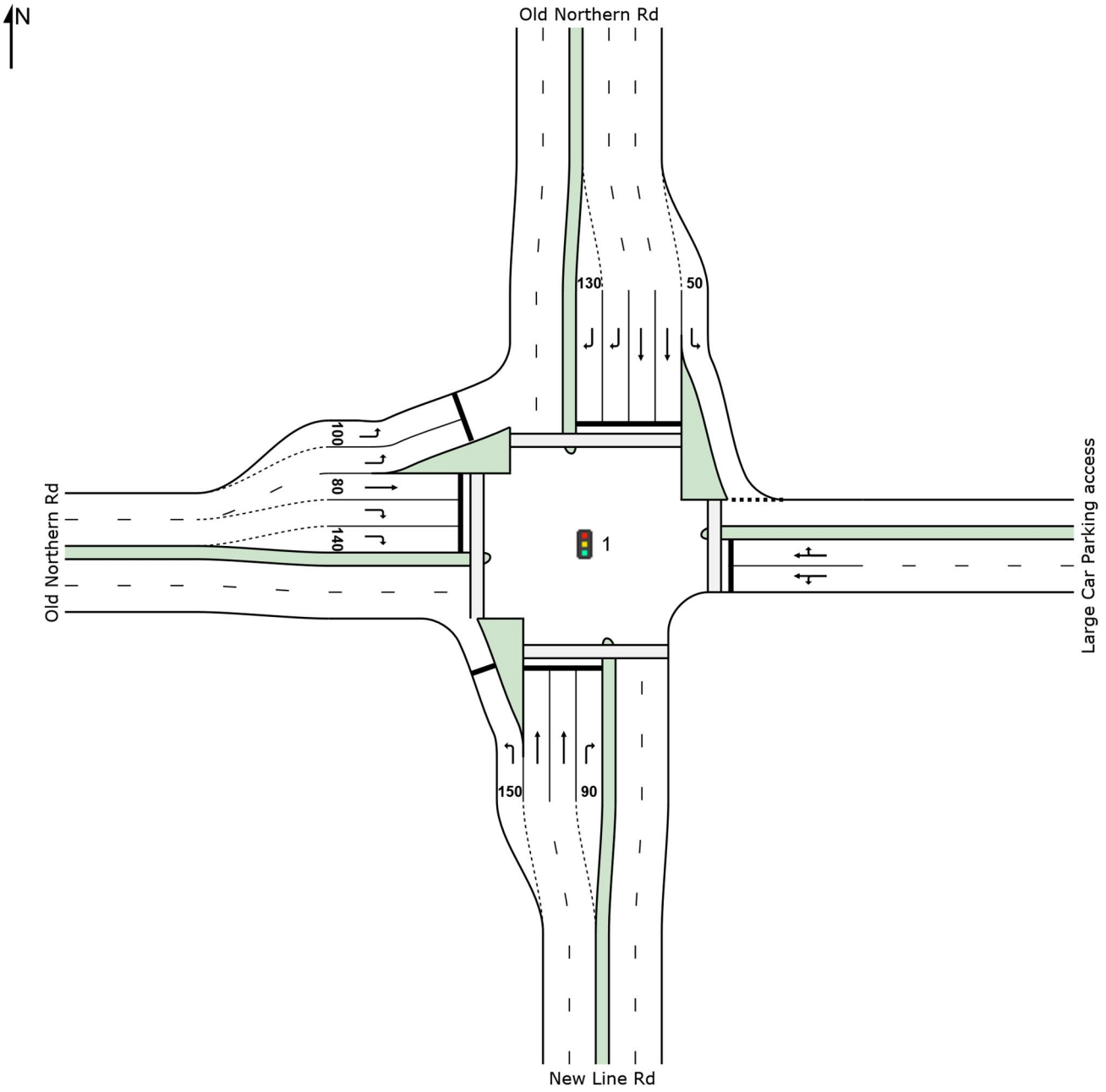
Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Tuesday, 19 December 2017 7:03:39 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026Base_RevA_from TMAP.sip7

C2.4 OLD NORTHERN ROAD AND NEW LINE ROAD WITH ROAD WIDENING AND INTERSECTION UPGRADE

SITE LAYOUT

Site: 1 [I-03-Old Northern Rd/New Line Rd AM-upgrade2]

Old Northern Rd/New Line Rd Roundabout
Signals - Fixed Time Isolated



Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Created: Wednesday, 20 December 2017 2:43:13 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026Base_RevA_from TMAP.sip7

MOVEMENT SUMMARY

Site: 1 [I-03-Old Northern Rd/New Line Rd AM-upgrade2]

Old Northern Rd/New Line Rd Roundabout
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: New Line Rd											
1	L2	379	6.4	0.741	39.6	LOS C	15.9	117.7	0.97	0.88	36.1
2	T1	945	5.7	0.873	43.0	LOS D	23.3	171.3	1.00	1.04	35.4
3	R2	225	1.3	0.817	51.9	LOS D	10.7	76.0	1.00	0.93	22.8
Approach		1549	5.2	0.873	43.5	LOS D	23.3	171.3	0.99	0.99	34.0
East: Large Car Parking access											
4	L2	214	9.9	0.872	52.7	LOS D	13.1	99.3	1.00	1.01	22.6
5	T1	112	7.4	0.872	52.1	LOS D	13.1	99.3	1.00	1.00	22.8
6	R2	63	4.3	0.872	57.3	LOS E	6.5	48.0	1.00	0.99	22.4
Approach		388	8.2	0.872	53.3	LOS D	13.1	99.3	1.00	1.00	22.7
North: Old Northern Rd											
7	L2	105	2.5	0.081	8.4	LOS A	1.1	7.8	0.32	0.63	46.0
8	T1	900	4.3	0.686	27.2	LOS B	17.6	127.9	0.91	0.79	41.7
9	R2	684	4.5	0.869	52.3	LOS D	17.1	124.0	1.00	1.00	32.4
Approach		1689	4.3	0.869	36.2	LOS C	17.6	127.9	0.91	0.87	37.3
West: Old Northern Rd											
10	L2	860	4.8	0.520	25.1	LOS B	13.6	99.4	0.77	0.80	42.1
11	T1	114	2.9	0.344	36.6	LOS C	4.5	32.5	0.93	0.73	28.7
12	R2	555	4.2	0.890	57.1	LOS E	14.3	103.9	1.00	1.03	30.9
Approach		1528	4.4	0.890	37.6	LOS C	14.3	103.9	0.87	0.88	36.4
All Vehicles		5156	4.9	0.890	40.1	LOS C	23.3	171.3	0.93	0.92	35.0

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
P2	East Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
P3	North Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		211	39.3	LOS D			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.

Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Thursday, 2 November 2017 12:17:15 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026Base_RevA_from TMAP.sip7

MOVEMENT SUMMARY

Site: 1 [I-03-Old Northern Rd/New Line Rd PM-upgrade2]

Old Northern Rd/New Line Rd Roundabout
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: New Line Rd											
1	L2	423	6.4	0.890	64.3	LOS E	27.8	205.6	1.00	0.98	29.1
2	T1	842	5.7	0.858	53.3	LOS D	26.8	196.8	1.00	0.99	32.2
3	R2	204	1.3	0.714	60.4	LOS E	11.9	84.1	1.00	0.85	20.8
Approach		1469	5.3	0.890	57.5	LOS E	27.8	205.6	1.00	0.97	29.9
East: Large Car Parking access											
4	L2	279	9.9	0.891	65.9	LOS E	22.0	166.2	1.00	0.99	19.6
5	T1	166	7.4	0.891	66.4	LOS E	22.0	166.2	1.00	1.01	19.7
6	R2	96	4.3	0.891	71.3	LOS F	14.1	103.7	1.00	1.02	19.4
Approach		541	8.1	0.891	67.0	LOS E	22.0	166.2	1.00	1.00	19.6
North: Old Northern Rd											
7	L2	133	2.5	0.102	9.8	LOS A	2.0	14.4	0.33	0.64	44.6
8	T1	811	4.3	0.624	34.2	LOS C	20.8	151.0	0.88	0.76	38.6
9	R2	780	4.5	0.866	61.8	LOS E	24.7	179.7	1.00	0.96	29.9
Approach		1723	4.3	0.866	44.8	LOS D	24.7	179.7	0.89	0.84	34.1
West: Old Northern Rd											
10	L2	707	4.8	0.407	28.1	LOS B	13.5	98.1	0.70	0.78	40.7
11	T1	199	2.9	0.573	49.6	LOS D	10.9	77.8	0.97	0.80	24.3
12	R2	572	4.2	0.874	68.0	LOS E	18.6	134.7	1.00	0.97	28.3
Approach		1478	4.3	0.874	46.4	LOS D	18.6	134.7	0.85	0.85	33.0
All Vehicles		5212	5.0	0.891	51.1	LOS D	27.8	205.6	0.92	0.90	31.1

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			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.

Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Thursday, 2 November 2017 12:17:17 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026Base_RevA_from TMAP.sip7

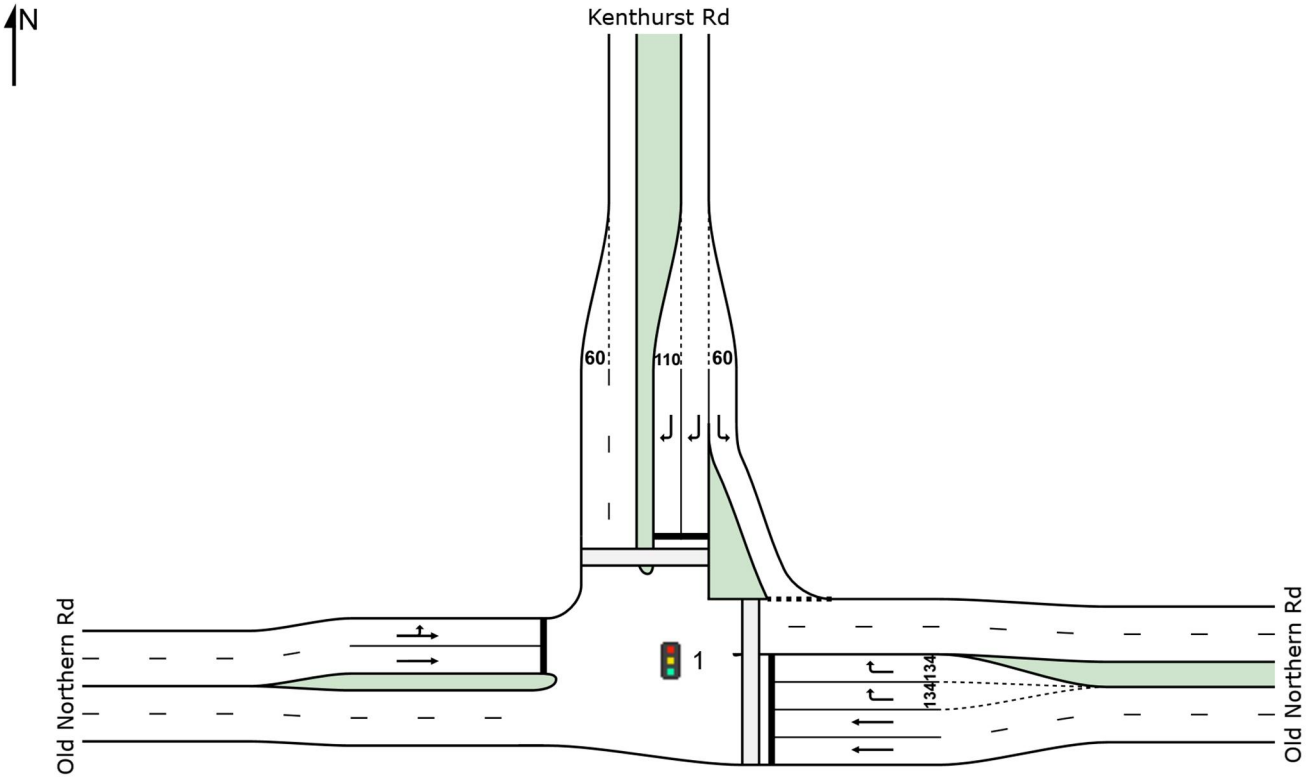
C3 2026 WITH DEVELOPMENT

C3.1 OLD NORTHERN ROAD AND KENTHURST ROAD WITH ROAD WIDENING AND INTERSECTION UPGRADE

SITE LAYOUT

Site: 1 [I-01-Old Northern Rd/Kenthurst Rd AM with bkground upgrades]

Old Northern Rd/Kenthurst Rd
Signals - Fixed Time Coordinated



SIDRA INTERSECTION 7.0 | Copyright © 2000-2017 Akcelik and Associates Pty Ltd | sidrasolutions.com
Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Created: Wednesday, 20 December 2017 2:49:29 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026 with Dev_Site2.sip7

MOVEMENT SUMMARY

Site: 1 [I-01-Old Northern Rd/Kenthurst Rd AM with bkground upgrades]

Old Northern Rd/Kenthurst Rd
Signals - Fixed Time Coordinated Cycle Time = 139 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Old Northern Rd											
5	T1	632	6.2	0.275	13.2	LOS A	9.8	72.0	0.50	0.44	49.3
6	R2	501	4.2	0.835	58.4	LOS E	23.9	173.7	0.95	1.02	30.3
Approach		1133	5.3	0.835	33.2	LOS C	23.9	173.7	0.70	0.69	38.6
North: Kenthurst Rd											
7	L2	686	2.6	0.678	15.4	LOS B	25.3	180.9	0.65	0.78	47.3
9	R2	532	2.6	0.467	46.3	LOS D	14.4	102.9	0.85	0.81	33.5
Approach		1218	2.6	0.678	28.9	LOS C	25.3	180.9	0.74	0.79	40.1
West: Old Northern Rd											
10	L2	351	6.0	0.765	32.9	LOS C	26.6	195.4	0.75	0.76	39.1
11	T1	809	5.9	0.765	22.1	LOS B	26.6	195.4	0.72	0.68	43.6
Approach		1160	5.9	0.765	25.3	LOS B	26.6	195.4	0.73	0.70	42.1
All Vehicles		3511	4.6	0.835	29.1	LOS C	26.6	195.4	0.72	0.73	40.2

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	0	45.1	LOS E	0.0	0.0	0.81	0.81
P3	North Full Crossing	1	31.8	LOS D	0.0	0.0	0.68	0.68
All Pedestrians		1	36.6	LOS D			0.72	0.72

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.

Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Wednesday, 20 December 2017 2:49:38 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026 with Dev_Site2.sip7

MOVEMENT SUMMARY

Site: 1 [I-01-Old Northern Rd/Kenthurst Rd PM with bkground upgrades]

Old Northern Rd/Kenthurst Rd
Signals - Fixed Time Coordinated Cycle Time = 90 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Old Northern Rd											
5	T1	692	7.0	0.265	5.3	LOS A	5.5	40.8	0.39	0.34	55.2
6	R2	655	9.5	0.946	56.4	LOS D	28.4	214.7	0.96	1.01	30.7
Approach		1346	8.2	0.946	30.1	LOS C	28.4	214.7	0.67	0.67	39.8
North: Kenthurst Rd											
7	L2	671	2.8	0.734	14.7	LOS B	17.1	122.5	0.73	0.80	47.7
9	R2	422	4.7	0.631	43.1	LOS D	8.9	64.5	0.97	0.83	34.5
Approach		1093	3.6	0.734	25.7	LOS B	17.1	122.5	0.82	0.81	41.6
West: Old Northern Rd											
10	L2	465	7.7	0.895	29.8	LOS C	22.6	168.7	0.82	0.89	39.9
11	T1	687	6.9	0.895	26.1	LOS B	25.3	187.4	0.92	0.93	41.7
Approach		1153	7.2	0.895	27.6	LOS B	25.3	187.4	0.88	0.92	41.0
All Vehicles		3592	6.5	0.946	28.0	LOS B	28.4	214.7	0.78	0.79	40.7

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	0	39.2	LOS D	0.0	0.0	0.93	0.93
P3	North Full Crossing	2	28.0	LOS C	0.0	0.0	0.79	0.79
All Pedestrians		2	29.5	LOS C			0.81	0.81

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.

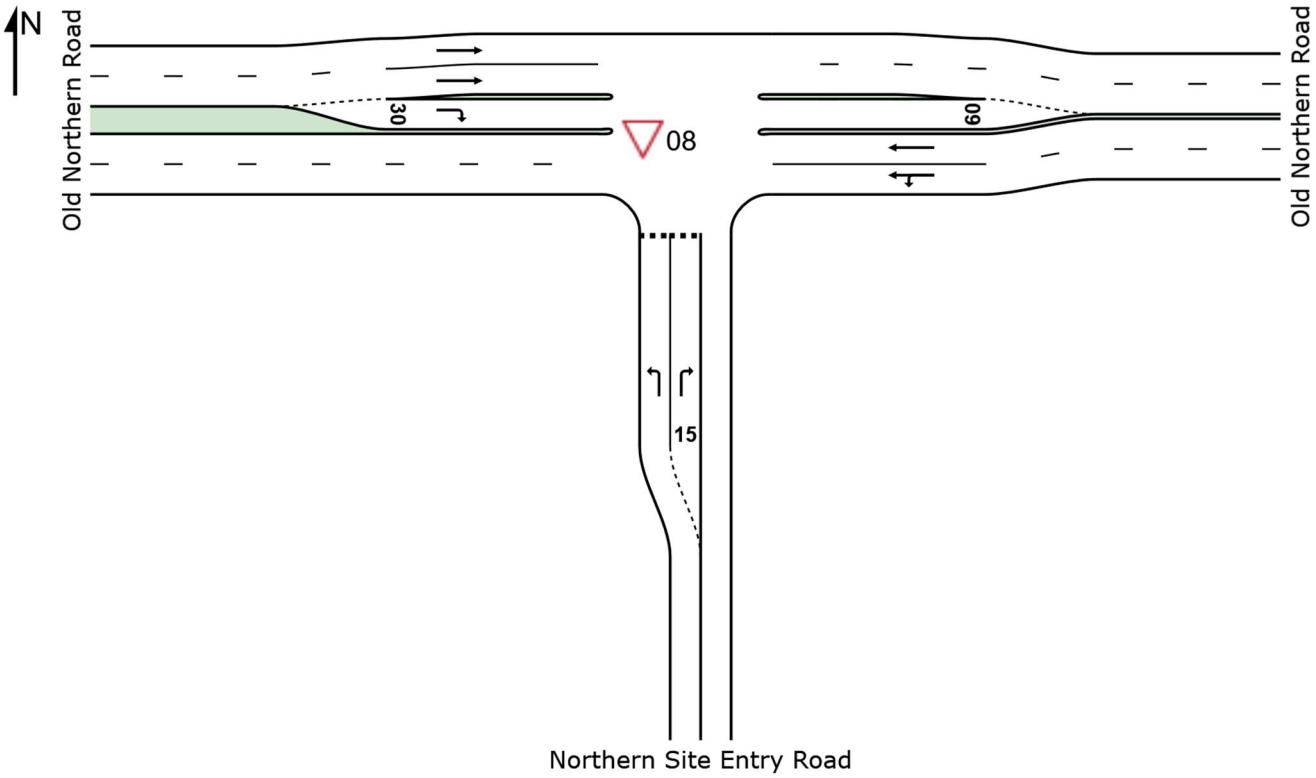
Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Wednesday, 20 December 2017 3:01:14 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026 with Dev_Site2.sip7

C3.2 SITE ACCESS TO OLD NORTHERN ROAD

SITE LAYOUT

Site: 08 [I-02-ONR/Northern Site Entry Road-AM with Seagull A - Import]

ONR/Northern Site Entry Road Intersection
Giveway / Yield (Two-Way)



Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Created: Wednesday, 20 December 2017 3:03:06 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026 with Dev_Site2.sip7

MOVEMENT SUMMARY

Site: 08 [I-02-ONR/Northern Site Entry Road-AM with Seagull A - Import]

ONR/Northern Site Entry Road Intersection
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: Northern Site Entry Road											
1	L2	20	0.0	0.028	8.5	LOS A	0.1	0.7	0.50	0.70	51.4
3	R2	23	0.0	0.171	31.7	LOS C	0.5	3.7	0.88	0.95	38.6
Approach		43	0.0	0.171	20.9	LOS B	0.5	3.7	0.70	0.84	43.6
East: Old Northern Road											
4	L2	8	0.0	0.299	5.6	LOS A	0.0	0.0	0.00	0.01	58.2
5	T1	1117	5.4	0.299	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		1125	5.3	0.299	0.1	NA	0.0	0.0	0.00	0.00	59.9
West: Old Northern Road											
11	T1	1501	4.3	0.396	0.1	LOS A	0.0	0.0	0.00	0.00	59.9
12	R2	6	0.0	0.018	14.7	LOS B	0.1	0.4	0.76	0.86	47.2
Approach		1507	4.3	0.396	0.1	NA	0.1	0.4	0.00	0.00	59.8
All Vehicles		2676	4.7	0.396	0.4	NA	0.5	3.7	0.01	0.02	59.5

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

Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Tuesday, 19 December 2017 7:49:46 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026 with Dev_Site2.sip7

Merge back to Old Northern Road Eastbound

MOVEMENT SUMMARY

Site: 1 [I-02-ONR/Northern Site Entry Road-AM with Seagull B - Import]

Merge From Right
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
West: Old Northern Road											
1	T1	1501	4.3	0.660	0.1	LOS A	0.0	0.0	0.00	0.00	59.7
Approach		1501	4.3	0.660	0.1	NA	0.0	0.0	0.00	0.00	59.7
SouthWest: Merge											
2	R1	23	0.0	0.061	7.8	LOS A	0.2	1.2	0.80	0.80	48.4
Approach		23	0.0	0.061	7.8	LOS A	0.2	1.2	0.80	0.80	48.4
All Vehicles		1524	4.3	0.660	0.3	NA	0.2	1.2	0.01	0.01	59.6

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

Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Tuesday, 19 December 2017 7:54:58 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026 with Dev_Site2.sip7

MOVEMENT SUMMARY

Site: 08 [I-02-ONR/Northern Site Entry Road-PM with Seagull A - Import]

ONR/Northern Site Entry Road Intersection
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: Northern Site Entry Road											
1	L2	1	0.0	0.002	9.7	LOS A	0.0	0.0	0.57	0.64	50.5
3	R2	1	0.0	0.016	54.1	LOS D	0.0	0.3	0.93	0.97	31.2
Approach		2	0.0	0.016	31.9	LOS C	0.0	0.3	0.75	0.80	38.6
East: Old Northern Road											
4	L2	7	0.0	0.375	5.6	LOS A	0.0	0.0	0.00	0.01	58.2
5	T1	1384	8.0	0.375	0.1	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		1392	7.9	0.375	0.1	NA	0.0	0.0	0.00	0.00	59.9
West: Old Northern Road											
11	T1	1356	4.9	0.359	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
12	R2	6	0.0	0.031	22.2	LOS B	0.1	0.7	0.86	0.94	43.1
Approach		1362	4.9	0.359	0.2	NA	0.1	0.7	0.00	0.00	59.8
All Vehicles		2756	6.4	0.375	0.1	NA	0.1	0.7	0.00	0.00	59.8

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

Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Tuesday, 19 December 2017 7:53:58 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026 with Dev_Site2.sip7

Merge back to Old Northern Road Eastbound

MOVEMENT SUMMARY

Site: 1 [I-02-ONR/Northern Site Entry Road-PM with Seagull B - Import]

Merge From Right
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
West: Old Northern Road											
1	T1	1356	4.9	0.598	0.1	LOS A	0.0	0.0	0.00	0.00	59.8
Approach		1356	4.9	0.598	0.1	NA	0.0	0.0	0.00	0.00	59.8
SouthWest: Merge											
2	R1	6	0.0	0.013	5.5	LOS A	0.0	0.3	0.73	0.71	51.1
Approach		6	0.0	0.013	5.5	LOS A	0.0	0.3	0.73	0.71	51.1
All Vehicles		1362	4.9	0.598	0.1	NA	0.0	0.3	0.00	0.00	59.7

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

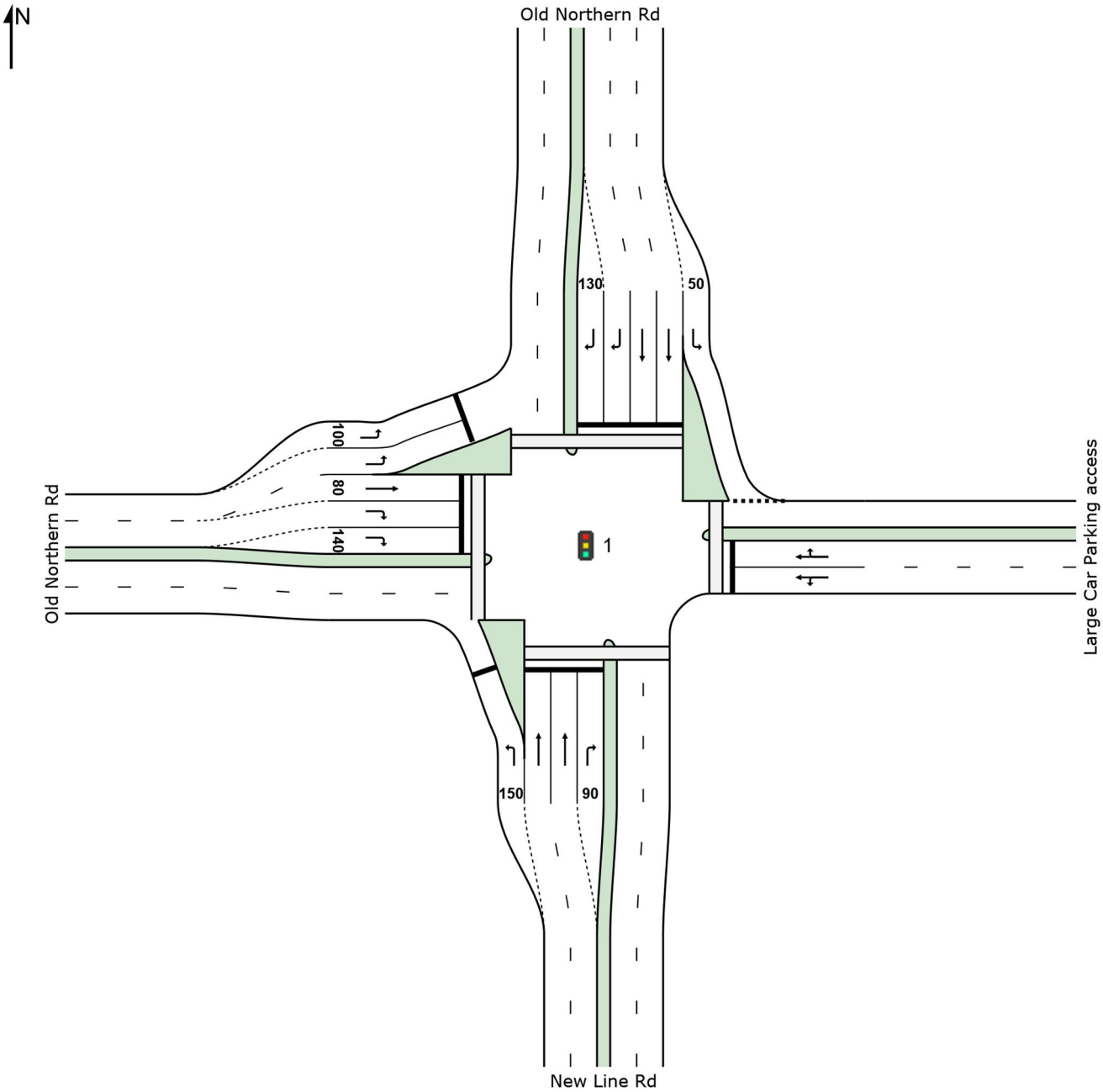
Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Tuesday, 19 December 2017 7:54:39 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026 with Dev_Site2.sip7

C3.3 OLD NORTHERN ROAD AND NEW LINE ROAD

SITE LAYOUT

Site: 1 [I-03-Old Northern Rd/New Line Rd AM-upgrade2 - Import]

Old Northern Rd/New Line Rd Roundabout
Signals - Fixed Time Isolated



Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Created: Wednesday, 20 December 2017 3:05:43 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026 with Dev_Site2.sip7

MOVEMENT SUMMARY

Site: 1 [I-03-Old Northern Rd/New Line Rd AM-upgrade2 - Import]

Old Northern Rd/New Line Rd Roundabout
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: New Line Rd											
1	L2	385	6.4	0.785	42.4	LOS C	17.0	125.7	0.99	0.91	35.1
2	T1	945	5.7	0.910	49.4	LOS D	25.2	184.7	1.00	1.11	33.4
3	R2	225	1.3	0.886	57.9	LOS E	11.5	81.6	1.00	1.01	21.3
Approach		1556	5.2	0.910	48.9	LOS D	25.2	184.7	1.00	1.05	32.3
East: Large Car Parking access											
4	L2	214	9.9	0.876	53.3	LOS D	13.2	99.7	1.00	1.01	22.5
5	T1	112	7.4	0.876	52.6	LOS D	13.2	99.7	1.00	1.00	22.7
6	R2	63	4.3	0.876	57.6	LOS E	6.6	48.4	1.00	0.99	22.4
Approach		388	8.2	0.876	53.8	LOS D	13.2	99.7	1.00	1.01	22.5
North: Old Northern Rd											
7	L2	105	2.5	0.081	8.4	LOS A	1.1	7.8	0.32	0.63	46.0
8	T1	900	4.3	0.686	27.2	LOS B	17.6	127.9	0.91	0.79	41.7
9	R2	686	4.5	0.872	52.6	LOS D	17.2	124.9	1.00	1.00	32.3
Approach		1692	4.3	0.872	36.3	LOS C	17.6	127.9	0.91	0.87	37.3
West: Old Northern Rd											
10	L2	865	4.8	0.510	24.3	LOS B	13.5	98.1	0.76	0.80	42.5
11	T1	114	2.9	0.322	35.5	LOS C	4.5	31.9	0.92	0.72	29.2
12	R2	573	4.2	0.862	53.3	LOS D	14.2	102.9	1.00	0.99	31.9
Approach		1552	4.4	0.862	35.9	LOS C	14.2	102.9	0.86	0.86	37.1
All Vehicles		5187	4.9	0.910	41.3	LOS C	25.2	184.7	0.93	0.93	34.6

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
P2	East Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
P3	North Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		211	39.3	LOS D			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.

Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Tuesday, 19 December 2017 7:18:22 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026 with Dev_Site2.sip7

MOVEMENT SUMMARY

Site: 1 [I-03-Old Northern Rd/New Line Rd PM-upgrade2 - Import]

Old Northern Rd/New Line Rd Roundabout
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: New Line Rd											
1	L2	428	6.4	0.873	61.0	LOS E	27.3	201.8	1.00	0.96	29.8
2	T1	842	5.7	0.826	49.4	LOS D	25.4	186.7	1.00	0.95	33.4
3	R2	204	1.3	0.584	54.6	LOS D	11.1	78.6	0.97	0.82	22.1
Approach		1475	5.3	0.873	53.5	LOS D	27.3	201.8	0.99	0.94	31.0
East: Large Car Parking access											
4	L2	279	9.9	0.887	65.2	LOS E	21.9	165.5	1.00	0.98	19.8
5	T1	166	7.4	0.887	65.8	LOS E	21.9	165.5	1.00	1.01	19.8
6	R2	96	4.3	0.887	70.9	LOS F	14.0	102.9	1.00	1.02	19.5
Approach		541	8.1	0.887	66.4	LOS E	21.9	165.5	1.00	1.00	19.7
North: Old Northern Rd											
7	L2	133	2.5	0.103	9.6	LOS A	1.9	13.9	0.32	0.64	44.8
8	T1	811	4.3	0.693	38.0	LOS C	22.1	160.3	0.92	0.80	37.2
9	R2	782	4.5	0.899	67.5	LOS E	26.2	190.4	1.00	1.00	28.6
Approach		1725	4.3	0.899	49.2	LOS D	26.2	190.4	0.91	0.88	32.8
West: Old Northern Rd											
10	L2	707	4.8	0.415	28.8	LOS C	13.7	99.7	0.72	0.78	40.4
11	T1	199	2.9	0.573	49.6	LOS D	10.9	77.8	0.97	0.80	24.3
12	R2	573	4.2	0.875	68.2	LOS E	18.6	135.2	1.00	0.97	28.3
Approach		1479	4.3	0.875	46.8	LOS D	18.6	135.2	0.86	0.86	32.9
All Vehicles		5220	5.0	0.899	51.5	LOS D	27.3	201.8	0.93	0.90	31.0

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

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			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.

Organisation: PARSONS BRINCKERHOFF AUSTRALIA | Processed: Tuesday, 19 December 2017 7:19:20 PM
Project: U:\Projects\PS106684__South_Dural_Senio\4_WIP\Docs\SIDRA\AmolK\SouthDural_2026 with Dev_Site2.sip7