

TRAFFIC AND PARKING IMPACT ASSESSMENT OF THE PROPOSED CHILD CARE CENTRE AT 10 BEN BULLEN PLACE, GOULBURN



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Transport Planning, Traffic Impact Assessments, Road Safety Audits, Expert Witness



Development Type:	Child Care Centre
Site Address:	10 Ben Bullen Place, Goulburn
Prepared for:	Greenscape Design
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1 INTRODUCTION

M^cLaren Traffic Engineering was commissioned by *Greenscape Design* to provide a traffic and parking impact assessment of the proposed Child Care Centre at 10 Ben Bullen Place, Goulburn as depicted in **Annexure A**.

1.1 Description and Scale of Development

The proposed development has the following characteristics relevant to traffic and parking:

- A child care centre accommodating 99 children and 17 staff members as per the following:
 - o 24 children between 0-2 years old (staff assigned at 1 per 4 children, or 6 staff);
 - o 35 children between 2-3 years old (staff assigned at 1 per 5 children, or 7 staff);
 - 40 children between 3-5 years old (staff assigned at 1 per 10 children, or 4 staff);
- An at-grade parking area with vehicular access via a proposed two-way driveway from Ben Bullen Place, accommodating 20 car parking spaces including:
 - 11 parent / visitor car parking spaces including one (1) accessible space;
 - Nine (9) staff car parking spaces.

1.2 State Environmental Planning Policy (Transport and Infrastructure) 2021

The proposed development does not qualify as a traffic generating development with relevant size and/or capacity under *Clause 2.122* of the *SEPP (Transport and Infrastructure) 2021*. Accordingly, formal referral to Transport for NSW (TfNSW) is unnecessary and the application can be assessed by Goulburn Mulwaree Council officers.

1.3 Site Description

The subject site includes one (1) vacant lot which is legally identified as Lot 156 DP248976 and currently zoned R^2 – Low Density Residential under the Goulburn Mulwaree Local Environmental Plan 2009. The site has a single frontage to Ben Bullen Place to the east and is located on a cul-de-sac.

The site is generally surrounded by low density residential dwellings with Bradfordville Public School located approximately 350m to the east of the site.



1.4 Site Context

The location of the site is shown on an aerial photo and a street map in **Figure 1** and **Figure 2** respectively.



FIGURE 1: SITE CONTEXT – AERIAL PHOTO



FIGURE 2: SITE CONTEXT – STREET MAP



2 EXISTING TRAFFIC AND PARKING CONDITIONS

2.1 Road Hierarchy

The road network servicing the site has characteristics as described in the following subsections.

2.1.1 Ben Bullen Place

- Unclassified LOCAL road that ends in a cul-de-sac;
- Approximately 8.8m wide carriageway facilitating traffic flow in both directions and kerbside parking on both sides of the road;
- No signposted speed limit Default 50km/h speed limit applies;
- Unrestricted kerbside parking permitted along both sides of the road.

2.1.2 Bradford Drive

- Unclassified LOCAL road that ends in a cul-de-sac;
- Approximately 10m wide carriageway traffic flow in both directions and kerbside parking on both sides of the road;
- No signposted speed limit Default 50km/h speed limit applies;
- Unrestricted kerbside parking permitted along both sides of the road.

2.2 Existing Traffic Management

- Priority controlled intersection of Ben Bullen Place / Bradford Drive;
- Priority controlled intersection of Bradford Drive / Hampden Street;
- Priority controlled intersection of Bradford Drive / Reign Street.



2.3 Existing Traffic Environment

Turning movement count traffic surveys were conducted at the intersections of Bradford Drive / Reign Street, Bradford Drive / Hampden Street and Nichols Street / Reign Street from 7:00_{AM} to 9:30_{AM} and 2:30_{PM} to 6:00_{PM} on Thursday 21 November 2023 representing a typical operating weekday. The full survey results are shown in **Annexure B** for reference.

2.3.1 Existing Road Performance

The performance of the surrounding intersections under the existing traffic conditions has been assessed using SIDRA INTERSECTION 9.1, **Table 1** summarises the resultant intersection performance data, with full SIDRA results reproduced in **Annexure C**.

Intersection	Peak Hour	Degree of Saturation ⁽¹⁾	Average Delay ⁽²⁾ (sec/vehicle)	Level of Service ⁽³⁾⁽⁴⁾	Control Type	Worst Movement		
			EXISTING PERFORMAN	NCE				
	A M	0.06	3.8	NA		RT from Bradford		
Bradford Drive/	0.06	(Worst: 5.8)	(Worst: A)		Drive			
Reign Street PM	рм	PM 0.05	3.1	NA	Give way	RT from Reign Street		
	Pivi		(Worst: 6.3)	(Worst: A)				
	0 M	AM 0.05	4.4	NA	Cive Wey	LT from Hampden Street		
Bradford Drive/	AIVI		(Worst: 5.6)	(Worst: A)				
Hampden Street	DM	PM 0.04	4.4	NA	Give way	LT from Hampden Street		
PM	Pivi		(Worst: 5.5)	(Worst: A)				
	A N 4	0.05	1.6	NA		RT from Nichols		
Nichols Street/	Alvi	0.05	(Worst: 6.4)	(Worst: A)		Street		
Reign Street	DM	0.05	1.7	NA	Give Way	RT from Nichols		
	PM	РМ	PM	0.05	(Worst: 6.3)	(Worst: A)		Street

TABLE 1: EXISTING INTERSECTION PERFORMANCES (SIDRA INTERSECTION 9.1)

Notes:

(1) The Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.

(2) The average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.

(3) The Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.

(4) No overall Level of Service is provided for Give Way and Stop controlled intersections as the low delays associated with the dominant movements skew the average delay of the intersection. The Level of Service of the worst approach is an indicator of the operation of the intersection, with a worse Level of Service corresponding to long delays and reduced safety outcomes for that approach.

As shown, the relevant intersections are currently performing at a high level of efficiency, with an overall or worst movement Level of Service "A" conditions in both the AM & PM peak hour periods. The Level of Service "A" performance is characterised by low approach delays and spare capacity.



2.4 Public Transport

The subject site has access to the existing bus stop (ID: 258016) located approximately 290m walking distance to the south of the site on Reign Street. The bus stop services existing bus route 821 (Goulburn to Kenmore via Gibson Street & Goulburn Base Hospital) which is provided by PBC Goulburn.

The location of the site subject to the surrounding public transport network is shown in **Figure 3**.



FIGURE 3: PUBLIC TRANSPORT NETWORK MAP

2.5 Future Road and Infrastructure Upgrades

From the Goulburn Mulwaree Council Development Application tracker and TfNSW Projects website, it appears that there are no future planned road or public transport changes that will affect traffic conditions within the immediate vicinity of the subject site.



3 PARKING ASSESSMENT

3.1 Council Parking Requirement

Reference is made to the *Goulburn Mulwaree Development Control Plan 2009 (GMDCP 2009) Part 3 – General Development Controls* which designates the following parking rates applicable to the proposed development:

Table 3-2: Off-street parking requirements

Child Care Centre

1 space per 2 employees plus set down/drop off area

Table 2 presents the parking requirements of the proposal according to GMDCP 2009 car parking rates.

Land Use	Scale	Rate	Spaces Required	Spaces Provided
Child Care Centre	17 employees	1 per 2 employees plus set down/drop off area	8.5 (9) plus set down/drop off area	20

TABLE 2: DCP PARKING RATES

As shown, strict application of the GMDCP 2009 requires the provision of **9** car parking spaces for staff use and a set down/drop off area for parents / visitors. The proposed plans detail the provision of **20** car parking spaces (9 staff spaces and 11 visitor spaces), resulting in compliance with GMDCP 2009 parking requirements. In the absence of parent / visitor parking rates, the visitor parking requirement of the site has been based upon queueing analysis which is detailed in the following subsection.

3.1.1 Parent / Visitor Parking Requirement - Queuing Analysis

In order to assess the peak demand of the child care centre visitor car parking spaces, conventional queuing theory has been employed, with relevant details and assumptions provided below:

- An 8-minute 16-second average length of stay for each parking space during the PM peak hour (i.e. a parent uses a parking space for approximately 8-minutes 16seconds to pick-up their child);
 - This is the average afternoon service time recorded within Validation Trip Generation Surveys, Child Care Centres, Analysis Report by TEF Consulting commissioned by the RMS.
- Afternoon peak hour traffic generation of 80 trips (40 in, 40 out) is used as outlined within **Section 4.1**.

By applying conventional queuing theory, it has been determined that eleven (**11**) spaces can adequately accommodate the 98th percentile demand of child care centre visitors in the PM peak period. The proposed plans depict eleven (**11**) spaces dedicated for child care



centre visitor use, satisfying the peak demand for the proposed use. The detailed calculations for the queueing analysis is presented in **Annexure D** for reference.

3.2 Parking for People with Disabilities

The GMDCP 2009 does not outline car parking rates for people with disabilities applicable to child care centre developments. As such, reference is made to *Section D4D6* of the *Building Code of Australia* (BCA) as part of the *National Construction Code 2022* (NCC) which categorises a child care centre as a Class 9b building and therefore requires the provision of car parking for people with disabilities at a rate of:

Class 9b 1 accessible space for every 50 carparking spaces or part thereof.

In accordance with the BCA requirements, one (1) car parking space for people with disabilities is to be provided. The proposed car parking layout details the provision of one (1) car parking space designed in accordance with *AS2890.6:2022*, complying with BCA requirements.

3.3 Bicycle & Motorcycle Parking Requirements

The GMDCP 2009 does not require the provision of bicycle / motorcycle parking. Accordingly, no bicycle / motorcycle parking facilities have been provided, thus satisfying Council requirements.

3.4 Servicing & Loading

The GMDCP 2009 does not outline any specific service facilities requirements for a child care centre. It is expected that all deliveries will be undertaken within the proposed car parking area outside peak drop off / pick up times, under a plan of management if necessary. A van (standard B99 design vehicle) or similar can be accommodated within the car parking area, utilising vacant visitor spaces. This is common practice for child care centres and will not noticeably affect operation of the site. It is reiterated that deliveries and other arrivals of similar nature are low in frequency and can be easily managed.

It is expected that site will be serviced by Council's waste collection services from the Ben Bullen Place frontage.

3.5 Car Park Design & Compliance

The car parking layout as depicted in **Annexure A**, has been assessed to achieve the relevant clauses and objectives of *AS2890.1:2004* and *AS2890.6:2022*. Swept path testing has been undertaken and the results are reproduced within **Annexure E** for reference.

The proposed car parking and vehicular access design achieves the following:

- 6.0m wide two-way driveway facilitating access to Ben Bullen Place;
- Minimum 5.8m wide parking aisles;
- Minimum 5.4m long, 2.4m wide spaces for staff;
- Minimum 5.4m long, 2.6m wide spaces for parents / visitors;



- Minimum 5.4m long, 2.4m wide accessible spaces with adjacent associated 5.4m long, 2.4m wide shared space;
- Minimum headroom of 2.2m for general circulation and 2.5m headroom clearance provided over accessible and adaptable parking areas;
- 2.0m x 2.5m pedestrian sight triangles clear of obstructions.

Whilst the plans have been assessed to comply with the relevant standards, it is usual and expected that a design certificate be required at the Construction Certificate stage to account for any changes following the development application.



4 TRAFFIC ASSESSMENT

The impact of the expected traffic generation levels associated with the subject proposal is discussed in the following sub-sections.

4.1 Traffic Generation

4.1.1 Vehicle Trip Generation

Traffic generation rates for the relevant land uses are provided in the *Transport for NSW* (TfNSW) *Guide to Transport Impact Assessment* (GTIA) and are as follows:

5.68 Education facilities – Child care centres (2015)

Long day care centre vehicle trips:

Site AM peak hour	0.81 peak vehicle trips per child
Site PM peak hour	0.8 peak vehicle trips per child

The resulting AM and PM peak hourly traffic generation is summarised in Table 3.

Use	Scale	Peak	Generation Rate	Trips ⁽¹⁾
Long-day care 9	00 Childron	AM	0.81 per child	81 (41 in, 40 out)
	99 Children	PM	0.8 per child	80 (40 in, 40 out)
Notes:	•			

TABLE 3: ESTIMATED TRAFFIC GENERATION

(1) 50% inbound and 50% outbound assumed for the AM and PM peak periods.

As shown, the expected traffic generation associated with the proposed development is in the order of **81** vehicle trips in the AM peak period (41 in, 40 out) and **80** vehicle trips in the PM peak period (40 in, 40 out).

4.2 Traffic Assignment

The road network, traffic surveys and locations of residential areas surrounding the site have been assessed and the following traffic assignment has been assumed for all traffic to and from the site, provided in **Figure 4** and **Figure 5**.





FIGURE 4: OUTBOUND TRIP DISTRIBUTION



FIGURE 5: INBOUND TRIP DISTRIBUTION



4.3 Traffic Impact

The traffic generation outlined in **Section 4.1** & **4.2** above has been added to the existing traffic volumes recorded. SIDRA INTERSECTION 9.1 was used to assess the intersections performance. The purpose of this assessment is to compare the existing intersection operations to the future scenario under the increased traffic load. The results of this assessment are shown in **Table 4**.

Intersection	Peak Hour	Degree of Saturation ⁽¹⁾	Average Delay ⁽²⁾ (sec/vehicle)	Level of Service ⁽³⁾⁽⁴⁾	Control Type	Worst Movement				
EXISTING PERFORMANCE										
	0 M	0.06	3.8	NA		RT from Bradford				
Bradford Drive/	Alvi	0.06	(Worst: 5.8)	(Worst: A)		Drive				
Reign Street	DM	0.05	3.1	NA	Give way	RT from Reign				
	FIVI	0.05	(Worst: 6.3)	(Worst: A)		Street				
	ΔM	0.05	4.4	NA		LT from Hampden				
Bradford Drive/	Alvi	0.05	(Worst: 5.6)	(Worst: A)	Give Wey	Street				
Hampden Street	DM	0.04	4.4	NA	Give way	LT from Hampden Street				
	FIVI	0.04	(Worst: 5.5)	(Worst: A)						
	ΔM	0.05	1.6	NA		RT from Nichols				
Nichols Street/ Reign Street	Alvi	0.05	(Worst: 6.4)	(Worst: A)	Give Way	Street				
	DM	0.05	1.7	NA		RT from Nichols				
	FIVI	0.05	(Worst: 6.3)	(Worst: A)		Street				
		FUTURE (PO	OST-DEVELOPMENT) P	ERFORMANCE						
	A M	4 0.08	4.3	NA		RT from Bradford Drive				
Bradford Drive/	Alvi	0.08	(Worst: 5.9)	(Worst: A)						
Reign Street	5.4	0.07	3.9	NA	Give way	RT from Reign				
	Pivi	0.07	(Worst: 6)	(Worst: A)		Street				
	A M	0.07	3.1	NA		RT from				
Bradford Drive/	Alvi	0.07	(Worst: 6)	(Worst: A)		Hampden Street				
Hampden Street	DM	0.06	2.9	NA	Give way	RT from				
	Pivi	0.06	(Worst: 5.9)	(Worst: A)		Hampden Street				
	0 M	AM 0.06	2.4	NA		RT from Nichols				
Nichols Street/	Alvi		(Worst: 6.3)	(Worst: A)	Give Wey	Street				
Reign Street		0.07	2.4	NA	Give way	RT from Nichols				
	РМ	РМ	PM	PM	PM	0.07	(Worst: 6.2)	(Worst: A)		Street

 TABLE 4: INTERSECTION PERFORMANCE (SIDRA INTERSECTION 9.1)

NOTES: Refer to Table 1.

As shown, the intersections Bradford Drive / Reign Street, Bradford Drive / Hampden Street and Nichols Street / Reign Street all retain the same overall level of service under future conditions with minimal delays and additional capacity, indicating that there will be no adverse impact on the existing road network as a result of the proposed development.



5 CONCLUSIONS

In view of the foregoing, the subject Child Care Centre proposal at 10 Ben Bullen Place, Goulburn (as depicted in **Annexure A**) is fully supportable in terms of its traffic and parking impacts. The following outcomes of this traffic and parking impact assessment are relevant to note:

- a) The proposal includes the provision of 20 car parking spaces within a proposed atgrade carpark, comprised of 11 for parent / visitor use and nine (9) for staff use, satisfying the relevant controls applicable to the development, including GMDCP 2009 requirements.
- b) The GMDCP 2009 does not require the provision of bicycle and motorcycle parking facilities. As such nil (**0**) bicycle / motorcycle parking spaces have been provided.
- c) The parking areas of the site have been assessed against the relevant sections of *AS2890.1:2004* and *AS2890.6:2022* and have been found to satisfy the objectives of each standard. Swept path testing has been undertaken and the results are reproduced within **Annexure E.**
- d) The traffic generation of the proposed development has been estimated to be some 81 trips in the AM peak period (41 in, 40 out) and 80 trips in the PM peak period (40 in, 40 out). The impacts of the traffic generation have been modelled using SIDRA INTERSECTION 9.1, indicating that there will be no adverse impact to the performance of the intersections as a result of the generated traffic.



ANNEXURE A: PROPOSED PLANS (1 SHEET)





PARKING

PARKING: STAFF MEMBERS: VISITORS:	REQUIREMENTS 1 PER MEMBER 1 PER 6 CHILDREN	
PROPOSED: STAFF MEMBERS: VISITORS:	25 PARKING SPOTS 16 8 + 1 DISABLED	

CHILD CARE REQ STORAGE CALCULATIONS

Age Group	No. of Kids	Req. Indoor	Prop. indoor	Req. Outdoor	Prop. Outdoor
0-2	24	4.80m³	4.80m³	7.20m³	7.20m³
2-3	35	7.00m³	8.40m³	10.50m³	22.50m³
3-5	40	8.00m³	8.40m³	12.00m³	
TOTAL	99	19.80m³	21.60m ³	29.70m³	29.70m ³

FACILITIES

JUNIOR SANITARY FACILITIES		
<u>TOILETS</u> 0-2 YR OLD: 1 PER CHILDCARE 2-3 YR OLD: 1 PER 10 CHILDREN 3-5 YR OLD: 1 PER 10 CHILDREN	<u>PROPOSED</u> 1 4 4	<u>COMPLIES</u> YES YES YES
<u>Basins</u> 0-2 Yr Old: 1 PER Childcare 2-3 Yr Old: 1 PER 10 Children 3-5 Yr Old: 1 PER 10 Children	<u>PROPOSED</u> 1 4 4	<u>COMPLIES</u> YES YES YES
<u>NAPPY CHANGE</u> 0-2 YR OLD: REQUIRED 2-3 YR OLD: REQUIRED 3-5 YR OLD: NOT REQUIRED	<u>Proposed</u> 1 1	<u>COMPLIES</u> YES YES YES
<u>BOTTLE PREP</u> 0-2 YR OLD: REQUIRED	<u>proposed</u> 1	<u>COMPLIES</u> YES
<u>LAUNDRY</u> 0-3 YR OLD: REQUIRED	<u>PROPOSED</u> 1	<u>COMPLIES</u> YES
<u>ADULD SANITARY FACILITIES</u> REQUIRED FOR >16 STAFF	<u>proposed</u> 1 Unisex facil 1 Shower	<u>COMPLIES</u> ITY YES
<u>FOOD PREP/KITCHEN</u> REQUIRED	<u>PROPOSED</u> 1	<u>COMPLIES</u> YES
TOTAL: 2089.45m ²		
Hard Surface + Building	Landscape 65% 741-m2	Deep & 011
Building Built 31% Not Built Gr. Fleor 650m? Land		69% 1438m ²
TOTAL: 650m ²		

ENTRE AT 10 BEN BULLEN PI, GOULBURN	Scale:	1:1	100 @A1	
DR PLAN		Date :	14-	11-2024
DESIGN & ASSOCIATES T, BYRON BAY, NSW 2481	INFO@GREENSCAPEDESIGN.COM.AU	Project Number : 241018	Drawing Number : DA102	Rev :



ANNEXURE B: TRAFFIC SURVEY DATA (3 SHEETS)

TRANS TRAFFIC SURVEY



Intersection of Reign St and Bradford Dr, Goulburn

GPS	-34.725037, 149.7381	96					
Date:	Thu 21/11/24		North:	Bradford Dr	Survey	AM:	7:00 AM-9:30 AM
Weather:	Overcast		East:	Reign St	Period	PM:	2:30 PM-6:00 PM
Suburban:	Goulburn		South:	N/A	Traffic	AM:	8:30 AM-9:30 AM
Customer:	McLaren		West:	Reign St	Peak	PM:	3:00 PM-4:00 PM

All Vehicles

Ti	ne	North Ap	proach Bi	adford D	East A	proach F	Reign St	West A	oproach F	Reign St	Hourl	/ Total
Period Start	Period End	U	R	L	U	R	WB	U	EB	L	Hour	Peak
7:00	7:15	0	6	1	0	0	2	0	5	2	57	
7:15	7:30	0	3	0	0	0	0	0	2	0	62	
7:30	7:45	0	3	1	0	0	5	0	2	6	82	
7:45	8:00	0	7	0	0	0	5	0	5	2	98	
8:00	8:15	0	5	0	0	0	8	0	6	2	152	
8:15	8:30	0	8	0	0	1	6	0	4	6	197	
8:30	8:45	0	8	0	0	2	3	0	7	13	198	Peak
8:45	9:00	0	21	1	0	1	18	0	5	27		
9:00	9:15	0	12	1	0	1	13	0	7	32		
9:15	9:30	0	8	1	0	0	8	0	7	2		
14:30	14:45	0	4	0	0	0	6	0	7	5	178	
14:45	15:00	0	3	0	0	1	4	0	7	12	181	
15:00	15:15	0	1	1	0	0	12	0	8	13	184	Peak
15:15	15:30	0	25	0	0	5	33	0	7	24	176	
15:30	15:45	0	8	0	0	0	2	0	7	8	116	
15:45	16:00	0	8	0	0	0	7	0	10	5	113	
16:00	16:15	0	7	0	0	1	4	0	7	8	108	
16:15	16:30	0	8	0	0	1	8	0	11	6	101	
16:30	16:45	0	3	0	0	0	6	1	6	6	94	
16:45	17:00	0	4	0	1	0	9	0	6	5	97	
17:00	17:15	0	2	2	0	0	3	0	6	7	101	
17:15	17:30	0	6	1	0	0	4	0	7	9		
17:30	17:45	0	4	1	0	1	6	0	8	5		
17:45	18:00	0	7	0	1	0	7	0	8	6		

Peak	Time	North Approach Bradford D			East Ap	proach F	Reign St	West A	Peak		
Period Star	Period End	U	R	L	U	R	WB	U	EB	L	total
8:30	9:30	0	49	3	0	4	42	0	26	74	198
15:00	16:00	0	42	1	0	5	54	0	32	50	184

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.



TRANS TRAFFIC SURVEY



GPS -34.724352, 149.737963

Date:	Thu 21/11/24
Weather:	Overcast
Suburban:	Goulburn
Customer:	McLaren

North:	Bradford Dr	
East:	Hampden St	
South:	Bradford Dr	
West	N/A	

Survey	AM:	7:00 AM-9:30 AM
Period	PM:	2:30 PM-6:00 PM
Traffic	AM:	8:15 AM-9:15 AM
Peak	PM:	2:45 PM-3:45 PM

DNV.GL

DNVGL

All Vehicles

Ti	me	North Ap	proach Bi	adford D	East App	roach Ha	mpden St	South Ap	proach B	radford D	Hourl	/ Total
Period Start	Period End	U	SB	L	U	R	L	U	R	NB	Hour	Peak
7:00	7:15	0	2	1	0	0	5	0	1	1	32	
7:15	7:30	0	1	0	0	0	2	0	0	0	29	
7:30	7:45	0	2	0	0	0	2	0	4	2	40	
7:45	8:00	0	2	0	0	0	5	0	1	1	53	
8:00	8:15	0	4	0	0	0	1	0	2	0	97	
8:15	8:30	0	3	0	0	0	4	1	3	3	138	Peak
8:30	8:45	0	2	0	0	0	6	0	15	0	136	
8:45	9:00	0	6	1	0	2	16	0	26	2		
9:00	9:15	0	1	1	0	1	12	0	30	3		
9:15	9:30	0	4	0	0	1	5	0	2	0		
14:30	14:45	0	1	0	0	2	3	0	0	5	100	
14:45	15:00	0	1	2	0	1	2	0	10	3	107	Peak
15:00	15:15	0	1	0	0	1	1	0	12	1	102	
15:15	15:30	0	2	0	0	0	23	0	24	5	102	
15:30	15:45	0	2	1	0	1	6	0	7	1	63	
15:45	16:00	0	7	0	0	1	1	0	2	3	56	
16:00	16:15	0	4	0	0	0	3	0	4	5	52	
16:15	16:30	0	1	0	0	0	7	0	2	5	47	
16:30	16:45	0	2	1	0	1	1	0	2	4	50	
16:45	17:00	0	2	0	0	1	2	0	1	4	50	
17:00	17:15	0	2	0	0	0	2	0	5	2	55	
17:15	17:30	0	4	0	0	2	3	0	3	6		
17:30	17:45	0	5	0	0	0	0	0	3	3		
17:45	18:00	0	2	0	0	2	5	0	1	5		

Peak	Time	North Approach Bradford DeEast Approach Hampden StSouth Approach Bradford D									
Period Start	Period End	U	SB	L	U	R	L	U	R	NB	total
8:15	9:15	0	12	2	0	3	38	1	74	8	138
14:45	15:45	0	6	3	0	3	32	0	53	10	107

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration. Graphic







TRANS TRAFFIC SURVEY



GPS -34.725177, 149.737065

•. •	•		
Date:	Thu 21/11/24	North:	N/A
Weather:	Overcast	East:	Rei
Suburban:	Goulburn	South:	Nic
Customer:	McLaren	West:	Rei

orth:	N/A
ast:	Reign St
outh:	Nichols St
/est:	Reign St

DNV·GL

DNV.GL

DNV.GL

Survey	AM:	7:00 AM-9:30 AM
Period	PM:	2:30 PM-6:00 PM
Traffic	AM:	8:30 AM-9:30 AM
Peak	PM:	3:00 PM-4:00 PM

All Vehicles

Ti	me	East Ap	proach F	Reign St	South Ap	proach N	lichols St	West A	oproach F	Reign St	Hourly	/ Total
Period Start	Period End	U	WB	L	U	R	L	U	R	EB	Hour	Peak
7:00	7:15	0	2	6	0	2	0	0	0	5	60	
7:15	7:30	0	2	1	0	1	2	0	1	1	66	
7:30	7:45	0	4	4	0	0	0	0	1	8	83	
7:45	8:00	0	10	2	0	2	0	0	1	5	98	
8:00	8:15	0	5	8	0	3	0	0	0	5	154	
8:15	8:30	0	7	7	0	1	0	0	1	9	199	
8:30	8:45	0	6	5	0	3	1	0	0	17	203	Peak
8:45	9:00	0	27	12	0	7	2	0	3	25		
9:00	9:15	0	23	2	0	7	1	0	1	32		
9:15	9:30	0	12	4	0	3	3	0	1	6		
14:30	14:45	0	6	4	0	4	2	0	3	8	182	
14:45	15:00	0	5	2	0	6	0	0	1	13	183	
15:00	15:15	0	11	2	0	6	1	0	1	15	188	Peak
15:15	15:30	0	46	12	0	11	2	0	1	20	184	
15:30	15:45	0	8	2	0	2	2	1	0	13	130	
15:45	16:00	0	9	6	0	3	2	0	0	12	129	
16:00	16:15	0	9	2	0	6	3	0	3	9	127	
16:15	16:30	0	14	2	0	4	1	0	4	13	115	
16:30	16:45	0	8	2	0	6	1	0	3	7	105	
16:45	17:00	0	11	2	0	4	2	0	4	7	105	
17:00	17:15	0	3	2	0	6	1	0	1	7	109	
17:15	17:30	0	5	5	0	8	2	0	0	8		
17:30	17:45	0	7	3	0	4	3	0	1	9		
17:45	18:00	0	11	3	0	7	5	0	1	7		

Peak	Time	East Ap	proach F	leign St	South Ap	proach N	lichols St	West A	oproach F	Reign St	Peak
Period Start	Period End	U	WB	L	U	R	L	U	R	EB	total
8:30	9:30	0	68	23	0	20	7	0	5	80	203
15:00	16:00	0	74	22	0	22	7	1	2	60	188

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.





ANNEXURE C: SIDRA RESULTS (12 SHEETS)

V Site: 101 [Existing AM - Bradford Drive / Reign Street (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Bradford Drive / Reign Street Goulburn, NSW Existing AM Site Category: Existing - AM Give-Way (Two-Way)

Vehic	cle Mo	ovement	Perfo	rma	nce										
Mov ID	Turn	Mov Class	Dem Fl [Total veh/ <u>h</u>	nand Iows HV] <u>%</u>	Ar F [Total veh/ <u>h</u>	rival lows HV] %_	Deg. Satn v/ <u>c</u>	Aver. Delay se <u>c</u>	Level of Service	95% I Qu [Veh. veh_	Back Of Jeue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East:	Reign	Street (E)												
5	T1	All MCs	42	2.4	42	2.4	0.024	0.0	LOS A	0.0	0.2	0.04	0.06	0.04	59.3
6	R2	All MCs	4	0.0	4	0.0	0.024	5.7	LOS A	0.0	0.2	0.04	0.06	0.04	56.6
Appro	ach		46	2.2	46	2.2	0.024	0.5	NA	0.0	0.2	0.04	0.06	0.04	59.1
North	Brad	ford Drive	•												
7	L2	All MCs	3	0.0	3	0.0	0.044	5.6	LOS A	0.1	1.0	0.17	0.57	0.17	52.5
9	R2	All MCs	49	2.0	49	2.0	0.044	5.8	LOS A	0.1	1.0	0.17	0.57	0.17	52.1
Appro	ach		52	1.9	52	1.9	0.044	5.8	LOS A	0.1	1.0	0.17	0.57	0.17	52.1
West:	Reigr	n Street (V	V)												
10	L2	All MCs	74	9.5	74	9.5	0.056	5.7	LOS A	0.0	0.0	0.00	0.43	0.00	53.7
11	T1	All MCs	26	0.0	26	0.0	0.056	0.0	LOS A	0.0	0.0	0.00	0.43	0.00	56.3
Appro	ach		100	7.0	100	7.0	0.056	4.2	NA	0.0	0.0	0.00	0.43	0.00	54.3
All Ve	hicles		198	4.5	198	4.5	0.056	3.8	NA	0.1	1.0	0.05	0.38	0.05	54.7

Site Level of Service (LOS) Method: Delay (RTA NSW). 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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V Site: 101 [Existing PM - Bradford Drive / Reign Street (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Bradford Drive / Reign Street Goulburn, NSW Existing AM Site Category: Existing Give-Way (Two-Way)

Vehic	le Mo	ovement	t Perfo	rma	nce										
Mov ID	Turn	Mov Class	Dem F [Total veh/h	nand Iows HV] %	Ar F [Total veh/h	rival lows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Q [Veh. veh	Back Of ueue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East:	Reign	Street (E	.)												
5	T1	All MCs	54	1.9	54	1.9	0.032	0.0	LOS A	0.0	0.3	0.05	0.06	0.05	59.5
6	R2	All MCs	5	40.0	5	40.0	0.032	6.3	LOS A	0.0	0.3	0.05	0.06	0.05	54.7
Appro	ach		59	5.1	59	5.1	0.032	0.6	NA	0.0	0.3	0.05	0.06	0.05	59.1
North	Brad	ford Drive)												
7	L2	All MCs	1	0.0	1	0.0	0.037	5.6	LOS A	0.1	0.8	0.19	0.57	0.19	52.4
9	R2	All MCs	42	0.0	42	0.0	0.037	5.8	LOS A	0.1	0.8	0.19	0.57	0.19	52.2
Appro	ach		43	0.0	43	0.0	0.037	5.8	LOS A	0.1	0.8	0.19	0.57	0.19	52.2
West:	Reigr	n Street (V	N)												
10	L2	All MCs	50	14.0	50	14.0	0.046	5.7	LOS A	0.0	0.0	0.00	0.36	0.00	54.1
11	T1	All MCs	32	3.1	32	3.1	0.046	0.0	LOS A	0.0	0.0	0.00	0.36	0.00	57.0
Appro	ach		82	9.8	82	9.8	0.046	3.5	NA	0.0	0.0	0.00	0.36	0.00	55.2
All Ve	hicles		184	6.0	184	6.0	0.046	3.1	NA	0.1	0.8	0.06	0.31	0.06	55.6

Site Level of Service (LOS) Method: Delay (RTA NSW). 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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V Site: 101 [Existing AM - Bradford Drive / Hampden Street (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Bradford Drive / Hampden Street Goulburn, NSW Existing AM Site Category: Existing Give-Way (Two-Way)

Vehic	le Mo	ovement	t Perfo	rma	nce										
Mov	Turn	Mov	Dem	nand	Ar	rival	Deg.	Aver.	Level of	95% E	Back Of	Prop.	Eff.	Aver.	Aver.
ID		Class	FI Tatal		FI Tatal	lows	Satn	Delay	Service	QL [\/ab		Que	Stop	No. of	Speed
			l Iolai	пvј %	veh/h	пvј %	v/c	80C		i ven. veh	Disi j m		Rate	Cycles	km/h
South	: Brad	Iford Drive	e (S)	70	VOII/II	70	110	000		VOIT					KITI/TT
2	T1	All MCs	8	0.0	8	0.0	0.048	0.0	LOS A	0.2	1.7	0.07	0.51	0.07	53.1
3	R2	All MCs	74	9.5	74	9.5	0.048	4.9	LOS A	0.2	1.7	0.07	0.51	0.07	48.7
Appro	ach		82	8.5	82	8.5	0.048	4.4	NA	0.2	1.7	0.07	0.51	0.07	49.1
East:	Hamp	den Stree	et												
4	L2	All MCs	38	0.0	38	0.0	0.026	5.6	LOS A	0.1	0.7	0.05	0.56	0.05	48.5
6	R2	All MCs	3	0.0	3	0.0	0.026	5.6	LOS A	0.1	0.7	0.05	0.56	0.05	52.5
Appro	ach		41	0.0	41	0.0	0.026	5.6	LOS A	0.1	0.7	0.05	0.56	0.05	49.0
North:	Brad	ford Drive	e (N)												
7	L2	All MCs	2	0.0	2	0.0	0.007	5.5	LOS A	0.0	0.0	0.00	0.09	0.00	56.8
8	T1	All MCs	12	0.0	12	0.0	0.007	0.0	LOS A	0.0	0.0	0.00	0.09	0.00	58.7
Appro	ach		14	0.0	14	0.0	0.007	0.8	NA	0.0	0.0	0.00	0.09	0.00	58.2
All Ve	hicles		137	5.1	137	5.1	0.048	4.4	NA	0.2	1.7	0.06	0.48	0.06	49.9

Site Level of Service (LOS) Method: Delay (RTA NSW). 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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V Site: 101 [Existing PM - Bradford Drive / Hampden Street (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Bradford Drive / Hampden Street Goulburn, NSW Existing AM Site Category: Existing Give-Way (Two-Way)

Vehic	le M	ovement	t Perfo	rma	nce _										
Mov	Turn	Mov	Dem	hand	Ar	rival	Deg.	Aver.	Level of	95%	Back Of	Prop.	Eff.	Aver.	Aver.
ID		Class	H Total	lows	H I Totol	OWS	Satn	Delay	Service	C [\/oh	Ueue	Que	Stop	No. of	Speed
			veh/h	· · · · j	veh/h	· · v j %	v/c	sec		veh	m m		Trate	Cycles	km/h
South	: Brad	Iford Drive	e (S)												
2	T1	All MCs	10	0.0	10	0.0	0.038	0.0	LOS A	0.2	1.4	0.05	0.48	0.05	53.7
3	R2	All MCs	53	17.0	53	17.0	0.038	4.9	LOS A	0.2	1.4	0.05	0.48	0.05	48.7
Appro	ach		63	14.3	63	14.3	0.038	4.1	NA	0.2	1.4	0.05	0.48	0.05	49.4
East:	Hamp	den Stree	et												
4	L2	All MCs	32	0.0	32	0.0	0.022	5.5	LOS A	0.1	0.6	0.04	0.56	0.04	48.6
6	R2	All MCs	3	0.0	3	0.0	0.022	5.5	LOS A	0.1	0.6	0.04	0.56	0.04	52.5
Appro	ach		35	0.0	35	0.0	0.022	5.5	LOS A	0.1	0.6	0.04	0.56	0.04	49.1
North:	Brad	ford Drive	e (N)												
7	L2	All MCs	3	0.0	3	0.0	0.005	5.5	LOS A	0.0	0.0	0.00	0.20	0.00	55.9
8	T1	All MCs	6	0.0	6	0.0	0.005	0.0	LOS A	0.0	0.0	0.00	0.20	0.00	57.0
Appro	ach		9	0.0	9	0.0	0.005	1.8	NA	0.0	0.0	0.00	0.20	0.00	56.5
All Ve	hicles		107	8.4	107	8.4	0.038	4.4	NA	0.2	1.4	0.04	0.48	0.04	49.9

Site Level of Service (LOS) Method: Delay (RTA NSW). 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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V Site: 101 [Existing AM - Nichols Street / Reign Street (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Nichols Street / Reign Street Goulburn, NSW Existing AM Site Category: Existing - AM Give-Way (Two-Way)

Vehic	le M	ovement	t Perfo	rma	nce										
Mov ID	Turn	Mov Class	Derr F [Total veh/h	nand Iows HV] %	Ar Fl [Total] veh/h	rival ows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Q [Veh. veh	Back Of ueue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South	: Nich	ols Street	t												
1	L2	All MCs	7	0.0	7	0.0	0.025	5.7	LOS A	0.1	0.6	0.21	0.56	0.21	51.6
3	R2	All MCs	20	20.0	20 2	20.0	0.025	6.4	LOS A	0.1	0.6	0.21	0.56	0.21	50.4
Appro	ach		27	14.8	27	14.8	0.025	6.2	LOS A	0.1	0.6	0.21	0.56	0.21	50.7
East:	Reign	Street (E	.)												
4	L2	All MCs	23	4.3	23	4.3	0.048	5.6	LOS A	0.0	0.0	0.00	0.15	0.00	55.7
5	T1	All MCs	68	1.5	68	1.5	0.048	0.0	LOS A	0.0	0.0	0.00	0.15	0.00	58.7
Appro	ach		91	2.2	91	2.2	0.048	1.4	NA	0.0	0.0	0.00	0.15	0.00	57.9
West:	Reigr	n Street (\	N)												
11	T1	All MCs	80	3.8	80	3.8	0.045	0.0	LOS A	0.0	0.2	0.03	0.04	0.03	59.6
12	R2	All MCs	5	0.0	5	0.0	0.045	5.6	LOS A	0.0	0.2	0.03	0.04	0.03	56.4
Appro	ach		85	3.5	85	3.5	0.045	0.3	NA	0.0	0.2	0.03	0.04	0.03	59.4
All Ve	hicles		203	4.4	203	4.4	0.048	1.6	NA	0.1	0.6	0.04	0.16	0.04	57.5

Site Level of Service (LOS) Method: Delay (RTA NSW). 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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V Site: 101 [Existing PM - Nichols Street / Reign Street (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Nichols Street / Reign Street Goulburn, NSW Existing AM Site Category: Existing Give-Way (Two-Way)

Vehic	cle M	ovement	Perfo	rma	nce										
Mov ID	Turn	Mov Class	Derr Fl [Total veh/h	nand Iows HV] %	Ar Fl [Total] veh/h	rival ows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Q [Veh. veh	Back Of ueue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South	: Nich	ols Street													
1	L2	All MCs	7	0.0	7	0.0	0.026	5.7	LOS A	0.1	0.7	0.20	0.57	0.20	51.6
3	R2	All MCs	22	18.2	22	18.2	0.026	6.3	LOS A	0.1	0.7	0.20	0.57	0.20	50.5
Appro	ach		29	13.8	29	13.8	0.026	6.1	LOS A	0.1	0.7	0.20	0.57	0.20	50.8
East:	Reign	Street (E)												
4	L2	All MCs	22	0.0	22	0.0	0.050	5.6	LOS A	0.0	0.0	0.00	0.14	0.00	56.0
5	T1	All MCs	74	1.4	74	1.4	0.050	0.0	LOS A	0.0	0.0	0.00	0.14	0.00	58.7
Appro	ach		96	1.0	96	1.0	0.050	1.3	NA	0.0	0.0	0.00	0.14	0.00	58.1
West:	Reigr	n Street (\	∕)												
11	T1	All MCs	60	6.7	60	6.7	0.033	0.0	LOS A	0.0	0.1	0.01	0.02	0.01	59.7
12	R2	All MCs	2	0.0	2	0.0	0.033	5.5	LOS A	0.0	0.1	0.01	0.02	0.01	56.6
Appro	ach		62	6.5	62	6.5	0.033	0.2	NA	0.0	0.1	0.01	0.02	0.01	59.7
All Ve	hicles		187	4.8	187	4.8	0.050	1.7	NA	0.1	0.7	0.04	0.16	0.04	57.4

Site Level of Service (LOS) Method: Delay (RTA NSW). 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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V Site: 101 [Future AM - Bradford Drive / Reign Street (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Bradford Drive / Reign Street Goulburn, NSW Existing AM Site Category: Existing - AM Give-Way (Two-Way)

Vehic	cle M	ovement	t Perfo	rma	nce										
Mov ID	Turn	Mov Class	Dem Fl	hand lows มหาก	Ar Fl	rival ows uv/ 1_	Deg. Satn	Aver. Delay	Level of Service	95% E Qu	Back Of ieue	Prop. Que	Eff. Stop	Aver. No. of	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m		Tale	Cycles	km/h
East:	Reign	Street (E	i)												
5	T1	All MCs	42	2.4	42	2.4	0.030	0.1	LOS A	0.1	0.5	0.11	0.16	0.11	58.3
6	R2	All MCs	12	0.0	12	0.0	0.030	5.8	LOS A	0.1	0.5	0.11	0.16	0.11	55.7
Appro	ach		54	1.9	54	1.9	0.030	1.4	NA	0.1	0.5	0.11	0.16	0.11	57.7
North	Brad	ford Drive)												
7	L2	All MCs	11	0.0	11	0.0	0.075	5.6	LOS A	0.3	1.8	0.17	0.57	0.17	52.4
9	R2	All MCs	78	1.3	78	1.3	0.075	5.9	LOS A	0.3	1.8	0.17	0.57	0.17	52.1
Appro	ach		89	1.1	89	1.1	0.075	5.9	LOS A	0.3	1.8	0.17	0.57	0.17	52.2
West:	Reigr	n Street (V	N)												
10	L2	All MCs	103	6.8	103	6.8	0.071	5.6	LOS A	0.0	0.0	0.00	0.46	0.00	53.5
11	T1	All MCs	26	0.0	26	0.0	0.071	0.0	LOS A	0.0	0.0	0.00	0.46	0.00	56.0
Appro	ach		129	5.4	129	5.4	0.071	4.5	NA	0.0	0.0	0.00	0.46	0.00	54.0
All Ve	hicles		272	3.3	272	3.3	0.075	4.3	NA	0.3	1.8	0.08	0.44	0.08	54.1

Site Level of Service (LOS) Method: Delay (RTA NSW). 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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V Site: 101 [Future PM - Bradford Drive / Reign Street (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Bradford Drive / Reign Street Goulburn, NSW Existing AM Site Category: Existing Give-Way (Two-Way)

Vehio	cle M	ovement	t Perfo	rma	nce										
Mov ID	Turn	Mov Class	Dem F [Total veh/ <u>h</u>	nand Iows HV] <u>%</u>	Ar Fl [Total veh/ <u>h</u>	rival lows HV] %_	Deg. Satn v/c	Aver. Delay se <u>c</u>	Level of Service	95% Q [Veh. veh	Back Of ueue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/ <u>h</u>
East:	Reign	Street (E	i)												
5	T1	All MCs	54	1.9	54	1.9	0.038	0.1	LOS A	0.1	0.6	0.10	0.15	0.10	58.7
6	R2	All MCs	13	15.4	13	15.4	0.038	6.0	LOS A	0.1	0.6	0.10	0.15	0.10	55.2
Appro	ach		67	4.5	67	4.5	0.038	1.3	NA	0.1	0.6	0.10	0.15	0.10	58.0
North	: Brad	ford Drive	9												
7	L2	All MCs	9	0.0	9	0.0	0.067	5.6	LOS A	0.2	1.6	0.18	0.57	0.18	52.4
9	R2	All MCs	70	0.0	70	0.0	0.067	5.9	LOS A	0.2	1.6	0.18	0.57	0.18	52.1
Appro	ach		79	0.0	79	0.0	0.067	5.9	LOS A	0.2	1.6	0.18	0.57	0.18	52.2
West:	Reigr	n Street (\	N)												
10	L2	All MCs	78	9.0	78	9.0	0.061	5.7	LOS A	0.0	0.0	0.00	0.41	0.00	53.8
11	T1	All MCs	32	3.1	32	3.1	0.061	0.0	LOS A	0.0	0.0	0.00	0.41	0.00	56.4
Appro	ach		110	7.3	110	7.3	0.061	4.0	NA	0.0	0.0	0.00	0.41	0.00	54.5
All Ve	hicles		256	4.3	256	4.3	0.067	3.9	NA	0.2	1.6	0.08	0.39	0.08	54.6

Site Level of Service (LOS) Method: Delay (RTA NSW). 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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V Site: 101 [Future AM - Bradford Drive / Hampden Street (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Bradford Drive / Hampden Street Goulburn, NSW Existing AM Site Category: Existing Give-Way (Two-Way)

Vehic	le M	ovement	t Perfo	rma	nce										
Mov	Turn	Mov	Dem	nand	Ar	rival	Deg.	Aver.	Level of	95%	Back Of	Prop.	Eff.	Aver.	Aver.
U		Class	FI [Total	IOWS	Fi [Total	ows HV/1	Sath	Delay	Service	[Veh	ueue Dist 1	Que	Stop Rate	NO. OT Cycles	Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m		i tato	0,000	km/h
South	: Brad	Iford Drive	e (S)												
2	T1	All MCs	45	0.0	45	0.0	0.070	0.2	LOS A	0.3	2.4	0.14	0.36	0.14	54.7
3	R2	All MCs	74	9.5	74	9.5	0.070	5.0	LOS A	0.3	2.4	0.14	0.36	0.14	50.1
Appro	ach		119	5.9	119	5.9	0.070	3.2	NA	0.3	2.4	0.14	0.36	0.14	51.7
East:	Hamp	den Stree	ət												
4	L2	All MCs	38	0.0	38	0.0	0.030	5.7	LOS A	0.1	0.8	0.13	0.54	0.13	48.2
6	R2	All MCs	7	0.0	7	0.0	0.030	6.0	LOS A	0.1	0.8	0.13	0.54	0.13	52.2
Appro	ach		45	0.0	45	0.0	0.030	5.7	LOS A	0.1	0.8	0.13	0.54	0.13	49.1
North:	Brad	ford Drive	e (N)												
7	L2	All MCs	6	0.0	6	0.0	0.028	5.5	LOS A	0.0	0.0	0.00	0.07	0.00	56.9
8	T1	All MCs	49	0.0	49	0.0	0.028	0.0	LOS A	0.0	0.0	0.00	0.07	0.00	59.0
Appro	ach		55	0.0	55	0.0	0.028	0.6	NA	0.0	0.0	0.00	0.07	0.00	58.6
All Ve	hicles		219	3.2	219	3.2	0.070	3.1	NA	0.3	2.4	0.11	0.33	0.11	52.7

Site Level of Service (LOS) Method: Delay (RTA NSW). 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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V Site: 101 [Future PM - Bradford Drive / Hampden Street (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Bradford Drive / Hampden Street Goulburn, NSW Existing AM Site Category: Existing Give-Way (Two-Way)

Vehic	cle M	ovemen	t Perfo	rma	nce										
Mov ID	Turn	Mov Class	Dem F [Total	nand lows HV]	Ar Fl [Total	rival lows HV]	Deg. Satn	Aver. Delay	Level of Service	95% Q [Veh.	Back Of ueue Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
South	: Brad	Iford Drive	veh/h e (S)	%	veh/h	%	V/C	sec	_	veh	m	_	_	_	km/h
2	T1	All MCs	46	0.0	46	0.0	0.059	0.1	LOS A	0.3	2.0	0.13	0.32	0.13	55.5
3	R2	All MCs	53	17.0	53	17.0	0.059	5.0	LOS A	0.3	2.0	0.13	0.32	0.13	50.2
Appro	ach		99	9.1	99	9.1	0.059	2.7	NA	0.3	2.0	0.13	0.32	0.13	52.5
East:	Hamp	den Stree	et												
4	L2	All MCs	32	0.0	32	0.0	0.026	5.7	LOS A	0.1	0.7	0.12	0.54	0.12	48.2
6	R2	All MCs	7	0.0	7	0.0	0.026	5.9	LOS A	0.1	0.7	0.12	0.54	0.12	52.3
Appro	ach		39	0.0	39	0.0	0.026	5.7	LOS A	0.1	0.7	0.12	0.54	0.12	49.3
North	: Brad	ford Drive	e (N)												
7	L2	All MCs	7	0.0	7	0.0	0.025	5.5	LOS A	0.0	0.0	0.00	0.09	0.00	56.8
8	T1	All MCs	42	0.0	42	0.0	0.025	0.0	LOS A	0.0	0.0	0.00	0.09	0.00	58.7
Appro	ach		49	0.0	49	0.0	0.025	0.8	NA	0.0	0.0	0.00	0.09	0.00	58.2
All Ve	hicles		187	4.8	187	4.8	0.059	2.9	NA	0.3	2.0	0.09	0.30	0.09	53.2

Site Level of Service (LOS) Method: Delay (RTA NSW). 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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V Site: 101 [Future AM - Nichols Street / Reign Street (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Nichols Street / Reign Street Goulburn, NSW Existing AM Site Category: Existing - AM Give-Way (Two-Way)

Vehic	le Mo	ovement	t Perfo	rma	nce										
Mov ID	Turn	Mov Class	Derr F [Total veh/h	nand Iows HV] %	Ar Fl [Total] veh/h	rival lows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% [Qu [Veh. veh	Back Of ieue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South	: Nich	ols Street	t												
1	L2	All MCs	7	0.0	7	0.0	0.048	5.7	LOS A	0.2	1.2	0.24	0.58	0.24	51.5
3	R2	All MCs	45	8.9	45	8.9	0.048	6.3	LOS A	0.2	1.2	0.24	0.58	0.24	50.8
Appro	ach		52	7.7	52	7.7	0.048	6.2	LOS A	0.2	1.2	0.24	0.58	0.24	50.9
East:	Reign	Street (E	.)												
4	L2	All MCs	48	2.1	48	2.1	0.063	5.6	LOS A	0.0	0.0	0.00	0.24	0.00	55.0
5	T1	All MCs	72	1.4	72	1.4	0.063	0.0	LOS A	0.0	0.0	0.00	0.24	0.00	57.9
Appro	ach		120	1.7	120	1.7	0.063	2.2	NA	0.0	0.0	0.00	0.24	0.00	56.8
West:	Reigr	n Street (V	N)												
11	T1	All MCs	84	3.6	84	3.6	0.047	0.0	LOS A	0.0	0.2	0.03	0.04	0.03	59.6
12	R2	All MCs	5	0.0	5	0.0	0.047	5.7	LOS A	0.0	0.2	0.03	0.04	0.03	56.4
Appro	ach		89	3.4	89	3.4	0.047	0.3	NA	0.0	0.2	0.03	0.04	0.03	59.4
All Ve	hicles		261	3.4	261	3.4	0.063	2.4	NA	0.2	1.2	0.06	0.24	0.06	56.4

Site Level of Service (LOS) Method: Delay (RTA NSW). 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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V Site: 101 [Future PM - Nichols Street / Reign Street (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Nichols Street / Reign Street Goulburn, NSW Existing AM Site Category: Existing Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Dem Fl [Total veh/h	nand Iows HV] %	Ar Fl [Total] veh/h	rival lows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Qı [Veh. veh	Back Of Jeue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Nichols Street															
1	L2	All MCs	7	0.0	7	0.0	0.048	5.8	LOS A	0.2	1.2	0.23	0.58	0.23	51.6
3	R2	All MCs	46	8.7	46	8.7	0.048	6.2	LOS A	0.2	1.2	0.23	0.58	0.23	50.9
Appro	ach		53	7.5	53	7.5	0.048	6.1	LOS A	0.2	1.2	0.23	0.58	0.23	51.0
East: Reign Street (E)															
4	L2	All MCs	46	0.0	46	0.0	0.065	5.6	LOS A	0.0	0.0	0.00	0.22	0.00	55.2
5	T1	All MCs	78	1.3	78	1.3	0.065	0.0	LOS A	0.0	0.0	0.00	0.22	0.00	58.0
Appro	ach		124	0.8	124	0.8	0.065	2.1	NA	0.0	0.0	0.00	0.22	0.00	57.0
West: Reign Street (W)															
11	T1	All MCs	64	6.3	64	6.3	0.035	0.0	LOS A	0.0	0.1	0.02	0.02	0.02	59.8
12	R2	All MCs	2	0.0	2	0.0	0.035	5.6	LOS A	0.0	0.1	0.02	0.02	0.02	56.6
Appro	ach		66	6.1	66	6.1	0.035	0.2	NA	0.0	0.1	0.02	0.02	0.02	59.7
All Ve	nicles		243	3.7	243	3.7	0.065	2.4	NA	0.2	1.2	0.05	0.24	0.05	56.3

Site Level of Service (LOS) Method: Delay (RTA NSW). 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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ANNEXURE D: QUEUING ANALYSIS (1 SHEET)

Multi-Server Queue Worksheet

Service Bays	11	Arrival Rate (vehicles/hour)	40	Wait Time in Each Bay (seconds)	496
Vehicles/Second IN	0.0111	Vehicles/Second OUT (per bay)	0.0020		
P0	0.0040	rho (M/M/c and M/M/1) Non-Random Service Bays Minimum	5.511	rho (M/M/1 only)	0.5010

1st Term	Pn	P(>n)	Alternate (P>n)	Percentile	Number of Vehicles in System	Number of Vehicles Queued		
1.00E+00	0.004	99.6%	99.60%	50%	5	0		
5.51E+00	0.022	97.4%	97.37%	60%	6	0		
1.52E+01	0.061	91.3%	91.23%	70%	7	0		
2.79E+01	0.112	80.0%	79.96%	80%	7	0		
3.84E+01	0.155	64.5%	64.42%	85%	8	0		
4.24E+01	0.171	47.5%	47.30%	90%	9	0		
3.89E+01	0.157	31.8%	31.57%	95%	10	0		
3.06E+01	0.123	19.5%	19.19%	98%	11	0		
In the single-line, multiserver, single-phase model, customers form a single line and								

In the single-line, multiserver, single-phase model, customers form a single line and are served by the first server available. The model assumes that there are *s* identical servers, the service time distribution for *each server* is exponential, and the mean service time is $1/\mu$. Using these assumptions, we can describe the operating characteristics with the following formulas:

s = the number of servers in the system

 $p = \frac{\lambda}{s\mu}$ = the average utilization of the system

$$P_{0} = \left[\sum_{n=0}^{s-1} \frac{(\lambda/\mu)^{n}}{n!} + \frac{(\lambda/\mu)^{s}}{s!} \left(\frac{1}{1-p}\right)\right]^{-1} = \text{the probability that no customers} \\ L_{Q} = \frac{P_{o}(\lambda/\mu)^{s}p}{s!(1-p)^{2}} = \text{the average number of customers waiting in line} \\ W_{Q} = \frac{L_{Q}}{\lambda} = \text{the average time spent waiting in line} \\ W = W_{Q} + \frac{1}{\mu} = \text{the average time spent in the system, including service} \\ L = \lambda W = \text{the average number of customers in the service system} \\ P = \begin{cases} \frac{(\lambda/\mu)^{n}}{n!} P_{0} & \text{for } n \leq s \\ 0 & \text{otherwise} \end{cases} = \text{the probability that } n \text{ customers are} \end{cases}$$

$$P_n = \begin{cases} \frac{(\lambda/\mu)^n}{n!} P_0 & \text{for } n \le s \\ \frac{(\lambda/\mu)^n}{s! s^{n-s}} P_0 & \text{for } n > s \end{cases} = \frac{\text{the probability that } n \text{ customers}}{\text{in the system at a given time}}$$



ANNEXURE E: SWEPT PATH TESTING (2 SHEETS)



AUSTRALIAN STANDARD 85TH PERCENTILE SIZE VEHICLE (B85)



All tests performed at 10km/h on public roads and 5km/h internally.



B99 passing B85 along site driveway and circulation road. SUCCESSFUL