

TRAFFIC IMPACT ASSESSMENT

241 Waterfall Way, Armidale

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CONTENTS

1 INTRODUCTION	5
1.1 Project Overview	5
1.2 Proposed Application	5
1.3 Scope and Context of Report	6
1.4 Reference Guides	6
1.5 Data Sources	6
2 SIDRA MODELLING METHODOLOGY	7
2.1 Delay Based Intersection Analysis	7
2.2 Practical Degree of Saturation	7
2.3 Queueing Ratio Analysis Criteria	7
3 EXISTING CONDITIONS	9
3.1 On-Site Uses	9
3.2 Site Surrounding Road Network	9
3.3 Public Transport	9
3.3.1 Public Transport, Pedestrian and Bicycle Facilities	9
3.4 Existing Intersection Performance	12
4 DEVELOPMENT DETAILS	16
4.1 Development Layout	16
4.2 Vehicle Access	16
4.2.1 Design Speed	16
4.2.2 Access Spacing	16
4.2.3 Sight Distance	17
4.2.4 Access Capacity	18
4.2.5 Safety	18
5 TRAFFIC GENERATION	20
6 TRAFFIC IMPACT ASSESSMENT	21
6.1 External Intersection Impact Assessment	21
6.2 Intersection Impact Analysis Results	22
6.3 Access Intersection Capacity Modelling Results	22
7 LAYOUT DESIGN REVIEW	24
7.1 Road Layout Design Conformance	24
7.2 Lot Access	24
7.3 Servicing Requirements	25
8 TRAFFIC ENGINEERING CONCLUSIONS	26
8.1 Conclusion	26
8.2 Recommendation	27
APPENDIX A: LAYOUT PLAN	28
APPENDIX B: TURN VOLUMES	29
APPENDIX C: SIDRA RESULTS	30

TABLES

Table 1.1: Proposed Development Extents	5
Table 1.2: Legislative Summary	6
Table 2.1: LoS Definitions Based on Delay	7
Table 2.2: Degree of Saturation	7
Table 2.3: Queue Storage Ratio	8
Table 3.1: Surrounding Road Network	9
Table 3.2: Existing Conditions Year 2025 PM Peak Results	13
Table 3.3: Existing Conditions Year 2025 PM Peak Results	14
Table 4.1: SISD Results	17
Table 4.2: MGSD Analysis Results	18
Table 4.3: Crash Information	19
Table 5.1: Trip Generation, Distribution and Assignment	20
Table 6.1: Castledoyle Road / Waterfall Way Intersection Impact Analysis Results	22
Table 6.2: Access Intersection Capacity Analysis Results	23
Table 7.1: Internal Road Cross Section	24

FIGURES

Figure 1.1: Project Locality	5
Figure 3.1: Bus Stop Locations	10
Figure 3.2: Existing Bus Route Map	11
Figure 3.3: Waterfall Way / Castledoyle Road Existing Geometry	12
Figure 4.1: Left Turn Overlap Avoidance Spacing	16
Figure 4.2: MGSD Requirements	18
Figure 4.3 Crash Analysis	19
Figure 6.1: Proposed Access Intersection Configuration	22
Figure 7.1 Standard Driveways 030-070A / 030-071	25

1 INTRODUCTION

1.1 Project Overview

Dykman Consulting was appointed in order to conduct a Traffic Impact Assessment (TIA) for a proposed 275 lot subdivision situated on Lot 1 DP1209469, Lot 8 DP240862 & Lots 69 & 70 DP755808. The proposed site is located on the R1 General Residential and R2 Low Density Residential zones of the Armidale Regional Council's (ARC) Development Control Plan (DCP), 2024. The site locality is provided in Figure 1.1.

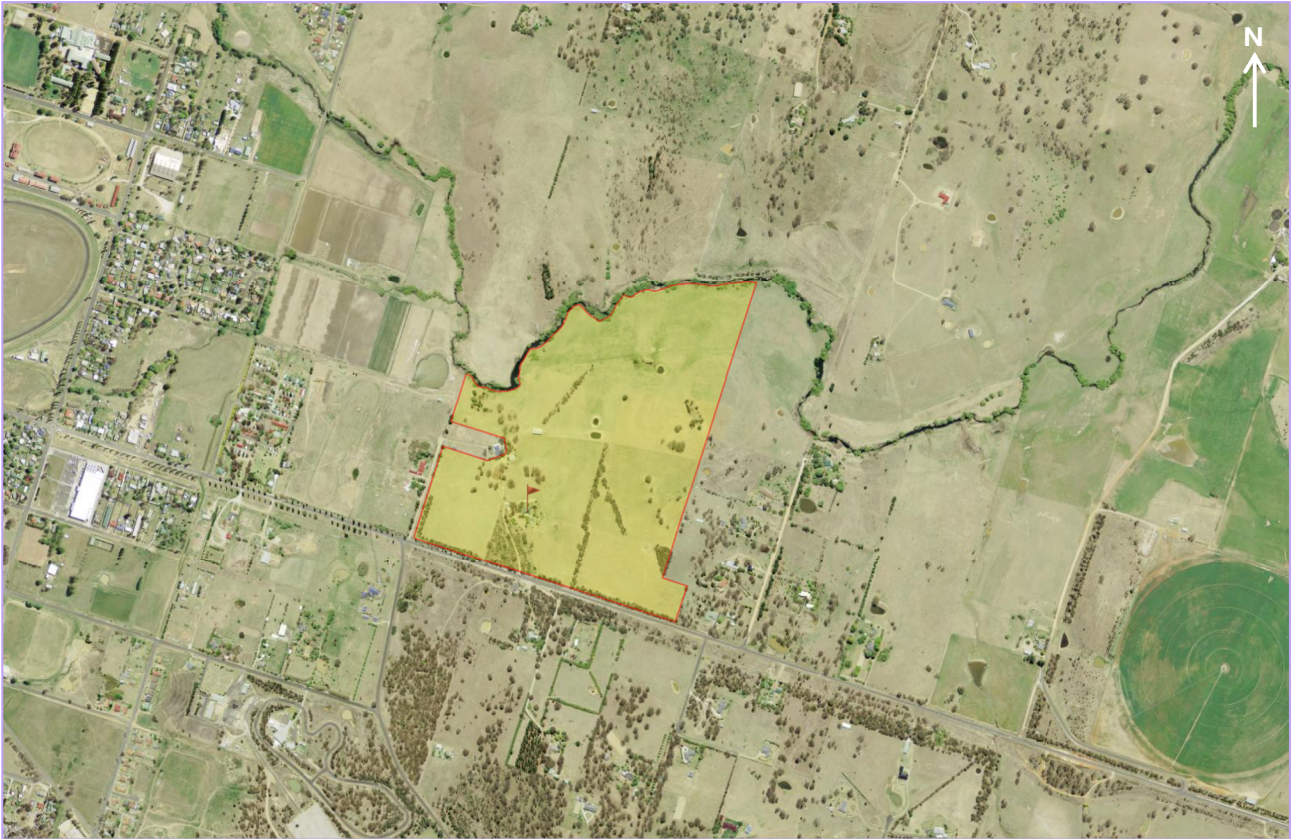


Figure 1.1: Project Locality

Access to the site is proposed to be obtained from a news access intersection from Waterfall Way with a formalised internal road network. Subsequent sections will discuss the access configuration in more detail.

1.2 Proposed Application

The proposed application is for a material change of use consisting of:

Table 1.1: Proposed Development Extents

Parameter	Extent
Lots:	275
Internal Road Network:	20m wide Local Collector 16m wide Local Access Streets 14m wide Access Places

The following legislative summary items applicable to the proposed reconfiguration and TIA are indicated in Table 1.2.

Table 1.2: Legislative Summary

Legislative Summary	
Local Government Authority	Armidale Regional Council
Planning Scheme Zone/s	C2, C3, R1, R2, and RE1
Applicable Planning Scheme	Armidale Regional Council Development Control Plan, 2024

1.3 Scope and Context of Report

This report investigates the transport aspects associated with the proposed development. The scope of the transport aspects investigated includes:

- Broadly identify the existing transport infrastructure which is of relevance to the Project.
- Broadly define the proposed road upgrade works to address infrastructure requirements.
- Assess the current, background operation of the surrounding transport infrastructure.
- Estimate traffic generation associated with the Project and the distribution of this development traffic on the identified road network.
- Assess the potential traffic impact on the surrounding transport infrastructure.
- Identify potential mitigation and management strategies to be implemented to offset the traffic impact of the proposed Project (if required).

The adopted methodology centres on establishing a background, or “without Project” traffic scenario for the identified transport routes and comparing this with a scenario including the Project-generated traffic, i.e. the “with Project” or post development scenario. This process allows for the assessment of the traffic impacts of the Project in terms of road safety, access requirements, intersection operations, road link capacity and other transport infrastructure. Following this, potential mitigation and/or management measures will be formulated, if required, to address the potential traffic impacts caused by the proposed development.

1.4 Reference Guides

The following documents have been evaluated in order to formulate the traffic advice within this assessment:

- AS/NZS 2890.1 – 2004 Parking facilities Part 1: Off-street car parking
- AS/NZS 2890.2 – 2018: Off-street commercial vehicle facilities
- RMS Guide to Traffic Impact Assessment Manual, 2024
- Plans of the proposed development provided in **Appendix A** to this report
- Armidale Regional Council Development Control Plan, 2024

1.5 Data Sources

The following sources of data have been used for the purpose of this assessment:

- Traffic Count Data as obtained from 360 Surveys – refer **Appendix B**. An industry standard 3% traffic growth rate was adopted to project future year volumes from baseline volumes.
- Intersection turning movement counts, undertaken on 30 May 2024 for the following intersection:
 - Waterfall Way / Tombs Road.
- The raw traffic data from this intersection count is included for reference as **Appendix B**.
- RMS Crash Map Viewer (<https://www.transport.nsw.gov.au/roadsafety/statistics/interactive-crash-statistics/lga-view-crashes-map>) - crash data in vicinity of the site.

2 SIDRA MODELLING METHODOLOGY

2.1 Delay Based Intersection Analysis

An increase in vehicles through an intersection as a result of the development or future growth will likely increase traffic delays. Increases in delays have an economic and social impact on the community through increased travel times, driver impatience (leading to possible crashes) and the associated economic cost of these delays to private and commercial / heavy vehicle trips. The following input types are required as a basis to evaluate existing intersection performance:

- Existing intersection geometry and lane configuration data
- Vehicle movement data
- Peak hour traffic volume data

The delay-based analyses criteria adopted for the purposes of this study are provided in Table 2.1. The table indicates the LoS per intersection control type associated with a respective delay per vehicle measured in seconds.

Table 2.1: LoS Definitions Based on Delay

Level of Service	Control delay per Vehicle in Seconds (d)		
	Signals	Roundabout	Sign Control
A	$d \leq 10$	$d \leq 10$	$d \leq 10$
B	$10 d \leq 20$	$10 d \leq 20$	$10 d \leq 15$
C	$20 d \leq 35$	$20 d \leq 35$	$15 d \leq 25$
D	$35 d \leq 55$	$35 d \leq 50$	$25 d \leq 35$
E	$55 d \leq 80$	$50 d \leq 70$	$35 d \leq 50$
F	$d < 80$	$d < 70$	$d < 50$

Source: RMS Modelling Guidelines 2013

Intersection Level of Service (LoS) was assessed using the NSW LoS criteria as provided in Table 2.1 above. For the purpose of this assessment a maximum threshold of LoS D for the whole intersection was adopted. Therefore, an intersection option found to operate at LoS E or F is deemed unacceptable from a traffic performance perspective, as defined in the Austroads Guide to Traffic Management: Part 3 Traffic Studies and Analysis (2017).

2.2 Practical Degree of Saturation

The Degree of Saturation (DoS) is defined as the ratio of demand (arrival) flow to capacity, which is equivalent to volume / capacity ratio, or V/C ratio. A DoS above 1.0 represents oversaturated conditions where the demand flows exceeds available capacity. The DoS criteria adopted for this assessment is provided in Any intersection operating at higher than the maximum DoS is considered unacceptable for operational performance.

Table 2.2: Degree of Saturation

Intersection type	Maximum Practical degree of saturation
Signals	0.900
Roundabouts	0.850
Sign-controlled	0.800
Continuous lanes	0.980

Source: RMS Modelling Guidelines 2013

2.3 Queueing Ratio Analysis Criteria

Vehicle queueing analysis results were evaluated in parallel to vehicle delay (LoS). Queueing analyses results depict the queue storage ratio (percentile of vehicles queueing in relation to the lane storage capacity in meters). Queueing analysis outputs contribute to safety impacts, where extensive queueing

beyond allowable storage capacity contributes to a higher probability for the occurrence of an accident. The queue storage ratio analyses criteria are indicated in Table 2.3.

Table 2.3: Queue Storage Ratio

Control delay per Vehicle in Seconds (d)			
Level of Service	Queue Storage Ratio – Percentile (Rq%)	Colour	Rating
A	$Rq\% \leq 6$	Green	Excellent
B	$0.6 < Rq\% \leq 0.7$	Light Blue	Very Good
C	$0.7 < Rq\% \leq 0.8$	Dark Blue	Good
D	$0.8 < Rq\% \leq 0.9$	Magenta	Fair
E	$0.9 < Rq\% \leq 0.1$	Orange	Poor
F	$1.0 < Rq\%$	Red	Very Poor

Source: SIDRA Intersection 8 User Guide

3 EXISTING CONDITIONS

3.1 On-Site Uses

The site currently consists of a vacant site which will be developed as part of this application.

3.2 Site Surrounding Road Network

Descriptive details regarding the road network surrounding the proposed site are provided in Table 3.1. The table provides information regarding existing geometrical conditions of the road network and associated road links.

Table 3.1: Surrounding Road Network

Road Name	Road Class	Number of Lanes per Direction	Carriageway Single / Dual	Lane Width (m)	Posted Speed (km/h)
Waterfall Way	Major Distributor	1	S	3.5	80
Tombs Road	Local Collector	1	S	Unformed	50
Castledoye Road	Minor Distributor	1	S	3	80

There are no classified stock routes in close proximity of the site or proposed access location which would have an impact on the proposed development.

Tombs Road

Tombs Road is currently an unformed gravel road with a classification of a Local Collector Road. The formation of the road allows for an assumed speed of 50km/h. The northern Tombs Road access onto Waterfall Way is proposed to be closed off as part of this application, with existing traffic heading to and from the north of Tombs Road to divert via the new internal road network and distribute externally via the new access intersection. The road is a council road and falls under the ownership of Armidale Regional Council.

Castledoye Road

The road can be classified as a Minor Distributor with a posted speed of 80km/h. The road has a paved width of approximately 6m without any formal roadside shoulders. Castledoye Road intersects with Waterfall Way as a priority-controlled intersection with formal signage and line marking. The road is a council road and falls under the ownership of Armidale Regional Council.

Waterfall Way

This is considered to be a Major Distributor with a posted speed of 80km/h and a paved road width of approximately 9m. Roadside shoulders of about 1m width occurs along both sides of the carriageway. The road is classified as a state road and falls under the ownership of RMS.

3.3 Public Transport

3.3.1 Public Transport, Pedestrian and Bicycle Facilities

The closest bus stop to the proposed site is located approximately 1.4km from the site which services bus route 483. The closest bus stop locations are illustrated in Figure 3.1.

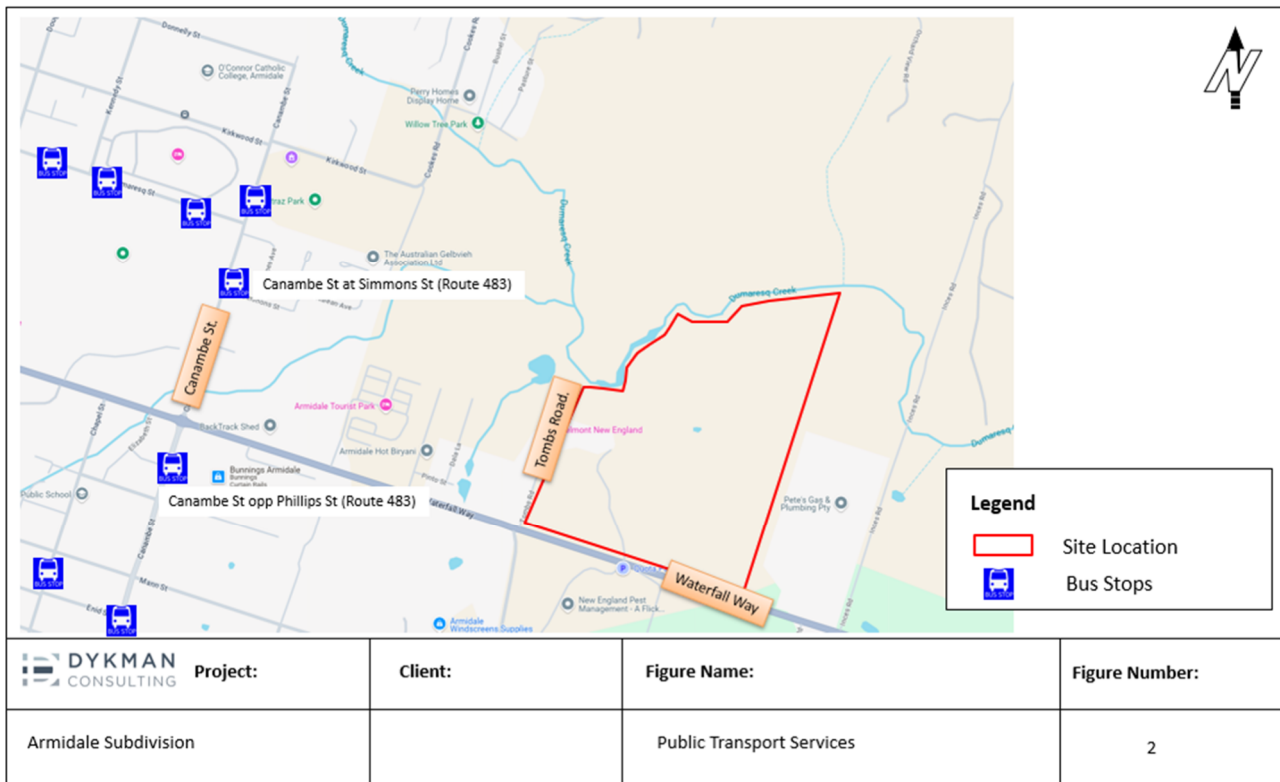


Figure 3.1: Bus Stop Locations

Given the dispersed extent of available bus stops and significant walking distance to these stops, allowance is made for in the proposed layout to accommodate a bus stop. This would enhance accessibility and connectivity to these bus routes servicing the CBD and surrounding neighbourhoods. The existing bus routes which should be allowed for in the layout design would include Route 483 as illustrated on the existing route map in Figure 3.2.

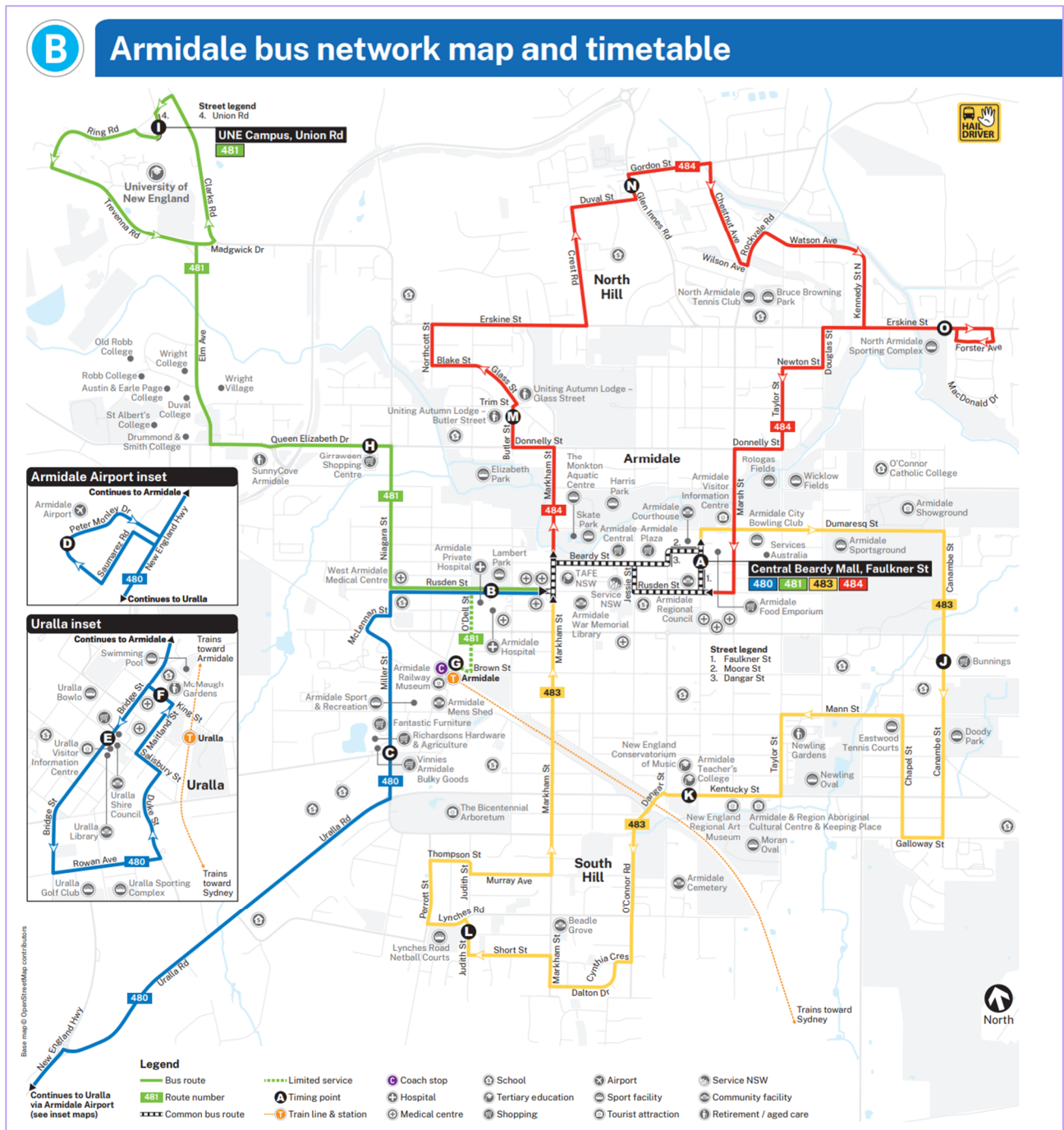


Figure 3.2: Existing Bus Route Map

3.4 Existing Intersection Performance

The key intersection expected to be impacted as a result of the development was considered to be the Waterfall Way / Castledoye Road intersection. Given the central areas of employment, education, shopping and medical necessities occurring within Armidale, the majority of development trips would traverse through this intersection before cascading through the network. The existing condition modelling evaluated the AM and PM peak hour traffic volumes traversing through the intersection based on the existing geometry and control. The existing geometry and control measures of the intersection are illustrated in Figure 3.3.

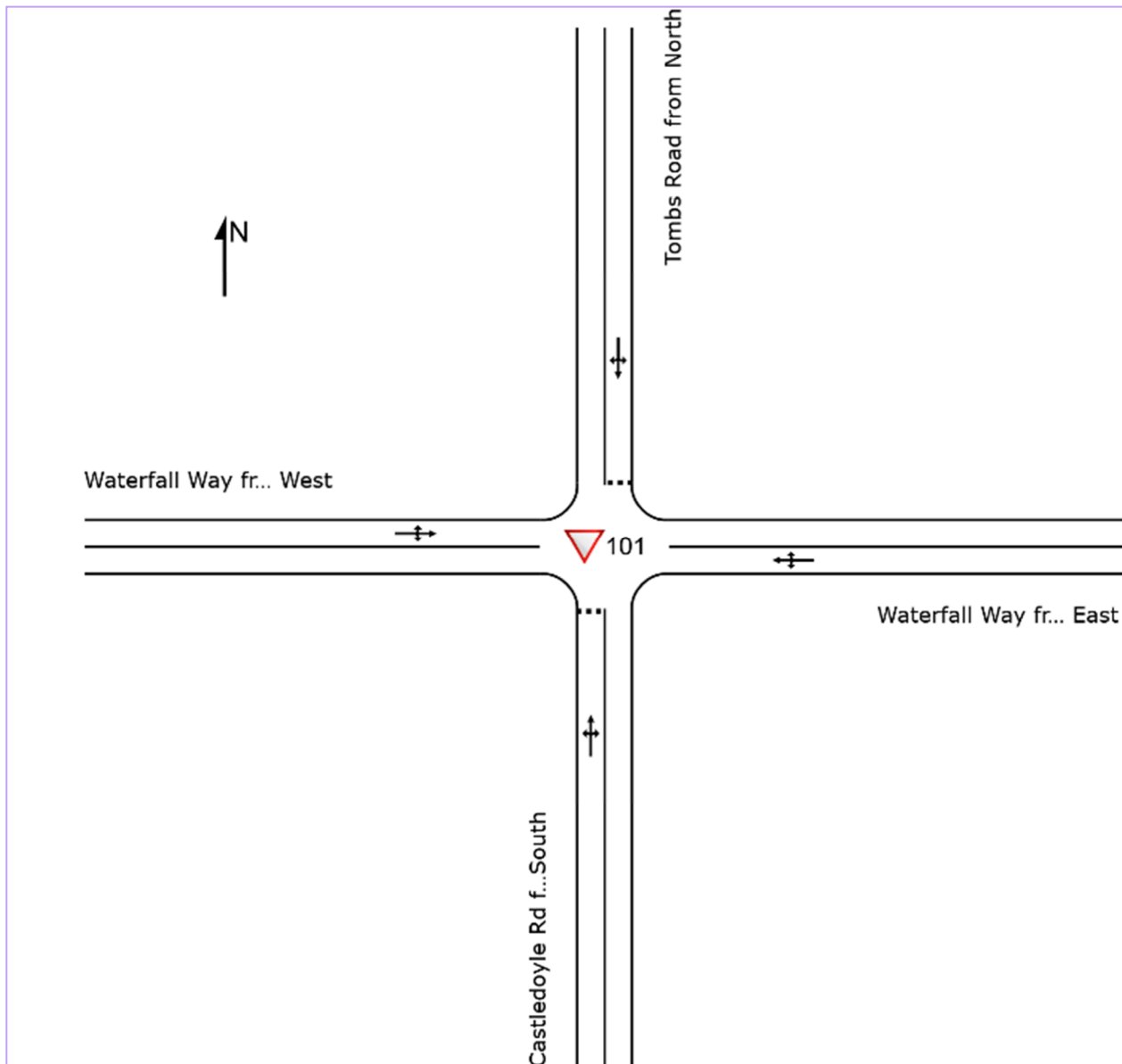


Figure 3.3: Waterfall Way / Castledoye Road Existing Geometry

The analysis results of the existing operating conditions of the intersection are provided in Table 3.2 and Table 3.3 for both peak hours.

Table 3.2: Existing Conditions Year 2025 PM Peak Results

Vehicle Movement Performance Year 2025 AM Peak															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total]	HV]	[Total]	HV]				[Veh.	Dist]				
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Castledoye Rd from South															
1	L2	All MCs	82	42.3	82	42.3	0.093	7.3	LOS A	0.4	3.4	0.38	0.61	0.38	50.1
2	T1	All MCs	1	0.0	1	0.0	0.093	6.7	LOS A	0.4	3.4	0.38	0.61	0.38	52.2
3	R2	All MCs	5	40.0	5	40.0	0.093	11.1	LOS B	0.4	3.4	0.38	0.61	0.38	49.8
Approach			88	41.7	88	41.7	0.093	7.5	LOS A	0.4	3.4	0.38	0.61	0.38	50.1
East: Waterfall Way from East															
4	L2	All MCs	8	50.0	8	50.0	0.138	6.1	LOS A	0.0	0.1	0.00	0.03	0.00	54.9
5	T1	All MCs	202	41.1	202	41.1	0.138	0.0	LOS A	0.0	0.1	0.00	0.03	0.00	59.8
6	R2	All MCs	1	0.0	1	0.0	0.138	5.7	LOS A	0.0	0.1	0.00	0.03	0.00	56.9
Approach			212	41.3	212	41.3	0.138	0.3	NA	0.0	0.1	0.00	0.03	0.00	59.5
North: Tombs Road from North															
7	L2	All MCs	1	0.0	1	0.0	0.017	6.1	LOS A	0.1	0.5	0.53	0.68	0.53	49.2
8	T1	All MCs	1	0.0	1	0.0	0.017	6.4	LOS A	0.1	0.5	0.53	0.68	0.53	49.6
9	R2	All MCs	5	60.0	5	60.0	0.017	13.4	LOS B	0.1	0.5	0.53	0.68	0.53	46.7
Approach			7	42.9	7	42.9	0.017	11.3	LOS B	0.1	0.5	0.53	0.68	0.53	47.5
West: Waterfall Way from West															
10	L2	All MCs	5	80.0	5	80.0	0.158	6.5	LOS A	0.5	5.3	0.22	0.28	0.22	51.9
11	T1	All MCs	146	66.2	146	66.2	0.158	0.0	LOS A	0.5	5.3	0.22	0.28	0.22	57.7
12	R2	All MCs	44	64.3	44	64.3	0.158	10.2	LOS B	0.5	5.3	0.22	0.28	0.22	52.1
Approach			196	66.1	196	66.1	0.158	2.5	NA	0.5	5.3	0.22	0.28	0.22	56.2
All Vehicles			503	51.0	503	51.0	0.158	2.6	NA	0.5	5.3	0.16	0.24	0.16	56.2
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).															

Table 3.3: Existing Conditions Year 2025 PM Peak Results

Vehicle Movement Performance Year 2025 PM Peak																
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn		Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total]	HV]	[Total]	HV]					[Veh.	Dist]				
			veh/h	%	veh/h	%	v/c		sec		veh	m				km/h
South: Castledoyle Rd from South																
1	L2	All MCs	2	50.0	2	50.0	0.003		6.2	LOS A	0.0	0.1	0.11	0.53	0.11	50.9
2	T1	All MCs	1	0.0	1	0.0	0.003		4.3	LOS A	0.0	0.1	0.11	0.53	0.11	53.4
3	R2	All MCs	1	0.0	1	0.0	0.003		5.7	LOS A	0.0	0.1	0.11	0.53	0.11	52.7
Approach			4	25.0	4	25.0	0.003		5.6	LOS A	0.0	0.1	0.11	0.53	0.11	51.9
East: Waterfall Way from East																
4	L2	All MCs	1	0.0	1	0.0	0.016		5.5	LOS A	0.0	0.1	0.02	0.05	0.02	56.7
5	T1	All MCs	22	38.1	22	38.1	0.016		0.0	LOS A	0.0	0.1	0.02	0.05	0.02	59.1
6	R2	All MCs	1	100.0	1	100.0	0.016		6.8	LOS A	0.0	0.1	0.02	0.05	0.02	51.6
Approach			24	39.1	24	39.1	0.016		0.5	NA	0.0	0.1	0.02	0.05	0.02	58.6
North: Tombs Road from North																
7	L2	All MCs	1	0.0	1	0.0	0.002		5.6	LOS A	0.0	0.1	0.11	0.53	0.11	52.9
8	T1	All MCs	1	0.0	1	0.0	0.002		4.3	LOS A	0.0	0.1	0.11	0.53	0.11	53.4
9	R2	All MCs	1	0.0	1	0.0	0.002		5.7	LOS A	0.0	0.1	0.11	0.53	0.11	52.7
Approach			3	0.0	3	0.0	0.002		5.2	LOS A	0.0	0.1	0.11	0.53	0.11	53.0
West: Waterfall Way from West																
10	L2	All MCs	1	100.0	1	100.0	0.019		6.7	LOS A	0.0	0.3	0.03	0.11	0.03	51.8
11	T1	All MCs	23	40.9	23	40.9	0.019		0.0	LOS A	0.0	0.3	0.03	0.11	0.03	58.6
12	R2	All MCs	4	25.0	4	25.0	0.019		5.8	LOS A	0.0	0.3	0.03	0.11	0.03	54.6
Approach			28	40.7	28	40.7	0.019		1.1	NA	0.0	0.3	0.03	0.11	0.03	57.7
All Vehicles			60	36.8	60	36.8	0.019		1.4	NA	0.0	0.3	0.04	0.14	0.04	57.3
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).																

The analysis results indicate that minimal turn movements occur at the intersection. The existing operational performance constitutes LOS A during the PM peak and worst movement LOS B during the AM peak.



4 DEVELOPMENT DETAILS

4.1 Development Layout

The proposed site layout plan is attached as **Appendix A**. This includes a proposed subdivision for 275 Lots.

4.2 Vehicle Access

It is proposed that vehicle access be obtained from a new formal intersection off Waterfall Way. An assessment has been carried out to determine the viability of the proposed access position from a traffic engineering perspective. From an engineering perspective the location of an access should be spaced at sufficient distances to allow for safe and effective driver reaction times and deceleration distances, whilst not impacting on operational performance / capacity of a road. Analysis was carried out to location viability of the proposed access intersection, whilst not compromising the safety of road network. Intersection and access requirements were determined based on the factors as indicated in the Austroads Guide to Road Design Part 4A.

- Access spacing
- Intersection sight distance
- Ingress and egress capacity
- Safety and risk assessment

4.2.1 Design Speed

The existing posted speed along Waterfall Way is 80km/h. The posted speed along the frontage of the site will be reduced to 50km/h and as such a design speed of 60km/h (posted + 10km/h) was assumed.

4.2.2 Access Spacing

Left Turn Collision Avoidance

An overlap occurs when the through driver must monitor more than one access at a time. Providing at least the stopping sight distance between access points will allow a through vehicle to avoid a collision with an entering vehicle. However, this is too conservative as the entering vehicle will be accelerating away.

Austroads uses deceleration rates from 2.5 m/sec² (comfortable) to 3.5 m/sec² (maximum) and implied acceleration rates for developing acceleration lanes from about 1.0 m/sec² to 1.4 m/sec² (Section 5 of AGRD Part 4A). By applying the standard equations of motion and assuming constant acceleration and deceleration rates, the values for 'd' and 'a' can be calculated, the value of 'd' being the minimum spacing to avoid the collision. The required spacing for left turn overlap avoidance is indicated in Figure 4.1.

Speed (km/h)	$d + a$ (m)		a (m)		Spacing (desirable) $A - C$ (m)	Spacing (minimum) $B - D$ (m)	SSD (m)
	A Decel. rate 2.5 m/s ²	B Decel. rate 3.5 m/s ²	C Accel. rate 1.0 m/s ²	D Accel. rate 1.5 m/s ²			
50	31	26	5	7	30 (26)	20 (19)	45
60	45	38	7	10	40 (38)	30 (28)	65
70	61	51	9	14	55 (52)	40 (37)	85
80	79	67	12	18	70 (67)	50 (49)	105
90	100	85	15	23	85 (85)	65 (62)	130
100	124	105	19	29	105 (105)	80 (76)	170

Figure 4.1: Left Turn Overlap Avoidance Spacing

Based on the road design speed fronting the site of 60 km/h, a spacing distance of 40m as desirable is required for access on the same side. The nearest intersection on the same side (Inces Road) is located approximately 618m from the proposed access intersection. The spacing is thus fully compliant to allow for safe left turn overlaps.

4.2.3 Sight Distance

An access sight distance evaluation was undertaken for the proposed site accesses egress in order to evaluate whether safe sight distances would be achieved, given the proposed location. The sight distance assessment was conducted for:

- Safe Intersection Sight Distance (SISD)
- Minimum Gap Sight Distance (MGSD)

Safe Intersection Sight Distance (SISD)

SISD is derived from two components:

1. the distance travelled during the total reaction time
2. the distance travelled during the braking time from the design speed to a stop and their relationship is shown below.

The access required SSD was determined based on the following equation:

$$SISD = \frac{RT \times V}{3.6} + \frac{V^2}{254 (d + 0.01 \times a)}$$

Where:

SSD = stopping sight distance (m)

RT = reaction time (sec) – refer to AGRD Part 3 (Austroads 2016b) for a guide to values

V = operating (85th percentile) speed (km/h)

d = coefficient of deceleration – refer to Table 3.3 and AGRD Part 3 for a guide to values

a = longitudinal grade in % (in direction of travel: positive for uphill grade, negative for downhill grade)

It was found that the proposed site access is located along a gently undulating gradient on Gwydir Highway with straight horizontal alignment for both directions of travel. Table 4.1 provides the assessment results.

Table 4.1: SISD Results

Parameter	Direction of Travel	
	To West	To East
Ot	3	3
Rt	1.5	1.5
Dt	4.5	4.5
V	60	60
d	0.46	0.46
a	4.5	2
SISD Required	103	105

The minimum required SISD would need to be 103m to the west and 105m to the east. It was found that the available sight distance would be sufficient to meet the minimum required SISD requirements. The available sight distance would be >215m for both directions of travel. This is considered sufficient.

Minimum Gap Sight Distance

The MGSD was calculated based on the observation angle to approaching traffic and critical gap acceptance values adopted by drivers undertaking typical manoeuvres at the intersections. The MGSD is defined by the Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections (Austroads, 2010) as the minimum distance in meters required for the driver of a vehicle entering the major flow to see a vehicle in the conflicting streams, in order to safely commence the desired manoeuvre. The MGSD varies depending on vehicle approach speeds and critical gap acceptance times, as shown in Figure 4.2.

Critical gap acceptance time (ta) (secs)	85th percentile speed of approaching vehicle (km/h)										
	10	20	30	40	50	60	70	80	90	100	110
4	11	22	33	44	55	67	78	89	100	111	122
5	14	28	42	55	69	83	97	111	125	139	153
6	17	33	50	67	83	100	117	133	150	167	183
7	19	39	58	78	97	117	136	155	175	194	214
8	22	44	67	89	111	133	155	178	200	222	244
9	25	50	75	100	125	150	175	200	225	250	275
10	28	56	83	111	139	167	194	222	250	278	305

Figure 4.2: MGSD Requirements

Based on the evaluation the following MGSD is required for the access:

- Left and right turn movement from minor road (Access) = 83m
- Right turn from major road = 67m

The MGSD analysis results are provided in Table 4.2.

Table 4.2: MGSD Analysis Results

Movement	MGSD Required	Sight Distance Achieved (Y/N)
Left and right turn movement from minor road (Access)	83m	Y
Right turn from major road (Waterfall Way)	67m	Y

It was found that sufficient MGSD is available to meet the minimum requirements. The sight distance analysis indicating a 215m sight line from the access in line of travel path is available. Sight distances are considered acceptable.

4.2.4 Access Capacity

It is proposed that the access allow for dedicated right and left turning lanes as per the access intersection design. This would allow for safe vehicle storage and allow for unopposed vehicle passing of the through lane movements to enhance operational efficiency. A SIDRA modelling exercise was carried out to determine the operational performance of the access at future year 2038. The analysis results are detailed in Section 4 of this report. However, it was found that based on the access geometry proposed, sufficient capacity would prevail.

4.2.5 Safety

Readily available crash data was obtained from the TfNSW Crash Map data portal. The data indicates that only two crashes occurred in close proximity to the site in the last 5 years.



Figure 4.3 Crash Analysis

Table 4.3: Crash Information

Year	Degree of Crash	RUM Code	Description	Number Injured
2019	Moderate Injury	71	Off road on left	2
2022	No injury (tow away)	67	Struck animal	0

The crash analysis indicate that minimal crashes have occurred in the last 5 years in close proximity the site. The development and associated access is thus not expected to have an impact on such existing crash trends.

In summary it was found that the proposed access intersection and development as proposed would not adversely affect the safety, efficiency and ongoing operation of the road and that the proposed intersection geometry as proposed would be functional.

5 TRAFFIC GENERATION

The traffic generation of the proposed development has been forecast with reference to the Roads & Maritime Service (RMS) Guide to Traffic Generating Developments (GTGD) October 2002 and August 2013 Technical Direction. For low density residential dwellings, the GTGD October 2002 provides one set of generation rates, whereas the August 2013 Technical Direction categorises the generation rates into two sets namely Sydney (CBD) and regional areas. With consideration of the location of the proposed development, it has been considered reasonable to adopt the generation rates outlined in the GTGD October 2002, which seem to represent an approximate middle range between the Sydney (CBD) and regional rates in the August 2013 edition. These are industry standard trip generation rates applicable for this proposed development.

Table 5.1: Trip Generation, Distribution and Assignment

Development Traffic Calculations					
Proposed No. Lots	=	275			
Traffic Generation					
AM Peak Generation Rate	=	0.85	trips per lot		
AM Peak Dev Traffic Volume	=	234	-		
PM Peak Generation Rate	=	0.85	trips per lot		
PM Peak Dev Traffic Volume	=	234	-		
Daily Generation Rate	=	9	trips per lot		
Daily Dev Traffic Volume	=	2475	-		
Traffic Distribution					
AM PEAK			PM PEAK		
% New Trips	=	100 %	% New Trips	=	100 %
New Trips Volume	=	234	New Trips Volume	=	234
Inbound %	=	20%	Inbound %	=	80%
Inbound Volume	=	47	Inbound Volume	=	187
Inbound from East via Waterfall Way	=	5%	Inbound from East via Waterfall Way	=	5%
Inbound from East via Waterfall Way (volume)	=	3	Inbound from East via Waterfall Way (volume)	=	10
Inbound from West via Waterfall Way	=	95%	Inbound from West via Waterfall Way	=	95%
Inbound from West via Waterfall Way (volume)	=	45	Inbound from West via Waterfall Way (volume)	=	178
Outbound %	=	80%	Outbound %	=	20%
Outbound Volume	=	187	Outbound Volume	=	47
Outbound to East via Waterfall Way	=	5%	Outbound to East via Waterfall Way	=	5%
Outbound to East via Waterfall Way (volume)	=	10	Outbound to East via Waterfall Way (volume)	=	3
Outbound to West via Waterfall Way	=	95%	Outbound to West via Waterfall Way	=	95%
Outbound to West via Waterfall Way (volume)	=	178	Outbound to West via Waterfall Way (volume)	=	45

The development is expected to generate approximately 234 vehicles per hour during both AM and PM peaks. Of these trips, 95% is assumed to travel to and from Armidale. The trip distribution and assignment is based on the overall development which takes the total development quantum into consideration to determine overall impacts.

6 TRAFFIC IMPACT ASSESSMENT

6.1 External Intersection Impact Assessment

This subsection provides the impact analysis findings of the expected intersections of impact. Traffic modelling has been conducted using SIDRA v9 for the following scenarios for both the AM and PM peak hours for each of the expected intersection of impact:

“Without Development” Scenarios

- **Scenario 1:** Opening Year 2028 AM Peak Hour Analysis Results with existing geometry and control (without Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control without the additional development generated traffic at year 2028. This was done for the AM peak hour for the future year 2028 in order to determine the operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection.
- **Scenario 2:** Opening Year 2028 PM Peak Hour Analysis Results with existing geometry and control (without Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control without the additional development generated traffic at year 2028. This was done for the PM peak hour for the future year 2028 in order to determine operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection
- **Scenario 3:** Future Year 2038 (opening + 10 years) AM Peak Hour Analysis Results with existing geometry and control (without Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control without the additional development generated traffic at year 2038. This was done for the AM peak hour for the future year 2038 in order to determine operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection.
- **Scenario 4:** Future Year 2038 (opening + 10 years) PM Peak Hour Analysis Results with existing geometry and control (without Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control without the additional development generated traffic at year 2038. This was done for the PM peak hour for the future year 2038 in order to determine operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection.

“With Development” Scenarios

- **Scenario 5:** Opening Year 2028 AM Peak Hour Analysis Results with existing geometry and control (with Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control with the additional development generated traffic at year 2028. This was done for the AM peak hour for the future year 2028 in order to determine the impact on operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection.
- **Scenario 6:** Opening Year 2028 PM Peak Hour Analysis Results with existing geometry and control (with Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control with the additional development generated traffic at year 2028. This was done for the PM peak hour for the future year 2028 in order to determine the impact on operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection
- **Scenario 7:** Future Year 2038 (opening + 10 years) AM Peak Hour Analysis Results with existing geometry and control (with Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control with the additional development generated traffic at year 2038. This was done for the AM peak hour for the future year 2038 in order to determine the impact on operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection.
- **Scenario 8:** Future Year 2038 (opening + 10 years) PM Peak Hour Analysis Results with existing geometry and control (with Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control with the additional development generated traffic at year 2038. This was done for the PM peak hour for the future year 2038 in order to determine the impact on operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection.

6.2 Intersection Impact Analysis Results

The impact analysis results of the Castledoyle Road / Waterfall Way intersection is provided in Table 6.1

Table 6.1: Castledoyle Road / Waterfall Way Intersection Impact Analysis Results

Analysis Scenario	Intersection Degree of Saturation	Worst Movement Level of Service	Intersection Average Delay (sec)	Maximum 95% Back of Queue Length (m)
Scenario 1	0.17	B	2.6	6
Scenario 2	0.02	A	1.3	0.3
Scenario 3	0.24	C	3.1	9.5
Scenario 4	0.02	A	1.2	0.3
Scenario 5	0.24	C	2.5	7.9
Scenario 6	0.11	A	0.3	0.3
Scenario 7	0.30	D	3.4	12.9
Scenario 8	0.12	A	0.3	0.3

The analysis results indicate that the intersection will operate at acceptable LOS thresholds and adequate levels of delay and queueing even at future year 2038 post development. The development is not considered to have a significant impact on the performance of the intersection. Detailed SIDRA outputs are provided in **Appendix B**.

6.3 Access Intersection Capacity Modelling Results

The capacity assessment for the proposed access intersection was carried out for future year 2038 with the development traffic volumes during both AM and PM peak hours. The analysis results are based on the layout as illustrated in Figure 6.1.

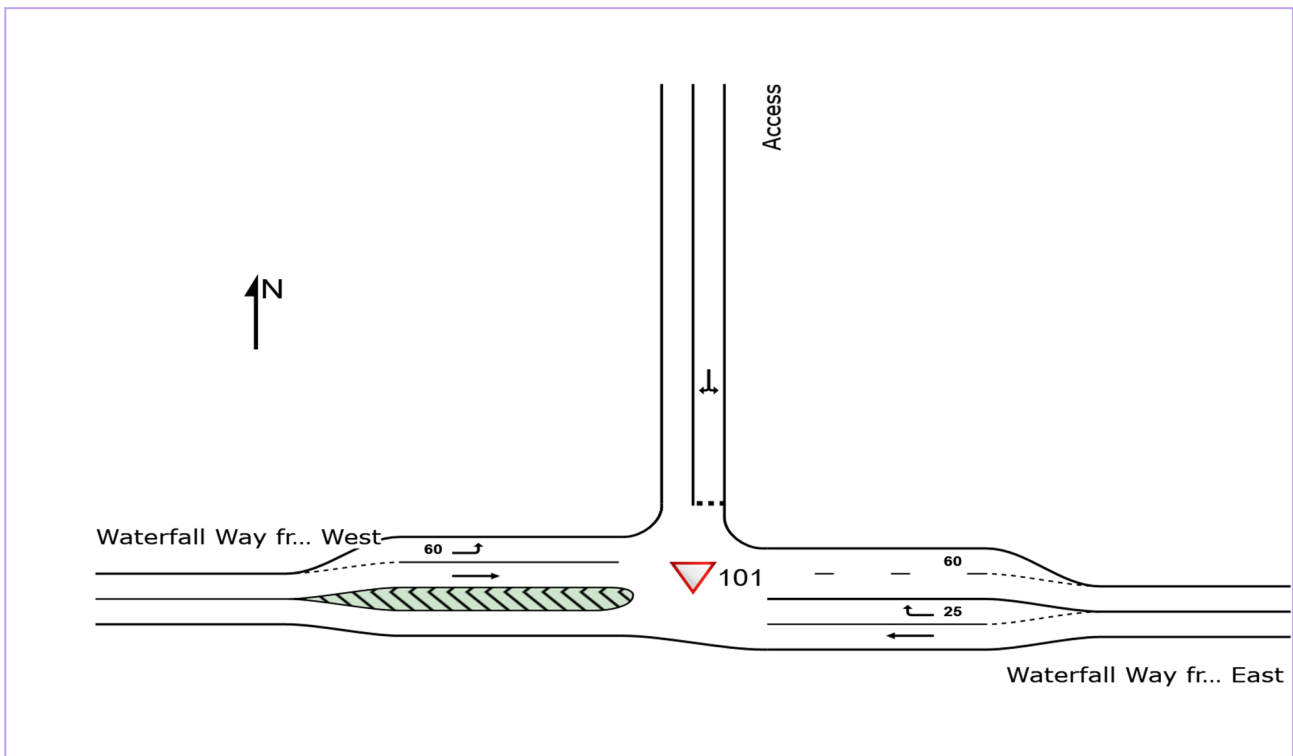


Figure 6.1: Proposed Access Intersection Configuration

Table 6.2: Access Intersection Capacity Analysis Results

Analysis Scenario	Intersection Degree of Saturation	Worst Movement Level of Service	Intersection Average Delay (sec)	Maximum 95% Back of Queue Length (m)
Year 2038 AM Peak	0.69	D	6.1	29.4
Year 2038 PM Peak	0.11	A	2.8	2.0

The results indicate that the AM peak is considered to be the worst-case scenario. Although even at year 2038 the proposed intersection and associated geometry and control configuration would allow for acceptable level of service and delay metrics to prevail. The worst performing turn movement is considered to be the right turn movement out of site which would experience a LoS D with 30.2 second delay and 29.4m queue length. Detailed SIDRA outputs are provided in **Appendix B**.

7 LAYOUT DESIGN REVIEW

7.1 Road Layout Design Conformance

The new internal road will serve as a local collector with internal local access streets providing direct lot access which will be designed as per the Armidale Development Control Plan 2024 requirements. Table 7.1 outlines the adopted street cross section, and associated daily traffic volumes, for the internal road network.

Table 7.1: Internal Road Cross Section

Road Hierarchy	Road Reserve	Carriageway Width	Compliance	Maximum Traffic Catchment	Daily Traffic Volume (vpd)
New Road 1: Local Collector	22m	11.6m with 4.25m verge (walkway on one side)	Yes	333 Lots	Up to 2000
New Road 2-13: Local Access Streets	16m	8m with 4.25m verge (walkway on one side)	Yes	222 Lots	Up to 3000

The proposed road hierarchy and associated cross sectional elements are considered appropriate and compliant with the Armidale Development Control Plan 2024. The required target speeds of these internal roads are to be 50km/h for the Local Collector and 40km/h for the Access Streets. It is recommended that local Area Traffic Management (LATM) measures be included in the design in order to achieve these target speeds given the block lengths and horizontal curve radii within the layout. These measures are to be refined and included in relevant Operational Works Design Drawings.

7.2 Lot Access

Direct lot access is proposed to be obtained from the internal Local Access Streets. These will be facilitated by means of standard vehicle driveways as per Armidale Regional Council Standard Roadworks Drawings 030-070A and 030-071 as indicated in Figure 7.1

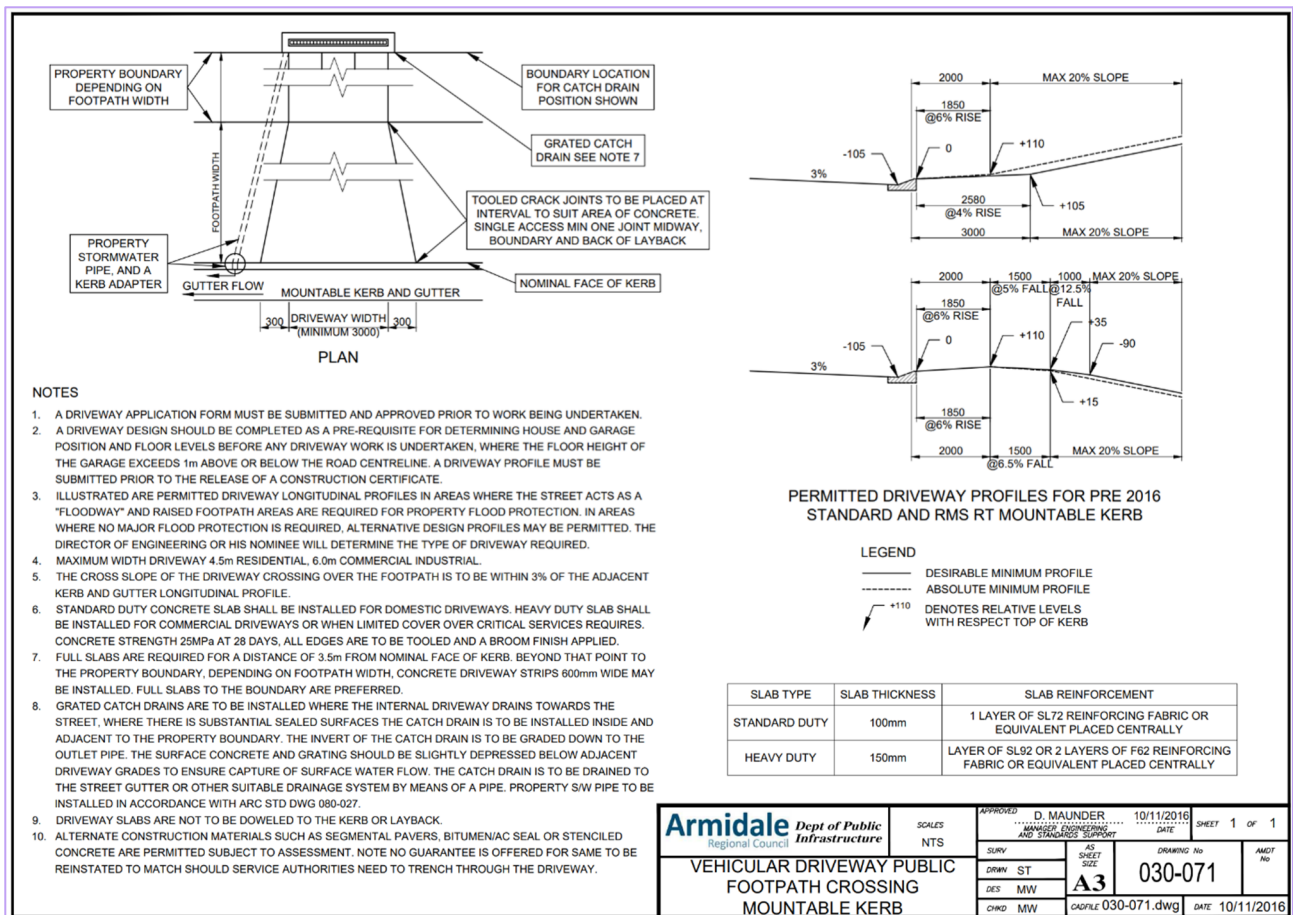


Figure 7.1 Standard Driveways 030-070A / 030-071

7.3 Servicing Requirements

Waste

Allowance has been made for allowing a 12.5m AS2890.2:2018 HRV side loading waste truck to access and exit the site in a forward gear. The waste truck would be able to circulate the internal layout while maintaining sufficient clearances.

8 TRAFFIC ENGINEERING CONCLUSIONS

8.1 Conclusion

The traffic and transportation aspects of the proposed development are considered acceptable and in line with council, RMS and Australian Standard requirements. The following summary of findings are provided:

- Dykman Consulting was appointed in order to conduct a Traffic Impact Assessment (TIA) for a proposed 275 LOT subdivision situated on LOT 1 DP1209469, LOT 8 DP240862 & LOTS 69 & 70 DP755808.
- The key intersection expected to be impacted as a result of the development was considered to be the Waterfall Way / Castledoyle Road intersection. Given the central areas of employment, education, shopping and medical necessities occurring within Armidale, the majority of development trips would traverse through this intersection before cascading through the network. The existing condition modelling evaluated the AM and PM peak hour traffic volumes traversing through the intersection based on the existing geometry and control. The analysis results indicate that minimal turn movements occur at the intersection. The existing operational performance constitutes LOS A during the PM peak and worst movement LOS B during the AM peak. The impact analysis results indicate that the intersection will operate at acceptable LOS thresholds and adequate levels of delay and queueing even at future year 2038 post development. The development is not considered to have a significant impact on the performance of the intersection. Detailed SIDRA outputs are provided in Appendix B.
- It is proposed that vehicle access be obtained from a new formal intersection off Waterfall Way. An assessment has been carried out to determine the viability of the proposed access position from a traffic engineering perspective. From an engineering perspective the location of an access should be spaced at sufficient distances to allow for safe and effective driver reaction times and deceleration distances, whilst not impacting on operational performance / capacity of a road. Analysis was carried out to location viability of the proposed access intersection, whilst not compromising the safety of road network. Intersection and access requirements were determined based on the factors as indicated in the Austroads Guide to Road Design Part 4A. It was found that the proposed access intersection and development as proposed would not adversely affect the safety, efficiency and ongoing operation of the road and that the proposed intersection geometry as proposed would be functional. Refer to Section 4 for specific assessment details.
- The development is expected to generate approximately 234 vehicles per hour during both AM and PM peaks. Of these trips, 95% is assumed to travel to and from Armidale. The trip distribution and assignment is based on the overall development which takes the total development quantum into consideration to determine overall impacts.
- The access SIDRA analyses results indicate that the AM peak is considered to be the worst-case scenario. Although even at year 2038 the proposed intersection and associated geometry and control configuration would allow for acceptable level of service and delay metrics to prevail. The worst performing turn movement is considered to be the right turn movement out of site which would experience a LoS D with 30.2 second delay and 29.4m queue length. Detailed SIDRA outputs are provided in Appendix B.
- The proposed road hierarchy and associated cross sectional elements are considered appropriate and compliant with the Armidale Development Control Plan 2024. The required target speeds of these internal roads are to be 50km/h for the Local Collector and 40km/h for the Access Streets. It is recommended that local Area Traffic Management (LATM) measures be included in the design in order to achieve these target speeds given the block lengths and horizontal curve radii within the layout. These measures are to be refined and included in relevant Operational Works Design Drawings.
- Given the dispersed extent of available bus stops and significant walking distance to these stops, allowance is made for in the proposed layout to accommodate a bus stop. This would enhance accessibility and connectivity to these bus routes servicing the CBD and surrounding neighbourhoods. The existing bus routes which should be allowed for in the layout design would include Route 483.

- Allowance has been made for allowing a 12.5m AS2890.2:2018 HRV side loading waste truck to access and exit the site in a forward gear. The waste truck would be able to circulate the internal layout while maintaining sufficient clearances.

8.2 Recommendation

It is recommended that the proposed development be approved from a Traffic Engineering perspective, subject to recommendations made within this Traffic Impact Assessment.

Appendix A: Layout Plan

CAD FILENAME: C:\265\knox\dykman\SYN\25002 - 241 Waterfall Way, Armidale - 650102 Working\022 DC Des\CAD\DRG\Service Strategy\25002-CO-1002.dwg Plot Date: 15 Apr. 2026

XREFS: - X_CD_CIVIL.dwg; X_LOTS.dwg; X_25002-Master.dwg; x_stormwater drainage.dwg; X_D_CONTS_FINISHED.dwg; X_D_CONTS_EXISTING.dwg; X_D_CONTROL_LINE.dwg; X_D_DESIGN_STRINGS.dwg; X_D_CUT_FILL_HATCH.dwg; X_DROA_INT.dwg; X_SURVEY.dwg; X_AERIAL_IMAGE.dwg; X_STRATEGY.dwg; X_D_WATERFALLWAY ENDANGERED TREE SURVEY.dwg; X_LOTS_OPTION F.dwg

E	LOT LAYOUT UPDATED	15.04.26	
D	LOT LAYOUT UPDATED	14.04.26	
C	LOT LAYOUT UPDATED	13.04.26	
B	LOT LAYOUT UPDATED	09.04.26	
A	ISSUED FOR APPROVAL	27.02.25	
REV	REVISION DETAILS	DATE	APPR

SCALE
1:1500
0 15 30 45 60m

KNOXCORP

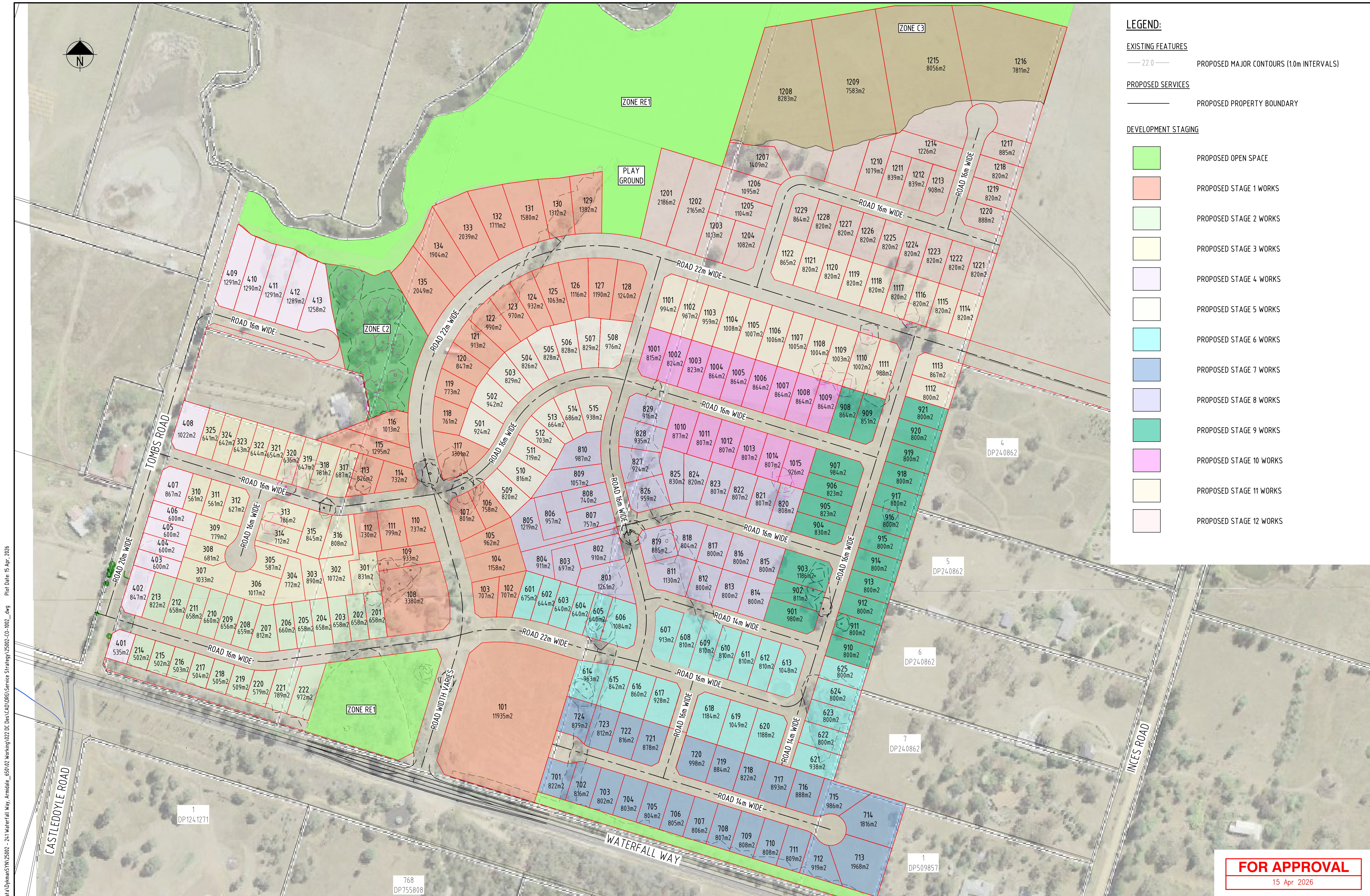


APPROVAL	RPEQ No
RPEQ SIGNATURE	DATE
DRAWN T.N.	DESIGNED M.G.
CHECKED S.G.	

PROPOSED SUBDIVISION
241 WATERFALL WAY ARMIDALE NSW
SERVICE STRATEGY

SERVICE STRATEGY
GENERAL SITE PLAN
ALL STAGES

ISSUE:	FOR APPROVAL
PROJECT No:	25002
DRAWING No:	25002-CO-1002
REV:	E



LEGEND:

EXISTING FEATURES

— 22.0 — PROPOSED MAJOR CONTOURS (1.0m INTERVALS)

PROPOSED SERVICES

— PROPOSED PROPERTY BOUNDARY

DEVELOPMENT STAGING

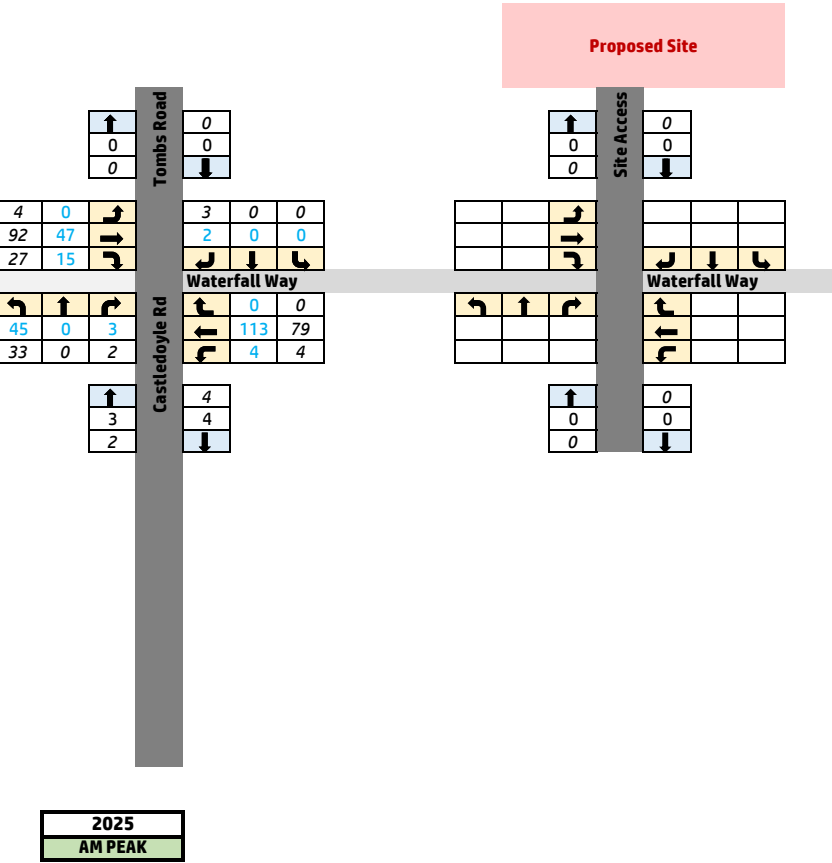
- PROPOSED OPEN SPACE
- PROPOSED STAGE 1 WORKS
- PROPOSED STAGE 2 WORKS
- PROPOSED STAGE 3 WORKS
- PROPOSED STAGE 4 WORKS
- PROPOSED STAGE 5 WORKS
- PROPOSED STAGE 6 WORKS
- PROPOSED STAGE 7 WORKS
- PROPOSED STAGE 8 WORKS
- PROPOSED STAGE 9 WORKS
- PROPOSED STAGE 10 WORKS
- PROPOSED STAGE 11 WORKS
- PROPOSED STAGE 12 WORKS

FOR APPROVAL

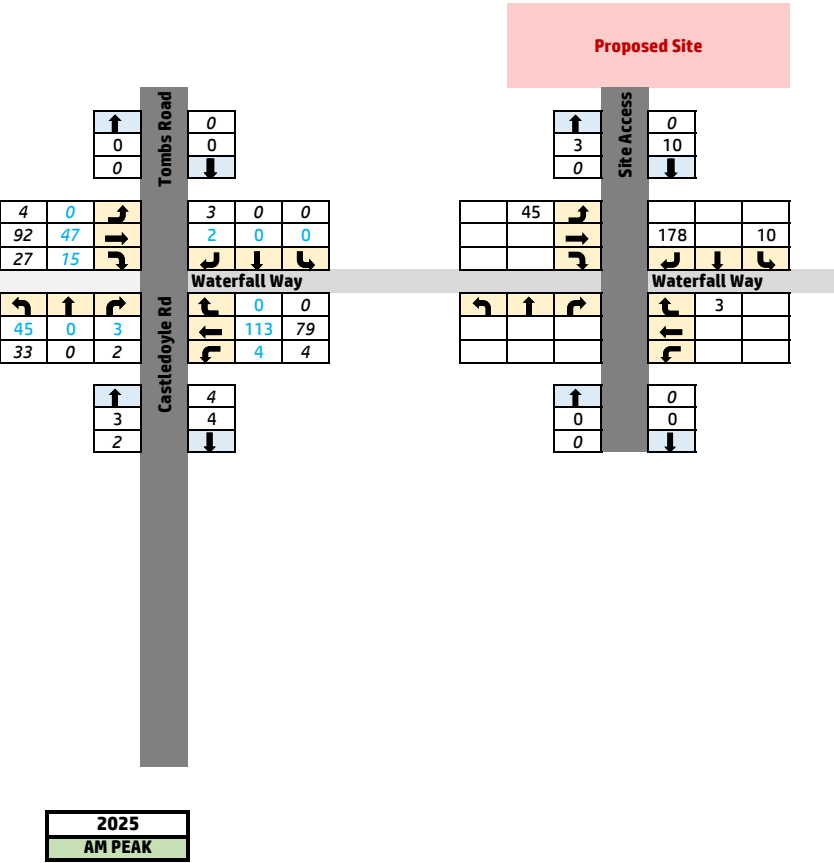
15 Apr. 2026

Appendix B: Turn Volumes

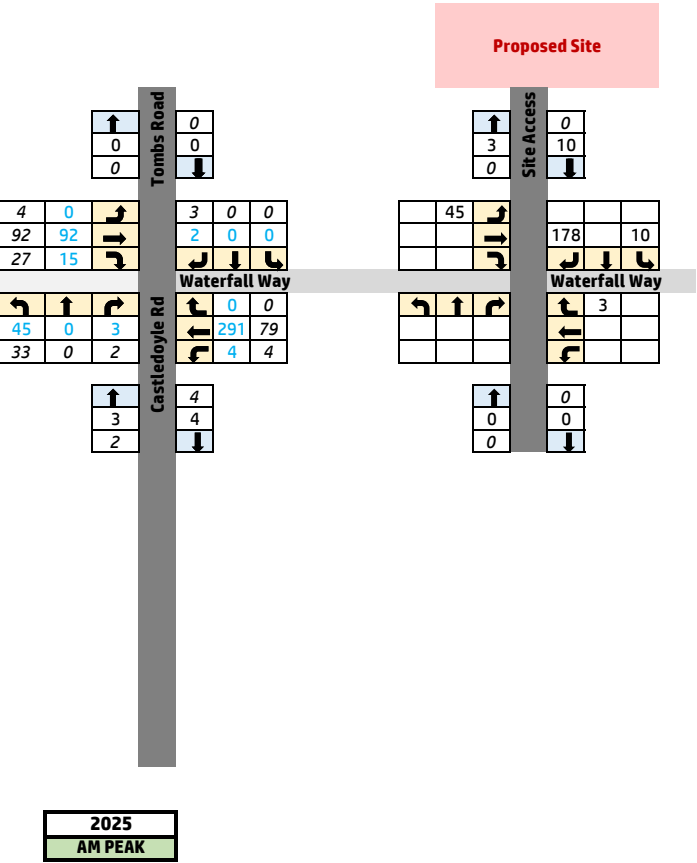
Armidale ROL
 Background Traffic Volumes



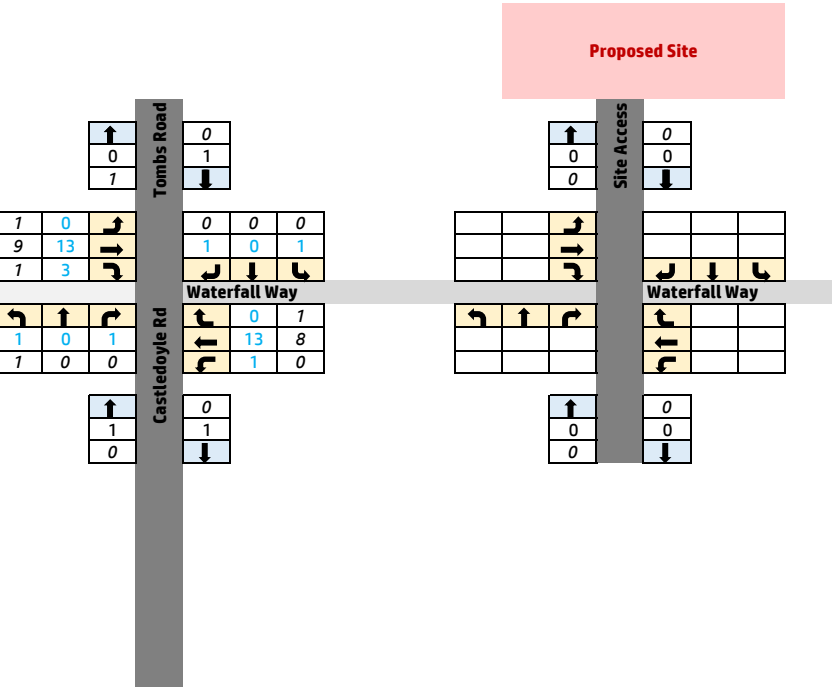
Armidale ROL
 Development Generated Traffic Volumes



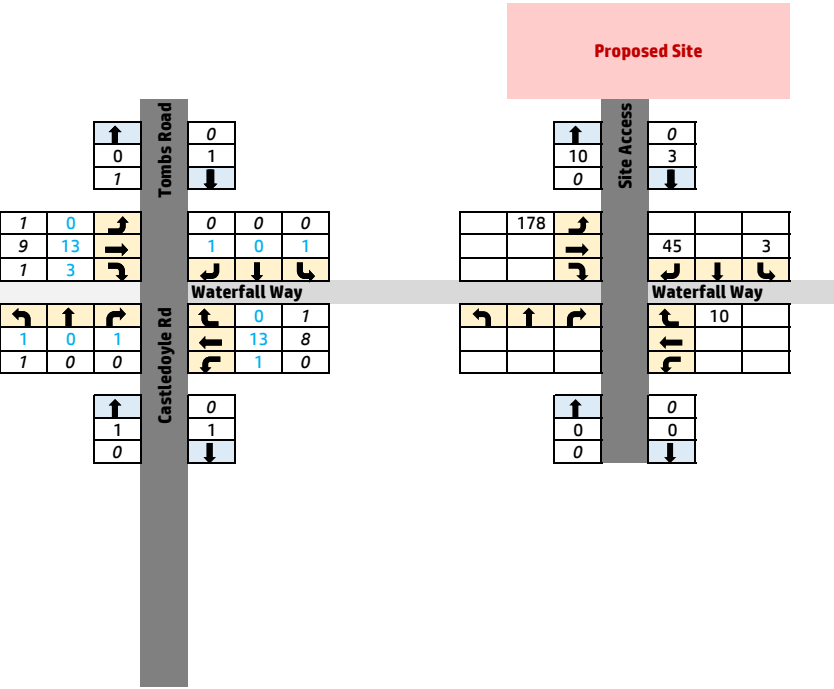
Armidale ROL
 Development Generated Traffic Volumes + Background Traffic



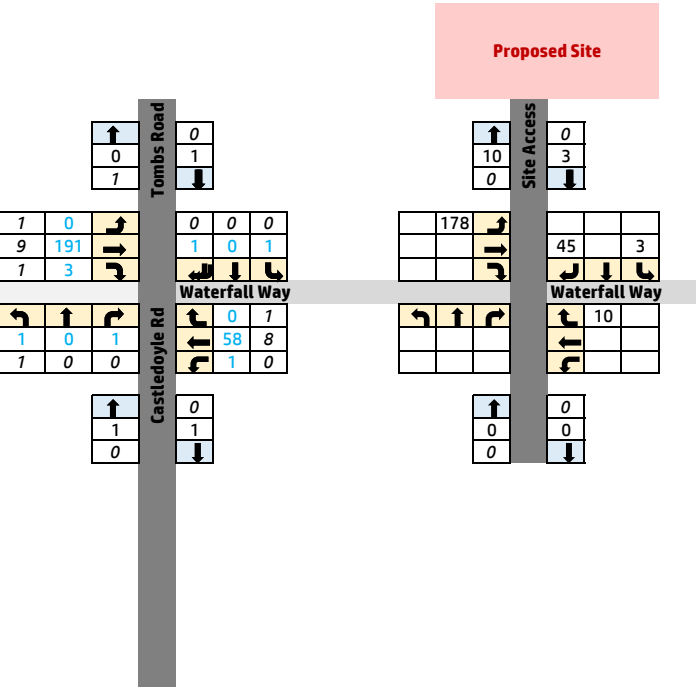
Armidale ROL
 Background Traffic Volumes



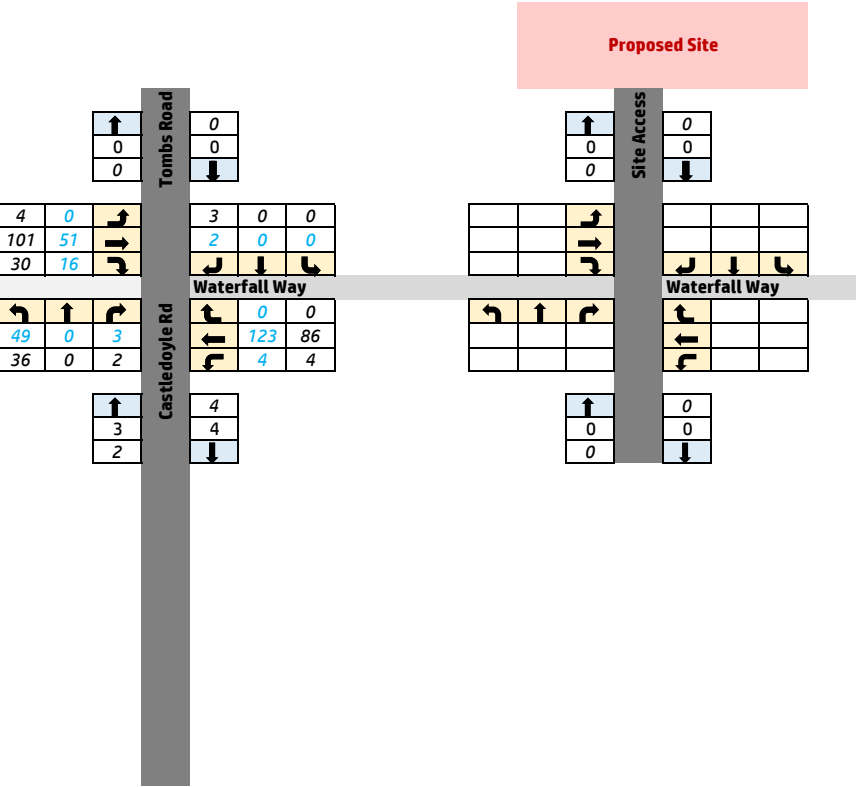
Armidale ROL
 Development Generated Traffic Volumes



Armidale ROL
 Development Generated Traffic Volumes + Background Traffic

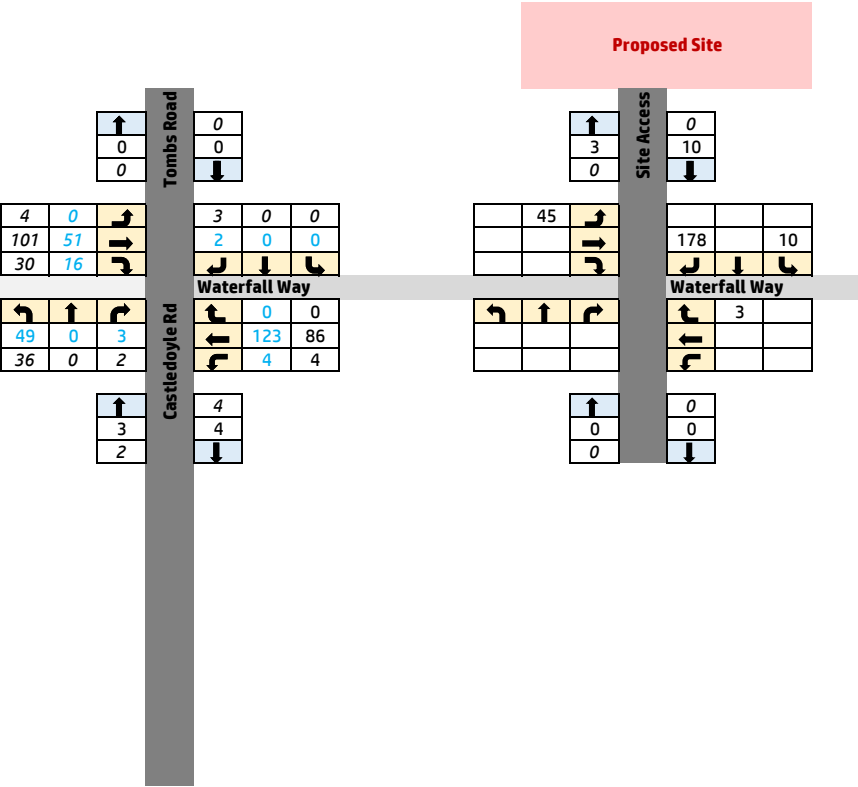


Armidale ROL
Background Traffic Volumes



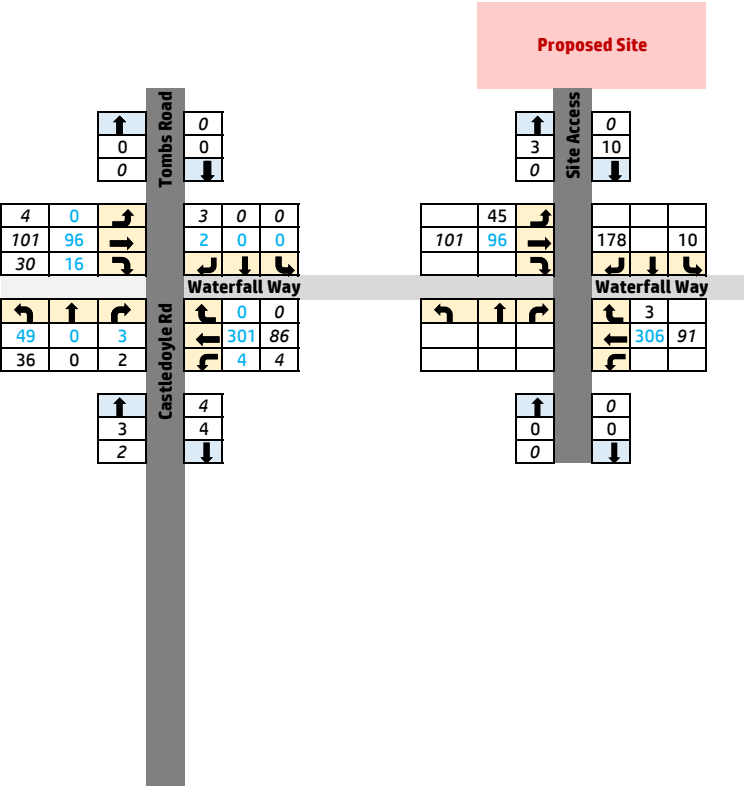
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AM PEAK

Armidale ROL
Development Generated Traffic Volumes



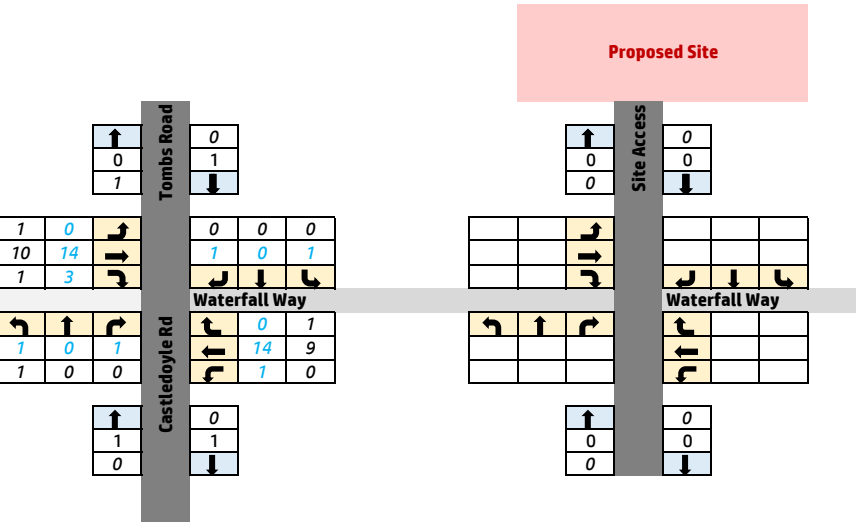
2028
AM PEAK

Armidale ROL
Development Generated Traffic Volumes + Background Traffic

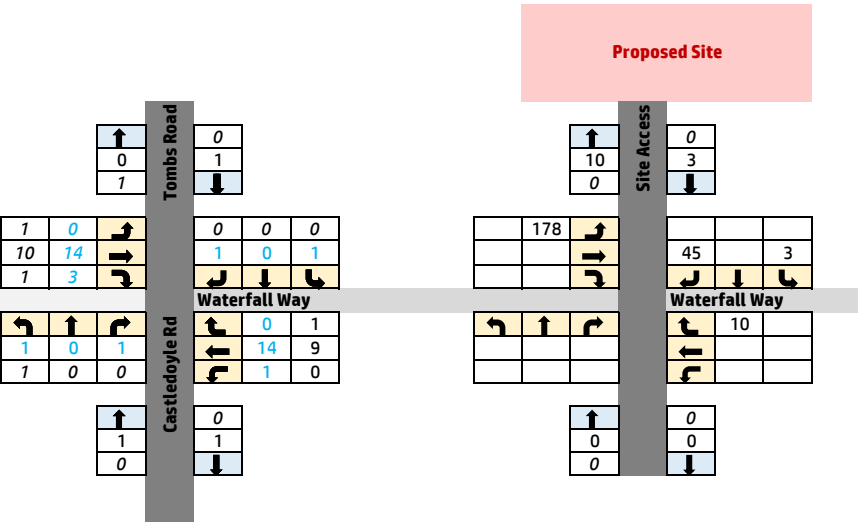


2028
AM PEAK

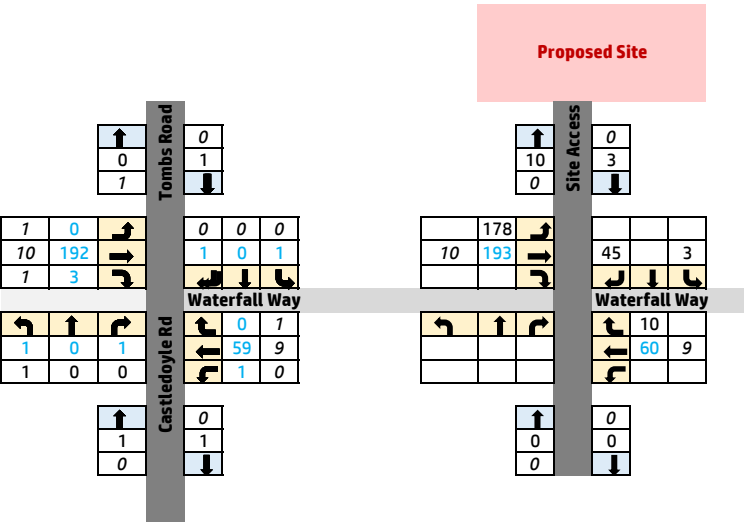
Armidale ROL
Background Traffic Volumes



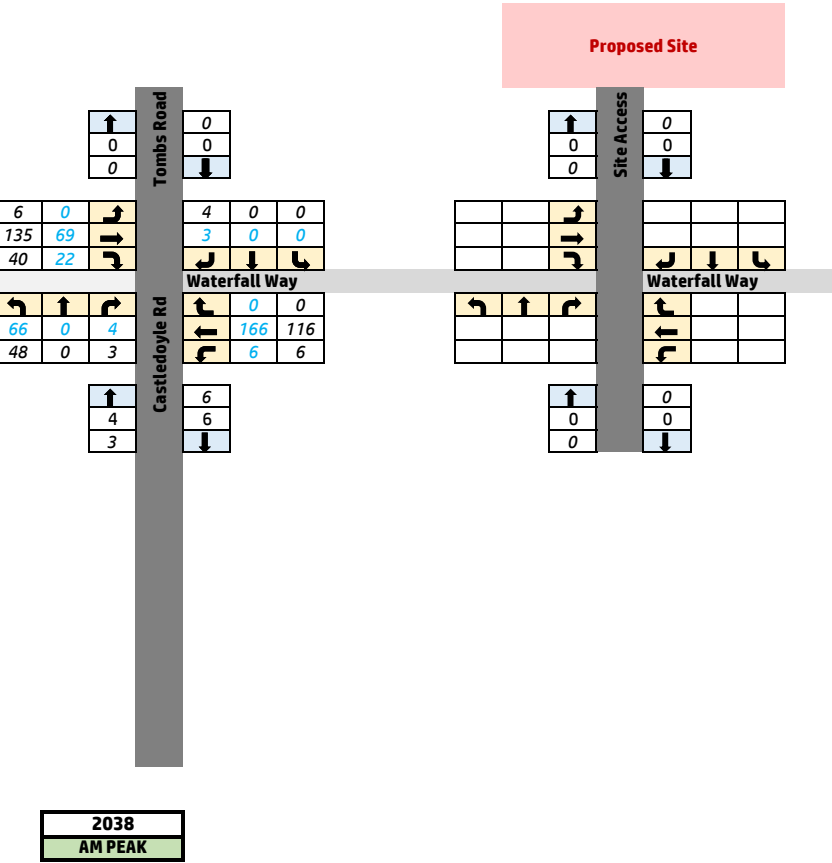
Armidale ROL
Development Generated Traffic Volumes



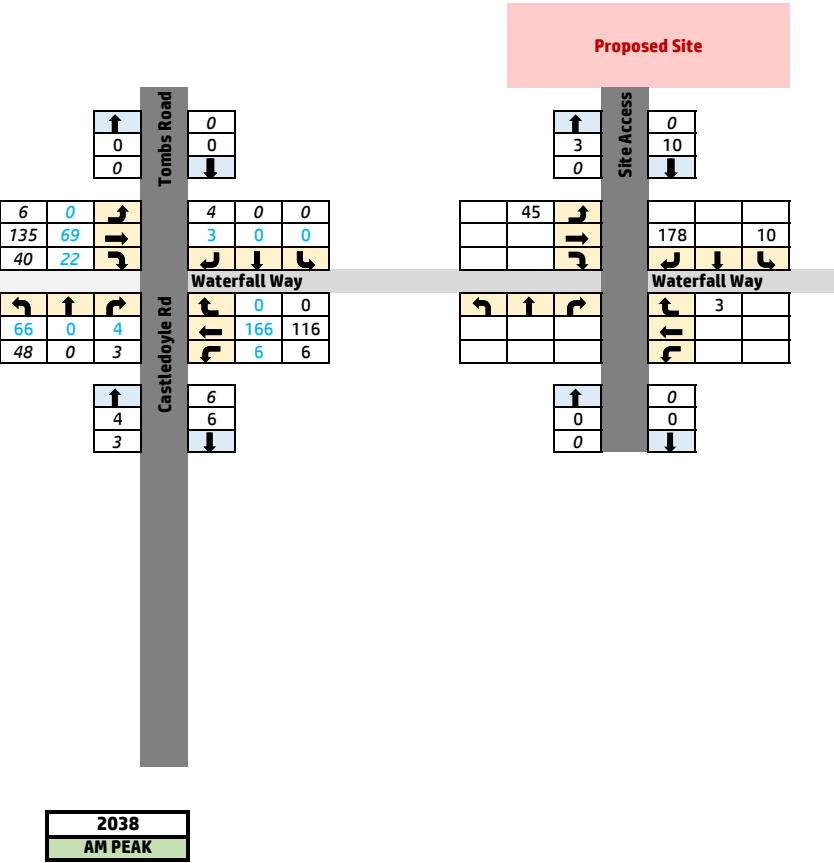
Armidale ROL
Development Generated Traffic Volumes + Background Traffic



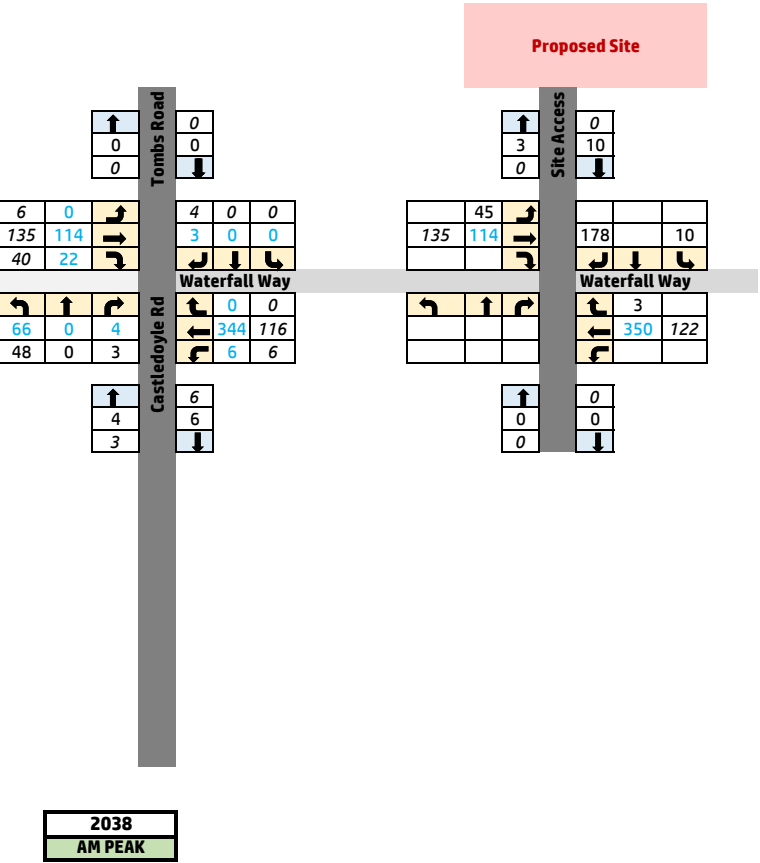
Armidale ROL
Background Traffic Volumes



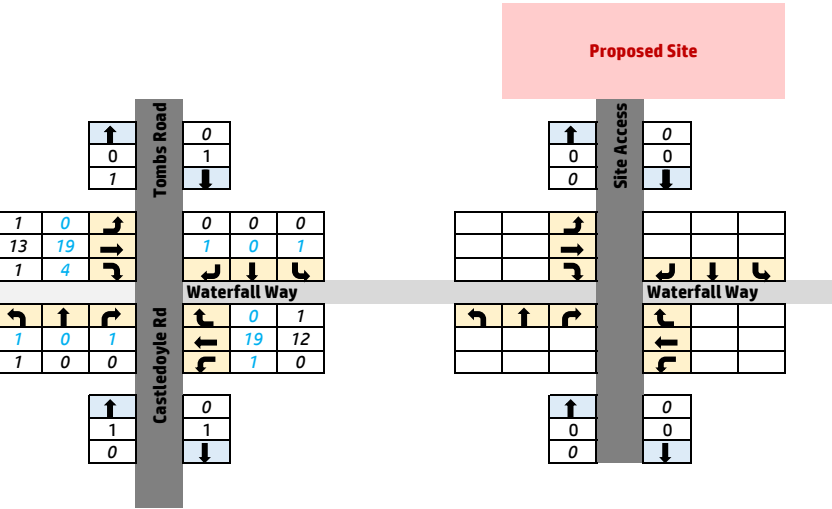
Armidale ROL
Development Generated Traffic Volumes



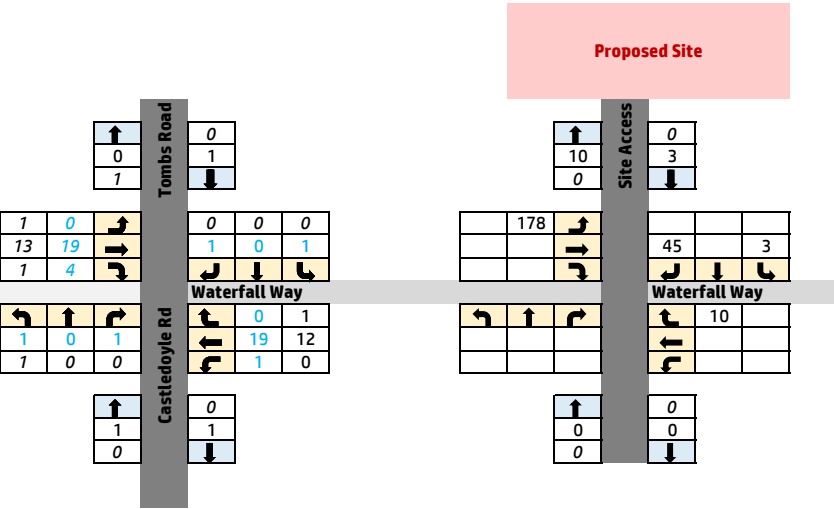
Armidale ROL
Development Generated Traffic Volumes + Background Traffic



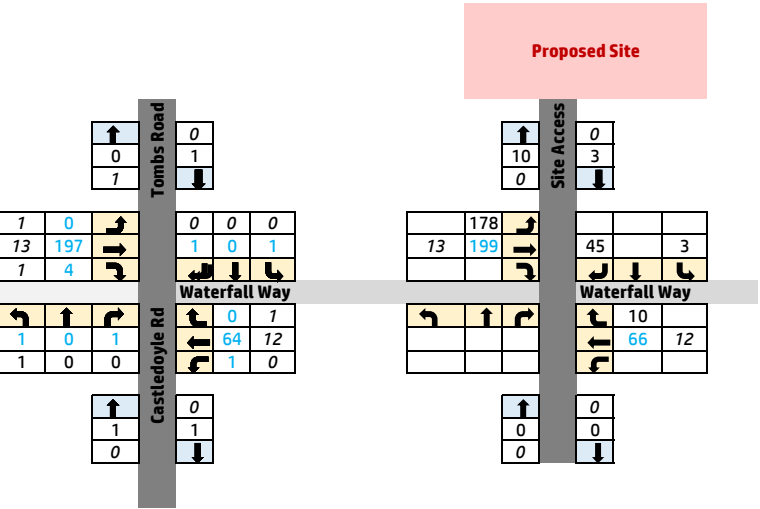
Armidale ROL
Background Traffic Volumes



Armidale ROL
Development Generated Traffic Volumes



Armidale ROL
Development Generated Traffic Volumes + Background Traffic



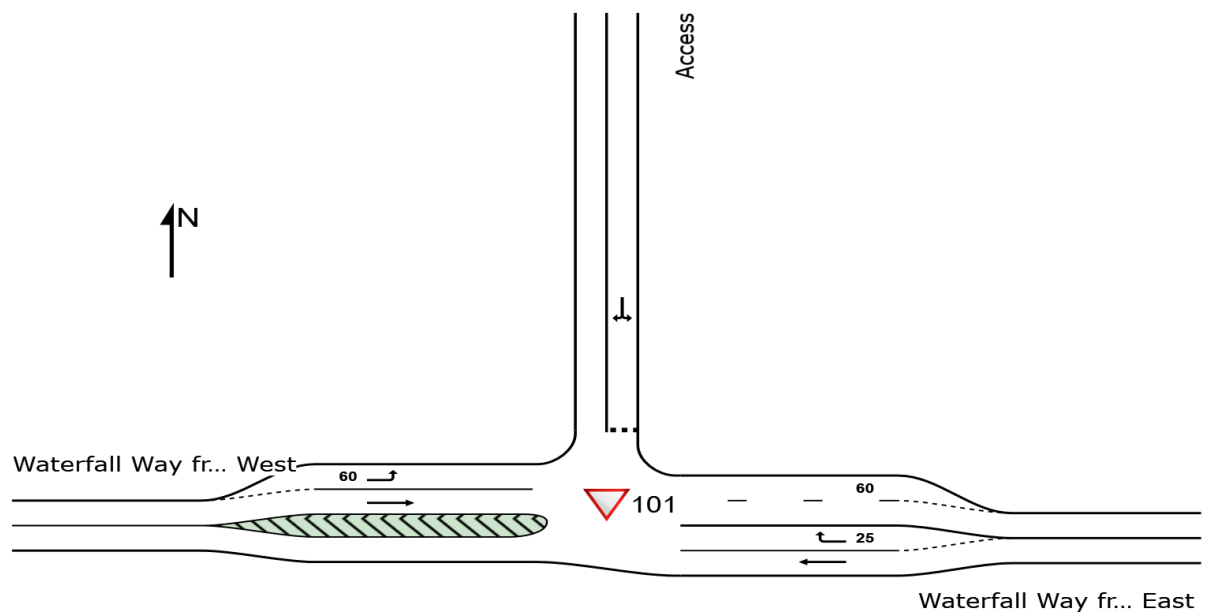
Appendix C: SIDRA Results

SITE LAYOUT

▽ Site: 101 [Access / Waterfall Way AM Peak Hour Opening
Year 2028 AM Peak (Site Folder: Access Analysis)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way PM Peak Hour Year 2038 With Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Castledoyle Rd from South															
1	L2	All MCs	2	50.0	2	50.0	0.004	6.5	LOS A	0.0	0.1	0.25	0.52	0.25	50.5
2	T1	All MCs	1	0.0	1	0.0	0.004	5.4	LOS A	0.0	0.1	0.25	0.52	0.25	53.0
3	R2	All MCs	1	0.0	1	0.0	0.004	7.0	LOS A	0.0	0.1	0.25	0.52	0.25	52.3
Approach			4	25.0	4	25.0	0.004	6.3	LOS A	0.0	0.1	0.25	0.52	0.25	51.6
East: Waterfall Way from East															
4	L2	All MCs	1	0.0	1	0.0	0.047	6.3	LOS A	0.0	0.2	0.02	0.03	0.02	57.2
5	T1	All MCs	80	15.8	80	15.8	0.047	0.0	LOS A	0.0	0.2	0.02	0.03	0.02	59.7
6	R2	All MCs	1	100.0	1	100.0	0.047	7.7	LOS A	0.0	0.2	0.02	0.03	0.02	52.1
Approach			82	16.7	82	16.7	0.047	0.2	NA	0.0	0.2	0.02	0.03	0.02	59.6
North: Tombs Road from North															
7	L2	All MCs	1	0.0	1	0.0	0.003	6.2	LOS A	0.0	0.1	0.34	0.54	0.34	52.3
8	T1	All MCs	1	0.0	1	0.0	0.003	5.4	LOS A	0.0	0.1	0.34	0.54	0.34	52.7
9	R2	All MCs	1	0.0	1	0.0	0.003	7.0	LOS A	0.0	0.1	0.34	0.54	0.34	52.0
Approach			3	0.0	3	0.0	0.003	6.2	LOS A	0.0	0.1	0.34	0.54	0.34	52.3
West: Waterfall Way from West															
10	L2	All MCs	1	100.0	1	100.0	0.122	6.7	LOS A	0.0	0.3	0.01	0.01	0.01	52.8
11	T1	All MCs	221	6.2	221	6.2	0.122	0.0	LOS A	0.0	0.3	0.01	0.01	0.01	59.8
12	R2	All MCs	4	25.0	4	25.0	0.122	5.8	LOS A	0.0	0.3	0.01	0.01	0.01	55.7
Approach			226	7.0	226	7.0	0.122	0.1	NA	0.0	0.3	0.01	0.01	0.01	59.7
All Vehicles			316	9.7	316	9.7	0.122	0.3	NA	0.0	0.3	0.02	0.03	0.02	59.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Access / Waterfall Way AM Peak Hour Opening
Year 2028 AM Peak (Site Folder: Access Analysis)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Waterfall Way from East															
5	T1	All MCs	418	22.9	418	22.9	0.246	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
6	R2	All MCs	3	0.0	3	0.0	0.003	6.7	LOS A	0.0	0.1	0.37	0.55	0.37	47.4
Approach			421	22.8	421	22.8	0.246	0.1	NA	0.0	0.1	0.00	0.00	0.00	59.8
North: Access															
7	L2	All MCs	11	0.0	11	0.0	0.514	10.0	LOS B	2.8	19.7	0.78	1.04	1.22	38.0
9	R2	All MCs	187	0.0	187	0.0	0.514	19.1	LOS C	2.8	19.7	0.78	1.04	1.22	38.0
Approach			198	0.0	198	0.0	0.514	18.6	LOS C	2.8	19.7	0.78	1.04	1.22	38.0
West: Waterfall Way from West															
10	L2	All MCs	47	0.0	47	0.0	0.026	5.5	LOS A	0.0	0.0	0.00	0.58	0.00	49.0
11	T1	All MCs	207	51.3	207	51.3	0.142	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach			255	41.7	255	41.7	0.142	1.1	NA	0.0	0.0	0.00	0.11	0.00	58.3
All Vehicles			874	23.1	874	23.1	0.514	4.6	NA	2.8	19.7	0.18	0.27	0.28	54.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Access / Waterfall Way AM Peak Hour Opening
Year 2028 PM Peak (Site Folder: Access Analysis)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Waterfall Way from East															
5	T1	All MCs	73	13.0	73	13.0	0.040	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	All MCs	9	0.0	9	0.0	0.010	7.2	LOS A	0.0	0.3	0.43	0.60	0.43	47.1
Approach			82	11.5	82	11.5	0.040	0.8	NA	0.0	0.3	0.05	0.07	0.05	58.8
North: Access															
7	L2	All MCs	3	0.0	3	0.0	0.075	6.4	LOS A	0.3	2.0	0.48	0.68	0.48	46.0
9	R2	All MCs	47	0.0	47	0.0	0.075	8.6	LOS A	0.3	2.0	0.48	0.68	0.48	46.0
Approach			51	0.0	51	0.0	0.075	8.5	LOS A	0.3	2.0	0.48	0.68	0.48	46.0
West: Waterfall Way from West															
10	L2	All MCs	187	0.0	187	0.0	0.101	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	49.0
11	T1	All MCs	214	4.9	214	4.9	0.113	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach			401	2.6	401	2.6	0.113	2.6	NA	0.0	0.0	0.00	0.27	0.00	55.7
All Vehicles			534	3.7	534	3.7	0.113	2.9	NA	0.3	2.0	0.05	0.28	0.05	55.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akcelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Access / Waterfall Way AM Peak Hour Future Year
2038 AM Peak (Site Folder: Access Analysis)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Waterfall Way from East															
5	T1	All MCs	497	25.8	497	25.8	0.298	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
6	R2	All MCs	3	0.0	3	0.0	0.003	7.0	LOS A	0.0	0.1	0.42	0.57	0.42	47.2
Approach			500	25.7	500	25.7	0.298	0.1	NA	0.0	0.1	0.00	0.00	0.00	59.7
North: Access															
7	L2	All MCs	11	0.0	11	0.0	0.695	16.6	LOS C	4.2	29.4	0.90	1.20	1.77	32.0
9	R2	All MCs	187	0.0	187	0.0	0.695	30.2	LOS D	4.2	29.4	0.90	1.20	1.77	32.0
Approach			198	0.0	198	0.0	0.695	29.5	LOS D	4.2	29.4	0.90	1.20	1.77	32.0
West: Waterfall Way from West															
10	L2	All MCs	47	0.0	47	0.0	0.026	5.5	LOS A	0.0	0.0	0.00	0.58	0.00	49.0
11	T1	All MCs	262	54.2	262	54.2	0.182	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach			309	45.9	309	45.9	0.182	0.9	NA	0.0	0.0	0.00	0.09	0.00	58.6
All Vehicles			1007	26.9	1007	26.9	0.695	6.1	NA	4.2	29.4	0.18	0.26	0.35	53.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akcelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Access / Waterfall Way AM Peak Hour Future Year
2038 PM Peak (Site Folder: Access Analysis)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Waterfall Way from East															
5	T1	All MCs	82	15.4	82	15.4	0.046	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	All MCs	11	0.0	11	0.0	0.011	7.2	LOS A	0.0	0.3	0.44	0.60	0.44	47.1
Approach			93	13.6	93	13.6	0.046	0.8	NA	0.0	0.3	0.05	0.07	0.05	58.8
North: Access															
7	L2	All MCs	3	0.0	3	0.0	0.078	6.5	LOS A	0.3	2.0	0.49	0.69	0.49	45.8
9	R2	All MCs	47	0.0	47	0.0	0.078	8.9	LOS A	0.3	2.0	0.49	0.69	0.49	45.8
Approach			51	0.0	51	0.0	0.078	8.7	LOS A	0.3	2.0	0.49	0.69	0.49	45.8
West: Waterfall Way from West															
10	L2	All MCs	187	0.0	187	0.0	0.101	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	49.0
11	T1	All MCs	223	6.1	223	6.1	0.119	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach			411	3.3	411	3.3	0.119	2.6	NA	0.0	0.0	0.00	0.26	0.00	55.8
All Vehicles			554	4.8	554	4.8	0.119	2.8	NA	0.3	2.0	0.05	0.27	0.05	55.5

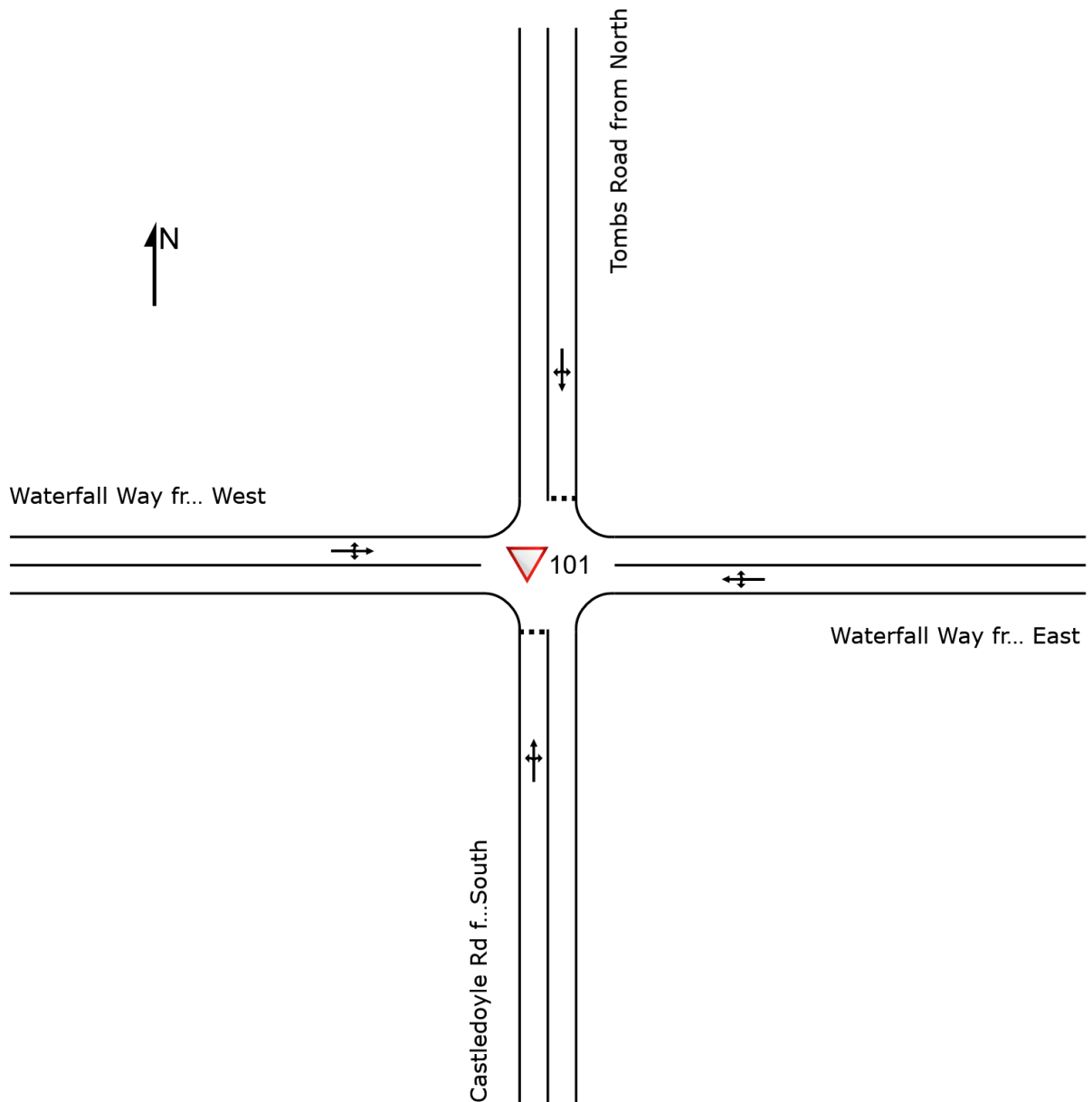
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akcelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SITE LAYOUT

▽ Site: 101 [Tombs Road / Waterfall Way AM Peak Hour Year
2025 Without Development (Site Folder: Intersection Impact)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way AM Peak Hour Year 2025 Without Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Castledoyle Rd from South															
1	L2	All MCs	82	42.3	82	42.3	0.093	7.3	LOS A	0.4	3.4	0.38	0.61	0.38	50.1
2	T1	All MCs	1	0.0	1	0.0	0.093	6.7	LOS A	0.4	3.4	0.38	0.61	0.38	52.2
3	R2	All MCs	5	40.0	5	40.0	0.093	11.1	LOS B	0.4	3.4	0.38	0.61	0.38	49.8
Approach			88	41.7	88	41.7	0.093	7.5	LOS A	0.4	3.4	0.38	0.61	0.38	50.1
East: Waterfall Way from East															
4	L2	All MCs	8	50.0	8	50.0	0.138	6.1	LOS A	0.0	0.1	0.00	0.03	0.00	54.9
5	T1	All MCs	202	41.1	202	41.1	0.138	0.0	LOS A	0.0	0.1	0.00	0.03	0.00	59.8
6	R2	All MCs	1	0.0	1	0.0	0.138	5.7	LOS A	0.0	0.1	0.00	0.03	0.00	56.9
Approach			212	41.3	212	41.3	0.138	0.3	NA	0.0	0.1	0.00	0.03	0.00	59.5
North: Tombs Road from North															
7	L2	All MCs	1	0.0	1	0.0	0.017	6.1	LOS A	0.1	0.5	0.53	0.68	0.53	49.2
8	T1	All MCs	1	0.0	1	0.0	0.017	6.4	LOS A	0.1	0.5	0.53	0.68	0.53	49.6
9	R2	All MCs	5	60.0	5	60.0	0.017	13.4	LOS B	0.1	0.5	0.53	0.68	0.53	46.7
Approach			7	42.9	7	42.9	0.017	11.3	LOS B	0.1	0.5	0.53	0.68	0.53	47.5
West: Waterfall Way from West															
10	L2	All MCs	5	80.0	5	80.0	0.158	6.5	LOS A	0.5	5.3	0.22	0.28	0.22	51.9
11	T1	All MCs	146	66.2	146	66.2	0.158	0.0	LOS A	0.5	5.3	0.22	0.28	0.22	57.7
12	R2	All MCs	44	64.3	44	64.3	0.158	10.2	LOS B	0.5	5.3	0.22	0.28	0.22	52.1
Approach			196	66.1	196	66.1	0.158	2.5	NA	0.5	5.3	0.22	0.28	0.22	56.2
All Vehicles			503	51.0	503	51.0	0.158	2.6	NA	0.5	5.3	0.16	0.24	0.16	56.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way PM Peak Hour Year 2025 Without Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Castledoyle Rd from South															
1	L2	All MCs	2	50.0	2	50.0	0.003	6.2	LOS A	0.0	0.1	0.11	0.53	0.11	50.9
2	T1	All MCs	1	0.0	1	0.0	0.003	4.3	LOS A	0.0	0.1	0.11	0.53	0.11	53.4
3	R2	All MCs	1	0.0	1	0.0	0.003	5.7	LOS A	0.0	0.1	0.11	0.53	0.11	52.7
Approach			4	25.0	4	25.0	0.003	5.6	LOS A	0.0	0.1	0.11	0.53	0.11	51.9
East: Waterfall Way from East															
4	L2	All MCs	1	0.0	1	0.0	0.016	5.5	LOS A	0.0	0.1	0.02	0.05	0.02	56.7
5	T1	All MCs	22	38.1	22	38.1	0.016	0.0	LOS A	0.0	0.1	0.02	0.05	0.02	59.1
6	R2	All MCs	1	100.0	1	100.0	0.016	6.8	LOS A	0.0	0.1	0.02	0.05	0.02	51.6
Approach			24	39.1	24	39.1	0.016	0.5	NA	0.0	0.1	0.02	0.05	0.02	58.6
North: Tombs Road from North															
7	L2	All MCs	1	0.0	1	0.0	0.002	5.6	LOS A	0.0	0.1	0.11	0.53	0.11	52.9
8	T1	All MCs	1	0.0	1	0.0	0.002	4.3	LOS A	0.0	0.1	0.11	0.53	0.11	53.4
9	R2	All MCs	1	0.0	1	0.0	0.002	5.7	LOS A	0.0	0.1	0.11	0.53	0.11	52.7
Approach			3	0.0	3	0.0	0.002	5.2	LOS A	0.0	0.1	0.11	0.53	0.11	53.0
West: Waterfall Way from West															
10	L2	All MCs	1	100.0	1	100.0	0.019	6.7	LOS A	0.0	0.3	0.03	0.11	0.03	51.8
11	T1	All MCs	23	40.9	23	40.9	0.019	0.0	LOS A	0.0	0.3	0.03	0.11	0.03	58.6
12	R2	All MCs	4	25.0	4	25.0	0.019	5.8	LOS A	0.0	0.3	0.03	0.11	0.03	54.6
Approach			28	40.7	28	40.7	0.019	1.1	NA	0.0	0.3	0.03	0.11	0.03	57.7
All Vehicles			60	36.8	60	36.8	0.019	1.4	NA	0.0	0.3	0.04	0.14	0.04	57.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akcelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way AM Peak Hour Year 2028 Without Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh Dist] m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Castledoyle Rd from South															
1	L2	All MCs	89	42.4	89	42.4	0.103	7.5	LOS A	0.4	3.8	0.40	0.62	0.40	50.0
2	T1	All MCs	1	0.0	1	0.0	0.103	7.0	LOS A	0.4	3.8	0.40	0.62	0.40	52.0
3	R2	All MCs	5	40.0	5	40.0	0.103	12.0	LOS B	0.4	3.8	0.40	0.62	0.40	49.7
Approach			96	41.8	96	41.8	0.103	7.7	LOS A	0.4	3.8	0.40	0.62	0.40	50.0
East: Waterfall Way from East															
4	L2	All MCs	8	50.0	8	50.0	0.150	6.1	LOS A	0.0	0.1	0.00	0.02	0.00	54.9
5	T1	All MCs	220	41.1	220	41.1	0.150	0.0	LOS A	0.0	0.1	0.00	0.02	0.00	59.8
6	R2	All MCs	1	0.0	1	0.0	0.150	5.7	LOS A	0.0	0.1	0.00	0.02	0.00	57.0
Approach			229	41.3	229	41.3	0.150	0.3	NA	0.0	0.1	0.00	0.02	0.00	59.6
North: Tombs Road from North															
7	L2	All MCs	1	0.0	1	0.0	0.019	6.2	LOS A	0.1	0.5	0.55	0.70	0.55	48.6
8	T1	All MCs	1	0.0	1	0.0	0.019	6.7	LOS A	0.1	0.5	0.55	0.70	0.55	49.0
9	R2	All MCs	5	60.0	5	60.0	0.019	14.5	LOS B	0.1	0.5	0.55	0.70	0.55	46.2
Approach			7	42.9	7	42.9	0.019	12.2	LOS B	0.1	0.5	0.55	0.70	0.55	46.9
West: Waterfall Way from West															
10	L2	All MCs	5	80.0	5	80.0	0.175	6.5	LOS A	0.5	6.0	0.24	0.29	0.24	51.9
11	T1	All MCs	160	66.4	160	66.4	0.175	0.0	LOS A	0.5	6.0	0.24	0.29	0.24	57.7
12	R2	All MCs	48	65.2	48	65.2	0.175	10.8	LOS B	0.5	6.0	0.24	0.29	0.24	52.0
Approach			214	66.5	214	66.5	0.175	2.6	NA	0.5	6.0	0.24	0.29	0.24	56.2
All Vehicles			546	51.3	546	51.3	0.175	2.6	NA	0.5	6.0	0.17	0.24	0.17	56.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way PM Peak Hour Year 2028 Without Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Castledoyle Rd from South															
1	L2	All MCs	2	50.0	2	50.0	0.003	6.2	LOS A	0.0	0.1	0.12	0.53	0.12	50.9
2	T1	All MCs	1	0.0	1	0.0	0.003	4.4	LOS A	0.0	0.1	0.12	0.53	0.12	53.3
3	R2	All MCs	1	0.0	1	0.0	0.003	5.7	LOS A	0.0	0.1	0.12	0.53	0.12	52.6
Approach			4	25.0	4	25.0	0.003	5.6	LOS A	0.0	0.1	0.12	0.53	0.12	51.9
East: Waterfall Way from East															
4	L2	All MCs	1	0.0	1	0.0	0.017	5.5	LOS A	0.0	0.1	0.02	0.05	0.02	56.7
5	T1	All MCs	24	39.1	24	39.1	0.017	0.0	LOS A	0.0	0.1	0.02	0.05	0.02	59.2
6	R2	All MCs	1	100.0	1	100.0	0.017	6.8	LOS A	0.0	0.1	0.02	0.05	0.02	51.7
Approach			26	40.0	26	40.0	0.017	0.5	NA	0.0	0.1	0.02	0.05	0.02	58.7
North: Tombs Road from North															
7	L2	All MCs	1	0.0	1	0.0	0.002	5.6	LOS A	0.0	0.1	0.12	0.53	0.12	52.9
8	T1	All MCs	1	0.0	1	0.0	0.002	4.3	LOS A	0.0	0.1	0.12	0.53	0.12	53.3
9	R2	All MCs	1	0.0	1	0.0	0.002	5.7	LOS A	0.0	0.1	0.12	0.53	0.12	52.6
Approach			3	0.0	3	0.0	0.002	5.2	LOS A	0.0	0.1	0.12	0.53	0.12	53.0
West: Waterfall Way from West															
10	L2	All MCs	1	100.0	1	100.0	0.020	6.7	LOS A	0.0	0.3	0.03	0.10	0.03	51.8
11	T1	All MCs	25	41.7	25	41.7	0.020	0.0	LOS A	0.0	0.3	0.03	0.10	0.03	58.6
12	R2	All MCs	4	25.0	4	25.0	0.020	5.9	LOS A	0.0	0.3	0.03	0.10	0.03	54.7
Approach			31	41.4	31	41.4	0.020	1.0	NA	0.0	0.3	0.03	0.10	0.03	57.8
All Vehicles			64	37.7	64	37.7	0.020	1.3	NA	0.0	0.3	0.04	0.13	0.04	57.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way AM Peak Hour Year 2038 Without Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Castledoyle Rd from South															
1	L2	All MCs	120	42.1	120	42.1	0.163	8.3	LOS A	0.6	6.0	0.49	0.69	0.49	49.3
2	T1	All MCs	1	0.0	1	0.0	0.163	8.9	LOS A	0.6	6.0	0.49	0.69	0.49	51.3
3	R2	All MCs	7	42.9	7	42.9	0.163	16.8	LOS C	0.6	6.0	0.49	0.69	0.49	48.9
Approach			128	41.8	128	41.8	0.163	8.7	LOS A	0.6	6.0	0.49	0.69	0.49	49.3
East: Waterfall Way from East															
4	L2	All MCs	13	50.0	13	50.0	0.203	6.1	LOS A	0.0	0.1	0.00	0.03	0.00	54.9
5	T1	All MCs	297	41.1	297	41.1	0.203	0.0	LOS A	0.0	0.1	0.00	0.03	0.00	59.8
6	R2	All MCs	1	0.0	1	0.0	0.203	5.9	LOS A	0.0	0.1	0.00	0.03	0.00	57.0
Approach			311	41.4	311	41.4	0.203	0.3	NA	0.0	0.1	0.00	0.03	0.00	59.5
North: Tombs Road from North															
7	L2	All MCs	1	0.0	1	0.0	0.038	6.4	LOS A	0.1	1.0	0.69	0.85	0.69	45.3
8	T1	All MCs	1	0.0	1	0.0	0.038	8.2	LOS A	0.1	1.0	0.69	0.85	0.69	45.6
9	R2	All MCs	7	57.1	7	57.1	0.038	20.6	LOS C	0.1	1.0	0.69	0.85	0.69	43.3
Approach			9	44.4	9	44.4	0.038	17.7	LOS C	0.1	1.0	0.69	0.85	0.69	43.8
West: Waterfall Way from West															
10	L2	All MCs	5	80.0	5	80.0	0.244	6.5	LOS A	0.9	9.5	0.29	0.35	0.29	51.5
11	T1	All MCs	215	66.2	215	66.2	0.244	0.0	LOS A	0.9	9.5	0.29	0.35	0.29	57.1
12	R2	All MCs	65	64.5	65	64.5	0.244	13.5	LOS B	0.9	9.5	0.29	0.35	0.29	51.6
Approach			285	66.1	285	66.1	0.244	3.2	NA	0.9	9.5	0.29	0.35	0.29	55.7
All Vehicles			734	51.1	734	51.1	0.244	3.1	NA	0.9	9.5	0.21	0.28	0.21	55.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way PM Peak Hour Year 2038 Without Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Castledoyle Rd from South															
1	L2	All MCs	2	50.0	2	50.0	0.004	6.2	LOS A	0.0	0.1	0.12	0.53	0.12	50.9
2	T1	All MCs	1	0.0	1	0.0	0.004	4.4	LOS A	0.0	0.1	0.12	0.53	0.12	53.3
3	R2	All MCs	1	0.0	1	0.0	0.004	5.8	LOS A	0.0	0.1	0.12	0.53	0.12	52.6
Approach			4	25.0	4	25.0	0.004	5.7	LOS A	0.0	0.1	0.12	0.53	0.12	51.9
East: Waterfall Way from East															
4	L2	All MCs	1	0.0	1	0.0	0.017	5.5	LOS A	0.0	0.1	0.02	0.05	0.02	56.4
5	T1	All MCs	22	57.1	22	57.1	0.017	0.0	LOS A	0.0	0.1	0.02	0.05	0.02	58.8
6	R2	All MCs	1	100.0	1	100.0	0.017	6.9	LOS A	0.0	0.1	0.02	0.05	0.02	51.4
Approach			24	56.5	24	56.5	0.017	0.5	NA	0.0	0.1	0.02	0.05	0.02	58.4
North: Tombs Road from North															
7	L2	All MCs	1	0.0	1	0.0	0.003	5.6	LOS A	0.0	0.1	0.14	0.53	0.14	52.9
8	T1	All MCs	1	0.0	1	0.0	0.003	4.4	LOS A	0.0	0.1	0.14	0.53	0.14	53.3
9	R2	All MCs	1	0.0	1	0.0	0.003	5.8	LOS A	0.0	0.1	0.14	0.53	0.14	52.6
Approach			3	0.0	3	0.0	0.003	5.3	LOS A	0.0	0.1	0.14	0.53	0.14	52.9
West: Waterfall Way from West															
10	L2	All MCs	1	100.0	1	100.0	0.025	6.7	LOS A	0.0	0.3	0.03	0.08	0.03	52.1
11	T1	All MCs	34	40.6	34	40.6	0.025	0.0	LOS A	0.0	0.3	0.03	0.08	0.03	58.9
12	R2	All MCs	4	25.0	4	25.0	0.025	5.8	LOS A	0.0	0.3	0.03	0.08	0.03	54.9
Approach			39	40.5	39	40.5	0.025	0.8	NA	0.0	0.3	0.03	0.08	0.03	58.3
All Vehicles			71	43.3	71	43.3	0.025	1.2	NA	0.0	0.3	0.03	0.12	0.03	57.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akcelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way AM Peak Hour Year 2028 With Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh Dist] m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Castledoyle Rd from South															
1	L2	All MCs	89	42.4	89	42.4	0.138	9.0	LOS A	0.5	4.8	0.53	0.74	0.53	48.8
2	T1	All MCs	1	0.0	1	0.0	0.138	9.3	LOS A	0.5	4.8	0.53	0.74	0.53	50.7
3	R2	All MCs	5	40.0	5	40.0	0.138	17.6	LOS C	0.5	4.8	0.53	0.74	0.53	48.5
Approach			96	41.8	96	41.8	0.138	9.5	LOS A	0.5	4.8	0.53	0.74	0.53	48.8
East: Waterfall Way from East															
4	L2	All MCs	8	50.0	8	50.0	0.246	6.1	LOS A	0.0	0.1	0.00	0.01	0.00	55.0
5	T1	All MCs	407	22.2	407	22.2	0.246	0.0	LOS A	0.0	0.1	0.00	0.01	0.00	59.9
6	R2	All MCs	1	0.0	1	0.0	0.246	5.5	LOS A	0.0	0.1	0.00	0.01	0.00	57.1
Approach			417	22.7	417	22.7	0.246	0.1	NA	0.0	0.1	0.00	0.01	0.00	59.8
North: Tombs Road from North															
7	L2	All MCs	1	0.0	1	0.0	0.030	6.3	LOS A	0.1	0.8	0.68	0.81	0.68	45.2
8	T1	All MCs	1	0.0	1	0.0	0.030	8.7	LOS A	0.1	0.8	0.68	0.81	0.68	45.6
9	R2	All MCs	5	60.0	5	60.0	0.030	21.9	LOS C	0.1	0.8	0.68	0.81	0.68	43.2
Approach			7	42.9	7	42.9	0.030	17.8	LOS C	0.1	0.8	0.68	0.81	0.68	43.8
West: Waterfall Way from West															
10	L2	All MCs	5	80.0	5	80.0	0.219	10.4	LOS B	0.8	7.9	0.29	0.34	0.29	51.6
11	T1	All MCs	207	51.3	207	51.3	0.219	1.4	LOS A	0.8	7.9	0.29	0.34	0.29	57.3
12	R2	All MCs	48	65.2	48	65.2	0.219	10.3	LOS B	0.8	7.9	0.29	0.34	0.29	51.8
Approach			261	54.4	261	54.4	0.219	3.3	NA	0.8	7.9	0.29	0.34	0.29	56.1
All Vehicles			781	35.8	781	35.8	0.246	2.5	NA	0.8	7.9	0.17	0.22	0.17	56.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way PM Peak Hour Year 2028 With Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Castledoyle Rd from South															
1	L2	All MCs	2	50.0	2	50.0	0.004	6.4	LOS A	0.0	0.1	0.24	0.52	0.24	50.6
2	T1	All MCs	1	0.0	1	0.0	0.004	5.3	LOS A	0.0	0.1	0.24	0.52	0.24	53.0
3	R2	All MCs	1	0.0	1	0.0	0.004	6.9	LOS A	0.0	0.1	0.24	0.52	0.24	52.3
Approach			4	25.0	4	25.0	0.004	6.3	LOS A	0.0	0.1	0.24	0.52	0.24	51.6
East: Waterfall Way from East															
4	L2	All MCs	1	0.0	1	0.0	0.042	6.3	LOS A	0.0	0.1	0.02	0.03	0.02	57.2
5	T1	All MCs	72	13.2	72	13.2	0.042	0.0	LOS A	0.0	0.1	0.02	0.03	0.02	59.7
6	R2	All MCs	1	100.0	1	100.0	0.042	7.7	LOS A	0.0	0.1	0.02	0.03	0.02	52.1
Approach			74	14.3	74	14.3	0.042	0.2	NA	0.0	0.1	0.02	0.03	0.02	59.5
North: Tombs Road from North															
7	L2	All MCs	1	0.0	1	0.0	0.003	6.2	LOS A	0.0	0.1	0.33	0.54	0.33	52.3
8	T1	All MCs	1	0.0	1	0.0	0.003	5.3	LOS A	0.0	0.1	0.33	0.54	0.33	52.7
9	R2	All MCs	1	0.0	1	0.0	0.003	6.9	LOS A	0.0	0.1	0.33	0.54	0.33	52.0
Approach			3	0.0	3	0.0	0.003	6.1	LOS A	0.0	0.1	0.33	0.54	0.33	52.4
West: Waterfall Way from West															
10	L2	All MCs	1	100.0	1	100.0	0.117	6.7	LOS A	0.0	0.3	0.01	0.02	0.01	52.8
11	T1	All MCs	213	5.0	213	5.0	0.117	0.0	LOS A	0.0	0.3	0.01	0.02	0.01	59.8
12	R2	All MCs	4	25.0	4	25.0	0.117	5.8	LOS A	0.0	0.3	0.01	0.02	0.01	55.7
Approach			218	5.8	218	5.8	0.117	0.1	NA	0.0	0.3	0.01	0.02	0.01	59.7
All Vehicles			299	8.1	299	8.1	0.117	0.3	NA	0.0	0.3	0.02	0.03	0.02	59.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way AM Peak Hour Year 2038 With Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Castledoyle Rd from South															
1	L2	All MCs	120	42.1	120	42.1	0.226	10.3	LOS B	0.8	8.0	0.61	0.82	0.63	47.7
2	T1	All MCs	1	0.0	1	0.0	0.226	12.3	LOS B	0.8	8.0	0.61	0.82	0.63	49.5
3	R2	All MCs	7	42.9	7	42.9	0.226	26.4	LOS D	0.8	8.0	0.61	0.82	0.63	47.3
Approach			128	41.8	128	41.8	0.226	11.3	LOS B	0.8	8.0	0.61	0.82	0.63	47.7
East: Waterfall Way from East															
4	L2	All MCs	13	50.0	13	50.0	0.299	6.1	LOS A	0.0	0.1	0.00	0.02	0.00	55.0
5	T1	All MCs	484	25.2	484	25.2	0.299	0.0	LOS A	0.0	0.1	0.00	0.02	0.00	59.9
6	R2	All MCs	1	0.0	1	0.0	0.299	5.6	LOS A	0.0	0.1	0.00	0.02	0.00	57.1
Approach			498	25.8	498	25.8	0.299	0.2	NA	0.0	0.1	0.00	0.02	0.00	59.7
North: Tombs Road from North															
7	L2	All MCs	1	0.0	1	0.0	0.064	6.6	LOS A	0.2	1.6	0.81	0.92	0.81	40.3
8	T1	All MCs	1	0.0	1	0.0	0.064	11.1	LOS B	0.2	1.6	0.81	0.92	0.81	40.5
9	R2	All MCs	7	57.1	7	57.1	0.064	33.0	LOS D	0.2	1.6	0.81	0.92	0.81	38.7
Approach			9	44.4	9	44.4	0.064	27.7	LOS D	0.2	1.6	0.81	0.92	0.81	39.1
West: Waterfall Way from West															
10	L2	All MCs	5	80.0	5	80.0	0.301	12.1	LOS B	1.2	12.9	0.34	0.42	0.34	50.8
11	T1	All MCs	262	54.2	262	54.2	0.301	2.3	LOS A	1.2	12.9	0.34	0.42	0.34	56.3
12	R2	All MCs	65	64.5	65	64.5	0.301	12.0	LOS B	1.2	12.9	0.34	0.42	0.34	51.0
Approach			333	56.6	333	56.6	0.301	4.4	NA	1.2	12.9	0.34	0.42	0.34	55.1
All Vehicles			968	38.7	968	38.7	0.301	3.4	NA	1.2	12.9	0.21	0.27	0.21	55.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



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