



**Riddell Road
Orangeville, Ontario
Assessment of Intersections**

Paradigm Transportation Solutions Limited

January 2021

Project Summary



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200195

Riddell Road, Orangeville, Ontario Assessment of Intersections

January 2021

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Executive Summary

Content

The Town of Orangeville (the Town) retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Assessment of Intersections for Riddell Road at Alder Street and Centennial Road/Spencer Avenue.

The purpose of this study is to review the existing geometry and operations of the study area intersections to identify and validate operational and safety issues. Upon identification of issues, various mitigation measures will be developed and investigated. Schematic plans illustrating the various options will be prepared along with preliminary cost estimates.

Conclusions

At present, the Riddell Road intersections with Alder Street and Centennial Road/Spencer Avenue are operating at overall acceptable levels of service (LOS C or better). The low to moderate intersection volume to capacity ratios indicate the intersections currently have spare capacity.

Additional capacity will be required at the Riddell Road intersections with Alder Street and Centennial Road/Spencer Avenue upon reaching the 2031 forecast traffic volumes. Several remedial measures have been identified for each intersection including provision of additional capacity through additional lanes and/or lane re-assignment or changes in traffic control. Provision of these measures will result in better levels of service and more efficient travel on Riddell Road.

The remedial measures selected for implementation at each intersection and the timing of these improvements are interconnected where the shorter term improvements are dependent upon the longer-term improvement plan.

Recommendations

It is recommended the Town consider the costs and benefits of each identified improvement and carry out required consultation with County staff. It is also recommended the Town consider conducting a Riddell Road corridor study to identify any longer-term (+2031) roadway capacity needs. These will help the Town develop the preferred improvement plan which will address the identified corridor issues,



provide the required future capacity and assist in preparing future Capital Budget forecasts.

Note that regardless of the timing of improvements, the remedial measure of protected left-turn phasing at Riddell Road and Centennial Road/Spencer Avenue should be implemented in the immediate term to conform to Transportation Association of Canada *Geometric Design Guide for Canadian Roads* (2017) guidance.



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1 Introduction

1.1 Overview

The Town of Orangeville (the Town) retained Paradigm Transportation Solutions Limited (Paradigm) to undertake the Assessment of Intersections on Riddell Road at Alder Street and Centennial Road/ Spencer Avenue.

Figure 1.1 illustrates the study area.

1.2 Project Understanding

Riddell Road is a major arterial roadway providing access to local residential subdivisions, busy commercial areas and community centres and schools. It is a bypass route for vehicle traffic around Orangeville. Since opening in 2005, it has helped reduce truck and overall traffic volumes travelling through downtown Orangeville, enabling Broadway to function as a pedestrian-oriented main street. This change has contributed, in part, to Broadway being recognized as one of the Great Places in Canada.

Riddell Road is approximately 7 kilometres long with a 3-kilometre section in the Town's corporate limits Dufferin County Road 109 (Broadway) to Townline (County Road 23)) and the balance under County jurisdiction. The road has a 70 km/h posted speed limit and a three-lane rural cross-section with auxiliary lanes at most intersections and private entrances. Within Orangeville, Riddell Road intersects four public roads (excluding Broadway and Townline). Adjacent land uses include commercial, industrial and residential uses.

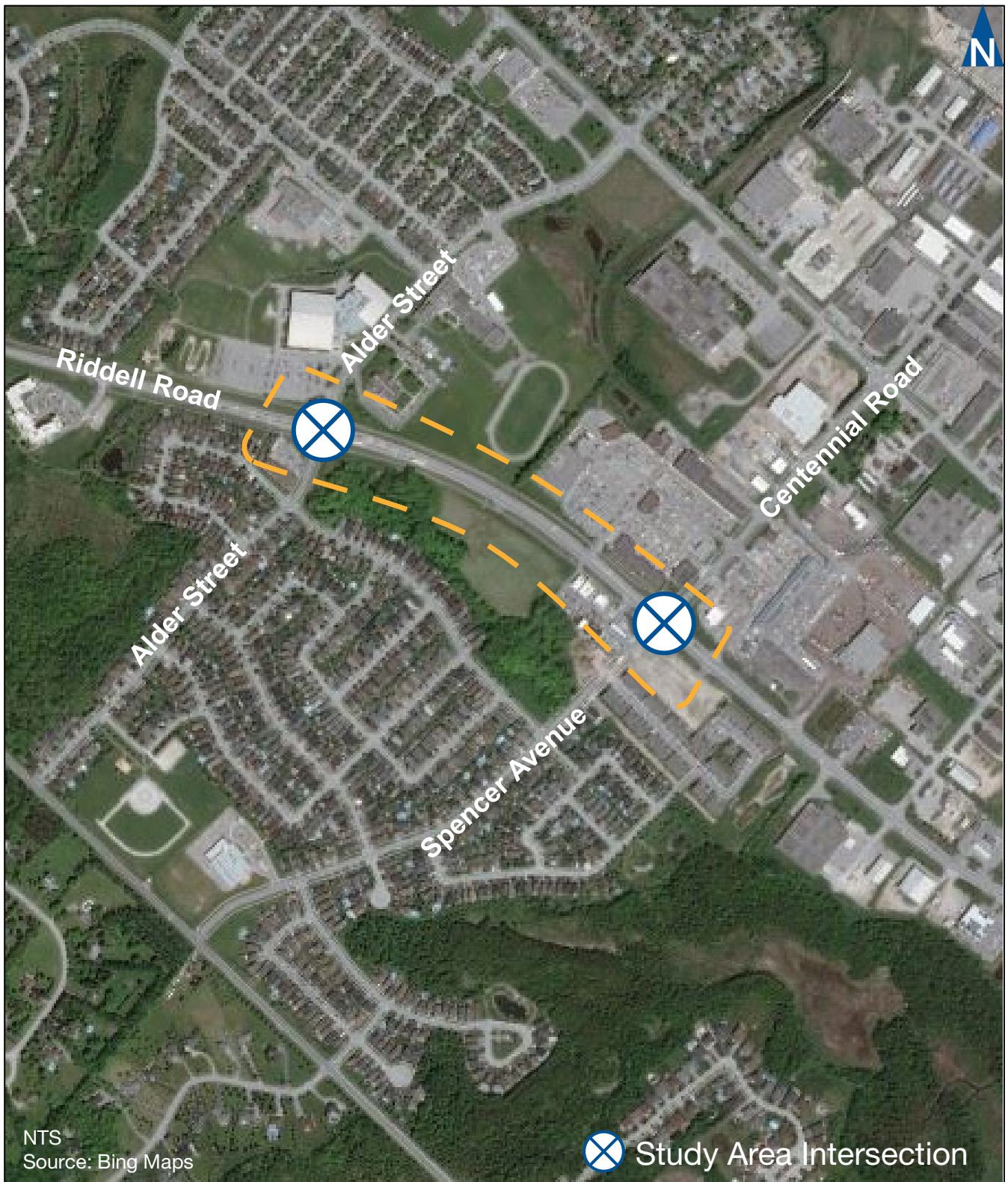
The Town has experienced considerable growth over the past 10 years. In response, Paradigm has been retained to conduct a traffic operations assessment to identify potential safety and operational issues, recommend remedial measures and assess their effectiveness.

1.3 Purpose and Scope

The purpose of this study, as confirmed during pre-consultation with Town Staff, is to:

- ▶ Review the existing geometry and operations of the study area intersections;
- ▶ Review the five-year collision data;
- ▶ Review the current posted speed limits;





- ▶ Analyse the future intersection operations both with and without remedial measures;
- ▶ Provide recommendations on immediate, intermediate and long-term improvement options for the study area intersections;
- ▶ Provide guidance on future recommended studies and practices; and
- ▶ Prepare preliminary cost estimates for the recommended measures.

This study assesses the 2031 horizon year, consistent with the *Dufferin Road 109 Traffic Capacity Analysis*¹.

¹ Prepared by Triton Engineering Services Limited for Dufferin County. *Dufferin Road 109 Traffic Capacity Analysis*. February 2020.

Note: this report has been used as background information only. Further use and interpretation should be undertaken through discussions and the County of Dufferin's approval.



2 Study Area Characteristics

This section documents current traffic conditions, operational deficiencies, and constraints, perceived or otherwise, that may be experienced by the public travelling at the intersections within the study area. The operational deficiencies and constraints identified at this stage will be fundamental to the process of defining the required remedial measures.

2.1 Land Use

The existing land uses abutting the Riddell Road corridor are primarily commercial, institutional and recreational. Although no house or school fronts directly onto Riddell Road, both Alder Street and Spencer Avenue provide access to neighbouring residential areas.

2.2 Roadways and Intersection Geometries

2.2.1 Roadway Descriptions

Details of the study area roads are as follows:

► Riddell Road

- Direction: north-south
- Right-of-Way Width: varies between 35 to 45 meters
- Official Plan² Designation: arterial
- Cross-Section:
 - South of Centennial Road/Spencer Avenue: Two-lane urban with auxiliary turning lanes at Centennial Road/Spencer Avenue intersection. The cross-section transitions to urban on the west side and rural on the east side approximately 130 metres south of the intersection
 - Between Centennial Road/Spencer Avenue and Alder Street: Two lanes with urban cross-section on west side and rural cross-section on east side with auxiliary turning lanes at Alder Street intersection
 - North of Alder Street: Two-lane rural cross-section
- Lane Widths:
 - Through lanes: 3.75 metres

² *The Official Plan of the Orangeville Planning Area*. December 2018. Schedule E: Roads Plan.



- Auxiliary lanes: 3.0 to 3.5 metres
- Stopping/Parking Restrictions: Stopping is prohibited on both sides of the roadway throughout the study area
- Posted Speed Limit: 70 km/h

► **Alder Street**

- Direction: east-west
- Official Plan Designation: minor collector
- Cross-Section:
 - Two-lane urban west of Riddell Road
 - Three-lane urban (one through lane in each direction and a central two-way left-turn lane) east of Riddell Road
 - Auxiliary left-turn lanes are provided on both approaches at Riddell Road
- Lane Widths:
 - Through lanes: 3.75 metres
 - Auxiliary lanes: 3.0 metres
- Stopping/Parking Restrictions: Not posted/signed; therefore, subject to Town By-law 78-2005;
- Posted Speed Limit: 40 km/h with a posted School Zone and Community Safety Zone east of Riddell Road.

► **Centennial Road**

- Direction: east-west
- Official Plan Designation: minor collector
- Cross-Section: Three-lane urban (one through lane in each direction and a central two-way left-turn lane) with a westbound auxiliary left-turn lane at Riddell Road
- Lane Widths:
 - Through lanes: 3.75 metres
 - Auxiliary lanes: 3.0 metres
- Stopping/Parking Restrictions: Stopping is prohibited on both sides of the roadway throughout the study area
- Posted Speed Limit: Not posted, designated as 50 km/h through Town By-law 78-2005.



► **Spencer Avenue**

- Direction: east-west (connection to Riddell Road completed in 2017)
- Official Plan Designation: minor collector
- Cross-Section: Two-lane urban with eastbound auxiliary left-turn lane at Riddell Road
- Lane Widths:
 - Through lanes: 3.75 metres
 - Auxiliary lanes: 3.0 metres
- Stopping/Parking Restrictions: Stopping is prohibited on both sides of the roadway throughout the study area
- Posted Speed Limit: 40 km/h, with a posted School Zone and Community Safety Zone west of the study area.

The roadway configurations and existing conditions were confirmed through a site visit conducted by Paradigm staff in June 2020.

Figure 2.1 illustrates the traffic control and lane configuration at the study area intersections. Note that both study area intersections operate under traffic signal control.





2.2.2 Sight Distance

Sight distances at both Riddell Road intersections were measured during the site visit and further validated via satellite imagery. The measured sight distances were assessed and compared to sight distance guidance and methodologies provided in the Transportation Association of Canada's (TAC) publication *Geometric Design Guidelines for Canadian Roads* (GDGCR)³. The assessment determined:

- ▶ All study area sight distances meet the minimum TAC departure sight distance criteria (i.e. vehicles entering Riddell Road); and
- ▶ It was also confirmed that the roadway was designed to meet the TAC stopping sight distance criteria, thereby providing motorists with ample time and space to bring their vehicles safely to a stop to avoid conflicts.

Overall, the intersection departure and stopping sight distances fall within the recommended guideline criteria which is based on standard engineering best practices.

2.2.3 Left-Turn Lane Sight Lines

Centennial Road/Spencer Avenue

The northbound and southbound left-turn lanes on Riddell Road at Centennial Road/Spencer Avenue are offset. As such, periodically the drivers waiting to make an opposing left turn do not have a clear line of sight to oncoming through traffic on Riddell Road. For example, when a Riddell Road southbound transport truck is waiting to make a left turn (to go eastbound on Centennial Road), a northbound vehicle cannot see oncoming southbound through traffic (on Riddell Road) "around" the truck. This can be perceived as a safety issue by some drivers.

Chapter 9.17.4.5 Left-Turn Lanes on Both Approaches of the TAC GDGCR (2017 edition) indicates that two types of left-turn lane designs are applicable: opposing left-turn lanes and adjacent (offset) left-turn lanes. The GDGCR states the following regarding adjacent left-turn lanes: "*The provision of adjacent left-turn lanes is not generally recommended due to the potential for collisions caused by visibility problems for left-turning vehicles. Visibility problems result from the presence of vehicles in adjacent left-turn lanes and, for this reason, such movements should generally only be used at signalized intersections with protected left turn phases*".

³ TAC. *Geometric Design Guide for Canadian Roads*. June 2017.



In general, while offset left-turn lanes are not an optimal design, they are acceptable provided appropriate signal phasing is provided.

Chapter 6 provides mitigation measures that could be implemented at this intersection to minimize the perceived issues and improve intersection operations and alignment.

Alder Street

Since the northbound and southbound left-turn lanes are aligned at this intersection, a sight line assessment was not required.

2.2.4 Pavement Markings

Pavement markings along the Riddell Road corridor include a solid yellow centreline, dashed white lines delineating travel lanes, turn lane markings (arrows), stop bars and delineated pedestrian crossings. Both signalized study area intersections (Alder Street and Centennial Road/Spencer Avenue) also provide delineated solid white parallel lines as pedestrian crosswalks and white stop bars across all approaches.

Pavement markings within the study area limits conform to standard guidelines and are in compliance with Ontario Traffic Manual Book 11 Pavement, Hazard and Delineation Markings of the Ontario Traffic Manual⁴.

The pavement markings within the study area show signs of wear and loss of marking based upon the field inspection. The Town has a yearly pavement marking program where reapplication/ refreshing will occur.

2.3 Active Transportation

2.3.1 Walking

Sidewalks are provided along both sides of all study area roadways except for the section of Riddell Road south of Centennial Road/Spencer Avenue where no sidewalks are provided.

2.3.2 Cycling

Alder Street has painted sharrows in both directions on both sides of the roadway to indicate that cyclists and autos share the roadway. Signed cycling facilities (lanes, paths, etc.) are not provided along any other study area roadway.

⁴ Ontario Traffic Manual, Book 11, Pavement, Hazard and Delineation Markings, Queen's Printer for Ontario, March 2000



It is noted that Riddell Road has a four-metre (approximate) hard surface shoulder reserved for future turn and/or acceleration/ deceleration lanes. To avoid confusion, it is recommended the Town stripe/hatch this area so it is clear to cyclists that these areas are not bike lanes.



3 Safety Review

A safety performance review for the Riddell Road corridor between Alder Street and Centennial Road/Spencer Avenue has been undertaken as part of this Operational Review. This review included collision analysis and a speed limit review. The results are outlined the following sections.

3.1 Collision Analysis

A high-level collision analysis was undertaken for the study area intersections of Riddell Road at Alder Street and Centennial Road/Spencer Avenue. Collision data were provided by the Town for the study area intersections for the seven-year period from January 2014 to May 2020. However, the data was limited in scope and did not contain detailed information such as collision type, location, weather conditions and severity. Therefore, only a high-level analysis could be undertaken.

Table 3.1 summarizes the overall collision data at both study area intersections. The data indicates:

- ▶ Riddell Road and Alder Street:
 - Data was provided for January 2014 through May 2020;
 - A total of 44 collisions occurred between February 2014 and May 2020;
 - The yearly collision rate is 6.14;
 - The highest number of yearly collisions, 11, occurred in 2014, reducing to nine in 2015;
 - Collisions were generally trending downward to 2016 where they have remained consistent at around five or six collisions; and
 - While not consistent year over year, collisions were recorded in February and March for most years which could be weather related.
- ▶ Riddell Road and Centennial Road/Spencer Avenue:
 - Data was provided for January 2017 through June 2019
 - A total of seven collisions occurred between January 2017 and June 2019;
 - The yearly collision rate is 2.33;
 - The highest number of collisions, four, occurred in 2019; and



- Collisions are generally trending upward.

Note that data is not provided for this intersection prior to October 2017 when the westerly (Spencer Avenue) leg was opened. It is recognized that the increase in collisions could be attributed to the opening of the westerly leg and the resulting change in traffic patterns.

In summary, other than time of year, there are no discernible collision patterns identified in the data.

TABLE 3.1: COLLISION SUMMARY

Year	Intersection	
	Alder Street	Centennial Road/ Spencer Avenue
2014	11	-
2015	9	-
2016	5	-
2017	4	1
2018	6	2
2019	5	4
2020	3*	-
Total	43	7
Avg. per Year	6.14	2.33

*Total as of 22 May 2020

Appendix A contains the detailed collision data set.

3.2 Speed Limit Review

The posted speed limit on Riddell Road in the study area is 70 km/h. Alder Street and Spencer Avenue each have posted speed limits of 40 km/h. Centennial Road does not have a posted speed limit; therefore, it is 50 km/h in accordance with the Town's Traffic Bylaw.

According to the TAC *Speed Management Guide*⁵, the desirable operating speeds for the study area roadways are:

- Riddell Road south of Centennial Road/Spencer Avenue:

⁵ Transportation Association of Canada. *Speed Management Guide, The Canadian Road Safety Engineering Handbook (CRSH)*. February 2016. Table 10.



- 70 to 80 km/h for a two-lane, undivided urban arterial roadway; or
- 80 to 90 km/h for a two-lane undivided rural arterial roadway
- ▶ Centennial Road, Spencer Avenue and Alder Street:
 - 60 km/h for a two-lane, undivided urban minor collector roadway

The posted speed limit of 70 km/h on Riddell Road is at or below the desirable TAC operating speeds, depending on the type of cross-section. The posted speed limits on Alder Street, Centennial Road, and Spencer Avenue are under the desirable operating speeds per the TAC guidelines.

The posted speed limits were reviewed using the methodology presented in the TAC *Canadian Guidelines for Establishing Posted Speed Limits*.⁶ The analysis considers the roadway geometry, curvature, lane widths, pedestrian and cyclist exposure, pavement surface conditions, number of intersections, and number of intersections with private access driveways. **Table 3.2** provides a summary comparing the posted speed limits and TAC recommended speed limits for each study area roadway.

The findings indicate the current maximum posted speed limits are at or below the recommended speed limits.

TABLE 3.2: SPEED LIMIT COMPARISON

Roadway	Posted Maximum Speed Limit	Recommended Speed Limit (TAC Guidelines)
Riddell Road	70 km/h	80 km/h
Alder Street west of Riddell Road	40 km/h	40 km/h
Alder Street east of Riddell Road	40 km/h	50 km
Centennial Road	Unposted (assumed 50 km/h)	60 km/h
Spencer Avenue	40 km/h	50 km/h

Appendix B contains the TAC Speed Limit Assessment Forms for the study area roadways.

⁶ Transportation Association of Canada. *Canadian Guidelines for Establishing Posted Speed Limits*. December 2009.



4 Traffic Operations Review

4.1 2020 Traffic Volumes

To assess intersection operations, turning movement counts are used to quantify the movement of vehicles through intersections. Existing traffic data at an intersection or on a road section forms the foundation for traffic analyses undertaken in a Transportation Impact Study (TIS).

This study was initiated and authored amidst the COVID-19 global pandemic. In response to the pandemic, the Province of Ontario implemented restrictions for day-to-day activities including the closure of non-essential businesses and other measures to curb the spread of the virus (i.e. lockdown, stay at home precautions). As a result, typical traffic volumes and travel patterns were impacted and collection of current traffic data was not possible.

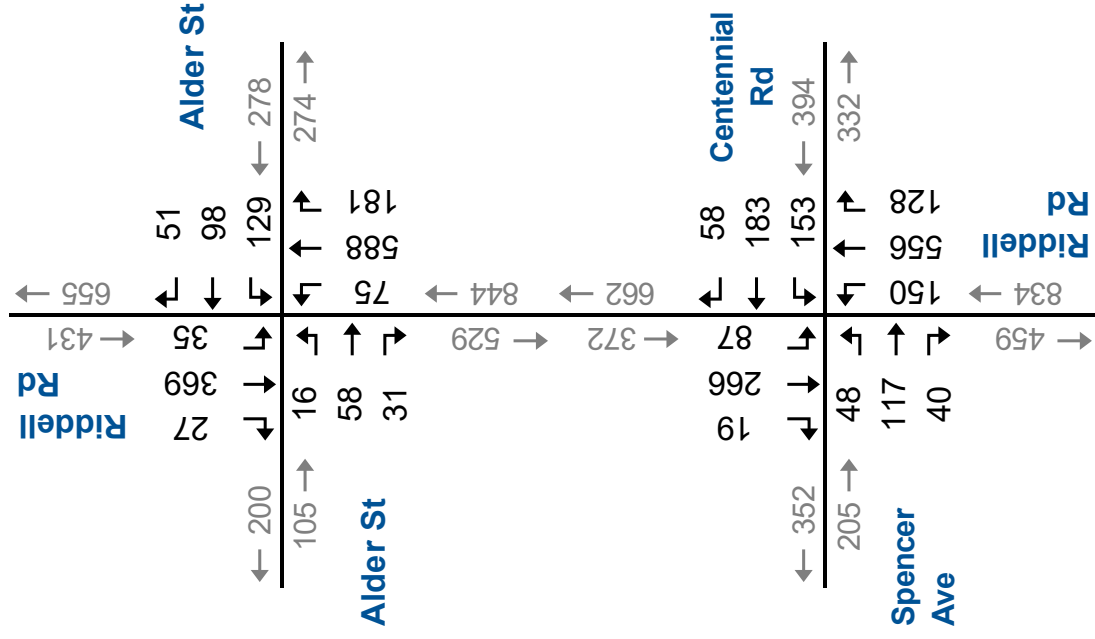
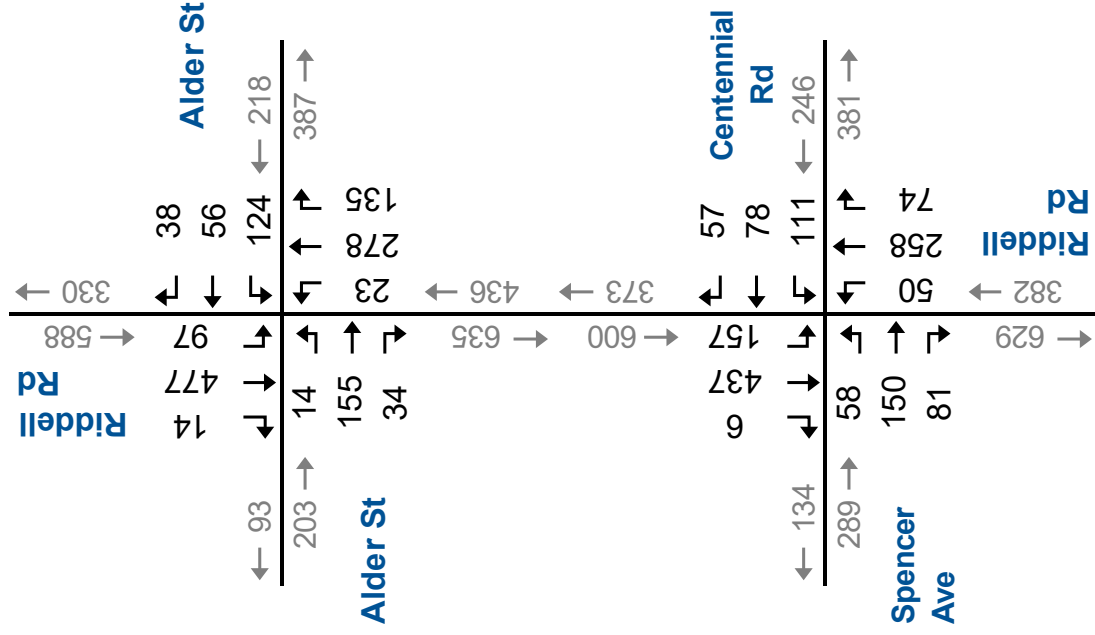
However, the *Dufferin Road 109 Traffic Capacity Analysis* report contained traffic count data for the study area intersections. The data was collected in December 2018 and January 2019. To reflect 2020 conditions, a growth rate of 2% per annum compounded for two years (total growth of 4%) was applied to the data. Note that the 2% growth rate is consistent with the growth used in the County's report.

Figure 4.1 illustrates the 2020 traffic volumes.



AM Peak Hour

PM Peak Hour



2020 Traffic Volumes

4.2 Operational Analysis Methodology

Intersection level of service (LOS) is a recognized method of quantifying the average delay experienced by drivers at intersections. It is based on the delay experienced by individual vehicles executing the various movements. The delay is related to the number of vehicles intending to make a particular movement, compared to the estimated capacity for that movement. The capacity is based on a number of criteria related to the opposing traffic flows and intersection geometry.

The highest possible rating is LOS A, under which the average total delay is equal to or less than 10.0 seconds per vehicle. When the average delay exceeds 80 seconds for signalized intersections or 50 seconds for unsignalized intersections, or when the volume-to-capacity (v/c) ratio is greater than 1.0, the movement is classified as LOS F, and remedial measures are usually implemented if they are feasible. LOS E is usually used as a guideline for the determination of roadway improvement needs on through lanes, while LOS F may be acceptable for left-turn movements at peak times depending on delays.

The operations of intersections in the study area were evaluated with the existing turning movement volumes using Synchro 9 with HCM 2000 procedures. The intersection analysis considered three separate measures of performance:

- ▶ The LOS for each turning movement based on the average delay per vehicle;
- ▶ The v/c ratio for each turning movement; and
- ▶ The estimated 95th percentile queue length.

As per the Town of Orangeville Traffic Impact Study Guidelines, movements are considered critical when:

- ▶ V/C ratios for overall intersection operations or shared through/turning movements increase to 0.85 or above; or
- ▶ V/C ratios for exclusive turning movements increase to 0.90.

The key parameters used in the analysis include:

- ▶ Existing lane configurations;
- ▶ Existing heavy vehicle percentages;



- ▶ Existing intersection peak hour factors (PHF), which facilitates an assessment of the busiest 15-minute period within the peak hour; and
- ▶ Synchro default values for all other inputs.

4.3 2020 Traffic Operations

Table 4.1 summarizes the existing intersection operations. The entries in the table indicate the AM and PM peak hour LOS, v/c ratios, and 95th percentile queues. The results indicate the study area intersections are operating as follows:

Riddell Road and Alder Street:

- ▶ AM Peak Hour
 - Overall intersection: LOS C with a v/c ratio of 0.60; and
 - The southbound through movement is operating at LOS D with a v/c ratio of 0.91.
- ▶ PM Peak Hour
 - Overall intersection: LOS C with a v/c ratio of 0.58; and
 - The northbound through movement is operating at LOS D with a v/c ratio of 0.92.

Riddell Road and Centennial Road/Spencer Avenue:

- ▶ AM Peak Hour
 - Overall intersection: LOS B with a v/c ratio of 0.50; and
 - No critical movements are noted.
- ▶ PM Peak Hour
 - Overall intersection: LOS B with a v/c ratio of 0.64; and
 - No critical movements are noted.

Overall, the results indicate the study area intersections are operating at acceptable levels of service. The low to moderate intersection v/c ratios indicate the intersections have spare capacity.

Appendix C contains the detailed Synchro 9 reports.



TABLE 4.1: 2020 PEAK HOUR TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				OVERALL
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Riddell Road & Alder Street	TCS	LOS Delay	B 12	B 14	>	B 14	B 15	B 13	>	B 14	B 15	B 18	B 14	B 17	B 16	D 37	B 13	C 33	C 23
			V/C	0.03	0.30	>		0.33	0.12	>		0.21	0.57	0.10		0.36	0.91	0.01		0.60
			95th	5	32	>		25	13	>		8	53	8		22	113	0		
			Storage Avail.	25	-	>		25	-	>		95	-	35		110	-	40		
		21	-	>		0	-	>		87	-	27		89	-	40				
	Riddell Road & Spencer Avenue/ Centennial Road	TCS	LOS Delay	C 20	C 23	>	C 22	C 23	C 21	>	C 22	A 7	A 9	A 7	A 8	A 9	B 11	A 6	B 10	B 14
V/C			0.20	0.50	>		0.50	0.25	>		0.11	0.31	0.06		0.27	0.49	0.01		0.50	
95th			15	42	>		27	22	>		8	33	5		23	61	0			
Storage Avail.			50	-	>		40	-	>		105	-	60		165	-	160			
	35	-	>		13	-	>		97	-	55		142	-	160					
PM Peak Hour	Riddell Road & Alder Street	TCS	LOS Delay	B 12	B 13	>	B 13	B 15	B 14	>	B 14	B 15	D 37	B 14	C 30	B 17	B 18	B 13	B 18	C 23
			V/C	0.03	0.10	>		0.26	0.18	>		0.27	0.92	0.18		0.32	0.59	0.02		0.58
			95th	5	14	>		25	22	>		18	146	17		12	70	2		
			Storage Avail.	25	-	>		25	-	>		95	-	35		110	-	40		
		20	-	>		0	-	>		77	-	>		98	-	38				
	Riddell Road & Spencer Avenue/ Centennial Road	TCS	LOS Delay	C 20	C 21	>	C 21	C 24	C 23	>	C 23	A 9	B 15	A 7	B 13	A 9	A 9	A 7	A 9	B 15
V/C			0.20	0.32	>		0.55	0.53	>		0.25	0.68	0.10		0.25	0.3	0.02		0.64	
95th			13	29	>		35	46	>		23	99	16		16	36	1			
Storage Avail.			50	-	>		40	-	>		105	-	60		165	-	160			
	37	-	>		5	-	>		82	-	44		149	-	159					

MOE - Measure of Effectiveness

LOS - Level of Service

V/C - Volume to Capacity Ratio

95th - 95th Percentile Queue Length

Storage - Existing Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

> - Shared Right-Turn Lane

< - Shared Left-Turn Lane



4.4 2031 Traffic Volumes

Consistent with the *Dufferin Road 109 Traffic Capacity Analysis*, a 2.0% growth rate compounded for 11 years (total growth of 29.4%) was applied to the 2020 traffic volumes to derive the 2031 traffic volumes. It should be noted that as per the Dufferin Road 109 report, the 2.0% growth rate is considered to be conservative.

Figure 4.2 illustrates the 2031 traffic volumes.

4.5 2031 Traffic Operations

The operations of the study area intersections were evaluated under the 2031 traffic volumes. The analyses were completed using Synchro 9 with HCM 2000 procedures with optimized signal timing and phasing. The key parameters such as existing intersection configurations, heavy vehicle percentages, peak hour factors, and pedestrian volumes were retained from the existing analysis.

Table 4.2 summarizes the AM and PM peak hour background traffic intersection operations including the AM and PM peak hour LOS, v/c ratios and 95th percentile queue lengths. The results indicate the study area intersections are forecast to operate as follows:

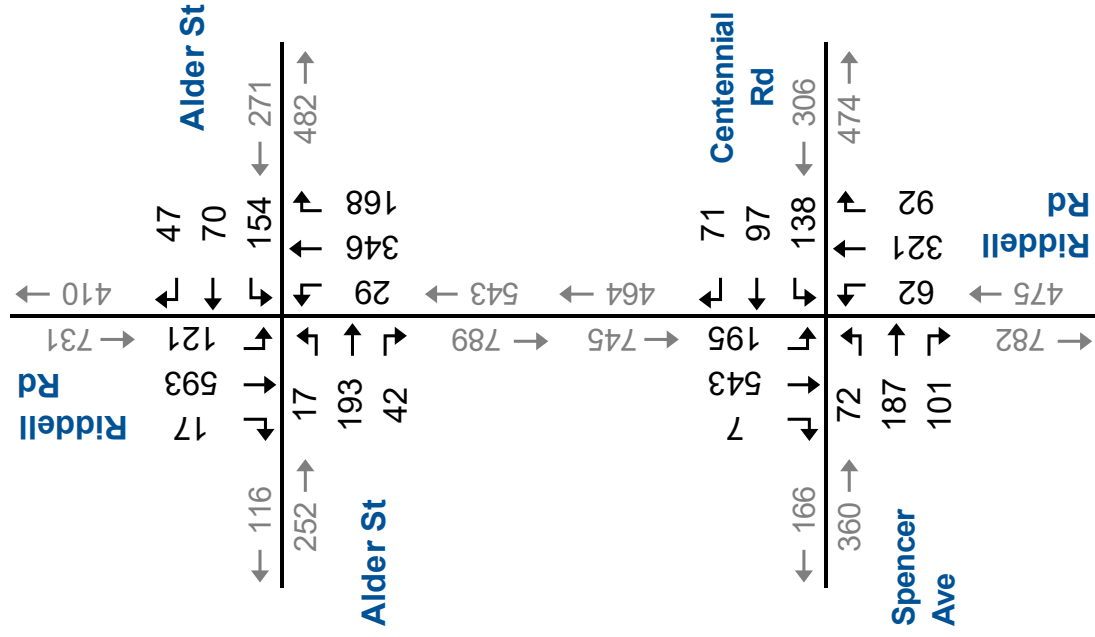
Riddell Road and Alder Street:

- ▶ AM Peak Hour
 - Overall intersection: LOS C with a v/c ratio of 0.78;
 - The southbound through movement is forecast to operate at LOS C with a v/c ratio of 0.88; and
 - The westbound left-turn movement is forecast to exceed the 25 metres of existing storage (enough for about three vehicles) by 32 metres, or about four vehicles.
- ▶ PM Peak Hour
 - Overall intersection: LOS B with a v/c ratio of 0.71;
 - The northbound through movement is forecast to operate at LOS C with a v/c ratio of 0.89; and
 - The westbound left-turn movement is forecast to exceed the 25 metres of existing storage (enough for about three vehicles) by 23 metres, or about three vehicles.

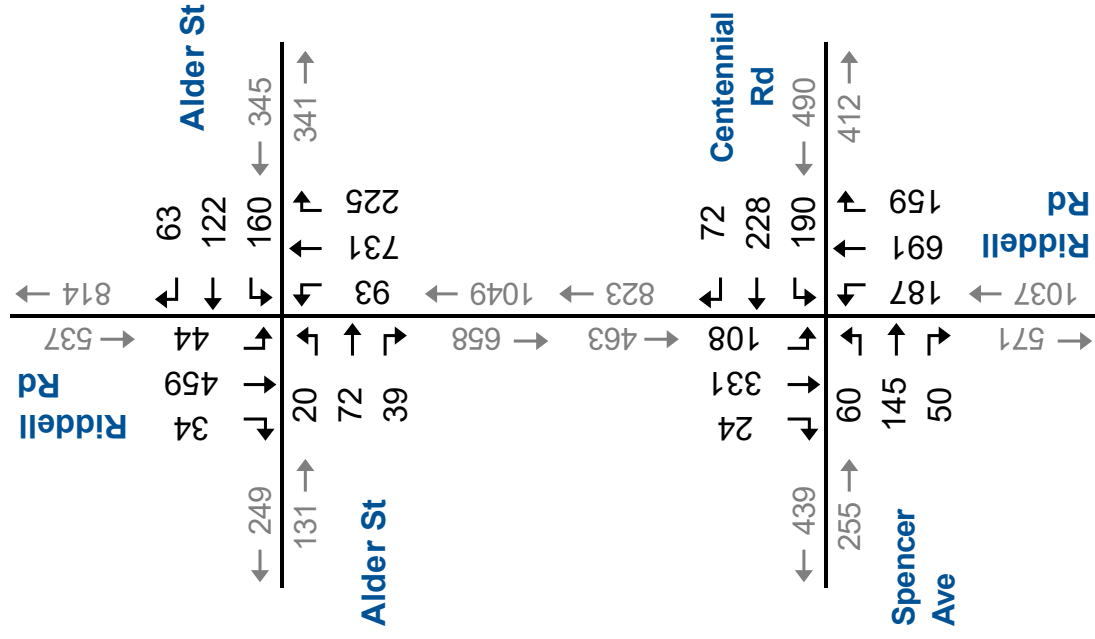
Overall, the intersection is forecast to continue operating at acceptable levels of service and with spare capacity. The northbound and



AM Peak Hour



PM Peak Hour



2031 Traffic Volumes

southbound through movements will continue to experience minor congestion. The forecast v/c ratios are not identified as critical under the Town's TIS guidelines. However, typically, when v/c ratios exceed 0.85 for through movements on arterial roads, remedial measures are considered.

Riddell Road and Centennial Road/Spencer Avenue:

- ▶ AM Peak Hour
 - Overall intersection: LOS B with a v/c ratio of 0.50; and
 - The westbound left-turn movement (from Riddell to Spencer) is forecast to exceed available storage by four metres, or less than one vehicle.
- ▶ PM Peak Hour
 - Overall intersection: LOS B with a v/c ratio of 0.64;
 - The westbound left-turn movement (from Riddell to Spencer) is forecast to exceed the 40 metres of existing storage (enough for about five vehicles) by 25 metres, or about three vehicles.

Overall, the intersection is forecast to continue operating at acceptable levels of service and with spare capacity. The identified queue storage issues are based on the 95th percentile back of queue estimates which are calculated based on the worst 5% of the peak hour. Conversely, the remaining 95% of the peak hour will not experience queues of this length. Therefore, the need for queue extension should be revisited as the traffic volumes increase to those outlined herein.

Appendix D contains the detailed Synchro 9 reports.



TABLE 4.2: 2031 TOTAL TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				OVERALL
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Riddell Road & Alder Street	TCS	LOS	B	C	>	C	C	B	>	C	B	B	B	B	B	C	A	C	C
			Delay	17	23	>	23	30	19	>	25	11	14	10	13	12	27	10	24	21
			V/C	0.05	0.50	>		0.62	0.22	>		0.22	0.55	0.13		0.38	0.88	0.01		0.78
			95th	8	63	>		57	28	>		7	54	6		22	113	1		
	Storage	25	-	>		25	-	>		95	-	35		110	-	40				
	Avail.	17	-	>		-32	-	>		88	-	29		88	-	39				
	Riddell Road & Spencer Avenue/ Centennial Road	TCS	LOS	C	C	>	C	D	C	>	C	A	B	A	A	B	B	A	B	B
			Delay	21	27	>	26	47	21	>	33	9	11	8	10	11	14	7	13	18
V/C			0.23	0.67	>		0.81	0.31	>		0.17	0.4	0.07		0.37	0.63	0.01		0.68	
95th			18	53	>		44	28	>		13	54	7		37	105	0			
Storage	50	-	>		40	-	>		105	-	60		165	-	160					
Avail.	32	-	>		-4	-	>		92	-	53		128	-	160					
PM Peak Hour	Riddell Road & Alder Street	TCS	LOS	B	B	>	B	C	C	>	C	B	C	B	C	B	B	A	B	B
			Delay	18	19	>	19	24	21	>	22	11	27	10	22	13	14	9	13	20
			V/C	0.05	0.18	>		0.43	0.32	>		0.28	0.89	0.20		0.35	0.57	0.02		0.71
			95th	9	27	>		48	46	>		17	152	16		12	73	3		
	Storage	25	-	>		25	-	>		95	-	35		110	-	40				
	Avail.	16	-	>		-23	-	>		78	-	>		98	-	37				
	Riddell Road & Spencer Avenue/ Centennial Road	TCS	LOS	C	C	>	C	D	C	>	D	A	B	A	B	B	A	A	A	C
			Delay	29	28	>	28	49	35	>	40	10	19	8	16	12	9	7	10	21
V/C			0.37	0.43	>		0.81	0.70	>		0.31	0.78	0.13		0.37	0.35	0.02		0.79	
95th			21	46	>		65	75	>		31	164	24		24	49	2			
Storage	50	-	>		40	-	>		105	-	60		165	-	160					
Avail.	29	-	>		-25	-	>		74	-	36		141	-	158					

MOE - Measure of Effectiveness

LOS - Level of Service

V/C - Volume to Capacity Ratio

95th - 95th Percentile Queue Length

Storage - Existing Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

> - Shared Right-Turn Lane

< - Shared Left-Turn Lane



5 Riddell Road and Alder Street Remedial Measures

As previously outlined, the northbound and southbound through movements at this intersection are currently experiencing congestion as indicated by the v/c ratios >0.90 . These conditions are forecast to improve slightly upon reaching the 2031 traffic volumes with the optimized signal timings; however, these movements will still experience congestion.

To improve operations, Synchro analyses were undertaken to determine the level of remedial measures required to provide acceptable v/c ratios on the critical movements. The analyses were undertaken using the same methodology as for the 2031, optimized timing and phasing and the following on Riddell Road:

- ▶ An additional northbound through lane (to one left-turn lane, two through lanes and one right-turn lane); and
- ▶ Re-assignment of the southbound right-turn lane to a shared through/right-turn lane.

Table 5.1 summarizes the AM and PM peak hour background traffic Riddell Road and Alder Street intersection operations including the AM and PM peak hour LOS, v/c ratios and 95th percentile queue lengths. The results indicate the intersections is forecast to operate as follows:

- ▶ AM Peak Hour
 - Overall intersection: LOS B with a v/c ratio of 0.53;
 - The westbound left-turn movement is forecast to exceed available storage by six metres, or less than one vehicle.
- ▶ PM Peak Hour
 - Overall intersection: LOS B with a v/c ratio of 0.49;
 - The westbound left-turn movement is forecast to exceed available storage by six metres, or less than one vehicle.

As expected, provision of the additional capacity results in overall improved intersection operations and on the critical northbound and southbound through movements. As well, there is noted improvement in the intersection v/c ratios to 0.53 during the AM peak hour and 0.49 during the PM peak hour indicating the intersection will utilize about 50% of its capacity.

Appendix E contains the detailed Synchro reports.



TABLE 5.1: 2031 TRAFFIC OPERATIONS – ALDER STREET WITH IMPROVEMENTS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				OVERALL
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Riddell Road & Alder Street	TCS	LOS	A	B	>	B	B	B	>	B	B	B	B	B	C	A	C	B	
			Delay	9	12	>	12	13	10	>	12	16	17	15	16	18	21	0	21	17
			V/C	0.04	0.35	>		0.39	0.16	>		0.24	0.44	0.13		0.50	0.72	0.00		0.53
			95th	5	38	>		31	17	>		8	28	9		26	51	0		
			Storage	25	-	>		25	-	>		95	-	35		110	-	40		
			Avail.	20	-	>		-6	-	>		87	-	26		84	-	40		
PM Peak Hour	Riddell Road & Alder Street	TCS	LOS	A	B	>	B	B	B	>	B	B	B	B	B	B	A	B	B	
			Delay	10	10	>	10	13	11	>	12	15	18	13	16	14	15	0	15	15
			V/C	0.04	0.14	>		0.32	0.25	>		0.35	0.68	0.15		0.28	0.46	0.00		0.49
			95th	6	18	>		31	29	>		19	54	11		11	34	0		
			Storage	25	-	>		25	-	>		95	-	35		110	-	40		
			Avail.	19	-	>		-6	-	>		77	-	>		99	-	40		

MOE - Measure of Effectiveness

LOS - Level of Service

V/C - Volume to Capacity Ratio

95th - 95th Percentile Queue Length

Storage - Existing Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

> - Shared Right-Turn Lane

< - Shared Left-Turn Lane



5.1 Future Recreation Centre Access

At present, the Alder Street Recreation Centre is accessed via:

- ▶ one right in/right out driveway connection to Alder Street located about 50 metres east of the east curb line of Riddell Road; and
- ▶ one all-turns driveway connection to Alder Street located about 105 metres east of the east curb line of Riddell Road.

The Town has plans to relocate the right in/right out driveway connection from Alder Street to Riddell Road near the northerly limits of the existing parking lot. It is expected that when this occurs, there will be a change in traffic patterns northbound on Riddell Road at Alder Street whereby right turns destined to the Recreation Centre will re-assign to the through movement to enter the Recreation Centre via the new right in/right out entrance (on Riddell Road). Note that the actual percentage re-assignment is not known at this time.

With this relocation, it is recommended that a dedicated inbound right-turn lane and a dedicated outbound acceleration lane be provided at the site driveway connection to Riddell Road. Since this driveway will be located on an arterial road, these lanes will provide safe areas for vehicles to decelerate when entering the site and accelerate before merging into traffic on Riddell Road. The appropriate pavement markings and signage, as per Ontario Traffic Manual, should be provided for both the inbound and outbound lanes.

As previously outlined, the northbound through movement is forecast to experience congestion at the 2031 horizon without additional capacity. However, with provision of the additional through lane, the movement will operate at acceptable levels of service and with spare capacity, capable of accommodating the re-assigned Recreation Centre volumes. Furthermore, the additional lane will continue on the far-side (north side) of the intersection where it can become the dedicated right-turn lane into the Recreation Centre.



6 Riddell Road and Centennial Road/ Spencer Avenue Remedial Options

The results of the analyses in **Chapter 4** indicate that remedial measures will not be required to provide sufficient capacity and acceptable levels of service at this intersection. However, several issues were identified by Town staff at the outset of the study, including:

- ▶ Offset of the northbound and southbound left-turn lanes; and
- ▶ Motorists using the southbound dedicated right-turn lane as a through lane to avoid the southbound through lane queue.

The following outlines the recommended improvements for three time periods: immediate implementation (within one year), intermediate-term implementation (2 to 5 years) and longer-term implementation (>5 years).

6.1 Immediate Implementation (within One Year)

6.1.1 Left-Turn Signal Timing Phase Justification

The need for left-turn signal timing phases at the study area intersections was assessed based on the information contained in Book 12 Traffic Signals of the Ontario Traffic Manual (OTM)⁷. Section 3.5 Phase Determination, Left-Turn Phase Justification outlines the methodology and states:

A left-turn phase may be justified:

- i. If the left-turning vehicles are not finding suitable turning gaps, volume exceeds at least two vehicles per cycle, and the Level of Service at the intersection will not be jeopardized; or
- ii. If the left-turn volume plus the opposing volume > 720 vehicles per hour; or
- iii. If a field check shows that vehicles consistently require more than two cycles in the queue in order to turn left; or
- iv. If an over-representation of left turning collisions is identified at the intersection.

⁷ Ontario Traffic Manual, Book 12, Traffic Signals, Queen's Printer for Ontario, March 2012



Table 6.1 outlines the results of the assessment and indicates that left-turn phases are not justified at the study area intersections based on the available data.

TABLE 6.1: LEFT-TURN PHASE JUSTIFICATION

Criteria	Centennial/Spencer	
	AM	PM
>2 left turns per cycle	No	No
Volume >720 vph	No	No
>2 cycles to turn left	No	No
Left-turning collisions	n/a	n/a

6.1.2 Protected Left-Turn Signal Phasing

As outlined above, left-turn signal timing phases are not currently justified at the intersection. However, OTM Book 12 Section 3.5 Phase Determination, Fully Protected Simultaneous Left Turn Phase states: *“The fully protected simultaneous left turn operation is used where the visibility of vehicles making left turns to the opposing traffic (or vice versa) is limited, or where distractions caused by turning traffic are a concern”* or *“...on high speed roads with potential visibility problems due to geometry, or where collision problems exist”*.

Additionally, Chapter 9.17.4.5 Left-Turn Lanes on Both Approaches of the TAC GDGCR states the following for adjacent (offset) left-turn lanes, *“Visibility problems result from the presence of vehicles in adjacent left-turn lanes and, for this reason, such movements should generally only be used at signalized intersections with protected left turn phases”*.

Based on OTM and TAC guidance, provision of protected left-turn phasing is warranted for the northbound and southbound left-turn movements. Therefore, it is recommended that protected left-turn phasing be implemented at this intersection in the immediate term to increase overall safety at the intersection and in the immediate area.

Required Equipment

The following equipment will be required on each approach to permit implementation of the protected phasing:

- ▶ Type 2 signal head⁸ (circular red indication, a circular amber indication and green arrow indication);

⁸ Figure 2 – Traffic Control Signal Heads, OTM Book 12, Traffic Signals, Queen's Printer for Ontario, March 2012



- ▶ Mounting pole/mast arm;
- ▶ A Rb-81 LEFT-TURN SIGNAL sign⁹; and
- ▶ Signal timing plan changes

In addition to this equipment, it is recommended that left-turn lane extension markings are also provided to guide vehicles on the correct path through the intersection (**Figure 6.1**).

Operational Impacts

Synchro analyses were completed for the intersection with the protected left-turn phasing in place. The results are outlined in **Table 6.1** and indicate:

- ▶ AM Peak Hour
 - The intersection is forecast to operate at an overall LOS D with a v/c ratio of 0.77 (an increase of 0.09); and
 - No critical movements are noted.
- ▶ PM Peak Hour
 - The intersection is forecast to operate at an overall LOS D with a v/c ratio of 0.86 (an increase of 0.07); and
 - The northbound through movement is forecast to operate at LOS D with a v/c ratio of 0.88; however, this is not considered critical under the Town's TIS guidelines; and
 - The westbound left-turn movement is forecast to exceed available storage by 23 metres; and
 - The northbound right-turn movement is forecast to exceed storage by three metres.

⁹ OTM Book 5, Regulatory Signs, Queen's Printer for Ontario, March 2000



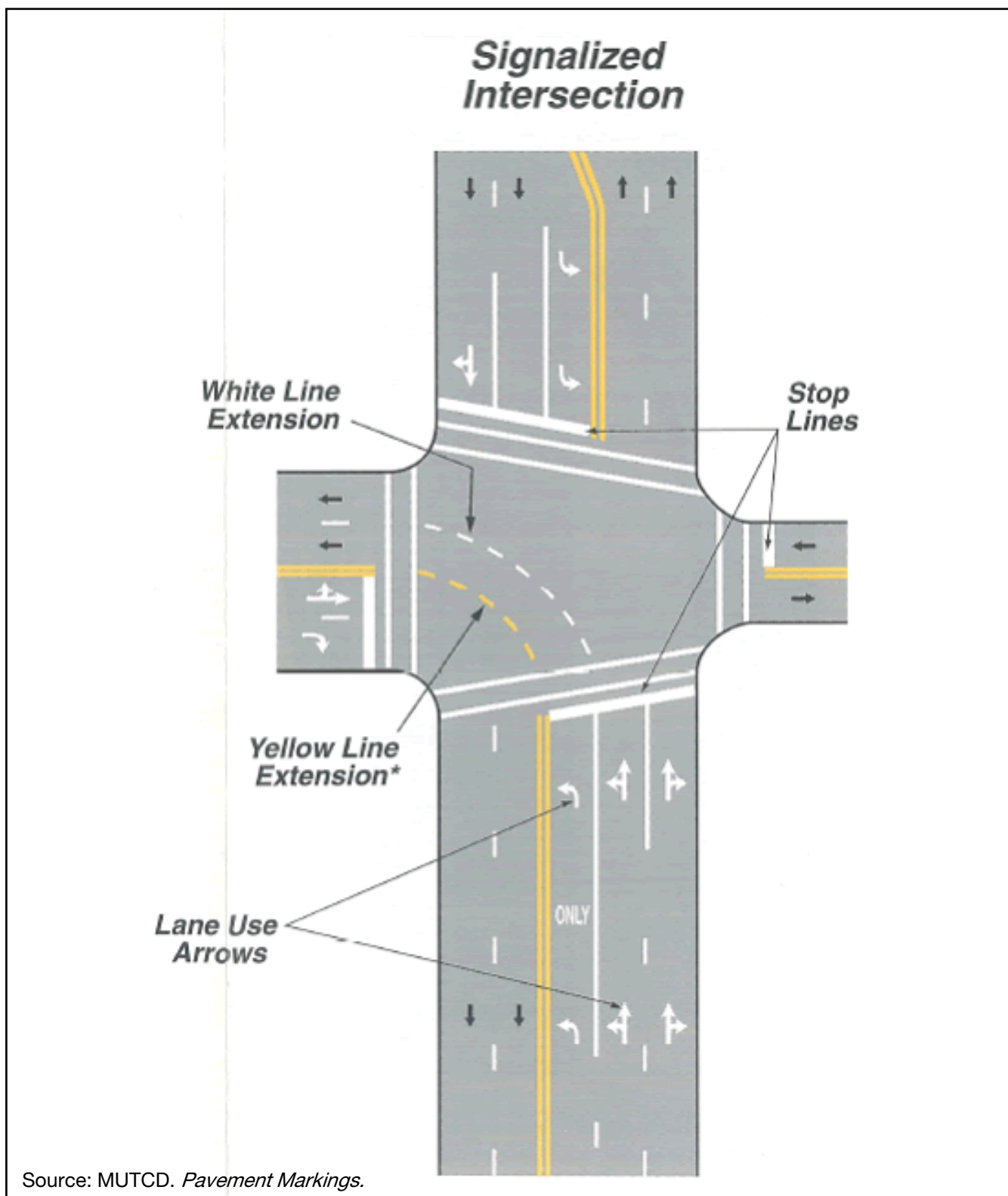


TABLE 6.1: 2031 TRAFFIC OPERATIONS – SPENCER AVE/CENTENNIAL RD WITH PROTECTED LEFT-TURN PHASING

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach															
				Eastbound				Westbound				Northbound				Southbound			
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach
AM Peak Hour	Riddell Road & Spencer Avenue/ Centennial Road	TCS	LOS	C	D	>	D	C	C	>	C	E	C	C	C	E	C	B	D
			Delay	34	52	>	49	34	27	>	30	70	30	21	34	57	27	14	35
			V/C	0.28	0.83	>		0.64	0.28	>		0.70	0.58	0.07		0.78	0.72	0.01	
			95th	27	84	>		37	40	>		32	95	9		77	152	0	
			Storage	50	-	>		40	-	>		105	-	60		165	-	160	
PM Peak Hour	Riddell Road & Spencer Avenue/ Centennial Road	TCS	Avail.	23	-	>		3	-	>		73	-	51		88	-	160	
			LOS	D	D	>	D	E	D	>	D	E	D	B	D	F	C	B	D
			Delay	45	50	>	49	63	44	>	52	56	37	14	37	85	23	16	37
			V/C	0.41	0.66	>		0.84	0.70	>		0.73	0.88	0.16		0.84	0.45	0.02	
			95th	27	67	>		63	95	>		69	243	63		63	93	0	
PM Peak Hour	Riddell Road & Spencer Avenue/ Centennial Road	TCS	Storage	50	-	>		40	-	>		105	-	60		165	-	160	
			Avail.	23	-	>		-23	-	>		36	-	-3		102	-	160	
			OVERALL																

MOE - Measure of Effectiveness

LOS - Level of Service

V/C - Volume to Capacity Ratio

95th - 95th Percentile Queue Length

Storage - Existing Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

> - Shared Right-Turn Lane

< - Shared Left-Turn Lane



Protected phasing can be a trade off where one problem is solved and another is created simply because no other movements, including pedestrians, can operate during the phase. However, the increase in overall intersection safety is paramount over the minor increase in intersection delay that occurs. Furthermore, the intersection will still have residual capacity, albeit with some congestion, especially during the PM peak hour. Therefore, it is recommended the protected phasing is implemented in the immediate term.

Appendix F contains the detailed Synchro reports.

6.1.3 Southbound Right-Turn Lane

At present, some motorists are using the dedicated southbound right turn lane as a through lane to avoid the southbound through lane queue. There are several factors that permit this to occur:

- ▶ There is no physical barrier preventing vehicles from completing this manoeuvre; and
- ▶ The pavement width of the receiving lane(s) area and the lack of pavement markings on the south side of the intersection permits it to operate as two lanes.

To mitigate these issues, it is recommended that the following are implemented in the immediate term to curtail this practice and increase the overall safety of the intersection:

Install collapsible bollards at the “end” of the right turn lane to limit the ability of vehicles to travel through the intersection. Supplementary pavement markings such as additional turn lane arrows and “Right Turn Lane” pavement lettering could be provided to indicate to drivers that the lane exits onto Spencer Avenue.

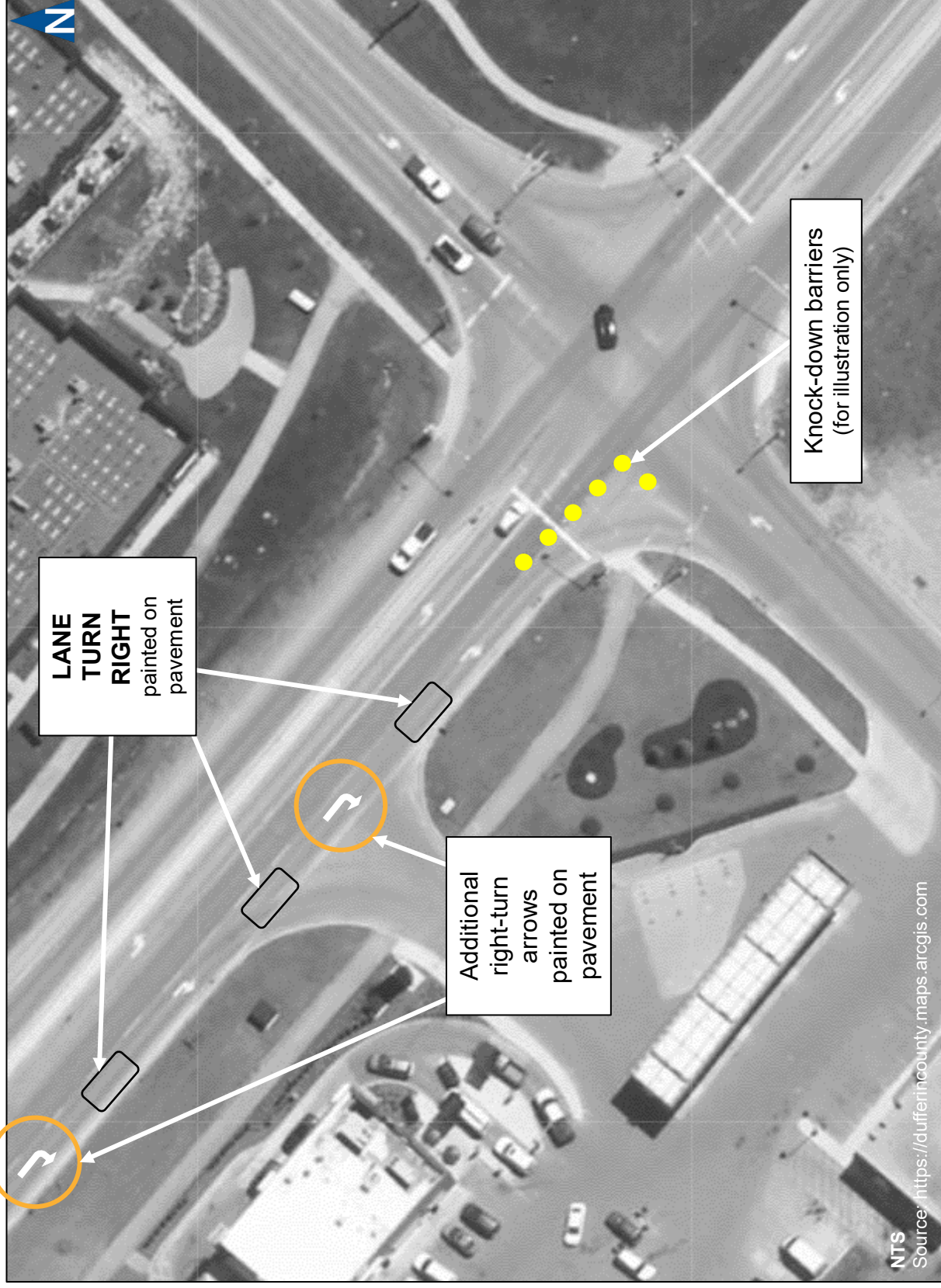
Required Equipment

The following equipment will be required to facilitate the recommended changes:

- ▶ Pavement markings, and
- ▶ Installation of an appropriate and maintenance-friendly barrier that is acceptable to both the County of Dufferin and Town of Orangeville

Figure 6.2 provides a conceptual plan illustrating these remedial measures.





6.2 Intermediate Implementation (within Two to Five Years)

6.2.1 Left-Turn Lane Alignment

As outlined in **Section 6.1**, implementation of protected northbound and southbound left-turn signal phasing will provide for safer left turns but with a decrease in overall intersection level of service and congestion. Alternatively, the Town could undertake an alignment of the left-turn lanes. The alignment would ultimately remove the need for the protected left-turn phases as adequate sight distance would be provided for the opposing movements at the conclusion of construction. This would result in the acceptable levels of service outlined in **Chapter 4**.

It should be noted that if the Town proceeds with the roadway re-alignment, it will not negate the need to provide the protected left-turn phasing in the immediate term. As well, if the Town decides to explore changes in traffic control at this intersection in the long-term (**Chapter 7**), the lane re-alignment may not be required depending on the timing of the changes and success of the protected phasing.

6.2.2 Southbound Right-Turn Lane

Remedial measures that could be considered in the intermediate to longer-term for this intersection are: Convert the dedicated southbound right-turn lane into a shared through/right-turn lane;

- ▶ Install pavement markings on the south side of the intersection, demarcating two separate through lanes; and
- ▶ Terminate the curb lane at the commercial (hotel) entrance located approximately 100 metres south of the south curb line of Spencer Avenue.

Prior to development of the commercial parcel, the lane should terminate in this area. After development of the parcel, this lane can be reassigned to a right-in only lane for the property.

An additional benefit of this lane is that it will also function as an acceleration lane for vehicles turning right onto Riddell Road from Spencer Avenue.

Required Equipment

The following equipment will be required to facilitate the recommended changes:

- ▶ Pavement markings,



- ▶ Removal of Wa-56R RIGHT LANE EXITS sign
- ▶ Installation of Wa-23R LANE ENDS sign¹⁰; and
- ▶ Signal timing plan changes

Operational Impacts

Synchro analyses were completed for the intersection with the lane reassignment and aforementioned protected left-turn phasing in place. The results are outlined in **Table 6.2** and indicate:

- ▶ AM Peak Hour
 - The intersection is forecast to operate at an overall LOS C with a v/c ratio of 0.69 (decrease of 0.08 from previous analyses); and
 - No critical movements are noted.
- ▶ PM Peak Hour
 - The intersection is forecast to operate at an overall LOS D with a v/c ratio of 0.86 (no change from previous analyses); and
 - The northbound through movement is forecast to operate at LOS D with a v/c ratio of 0.88; however, this is not considered critical under the Town's TIS guidelines; and
 - The westbound left-turn movement is forecast to exceed available storage by 23 metres; and
 - The northbound right-turn movement is forecast to exceed storage by three metres.

Overall, the lane re-assignment coupled with the protected left-turn phasing results in slightly improved intersection operations during the AM peak hour with no change during the PM peak hour. As with implementation of the protected left-turn phases, the increase in overall intersection safety outweighs the impacts to operations. However, the additional through lane is not required from an operational perspective as previously outlined in **Chapter 4**.

Appendix G contains the detailed Synchro reports.

¹⁰ OTM Book 5, Regulatory Signs, Queen's Printer for Ontario, March 2000



TABLE 6.2: 2031 TRAFFIC OPERATIONS – SPENCER AVE/CENTENNIAL RD WITH LANE RE-ASSIGNMENT

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach															
				Eastbound				Westbound				Northbound				Southbound			
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach
AM Peak Hour	Riddell Road & Spencer Avenue/ Centennial Road	TCS	LOS	C	D	>	D	C	C	>	C	D	C	C	C	E	B	A	C
			Delay	34	53	>	50	32	27	>	29	52	31	22	32	57	20	0	29
			V/C	0.28	0.83	>		0.61	0.27	>		0.55	0.59	0.07		0.78	0.4	0.00	
			95th	27	85	>		36	39	>		28	95	9		77	63	0	
			Storage	50	-	>		40	-	>		105	-	60		165	-	160	
PM Peak Hour	Riddell Road & Spencer Avenue/ Centennial Road	TCS	Avail.	23	-	>		4	-	>		77	-	51		88	-	160	
			OVERALL																
			LOS	D	D	>	D	E	D	>	D	E	D	B	D	F	B	A	C
			Delay	45	50	>	49	63	44	>	52	56	37	14	37	85	19	0	35
			V/C	0.41	0.66	>		0.84	0.70	>		0.73	0.88	0.16		0.84	0.26	0.00	
PM Peak Hour	Riddell Road & Spencer Avenue/ Centennial Road	TCS	95th	27	67	>		63	95	>		69	243	63		63	43	0	
			Storage	50	-	>		40	-	>		105	-	60		165	-	160	
			Avail.	23	-	>		-23	-	>		36	-	-3		102	-	160	
			OVERALL																
			OVERALL																

MOE - Measure of Effectiveness

LOS - Level of Service

V/C - Volume to Capacity Ratio

95th - 95th Percentile Queue Length

Storage - Existing Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

> - Shared Right-Turn Lane

< - Shared Left-Turn Lane



7 Long-Term (>5 Years) Remedial Measures – Both Intersections

Roundabouts at both study area intersections have been identified as a long-term remedial measures to accommodate the 2031+ traffic volumes. Three design scenarios were completed for each intersection using TORUS roundabout design software and analyzed using ARCADY . The scenarios are:

- ▶ **Scenario 1:** one-lane entry on all approaches;
- ▶ **Scenario 2:** two-lane entry on the north and south approaches and one-lane entry at the east and west approaches; and
- ▶ **Scenario 3:** two-lane entry on all approaches.

The y-intercept adjustment for all scenarios is 90% as per typical industry standards since the horizon is more than 10 years from the date of this report. All scenarios were completed using the forecast 2031 traffic volumes and existing heavy vehicle percentages.

7.1 Scenario 1: One-Lane Entry on All Approaches

The scenario includes a roundabout with a 40-metre diameter with one entry lane on each approach.

Table 7.1 summarizes the Scenario 1 operations. The results indicate that both intersections are forecast to operate with acceptable levels of service and within capacity during the AM peak hour. During the PM peak hour, the intersections are forecast to operate at overall LOS F and with v/c ratios >1.0 on the northbound approaches at each intersection.

Overall, additional capacity will be required on the northbound approaches to provide acceptable levels of service during the PM peak hour; therefore, roundabouts with one entry lane on each approach is not recommended at either intersection.



TABLE 7.1: SCENARIO 1 ARCADY ANALYSES

Intersection	Intersection Approach	Queue (PCE)	Delay (sec)	V/C Ratio	Overall LOS	Intersection Delay (sec)
AM Peak Hour						
Riddell Road at Alder Street	Westbound (East Leg)	1.04	5.57	0.31	B	11.63
	Southbound (North leg)	10.23	15.73	0.76		
	Eastbound (West leg)	1.07	9.81	0.42		
	Northbound (South leg)	1.16	10.01	0.59		
Riddell Road at Centennial Road/ Spencer Avenue	Westbound (East Leg)	1.07	6.48	0.36	B	13.96
	Southbound (North leg)	13.72	19.26	0.80		
	Eastbound (West leg)	2.04	13.64	0.60		
	Northbound (South leg)	1.22	10.70	0.56		
PM Peak Hour						
Riddell Road at Alder Street	Westbound (East Leg)	2.03	11.32	0.54	F	51.34
	Southbound (North leg)	1.08	9.91	0.60		
	Eastbound (West leg)	1.00	5.49	0.18		
	Northbound (South leg)	90.68	91.40	1.02		
Riddell Road at Centennial Road/ Spencer Avenue	Westbound (East Leg)	11.66	25.70	0.79	F	105.23
	Southbound (North leg)	2.30	12.16	0.60		
	Eastbound (West leg)	1.02	6.77	0.34		
	Northbound (South leg)	132.83	208.57	1.12		

7.2 Scenario 2: Partial Two-Lane Entry

This scenario includes a roundabout with a 47.5-metre inscribed circle diameter, one entry lane on the side street approaches and two entry lanes on Riddell Road.

Table 7.2 summarizes the Scenario 2 operations. The results indicate that both intersections are forecast to operate with acceptable levels of service during the AM and PM peak hours and with spare capacity. It should be noted that the southbound leg of Riddell Road with Centennial Road/Spencer Avenue is forecast to operate at LOS D



during the PM peak hour. This level of delay is typically acceptable and considered standard for left-turn movements.

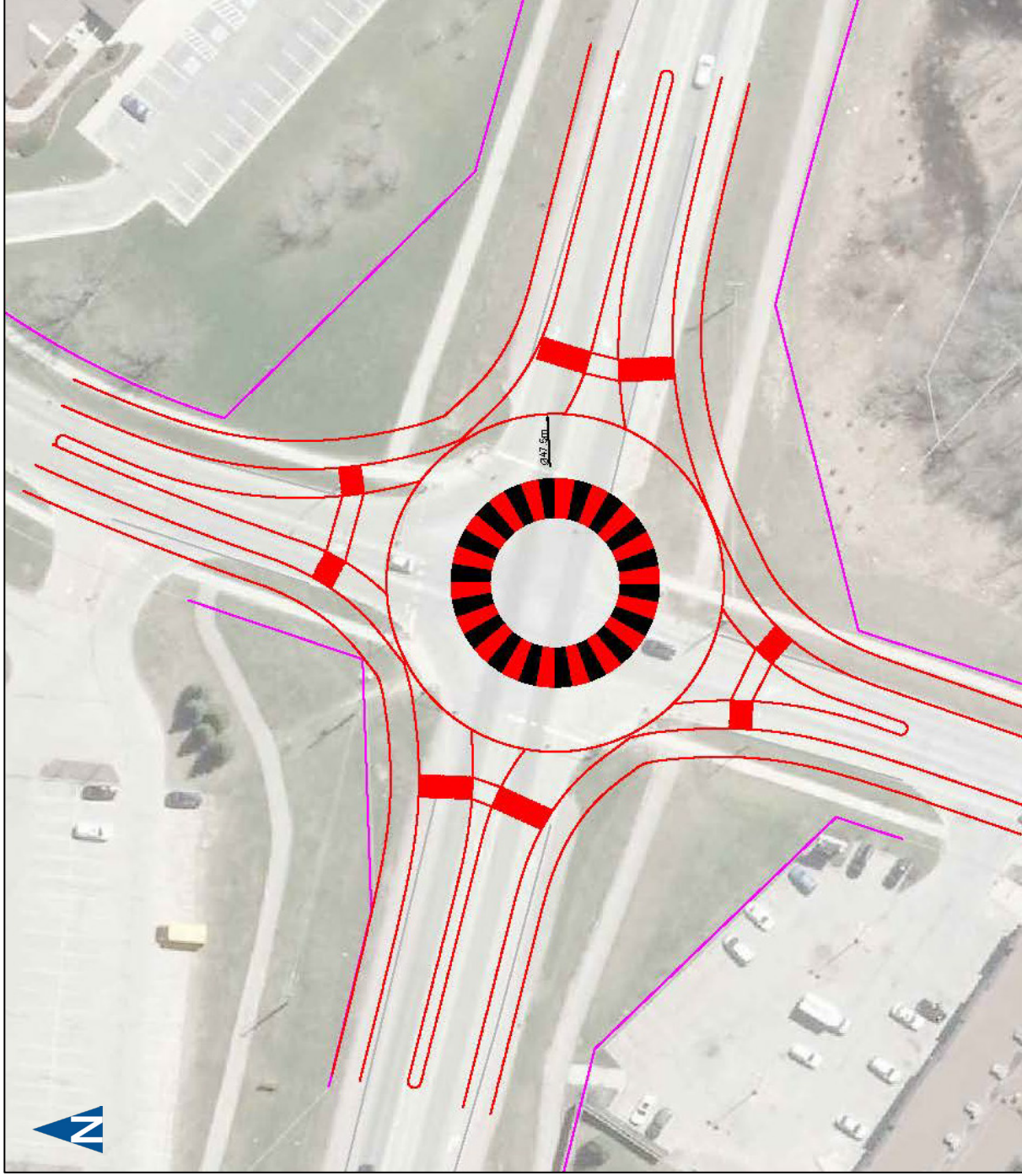
Overall, the partial two-lane entry roundabout is the recommended minimum design for each intersection. It will provide acceptable levels of service, spare capacity and permit the addition of lanes if required in the future.

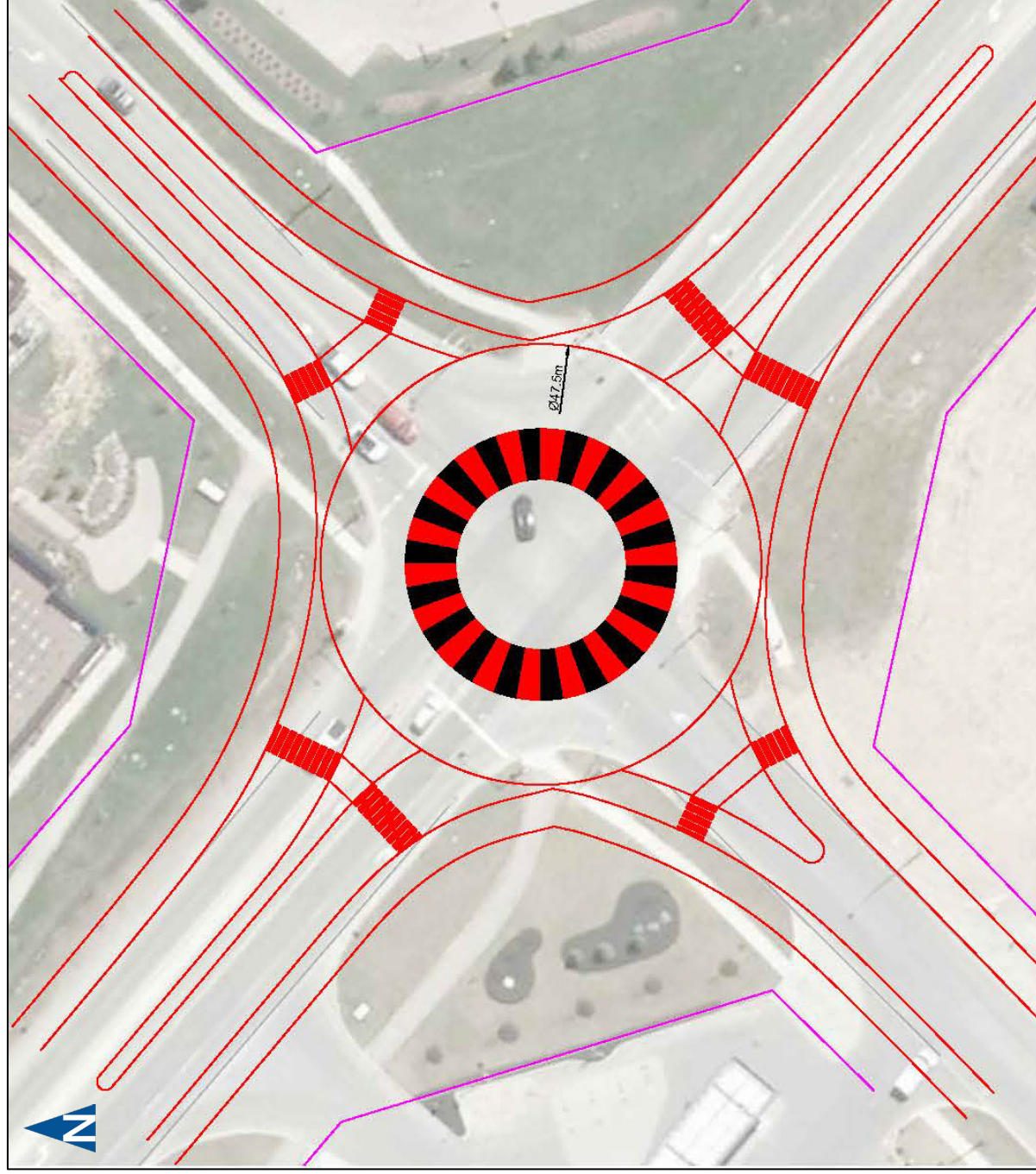
TABLE 7.2: SCENARIO 2 ARCADY ANALYSES

Intersection	Intersection Approach	Queue (PCE)	Delay (sec)	V/C Ratio	Overall LOS	Intersection Delay (sec)
AM Peak Hour						
Riddell Road at Alder Street	Westbound (East Leg)	1.04	5.50	0.30	A	5.46
	Southbound (North leg)	1.00	4.98	0.49		
	Eastbound (West leg)	1.07	9.34	0.40		
	Northbound (South leg)	1.16	4.29	0.38		
Riddell Road at Centennial Road/ Spencer Avenue	Westbound (East Leg)	1.07	6.36	0.36	A	6.74
	Southbound (North leg)	1.00	5.35	0.52		
	Eastbound (West leg)	2.04	12.72	0.58		
	Northbound (South leg)	1.22	4.62	0.36		
PM Peak Hour						
Riddell Road at Alder Street	Westbound (East Leg)	2.03	11.27	0.54	A	6.77
	Southbound (North leg)	1.08	4.15	0.39		
	Eastbound (West leg)	1.00	5.36	0.18		
	Northbound (South leg)	3.16	6.80	0.67		
Riddell Road at Centennial Road/ Spencer Avenue	Westbound (East Leg)	16.96	34.07	0.83	B	13.78
	Southbound (North leg)	1.15	4.87	0.37		
	Eastbound (West leg)	1.02	6.60	0.33		
	Northbound (South leg)	4.83	9.92	0.72		

Figure 7.1a and **Figure 7.1b** illustrate the roundabout placement for each intersection. The drawings show that a roundabout with a 47.5-metre inscribed circle diameter can be accommodated within the existing right-of-way of each intersection.







**Centennial Road/Spencer Avenue TORUS Roundabout
Design
47.5 Metre Inscribed Circle Diameter**

Figure 7.1b

7.3 Scenario 3: Two-Lane Entry on All Approaches

This scenario analyzes a roundabout with a 55-metre inscribed circle diameter with two entry lanes on all approaches.

Table 7.3 summarizes the Scenario 3 operations. The results indicate that both intersections are forecast to operate with acceptable levels of service and within spare capacity during both the AM and PM peak hours.

Overall, the full two-lane entry roundabout design is an acceptable design for each intersection as it will provide acceptable levels of service on all approaches, spare capacity on Riddell Road and significant spare capacity on the side street approaches.

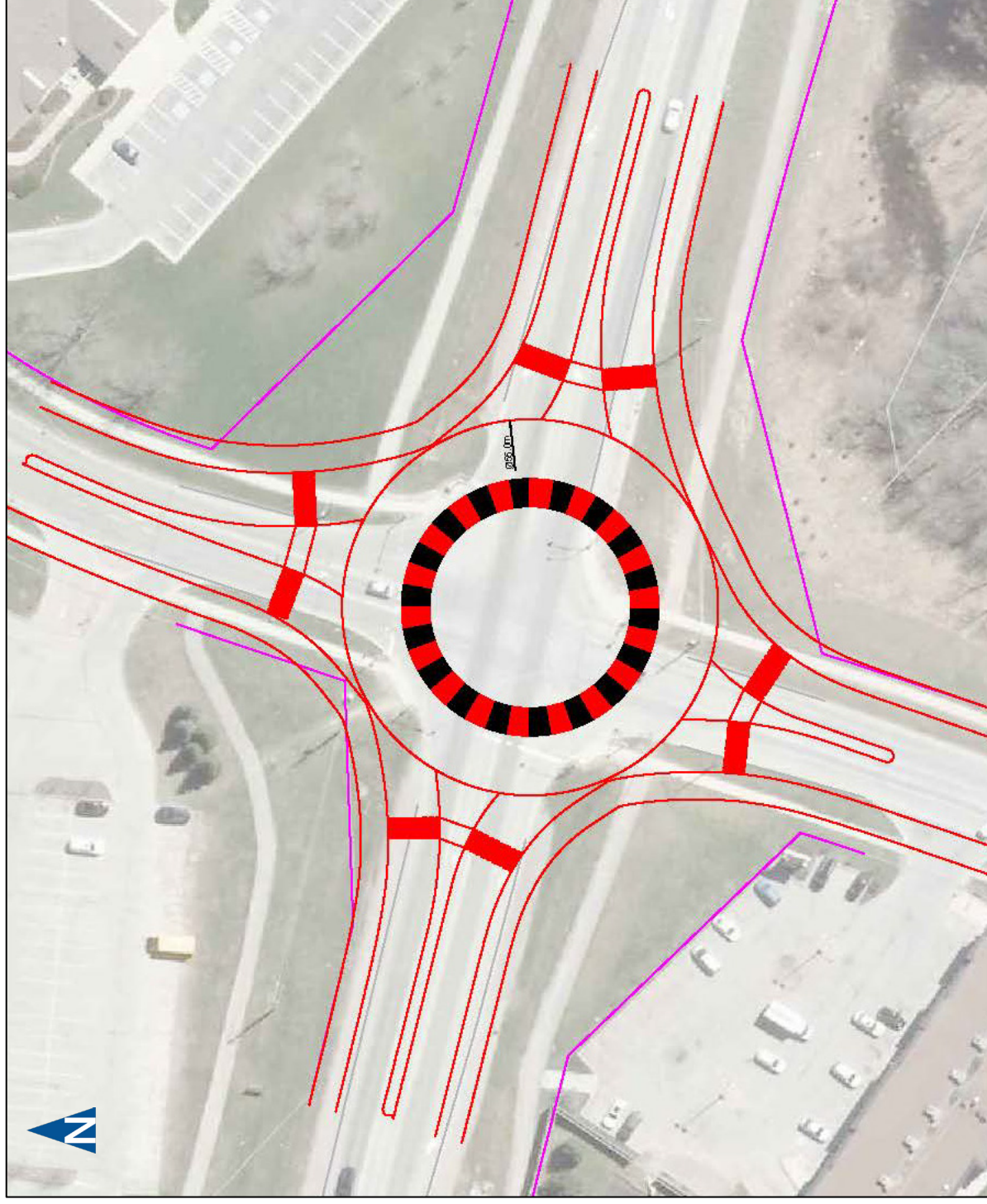


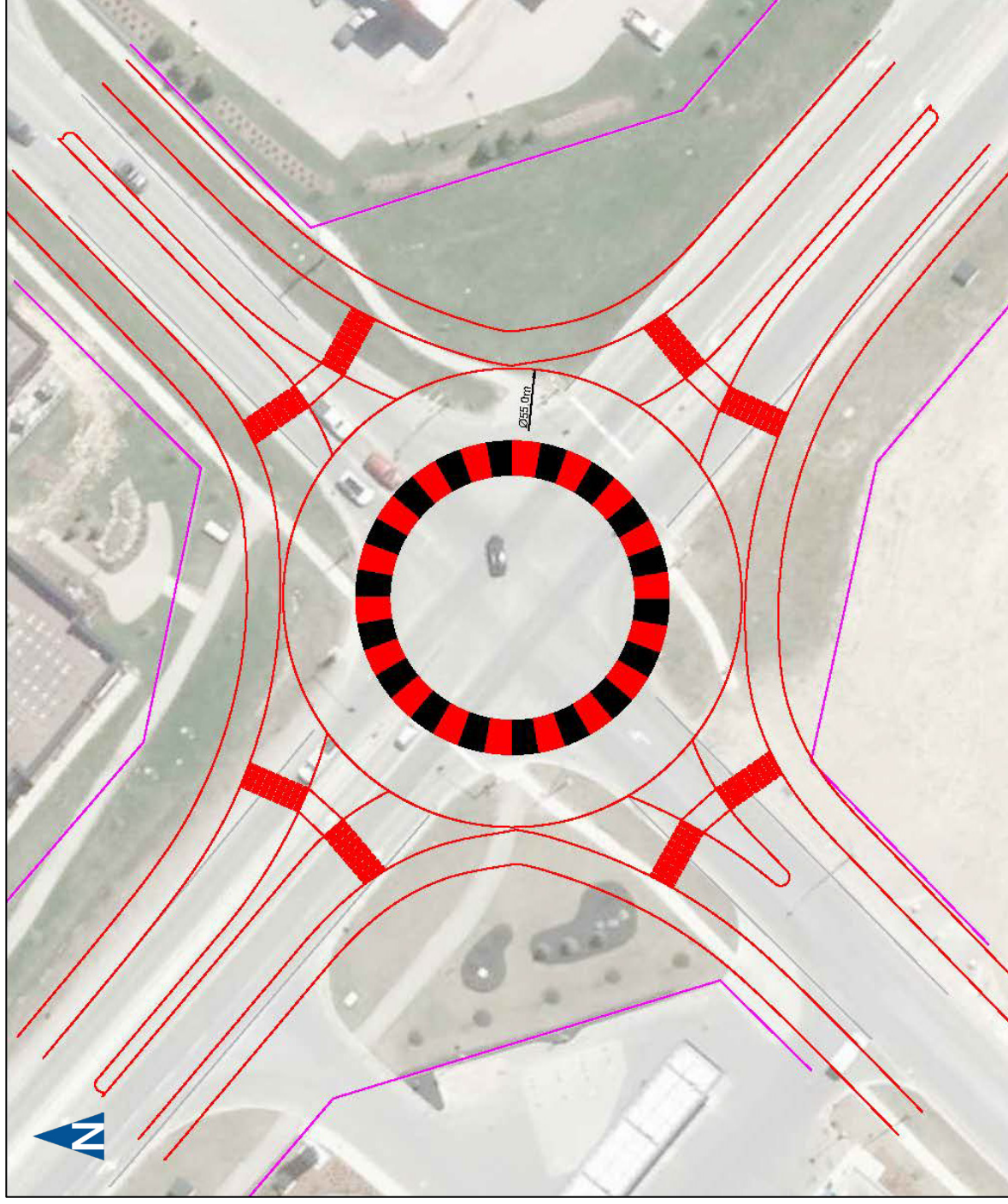
TABLE 7.3: SCENARIO 3 ARCADY ANALYSES

Intersection	Intersection Approach	Queue (PCE)	Delay (sec)	V/C Ratio	Overall LOS	Intersection Delay (sec)
AM Peak Hour						
Riddell Road at Alder Street	Westbound (East Leg)	1.04	5.50	0.30	A	5.46
	Southbound (North leg)	1.00	4.98	0.49		
	Eastbound (West leg)	1.07	9.34	0.40		
	Northbound (South leg)	1.16	4.29	0.38		
Riddell Road at Centennial Road/ Spencer Avenue	Westbound (East Leg)	1.07	6.36	0.36	A	6.74
	Southbound (North leg)	1.00	5.35	0.52		
	Eastbound (West leg)	2.04	12.72	0.58		
	Northbound (South leg)	1.22	4.62	0.36		
PM Peak Hour						
Riddell Road at Alder Street	Westbound (East Leg)	2.03	11.27	0.54	A	6.77
	Southbound (North leg)	1.08	4.15	0.39		
	Eastbound (West leg)	1.00	5.36	0.18		
	Northbound (South leg)	3.16	6.80	0.67		
Riddell Road at Centennial Road/ Spencer Avenue	Westbound (East Leg)	16.96	34.07	0.83	B	13.78
	Southbound (North leg)	1.15	4.87	0.37		
	Eastbound (West leg)	1.02	6.60	0.33		
	Northbound (South leg)	4.83	9.92	0.72		

Figure 7.2a and **Figure 7.2b** illustrate the roundabout placement for each intersection. The drawings show that a roundabout with a 55-metre inscribed circle diameter can be accommodated within the existing right-of-way at Centennial Road/Spencer Avenue. At Alder Street, minimal property acquisition may be required; however, this could be definitively determined during detailed roundabout design.







**Centennial Road/Spencer Avenue TORUS Roundabout
Design
55 Metre Inscribed Circle Diameter**

Figure 7.2b

Appendix H contains the detailed ARCADY reports for all three scenarios.

7.4 Roundabout Design

The Riddell Road corridor is a by-pass routing for heavy vehicles around the downtown area of Orangeville. As well, it also accommodates oversized/wide loads on a routine basis. Therefore, future roundabouts will need to be designed with mountable curbs to accommodate these vehicles which could increase the minimum inscribed circle diameter. This can be determined through a future detailed design study.

7.5 Roadway Widening

As outlined above, two entry lanes are required on Riddell Road at both intersections to provide adequate levels of service.

As discussed in **Chapter 5**, if an additional northbound through lane is provided on Riddell Road at Alder Street, this lane should continue north of the intersection and could become the dedicated right-turn lane for the relocated Recreation Centre Driveway.

Chapter 6 recommends intermediate-term re-assignment of the existing southbound right-turn lane on Riddell Road at Spencer Avenue to a shared through/right-turn lane, thereby providing two through lanes and the associated additional capacity.

Based on the above, the Town could consider widening Riddell Road between Alder Street and Centennial Road/Spencer Avenue to provide two through lanes in each direction. This will ensure adequate capacity through the area and will provide the required number of through lanes at each roundabout approach.

The need for this widening could be further assessed through a detailed corridor study which will also provide a longer-term plan for the entirety of Riddell Road.

7.6 Roundabout Summary

Based on the completed analyses, roundabouts are not required to provide adequate levels of service at the intersections at the 2031 horizon. However, provision of a roundabout with a minimum 47.5-metre inscribed circle diameter with two entering lanes on Riddell Road and one entering lane on the side street approaches will provide adequate levels of service for the study area intersection at the 2031



horizon and additional spare capacity (beyond the intersection-specific recommendations) to accommodate growth beyond this horizon.

The need to accommodate oversized loads through the roundabouts present challenges that may need to be mitigated through design. This may ultimately result in the need to provide a larger inscribed circle diameter or special design considerations (mountable curbs). If a larger inscribed circle diameter is required, the cost could outweigh the benefit, especially if land acquisition is required.

Furthermore, provision of roundabouts at these intersections will likely affect operations of the upstream and downstream intersections on Riddell Road and the side streets (Alder Street, Centennial Road and Spencer Avenue). A corridor study will provide the Town and County with the opportunity to assess these potential impacts and develop a long-term plan that meets the needs of both agencies.

Overall, it is recommended the Town consider the cost-benefit analysis of roundabout provision versus the intersection-specific recommendations in the long-term. Additionally, it is recognized that any long-term improvements on this corridor may be dependent upon discussions with County of Dufferin and should be assessed through a more detailed corridor study.



8 Intersection Improvements Summary

The remedial measures selected for implementation at each intersection and the timing of these improvements are interconnected where the shorter term improvements are dependent upon the longer-term improvement plan. For example, if the Town proceeds with a roundabout at Centennial Road/Spencer Avenue, re-alignment of the northbound and southbound left-turn lanes may not be required if the protected signal phasing provides adequate levels of service and improves safety.

It is recommended the Town consider the costs and benefits of each identified improvement and carry out any required consultation with County staff. As well, it is also recommended the Town consider conducting a Riddell Road corridor study to identify any longer-term (+2031) roadway capacity issues (**Chapter 9**). These will help the Town develop the preferred improvement plan which will address the identified corridor issues, provide the required future capacity and assist in future Capital Budget forecasts.

Table 8.1 provides a 3-tier general cost for each identified Alder Street and Centennial Road/Spencer Avenue intersection improvement: low cost, moderate cost and high cost.

Note that regardless of the timing of improvements, the remedial measure of protected left-turn phasing at Riddell Road and Centennial Road/Spencer Avenue should be implemented in the immediate term to conform to Transportation Association of Canada *Geometric Design Guide for Canadian Roads* guidance.



TABLE 8.1: IMPROVEMENTS COSTS

Improvement Measure	Cost		
	Low	Moderate	High
Signal timing adjustments	✓		
Pavement markings	✓		
Sign removal or installation	✓		
Knock-down barriers	✓		
Signal head installation (including all hardware)		✓	
Left-Turn Lane Alignment		✓	
Riddell Road Corridor Study: Caledon Garafraxa Townline to Broadway		✓	
Roundabout installation			✓
Roadway widening Alder to Centennial/Spencer (additional through lane per direction)			✓



9 Supplemental Riddell Road Corridor Recommendations

9.1 Corridor Study

It is recommended that the Town undertake a corridor study for Riddell Road between Caledon Garafraxa Townline and Broadway. The purpose of this study will be to assess the long-term needs of the corridor in terms of capacity, intersection control and access arrangements (including restrictions). The potential for and need to provide signal progression on the corridor can also be explored. It is recommended the study be undertaken for four horizons: 5 years, 10 years, 15 years and 20 years.

Additionally, corridor study will help the Town refine the longer-term corridor improvement plan by expanding on the analyses and recommendations contained herein.

9.2 Signal Timing Review

It is recommended the Town undertake regular reviews of the signal timing and phasing plans and resulting intersection operations. These reviews will assist the Town in mitigating capacity and safety issues before intersection operations deteriorate to unacceptable levels or collisions increase. Retention of all data will also enable the Town to easily compare the impacts of any refined timing or phasing plans. As well, the data can be used for future in-house intersection analyses.

9.3 Collision Database

As with most smaller municipalities in Ontario, the availability of recent (within the past five years) detailed collision data is scarce to non-existent in Orangeville. However, this data is an important tool to help determine where mitigation may be required.

It is recommended the Town create an account with the Ministry of Transportation Ontario (MTO) to request collision records and start a collision database. Records should be requested on a yearly basis to minimize the effort required to input the data. Note that the data will be provided in a multi-layer single collision file that will require manipulation before it can be analyzed. Given this, it is further recommended that the Town consult with other municipalities within Ontario to consider approaching MTO to request the data is provided in a ready-to-analyze format.



10 Conclusions and Recommendations

10.1 Conclusions

Additional capacity will be required at the Riddell Road intersections with Alder Street and Centennial Road/Spencer Avenue upon reaching the 2031 forecast traffic volumes. Several remedial measures have been identified for each intersection including provision of additional capacity through additional lanes and/or lane re-assignment or changes in traffic control.

The remedial measures selected for implementation at each intersection and the timing of these improvements are interconnected where the shorter term improvements are dependent upon the longer-term improvement plan.

10.2 Recommendations

It is recommended the Town consider the costs and benefits of each identified improvement and carry out required consultation with County staff. It is also recommended the Town consider conducting a Riddell Road corridor study to identify any longer-term (+2031) roadway capacity needs. These will help the Town develop the preferred improvement plan which will address the identified corridor issues, provide the required future capacity and assist in preparing future Capital Budget forecasts.

Note that regardless of the timing of improvements, the remedial measure of protected left-turn phasing at Riddell Road and Centennial Road/Spencer Avenue should be implemented in the immediate term to conform to Transportation Association of Canada *Geometric Design Guide for Canadian Roads* (2017) guidance.



Appendix A

Collision Data



2014 - RIDDELL AND ALDER

	Occ #	Dom	Type	Time	Score	Notes
1)	OV14001991	OrgVI	Motor vehicle collision	2014-02-20 9:04		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 2/20/2014 12:52:39 - Reportable / Event comments: ORANGEVILLE 14 WL2 90 LAT:43 54 12.859N LONG:080 07 35.319W UNC:14 CONF:90 (51 /
2)	OV14002341	OrgVI	Motor vehicle collision	2014-02-28 7:40		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 2/28/2014 08:37:50 - Reportable / Event comments: 2 VEHICLE MVC PI / JUST SOUTH OF ALDER ON RIDDELL / New equipment list for Unit [67] :
3)	OV14002344	OrgVI	Motor vehicle collision	2014-02-28 8:20		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 2/28/2014 10:04:56 - Reportable / Event comments: CRUISER 104 HAS BEEN INVOLVED IN ACCIDENT / SHUTTING DOWN S/B RIDDELL RD / PC M
4)	OV14004397	OrgVI	Motor vehicle collision	2014-04-15 19:36		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, ORANGEVILLE CROMS Incident (501836581) / ----- / 4/15/2014 20:17:15 - Reportable / Event comments: 2 VEH MVC PD - VEH KIA / NO INJ / AMB DISP , FIRE DISP / REQ 2 TOWS / RON COLE / ROYAL
5)	OV14005329	OrgVI	Motor vehicle collision	2014-05-02 6:08		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) CROMS Incident (501843976) / ----- / 5/2/2014 14:03:22 - Reportable / Event comments: NEW INFORMATION / / ----- / Closing comm
6)	OV14005954	OrgVI	Motor vehicle collision	2014-05-15 8:06		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) CROMS Incident (501848870) / ----- / 5/15/2014 08:54:24 - Reportable / Event comments: WL2 [51 CENTINIAL DR, ORANGEVILLE, 3026104
7)	OV14007649	OrgVI	Motor vehicle collision	2014-06-19 17:30		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) CROMS Incident (501861046) / ----- / 6/19/2014 19:18:07 - Reportable / Event comments: 3 VEH MVC / REQUEST 2 TOW TRUCK / REQUES
8)	OV14009123	OrgVI	Motor vehicle collision	2014-07-19 18:49		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) CROMS Incident (501871559) / ----- / 7/19/2014 19:48:23 - Reportable / Event comments: "RIDDELL RD/ALDER ST ORA" at: 2014/07/19 19
9)	OV14010783	OrgVI	Motor vehicle collision	2014-08-27 20:12		Complete - solved (non-criminal) - CROMS Incident (501888686) / ----- / 8/27/2014 20:48:02 - Reportable / Event comments: WL2 (BROADWAY AVE/2ND LINE,513090 2ND LINE, AMARANTH TWP) OMNI ROGERS WIRELESS / Duplicate Event:Location = RIDDELL
10)	OV14011115	OrgVI	Motor vehicle collision	2014-09-04 8:52		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) CROMS Incident (501888703) / ----- / 9/4/2014 09:47:38 - Reportable / Event comments: 2 VEH - PULLED OVER / ON RIDDELL N OF ALDER
11)	OV14013820	OrgVI	Motor vehicle collision	2014-11-07 17:53		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 11/7/2014 19:01:06 - Reportable / Event comments: LIC# AXLT564 / OTHER VEHICLE / LIC#AVJH646 / 115/4/w/2300 / New equipment list for Un

2015 RIDDELL AND ALDER

Occ #	Dom	Type	Time	Score	Notes
1)	OV15001885	OrgVI Motor vehicle collision	2015-02-20 11:26		Hist - Complete - unsolved - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 2/20/2015 12:31:56 - Reportable / Event comments: SUSPECT VEH H
2)	OV15002893	OrgVI Motor vehicle collision	2015-03-16 15:14		Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 3/16/2015 16:24:27 - Reportable / Event c
3)	OV15003113	OrgVI Motor vehicle collision	2015-03-21 17:06		Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 3/21/2015 17:44:38 - Reportable / Event c
4)	OV15004874	OrgVI Motor vehicle collision	2015-04-25 17:23		Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 4/25/2015 18:20:03 - Reportable / Event c
5)	OV15006775	OrgVI Motor vehicle collision	2015-06-02 19:13		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 6/2/2015 20:47:56 - Reportable / Event comments: 1 VEH INV
6)	OV15010622	OrgVI Motor vehicle collision	2015-08-14 16:18		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 8/14/2015 16:25:26 - Non-reportable / Event comments: SOU
7)	OV15012818	OrgVI Motor vehicle collision	2015-10-02 16:41		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 10/2/2015 17:18:40 - Reportable / Event comments: JUST NO
8)	OV15014926	OrgVI Impaired/over 80	2015-11-21 17:35		Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 11/21/2015 19:59:47 - Reportable / Event
9)	OV15015434	OrgVI Motor vehicle collision	2015-12-03 20:47		Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 12/3/2015 21:30:20 - Reportable / Event c

2016 RIDDELL AND ALDER

Occ #	Dom	Type	Time	Score	Notes
1)	OV16004000	OrgVI	Motor vehicle collision	2016-03-20 16:33	Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, ORANGEVILLE ON Canada (Beat: O, ESZ: 81417) 3/20/2016 17:21:18 - Reportable / Event comments: MVC PD ONLY / / --
2)	OV16009709	OrgVI	Motor vehicle collision	2016-06-19 18:02	Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 6/19/2016 18:45:47 - Reportable / Event comments: MVC-PD
3)	OV16011358	OrgVI	Motor vehicle collision	2016-07-18 14:08	Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 7/18/2016 17:11:51 - Reportable / Event c
4)	OV16013931	OrgVI	Motor vehicle collision	2016-08-31 15:40	Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 9/1/2016 06:25:57 - Reportable / Event co
5)	OV16019047	OrgVI	Motor vehicle collision	2016-12-15 15:09	Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, TOWN OF ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 12/15/2016 15:57:22 - Reportable / Event comments: 2 VEHS

2017 RIDDELL AND ALDER

Occ #	Dom	Type	Time	Score	Notes
1)	OV17003543	OrgVI	Motor vehicle collision	#####	Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, ORANGEVILLE ON Canada (Beat: O, ESZ: 81417) 3/20/2017 17:00:51 - Reportable / Event comments:
2)	OV17009539	OrgVI	Motor vehicle collision	#####	Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, ORANGEVILLE ON (ORANGEVILLE) (Beat: O, ESZ: 81400) 7/15/2017 18:22:31 - Reportable / Event comments: WAS REAR
3)	OV17013546	OrgVI	Motor vehicle collision	#####	Cleared by charge (includes charges recommended) - 9/29/2017 16:03:19 - Reportable / Event comments: COMPL PLATE: BXNF860 / OTHER: BPND854 / REQUEST NEXT TRUCK ON TH
4)	OV17008898	OrgVI	Motor vehicle collision	#####	Cleared by charge (includes charges recommended) - ALDER ST and RIDDELL RD, ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 7/3/2017 17:49:05 - Reportable / Event comments: 2
5)	OV17013546	OrgVI	Motor vehicle collision	#####	Cleared by charge (includes charges recommended) - 9/29/2017 16:03:19 - Reportable / Event comments: COMPL PLATE: BXNF860 / OTHER: BPND854 / REQUEST NEXT TRUCK ON TH
6)	OV17013548	OrgVI	Motor vehicle collision	#####	Cleared by charge (includes charges recommended) - ALDER ST and RIDDELL RD, ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 9/29/2017 15:53:25 - Reportable / Event comments:

2018 RIDDELL AND ALDER

Occ #	Dom	Type	Time	Score	Notes
1)	OV18002296	OrgVI Motor vehicle collision	2018-02-26 7:22		Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, ORANGEVILLE ON (ORANGEVILLE) (Beat: O, ESZ: 81400) 2/26/2018 08:58:31 - Non-reportable / Event comments: SPECIAL ADDRESS COMMENT: / ***IF SECURI
2)	OV18002665	OrgVI Motor vehicle collision	#####		Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, ORANGEVILLE ON (ORANGEVILLE) (Beat: O, ESZ: 81400) 3/4/2018 17:41:55 - Non-reportable / Event comments: AT RED LIGHT - GOT REAR ENDED / HONDA CIV
3)	OV18005924	OrgVI Motor vehicle collision	#####		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, ORANGEVILLE ON (ORANGEVILLE) (Beat: O, ESZ: 81400) 5/7/2018 19:13:41 - Reportable / Event comments: ALDER X RIDDELL MVC PD OCCURED AT 1230 HRS / REAR ENDED - OTH
4)	OV18007084	OrgVI Motor vehicle collision	#####		Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, ORANGEVILLE ON (ORANGEVILLE) (Beat: O, ESZ: 81400) 5/28/2018 19:03:02 - Reportable / Event comments: 2 VEHS PD ONLY / 102/P40 / VEHS MOVED INTO C
5)	OV18014085	OrgVI Motor vehicle collision	#####		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, ORANGEVILLE ON (ORANGEVILLE) (Beat: O, ESZ: 81400) 10/7/2018 15:25:59 - Reportable / Event comments: SPECIAL ADDRESS COMMENT: / WILD WING ALARM SUSPENSION ON
6)	OV18016477	OrgVI Motor vehicle collision	2018-11-26 8:12		Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, ORANGEVILLE ON (ORANGEVILLE) (Beat: O, ESZ: 81400) 11/26/2018 09:41:59 - Reportable / Event comments: 2 VEH / EMS ON SCENE / REQUEST 2 TOWS TO T

2019 ALDER AND RIDDELL

Occ #	Dom	Type	Time	Score	Notes
1)	OV19002613	OrgVI	Motor vehicle collision	2019-03-07 7:25	Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, ORANGEVILLE ON (ORANGEVILLE) (Beat: O, ESZ: 81400) 3/7/2019 08:49:36 - Non-reportable / Event comments
2)	OV19008020	OrgVI	Motor vehicle collision	#####	Complete - solved (non-criminal) - ALDER ST and RIDDELL RD, ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 6/21/2019 18:49:17 - Non-reportable / Event comments: 2 VEH MVC / ON SIDE O
3)	OV19002613	OrgVI	Motor vehicle collision	2019-03-07 7:25	Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, ORANGEVILLE ON (ORANGEVILLE) (Beat: O, ESZ: 81400) 3/7/2019 08:49:36 - Non-reportable / Event comments
4)	OV19003679	OrgVI	Motor vehicle collision	#####	Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, ORANGEVILLE ON (ORANGEVILLE) (Beat: O, ESZ: 81400) 3/27/2019 22:46:40 - Reportable / Event comments: 2
5)	OV19009323	OrgVI	Motor vehicle collision	#####	Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, ORANGEVILLE ON (ORANGEVILLE) (Beat: O, ESZ: 81400) 7/18/2019 15:27:01 - Non-reportable / Event commen
6)	OV19013199	OrgVI	Motor vehicle collision	2019-10-09 9:07	Cleared by charge (includes charges recommended) - RIDDELL RD and ALDER ST, ORANGEVILLE ON (ORANGEVILLE) (Beat: O, ESZ: 81400) 10/9/2019 12:00:05 - Reportable / Event comments: M

2020 ALDER AND RIDDELL

Occ #	Dom	Type	Time	Score	Notes
1)	OV20001435	OrigM Motor vehicle collision	2020-02-10 9:04		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, ORANGEVILLE ON (ORANGEVILLE) (Beat: O, ESZ: 81400) 2/10/2020 10:15:03 - Reportable / Event comments: 2 VEH MVC / NO EMS / NOT BLOCKING TRAFFIC / EAST OF INTERSECTION / CHILD IN CAR / COMP SAID NO EMS- NO INJURIES / OFFICERS 10-6 / COMP GOING TO COME TO STN / SGT FRY TAKING // ----- / Closing
2)	OV20001758	OrigM Motor vehicle collision	2020-02-20 7:41		Cleared by charge (includes charges recommended) - ALDER ST and RIDDELL RD, ORANGEVILLE ON Canada (Beat: O, ESZ: 81400) 2/20/2020 09:44:29 - Reportable / Event comments: MVC / UNKNOWN INJURIES / TWO VEHICLES / ONE CAR BLOCKING ROAD / SGT DRIVEN WILL TAKE CALL / OTHER DRIVER IS BLEEDING AT HEAD, REQ AMBULANCE / Tracking device C110/GPS Device/Defau
3)	OV20004601	OrigM Motor vehicle collision	#####		Complete - solved (non-criminal) - RIDDELL RD and ALDER ST, ORANGEVILLE ON (ORANGEVILLE) (Beat: O, ESZ: 81400) 5/22/2020 11:04:31 - Reportable / Event comments: 2 VEHICLES- NO INJURIES / CRV -UCM CFDJ105DUMP TRUCK: AT95248 / OFF THE SIDE OF ROAD // ----- / Closing comments: PON issued for Careless Driving. See report. SC113

2017 RIDDELL AND SPENCER

Occ #	Dom	Type	Time	Score	Notes
1)	OV17000337	OrgVI	Motor vehicle collision	#####	Complete - solved (non-criminal) - RIDDELL and SPENCER ST, ORANGEVILLE ON Canada (ESZ: 1) 1/9/2017 15:20:09 - Reportable / Event comments: MALE TRAPPED / 116/P4 / RECON

2018 RIDDELL AND SPENCER

Occ #	Dom	Type	Time	Score	Notes
1)	OV18007089	OrgVI	Motor vehicle collision	#####	Cleared by charge (includes charges recommended) - RIDDELL and SPENCER ST, ORANGEVILLE ON Canada (ESZ: 1) 5/28/2018 21:57:17 - Reportable / Event comments: 2 VEHS PD ONLY / S/W C
2)	OV18016742	OrgVI	Motor vehicle collision	#####	Complete - solved (non-criminal) - RIDDELL and SPENCER ST, ORANGEVILLE ON Canada (ESZ: 1) 12/2/2018 02:18:48 - Reportable / Event comments: RIDDELL/SPENCER - VEH VS PEDESTRIAN / 1

2019 RIDDELL AND CENTENNIAL

Occ #	Dom	Type	Time	Score	Notes
1)	OV19002542	OrgVI	Motor vehicle collision	#####	Cleared by charge (includes charges recommended) - SPENCER AV and RIDDELL RD, ORANGEVILLE ON Canada 3/5/2019 16:56:18 - Reportable / Event comments: RIDDELL/SPENCER / WRONG SIDE OF ROAD - UP ON THE SNOW BANK / N SD OF SPENCER
2)	OV19002792	OrgVI	Motor vehicle collision	#####	Cleared by charge (includes charges recommended) - CENTENNIAL RD and RIDDELL RD, ORANGEVILLE ON (Beat: O, ESZ: 81400) 3/11/2019 17:29:27 - Reportable / Event comments: FML PARTY REAR ENDED A CAR THEN BUMPED INTO THE NEXT / THEY A
3)	OV19005059	OrgVI	Motor vehicle collision	2019-04-24 9:36	Complete - solved (non-criminal) - CENTENNIAL RD and RIDDELL RD, ORANGEVILLE ON (Beat: O, ESZ: 81400) 4/24/2019 10:03:33 - Non-reportable / Event comments: 2 VEH / IN PARKING LOT FO TIMS NOW / GREEN PICK UP TRUCK AND 2001 ACURA BL
4)	OV19008028	OrgVI	Motor vehicle collision	#####	Complete - solved (non-criminal) - CENTENNIAL RD and RIDDELL RD, ORANGEVILLE ON (Beat: O, ESZ: 81400) 6/21/2019 20:00:17 - Reportable / Event comments: INADVERTENTLY CLOSED // ----- / Closing comments: VENASSE - SEE MVC REPORT /

Appendix B

TAC Speed Limit Assessment Forms





Automated Speed Limit Guidelines

FORM A - Automated Speed Limit Guidelines Spreadsheet

Version:
10-Apr-09

Name of Corridor:	Riddell Road			
Segment Evaluated:	Alder Street	to	Montgomery Road	
Geographic Region:	Orangeville, Ontario			
Road Agency:	Town of Orangeville			
Road Classification:	Arterial	Length of Corridor:	900	m
Urban / Rural:	Rural	Design Speed: (Required for Freeway, Expressway, Highway)		km/h
Divided / Undivided:	Undivided	Current Posted Speed: (For information only)	70	km/h
Major / Minor:	Major	Prevailing Speed: (85th Percentile - for information only)		km/h
# Through Lanes Per Direction:	1 lane	Policy: (Maximum Posted Speed)		

RISK		Score	
A1	GEOMETRY (Horizontal)	Lower	2
A2	GEOMETRY (Vertical)	Lower	2
A3	AVERAGE LANE WIDTH	Lower	2
B	ROADSIDE HAZARDS	Lower	1
C1	PEDESTRIAN EXPOSURE	Lower	3
C2	CYCLIST EXPOSURE	Medium	6
D	PAVEMENT SURFACE	Lower	1
E1	NUMBER OF INTERSECTIONS WITH PUBLIC ROADS	Number of Occurrences	12
	STOP controlled intersection	0	
	Signalized intersection	2	
	Roundabout or traffic circle	0	
	Crosswalk	0	
	Active, at-grade railroad crossing	0	
	Sidestreet STOP-controlled or lane	1	
E2	NUMBER OF INTERSECTIONS WITH PRIVATE ACCESS DRIVEWAYS	Number of Occurrences	0
	Left turn movements permitted	0	
	Right-in / Right-out only	0	
E3	NUMBER OF INTERCHANGES	Number of Occurrences	0
	Number of interchanges along corridor	0	
F	ON-STREET PARKING	N/A	0

Total Risk Score:

29

Recommended Posted
Speed Limit (km/h):

As determined by road characteristics

80

As determined by policy

The recommended posted speed limit may be checked against the prevailing speeds of the roadway and the road's safety performance.

Comments:



Automated Speed Limit Guidelines

FORM A - Automated Speed Limit Guidelines Spreadsheet

Version:
10-Apr-09

Name of Corridor:	Riddell Road		
Segment Evaluated:	Centennial Road/Spencer Avenue	to	Alder Street
Geographic Region:	Orangeville, Ontario		
Road Agency:	Town of Orangeville		
Road Classification:	Arterial	Length of Corridor:	500 m
Urban / Rural:	Urban	Design Speed: (Required for Freeway, Expressway, Highway)	
Divided / Undivided:	Undivided	Current Posted Speed: (For information only)	70 km/h
Major / Minor:	Major	Prevailing Speed: (85th Percentile - for information only)	
# Through Lanes	1 lane	Policy:	
Per Direction:		(Maximum Posted Speed)	

		RISK	Score
A1	GEOMETRY (Horizontal)	Lower	2
A2	GEOMETRY (Vertical)	Lower	2
A3	AVERAGE LANE WIDTH	Lower	2
B	ROADSIDE HAZARDS	Lower	1
C1	PEDESTRIAN EXPOSURE	Lower	3
C2	CYCLIST EXPOSURE	Medium	6
D	PAVEMENT SURFACE	Lower	1
E1	NUMBER OF INTERSECTIONS WITH PUBLIC ROADS	Number of Occurrences	20
	STOP controlled intersection	0	
	Signalized intersection	2	
	Roundabout or traffic circle	0	
	Crosswalk	0	
	Active, at-grade railroad crossing	0	
	Sidestreet STOP-controlled or lane	0	
E2	NUMBER OF INTERSECTIONS WITH PRIVATE ACCESS DRIVEWAYS	Number of Occurrences	4
	Left turn movements permitted	1	
	Right-in / Right-out only	0	
E3	NUMBER OF INTERCHANGES	Number of Occurrences	0
	Number of interchanges along corridor	0	
F	ON-STREET PARKING	N/A	0

Total Risk Score:

29

Recommended Posted
Speed Limit (km/h):

As determined by road characteristics

80

As determined by policy

The recommended posted speed limit may be checked against the prevailing speeds of the roadway and the road's safety performance.

Comments:



Automated Speed Limit Guidelines

FORM A - Automated Speed Limit Guidelines Spreadsheet

Version:
10-Apr-09

Name of Corridor:	Riddell Road		
Segment Evaluated:	Richardson Road	to	Centennial Road/Spencer Avenue
Geographic Region:	Orangeville, Ontario		
Road Agency:	Town of Orangeville		
Road Classification:	Arterial	Length of Corridor:	500 m
Urban / Rural:	Rural	Design Speed: (Required for Freeway, Expressway, Highway)	km/h
Divided / Undivided:	Undivided	Current Posted Speed: (For information only)	70 km/h
Major / Minor:	Major	Prevailing Speed: (85th Percentile - for information only)	km/h
# Through Lanes	1 lane	Policy:	
Per Direction:		(Maximum Posted Speed)	

		RISK	Score
A1	GEOMETRY (Horizontal)	Lower	2
A2	GEOMETRY (Vertical)	Lower	2
A3	AVERAGE LANE WIDTH	Lower	2
B	ROADSIDE HAZARDS	Lower	1
C1	PEDESTRIAN EXPOSURE	Lower	3
C2	CYCLIST EXPOSURE	Medium	6
D	PAVEMENT SURFACE	Lower	1
E1	NUMBER OF INTERSECTIONS WITH PUBLIC ROADS	Number of Occurrences	20
	STOP controlled intersection	0	
	Signalized intersection	2	
	Roundabout or traffic circle	0	
	Crosswalk	0	
	Active, at-grade railroad crossing	0	
	Sidestreet STOP-controlled or lane	0	
E2	NUMBER OF INTERSECTIONS WITH PRIVATE ACCESS DRIVEWAYS	Number of Occurrences	15
	Left turn movements permitted	4	
	Right-in / Right-out only	0	
E3	NUMBER OF INTERCHANGES	Number of Occurrences	0
	Number of interchanges along corridor	0	
F	ON-STREET PARKING	N/A	0

Total Risk Score:

29

Recommended Posted
Speed Limit (km/h):

As determined by road characteristics

80

As determined by policy

The recommended posted speed limit may be checked against the prevailing speeds of the roadway and the road's safety performance.

Comments:



Automated Speed Limit Guidelines

FORM A - Automated Speed Limit Guidelines Spreadsheet

Version:
10-Apr-09

Name of Corridor:	Alder Street		
Segment Evaluated:	B Line	to	Riddell Road
Geographic Region:	Orangeville, Ontario		
Road Agency:	Orangeville, Ontario		
Road Classification:	Collector	Length of Corridor:	718 m
Urban / Rural:	Urban	Design Speed: (Required for Freeway, Expressway, Highway)	km/h
Divided / Undivided:	Undivided	Current Posted Speed: (For information only)	40 km/h
Major / Minor:	Minor	Prevailing Speed: (85th Percentile - for information only)	km/h
# Through Lanes	1 lane	Policy:	
Per Direction:		(Maximum Posted Speed)	

		RISK	Score
A1	GEOMETRY (Horizontal)	Medium	2
A2	GEOMETRY (Vertical)	Lower	1
A3	AVERAGE LANE WIDTH	Medium	4
B	ROADSIDE HAZARDS	Medium	2
C1	PEDESTRIAN EXPOSURE	Lower	3
C2	CYCLIST EXPOSURE	Higher	9
D	PAVEMENT SURFACE	Lower	1
E1	NUMBER OF INTERSECTIONS WITH PUBLIC ROADS	Number of Occurrences	14
	STOP controlled intersection	1	
	Signalized intersection	1	
	Roundabout or traffic circle	0	
	Crosswalk	0	
	Active, at-grade railroad crossing	0	
	Sidestreet STOP-controlled or lane	5	
E2	NUMBER OF INTERSECTIONS WITH PRIVATE ACCESS DRIVEWAYS	Number of Occurrences	10
	Left turn movements permitted	14	
	Right-in / Right-out only	0	
E3	NUMBER OF INTERCHANGES	Number of Occurrences	0
	Number of interchanges along corridor	0	
F	ON-STREET PARKING	Medium	6

Total Risk Score:

52

Recommended Posted
Speed Limit (km/h):

As determined by road characteristics

40

As determined by policy

The recommended posted speed limit may be checked against the prevailing speeds of the roadway and the road's safety performance.

Comments:



Automated Speed Limit Guidelines

FORM A - Automated Speed Limit Guidelines Spreadsheet

Version:
10-Apr-09

Name of Corridor:	Alder Street		
Segment Evaluated:	Riddell Road	to	C Line
Geographic Region:	Orangeville, Ontario		
Road Agency:	Orangeville, Ontario		
Road Classification:	Collector	Length of Corridor:	650 m
Urban / Rural:	Urban	Design Speed: (Required for Freeway, Expressway, Highway)	km/h
Divided / Undivided:	Undivided	Current Posted Speed: (For information only)	40 km/h
Major / Minor:	Minor	Prevailing Speed: (85th Percentile - for information only)	km/h
# Through Lanes	1 lane	Policy:	
Per Direction:		(Maximum Posted Speed)	

		RISK	Score
A1	GEOMETRY (Horizontal)	Medium	2
A2	GEOMETRY (Vertical)	Lower	1
A3	AVERAGE LANE WIDTH	Medium	4
B	ROADSIDE HAZARDS	Lower	1
C1	PEDESTRIAN EXPOSURE	Lower	3
C2	CYCLIST EXPOSURE	Medium	6
D	PAVEMENT SURFACE	Lower	1
E1	NUMBER OF INTERSECTIONS WITH PUBLIC ROADS	Number of Occurrences	14
	STOP controlled intersection	0	
	Signalized intersection	2	
	Roundabout or traffic circle	0	
	Crosswalk	0	
	Active, at-grade railroad crossing	0	
	Sidestreet STOP-controlled or lane	4	
E2	NUMBER OF INTERSECTIONS WITH PRIVATE ACCESS DRIVEWAYS	Number of Occurrences	8
	Left turn movements permitted	10	
	Right-in / Right-out only	0	
E3	NUMBER OF INTERCHANGES	Number of Occurrences	0
	Number of interchanges along corridor	0	
F	ON-STREET PARKING	Lower	3

Total Risk Score:

43

Recommended Posted
Speed Limit (km/h):

As determined by road characteristics

50

As determined by policy

The recommended posted speed limit may be checked against the prevailing speeds of the roadway and the road's safety performance.

Comments:



Automated Speed Limit Guidelines

FORM A - Automated Speed Limit Guidelines Spreadsheet

Version:
10-Apr-09

Name of Corridor:	Centennial Road		
Segment Evaluated:	Riddell Road	to	C Line
Geographic Region:	Orangeville, Ontario		
Road Agency:			
Road Classification:	Collector	Length of Corridor:	500 m
Urban / Rural:	Urban	Design Speed: (Required for Freeway, Expressway, Highway)	
Divided / Undivided:	Undivided	Current Posted Speed: (For information only)	50 km/h
Major / Minor:	Minor	Prevailing Speed: (85th Percentile - for information only)	
# Through Lanes	1 lane	Policy:	
Per Direction:		(Maximum Posted Speed)	

		RISK	Score
A1	GEOMETRY (Horizontal)	Lower	1
A2	GEOMETRY (Vertical)	Lower	1
A3	AVERAGE LANE WIDTH	Lower	2
B	ROADSIDE HAZARDS	Higher	3
C1	PEDESTRIAN EXPOSURE	Lower	3
C2	CYCLIST EXPOSURE	Lower	3
D	PAVEMENT SURFACE	Lower	1
E1	NUMBER OF INTERSECTIONS WITH PUBLIC ROADS	Number of Occurrences	14
	STOP controlled intersection	0	
	Signalized intersection	2	
	Roundabout or traffic circle	0	
	Crosswalk	0	
	Active, at-grade railroad crossing	0	
	Sidestreet STOP-controlled or lane	0	
E2	NUMBER OF INTERSECTIONS WITH PRIVATE ACCESS DRIVEWAYS	Number of Occurrences	4
	Left turn movements permitted	3	
	Right-in / Right-out only	2	
E3	NUMBER OF INTERCHANGES	Number of Occurrences	0
	Number of interchanges along corridor	0	
F	ON-STREET PARKING	N/A	0

Total Risk Score:

33

Recommended Posted
Speed Limit (km/h):

As determined by road characteristics

60

As determined by policy

The recommended posted speed limit may be checked against the prevailing speeds of the roadway and the road's safety performance.

Comments:



Automated Speed Limit Guidelines

FORM A - Automated Speed Limit Guidelines Spreadsheet

Version:
10-Apr-09

Name of Corridor:	Spencer Avenue		
Segment Evaluated:	Riddell Road	to	Buckingham Street
Geographic Region:	Orangeville, Ontario		
Road Agency:			
Road Classification:	Collector	Length of Corridor:	500 m
Urban / Rural:	Urban	Design Speed: (Required for Freeway, Expressway, Highway)	
Divided / Undivided:	Undivided	Current Posted Speed:	40 km/h
Major / Minor:	Major	Prevailing Speed:	
# Through Lanes	1 lane	Policy:	
Per Direction:		(Maximum Posted Speed)	

		RISK	Score
A1	GEOMETRY (Horizontal)	Medium	2
A2	GEOMETRY (Vertical)	Lower	1
A3	AVERAGE LANE WIDTH	Medium	4
B	ROADSIDE HAZARDS	Lower	1
C1	PEDESTRIAN EXPOSURE	Lower	3
C2	CYCLIST EXPOSURE	Medium	6
D	PAVEMENT SURFACE	Lower	1
E1	NUMBER OF INTERSECTIONS WITH PUBLIC ROADS	Number of Occurrences	11
	STOP controlled intersection	0	
	Signalized intersection	1	
	Roundabout or traffic circle	0	
	Crosswalk	0	
	Active, at-grade railroad crossing	0	
	Sidestreet STOP-controlled or lane	4	
E2	NUMBER OF INTERSECTIONS WITH PRIVATE ACCESS DRIVEWAYS	Number of Occurrences	15
	Left turn movements permitted	32	
	Right-in / Right-out only	0	
E3	NUMBER OF INTERCHANGES	Number of Occurrences	0
	Number of interchanges along corridor	0	
F	ON-STREET PARKING	N/A	0

Total Risk Score:

44

Recommended Posted
Speed Limit (km/h):

As determined by road characteristics

50

As determined by policy

The recommended posted speed limit may be checked against the prevailing speeds of the roadway and the road's safety performance.

Comments:

Appendix C

2020 Traffic Operations Reports



Timings
1: Riddell Road & Alder Street

2020 AM Peak Hour
200195 - Orangeville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↰	↱	↰	↱	↰	↱	↰	↱
Traffic Volume (vph)	14	155	124	56	23	278	135	97	477	14
Future Volume (vph)	14	155	124	56	23	278	135	97	477	14
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		6		2		4		8		8
Permitted Phases	6		2		4		4	8		8
Detector Phase	6	6	2	2	4	4	4	8	8	8
Switch Phase										
Minimum Initial (s)	8.0	8.0	8.0	8.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	31.0	31.0	31.0	31.0	36.0	36.0	36.0	36.0	36.0	36.0
Total Split (s)	37.0	37.0	37.0	37.0	36.0	36.0	36.0	36.0	36.0	36.0
Total Split (%)	50.7%	50.7%	50.7%	50.7%	49.3%	49.3%	49.3%	49.3%	49.3%	49.3%
Yellow Time (s)	5.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	Max	Max	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	30.1	30.1	30.1	30.1	27.4	27.4	27.4	27.4	27.4	27.4
Actuated g/C Ratio	0.43	0.43	0.43	0.43	0.39	0.39	0.39	0.39	0.39	0.39
v/c Ratio	0.03	0.31	0.33	0.16	0.21	0.57	0.23	0.36	0.91	0.03
Control Delay	13.1	14.5	17.0	9.3	18.7	21.2	3.5	18.9	40.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.1	14.5	17.0	9.3	18.7	21.2	3.5	18.9	40.7	0.1
LOS	B	B	B	A	B	C	A	B	D	A
Approach Delay		14.4		13.7		15.5		36.2		
Approach LOS		B		B		B		D		

Intersection Summary

Cycle Length: 73
Actuated Cycle Length: 70.5
Natural Cycle: 70
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 23.5
Intersection Capacity Utilization 82.0%
Analysis Period (min) 15

Splits and Phases: 1: Riddell Road & Alder Street

↰ 02	↱ 04
37 s	36 s
↰ 06	↱ 08
37 s	36 s

Queues
1: Riddell Road & Alder Street

2020 AM Peak Hour
200195 - Orangeville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	17	230	151	114	28	339	165	118	582	17
v/c Ratio	0.03	0.31	0.33	0.16	0.21	0.57	0.23	0.36	0.91	0.03
Control Delay	13.1	14.5	17.0	9.3	18.7	21.2	3.5	18.9	40.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.1	14.5	17.0	9.3	18.7	21.2	3.5	18.9	40.7	0.1
Queue Length 50th (m)	1.4	20.0	14.4	5.8	2.5	35.8	0.0	11.3	73.9	0.0
Queue Length 95th (m)	4.5	31.9	25.4	13.4	7.6	52.9	8.0	21.5	#112.5	0.0
Internal Link Dist (m)		197.3		149.7		592.2			140.4	
Turn Bay Length (m)	25.0		25.0		95.0		35.0	110.0		40.0
Base Capacity (vph)	554	731	460	733	147	653	769	356	704	658
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.31	0.33	0.16	0.19	0.52	0.21	0.33	0.83	0.03

Intersection Summary

of lanes shown is within posted capacity, queue may be longer.
Queue shown is maximum over two cycles.

HCM Signalized Intersection Capacity Analysis 1: Riddell Road & Alder Street

2020 AM Peak Hour
20195 - Orangeville Intersections

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↰	↱	↲	↰	↱	↲	↰	↱	↲
Traffic Volume (vph)	14	155	34	124	56	38	23	278	135	97	477	14
Future Volume (vph)	14	155	34	124	56	38	23	278	135	97	477	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		0.94	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.94		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1693		1671	1658		1582	1532	1583	1671	1652	1462
Flt Permitted	0.68	1.00		0.62	1.00		0.21	1.00	1.00	0.48	1.00	1.00
Satd. Flow (perm)	1299	1693		1082	1658		346	1532	1583	837	1652	1462
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	17	189	41	151	68	46	28	339	165	118	582	17
RTOR Reduction (vph)	0	10	0	0	26	0	0	0	101	0	0	10
Lane Group Flow (vph)	17	220	0	151	88	0	28	339	64	118	582	7
Confl. Peds. (#/hr)			52	52			2					2
Heavy Vehicles (%)	0%	9%	0%	2%	2%	16%	14%	24%	2%	8%	15%	8%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		6			2			4		8		
Permitted Phases	6			2			4		4	8		8
Actuated Green, G (s)	30.1	30.1		30.1	30.1		27.4	27.4	27.4	27.4	27.4	27.4
Effective Green, g (s)	30.1	30.1		30.1	30.1		27.4	27.4	27.4	27.4	27.4	27.4
Actuated g/C Ratio	0.43	0.43		0.43	0.43		0.39	0.39	0.39	0.39	0.39	0.39
Clearance Time (s)	7.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	0.2	0.2		0.2	0.2		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	554	722		461	707		134	595	615	325	642	568
v/s Ratio Prot		0.13			0.05			0.22			0.35	
v/s Ratio Perm	0.01			0.14			0.08		0.04	0.14		0.00
v/c Ratio	0.03	0.30		0.33	0.12		0.21	0.57	0.10	0.36	0.91	0.01
Uniform Delay, d1	11.7	13.3		13.5	12.2		14.3	16.9	13.7	15.3	20.3	13.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	1.1		1.9	0.4		0.8	1.3	0.1	0.7	16.4	0.0
Delay (s)	11.8	14.4		15.3	12.6		15.1	18.2	13.8	16.0	36.8	13.2
Level of Service	B	B		B	B		B	B	B	B	D	B
Approach Delay (s)		14.2			14.2			16.7			32.8	
Approach LOS		B			B			B			C	

Intersection Summary

HCM 2000 Control Delay	22.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	70.5	Sum of lost time (s)	13.0
Intersection Capacity Utilization	82.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Timings 2: Riddell Road & Spencer Avenue/Centennial Road

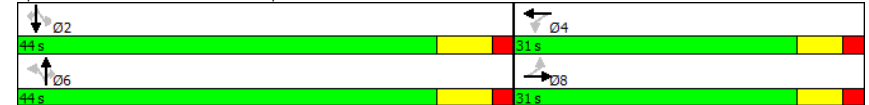
2020 AM Peak Hour
200195 - Orangeville Intersections

Movement	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↲	↰	↱	↲	↰	↱	↲
Traffic Volume (vph)	58	150	111	78	50	258	74	157	437	6
Future Volume (vph)	58	150	111	78	50	258	74	157	437	6
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		8		4		6		6	2	2
Permitted Phases	8		4		6		6	2	2	2
Detector Phase	8	8	4	4	6	6	6	2	2	2
Switch Phase										
Minimum Initial (s)	15.0	15.0	15.0	15.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	31.0	31.0	31.0	31.0	44.0	44.0	44.0	44.0	44.0	44.0
Total Split (s)	31.0	31.0	31.0	31.0	44.0	44.0	44.0	44.0	44.0	44.0
Total Split (%)	41.3%	41.3%	41.3%	41.3%	58.7%	58.7%	58.7%	58.7%	58.7%	58.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	7.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	15.9	15.9	15.9	15.9	37.0	37.0	37.0	37.0	37.0	37.0
Actuated g/C Ratio	0.24	0.24	0.24	0.24	0.56	0.56	0.56	0.56	0.56	0.56
v/c Ratio	0.20	0.53	0.50	0.31	0.11	0.31	0.10	0.27	0.49	0.01
Control Delay	21.8	22.9	30.0	15.3	7.9	9.2	2.5	9.4	11.4	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.8	22.9	30.0	15.3	7.9	9.2	2.5	9.4	11.4	0.0
LOS	C	C	C	B	A	A	A	A	B	A
Approach Delay		22.7		21.9		7.8			10.8	
Approach LOS		C		C		A			B	

Intersection Summary

Cycle Length: 75	
Actuated Cycle Length: 65.9	
Natural Cycle: 75	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.53	
Intersection Signal Delay: 14.1	Intersection LOS: B
Intersection Capacity Utilization 86.4%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 2: Riddell Road & Spencer Avenue/Centennial Road



Queues
2: Riddell Road & Spencer Avenue/Centennial Road

2020 AM Peak Hour
200195 - Orangeville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	60	239	114	139	52	266	76	162	451	6
v/c Ratio	0.20	0.53	0.50	0.31	0.11	0.31	0.10	0.27	0.49	0.01
Control Delay	21.8	22.9	30.0	15.3	7.9	9.2	2.5	9.4	11.4	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.8	22.9	30.0	15.3	7.9	9.2	2.5	9.4	11.4	0.0
Queue Length 50th (m)	6.2	22.1	12.7	8.9	2.7	15.8	0.0	9.3	30.5	0.0
Queue Length 95th (m)	15.1	42.0	27.3	22.0	8.4	33.4	5.4	22.6	60.8	0.0
Internal Link Dist (m)		130.7		209.9		212.7			592.2	
Turn Bay Length (m)	50.0		40.0		105.0		60.0	165.0		160.0
Base Capacity (vph)	472	686	361	667	488	847	759	593	912	687
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.35	0.32	0.21	0.11	0.31	0.10	0.27	0.49	0.01
Intersection Summary										

HCM Signalized Intersection Capacity Analysis
2: Riddell Road & Spencer Avenue/Centennial Road

2020 AM Peak Hour
200195 - Orangeville Intersections

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↰	↱	↲	↰	↱	↲	↰	↱	↲
Traffic Volume (vph)	58	150	81	111	78	57	50	258	74	157	437	6
Future Volume (vph)	58	150	81	111	78	57	50	258	74	157	437	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.94		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1746		1661	1672		1768	1508	1292	1687	1624	1188
Flt Permitted	0.67	1.00		0.55	1.00		0.47	1.00	1.00	0.60	1.00	1.00
Satd. Flow (perm)	1245	1746		955	1672		868	1508	1292	1057	1624	1188
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	60	155	84	114	80	59	52	266	76	162	451	6
RTOR Reduction (vph)	0	30	0	0	40	0	0	0	33	0	0	3
Lane Group Flow (vph)	60	209	0	114	99	0	52	266	43	162	451	3
Confl. Peds. (#/hr)		7		7			2					2
Heavy Vehicles (%)	2%	1%	4%	8%	3%	11%	2%	26%	25%	7%	17%	33%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		8			4			6			2	
Permitted Phases	8			4			6		6	2		2
Actuated Green, G (s)	15.8	15.8		15.8	15.8		37.0	37.0	37.0	37.0	37.0	37.0
Effective Green, g (s)	15.8	15.8		15.8	15.8		37.0	37.0	37.0	37.0	37.0	37.0
Actuated g/C Ratio	0.24	0.24		0.24	0.24		0.56	0.56	0.56	0.56	0.56	0.56
Clearance Time (s)	6.0	6.0		6.0	6.0		7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	298	419		229	401		488	847	726	594	913	668
v/s Ratio Prot		c0.12			0.06			0.18			c0.28	
v/s Ratio Perm	0.05			0.12			0.06		0.03	0.15		0.00
v/c Ratio	0.20	0.50		0.50	0.25		0.11	0.31	0.06	0.27	0.49	0.01
Uniform Delay, d1	20.0	21.6		21.6	20.2		6.7	7.7	6.5	7.4	8.7	6.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.9		1.7	0.3		0.4	1.0	0.2	1.1	1.9	0.0
Delay (s)	20.3	22.5		23.3	20.5		7.1	8.6	6.7	8.6	10.6	6.3
Level of Service	C	C		C	C		A	A	A	A	B	A
Approach Delay (s)		22.1			21.8			8.1			10.1	
Approach LOS		C			C			A			B	
Intersection Summary												
HCM 2000 Control Delay		13.7							B			
HCM 2000 Volume to Capacity ratio		0.50										
Actuated Cycle Length (s)		65.8							13.0			
Intersection Capacity Utilization		86.4%							E			
Analysis Period (min)		15										
c Critical Lane Group												

Timings
1: Riddell Road & Alder Street

2020 PM Peak Hour
200195 - Orangeville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↰	↱	↰	↱	↰	↰	↱	↱
Traffic Volume (vph)	16	58	129	98	75	588	181	35	369	27
Future Volume (vph)	16	58	129	98	75	588	181	35	369	27
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		6		2		4		8		8
Permitted Phases	6		2		4		4	8		8
Detector Phase	6	6	2	2	4	4	4	8	8	8
Switch Phase										
Minimum Initial (s)	8.0	8.0	8.0	8.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	31.0	31.0	31.0	31.0	36.0	36.0	36.0	36.0	36.0	36.0
Total Split (s)	37.0	37.0	37.0	37.0	36.0	36.0	36.0	36.0	36.0	36.0
Total Split (%)	50.7%	50.7%	50.7%	50.7%	49.3%	49.3%	49.3%	49.3%	49.3%	49.3%
Yellow Time (s)	5.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	Max	Max	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	30.1	30.1	30.1	30.1	28.3	28.3	28.3	28.3	28.3	28.3
Actuated g/C Ratio	0.42	0.42	0.42	0.42	0.40	0.40	0.40	0.40	0.40	0.40
v/c Ratio	0.03	0.13	0.26	0.21	0.27	0.92	0.27	0.32	0.59	0.04
Control Delay	13.2	9.9	15.8	11.0	17.2	41.0	6.0	23.5	20.9	1.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.2	9.9	15.8	11.0	17.2	41.0	6.0	23.5	20.9	1.4
LOS	B	A	B	B	B	D	A	C	C	A
Approach Delay		10.4		13.2		31.4		20.0		
Approach LOS		B		B		C		B		

Intersection Summary

Cycle Length: 73
Actuated Cycle Length: 71.4
Natural Cycle: 70
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 24.0
Intersection Capacity Utilization 75.1%
Analysis Period (min) 15

Splits and Phases: 1: Riddell Road & Alder Street

↰	↱	↰	↱
37 s	36 s	37 s	36 s
↰	↱	↰	↱
37 s	36 s	37 s	36 s

Queues
1: Riddell Road & Alder Street

2020 PM Peak Hour
200195 - Orangeville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	17	97	140	162	82	639	197	38	401	29
v/c Ratio	0.03	0.13	0.26	0.21	0.27	0.92	0.27	0.32	0.59	0.04
Control Delay	13.2	9.9	15.8	11.0	17.2	41.0	6.0	23.5	20.9	1.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.2	9.9	15.8	11.0	17.2	41.0	6.0	23.5	20.9	1.4
Queue Length 50th (m)	1.4	5.4	12.9	10.5	7.5	82.6	5.0	3.6	43.0	0.0
Queue Length 95th (m)	5.1	14.1	25.4	22.3	17.7	#146.3	17.1	12.0	69.9	1.9
Internal Link Dist (m)		197.3		149.7		592.2		140.4		
Turn Bay Length (m)	25.0		25.0		95.0		35.0	110.0		40.0
Base Capacity (vph)	522	768	544	768	326	740	760	126	726	699
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.13	0.26	0.21	0.25	0.86	0.26	0.30	0.55	0.04

Intersection Summary

of lanes shown is within posted capacity, queue may be longer.
Queue shown is maximum over two cycles.

HCM Signalized Intersection Capacity Analysis 1: Riddell Road & Alder Street

2020 PM Peak Hour
20195 - Orangeville Intersections

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱	↰	↱	↰	↱
Traffic Volume (vph)	16	58	31	129	98	51	75	588	181	35	369	27
Future Volume (vph)	16	58	31	129	98	51	75	588	181	35	369	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1781		1771	1767		1803	1759	1615	1805	1727	1579
Flt Permitted	0.65	1.00		0.69	1.00		0.41	1.00	1.00	0.16	1.00	1.00
Satd. Flow (perm)	1243	1781		1294	1767		774	1759	1615	300	1727	1579
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	63	34	140	107	55	82	639	197	38	401	29
RTOR Reduction (vph)	0	20	0	0	25	0	0	0	84	0	0	18
Lane Group Flow (vph)	17	77	0	140	137	0	82	639	113	38	401	11
Confl. Peds. (#/hr)			7	7			2					2
Heavy Vehicles (%)	0%	0%	0%	1%	0%	6%	0%	8%	0%	0%	10%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	6			2			4			8		
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	30.1	30.1		30.1	30.1		28.3	28.3	28.3	28.3	28.3	28.3
Effective Green, g (s)	30.1	30.1		30.1	30.1		28.3	28.3	28.3	28.3	28.3	28.3
Actuated g/C Ratio	0.42	0.42		0.42	0.42		0.40	0.40	0.40	0.40	0.40	0.40
Clearance Time (s)	7.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	0.2	0.2		0.2	0.2		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	524	750		545	744		306	697	640	118	684	625
v/s Ratio Prot		0.04			0.08			0.36			0.23	
v/s Ratio Perm	0.01			0.11			0.11		0.07	0.13		0.01
v/c Ratio	0.03	0.10		0.26	0.18		0.27	0.92	0.18	0.32	0.59	0.02
Uniform Delay, d1	12.1	12.5		13.4	13.0		14.6	20.4	14.0	14.9	16.9	13.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.3		1.1	0.5		0.5	16.8	0.1	1.6	1.3	0.0
Delay (s)	12.2	12.8		14.5	13.5		15.0	37.2	14.1	16.5	18.2	13.1
Level of Service	B	B		B	B		B	D	B	B	B	B
Approach Delay (s)		12.7			14.0			30.3			17.8	
Approach LOS		B			B			C			B	

Intersection Summary

HCM 2000 Control Delay	23.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	71.4	Sum of lost time (s)	13.0
Intersection Capacity Utilization	75.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Timings 2: Riddell Road & Spencer Avenue/Centennial Road

2020 PM Peak Hour
200195 - Orangeville Intersections

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↰	↱	↰	↱	↰	↱	↰	↱
Traffic Volume (vph)	48	117	153	183	150	556	128	87	266	19
Future Volume (vph)	48	117	153	183	150	556	128	87	266	19
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	8		4		6		6		2	
Permitted Phases	8		4		6		6		2	
Detector Phase	8	8	4	4	6	6	6	2	2	2
Switch Phase										
Minimum Initial (s)	15.0	15.0	15.0	15.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	31.0	31.0	31.0	31.0	44.0	44.0	44.0	44.0	44.0	44.0
Total Split (s)	31.0	31.0	31.0	31.0	44.0	44.0	44.0	44.0	44.0	44.0
Total Split (%)	41.3%	41.3%	41.3%	41.3%	58.7%	58.7%	58.7%	58.7%	58.7%	58.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	7.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	16.6	16.6	16.6	16.6	37.1	37.1	37.1	37.1	37.1	37.1
Actuated g/C Ratio	0.25	0.25	0.25	0.25	0.56	0.56	0.56	0.56	0.56	0.56
v/c Ratio	0.20	0.35	0.55	0.55	0.25	0.68	0.17	0.25	0.30	0.03
Control Delay	21.8	19.6	29.8	24.7	9.6	16.6	2.4	10.7	9.5	1.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.8	19.6	29.8	24.7	9.6	16.6	2.4	10.7	9.5	1.3
LOS	C	B	C	C	A	B	A	B	A	A
Approach Delay		20.1		26.7		13.2			9.4	
Approach LOS		C		C		B			A	

Splits and Phases: 2: Riddell Road & Spencer Avenue/Centennial Road



Queues
2: Riddell Road & Spencer Avenue/Centennial Road

2020 PM Peak Hour
200195 - Orangeville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	49	162	158	249	155	573	132	90	274	20
v/c Ratio	0.20	0.35	0.55	0.55	0.25	0.68	0.17	0.25	0.30	0.03
Control Delay	21.8	19.6	29.8	24.7	9.6	16.6	2.4	10.7	9.5	1.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.8	19.6	29.8	24.7	9.6	16.6	2.4	10.7	9.5	1.3
Queue Length 50th (m)	5.1	14.6	17.9	25.4	8.8	45.3	0.0	5.1	16.1	0.0
Queue Length 95th (m)	13.1	29.3	35.3	45.9	22.7	99.1	7.4	15.9	35.9	1.4
Internal Link Dist (m)		130.7		209.9		212.7			592.2	
Turn Bay Length (m)	50.0		40.0		105.0		60.0	165.0		160.0
Base Capacity (vph)	370	689	432	669	611	838	776	361	902	694
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.24	0.37	0.37	0.25	0.68	0.17	0.25	0.30	0.03
Intersection Summary										

HCM Signalized Intersection Capacity Analysis
2: Riddell Road & Spencer Avenue/Centennial Road

2020 PM Peak Hour
200195 - Orangeville Intersections

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↰	↱	↲	↰	↱	↲	↰	↱	↲
Traffic Volume (vph)	48	117	40	153	183	58	150	556	128	87	266	19
Future Volume (vph)	48	117	40	153	183	58	150	556	128	87	266	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1796		1671	1745		1770	1508	1292	1687	1624	1214
Flt Permitted	0.53	1.00		0.65	1.00		0.59	1.00	1.00	0.37	1.00	1.00
Satd. Flow (perm)	988	1796		1151	1745		1101	1508	1292	650	1624	1214
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	49	121	41	158	189	60	155	573	132	90	274	20
RTOR Reduction (vph)	0	18	0	0	17	0	0	0	59	0	0	9
Lane Group Flow (vph)	49	144	0	158	232	0	155	573	73	90	274	11
Heavy Vehicles (%)	2%	1%	4%	8%	3%	11%	2%	26%	25%	7%	17%	33%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		8			4			6			2	
Permitted Phases	8			4			6		6	2		2
Actuated Green, G (s)	16.6	16.6		16.6	16.6		37.1	37.1	37.1	37.1	37.1	37.1
Effective Green, g (s)	16.6	16.6		16.6	16.6		37.1	37.1	37.1	37.1	37.1	37.1
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.56	0.56	0.56	0.56	0.56	0.56
Clearance Time (s)	6.0	6.0		6.0	6.0		7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	245	446		286	434		612	838	718	361	903	675
v/s Ratio Prot		0.08			0.13			c0.38			0.17	
v/s Ratio Perm	0.05			c0.14			0.14		0.06	0.14		0.01
v/c Ratio	0.20	0.32		0.55	0.53		0.25	0.68	0.10	0.25	0.30	0.02
Uniform Delay, d1	19.8	20.5		21.8	21.7		7.6	10.6	7.0	7.6	7.9	6.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.4		2.3	1.3		1.0	4.5	0.3	1.6	0.9	0.0
Delay (s)	20.2	20.9		24.1	23.0		8.6	15.1	7.2	9.3	8.8	6.7
Level of Service	C	C		C	C		A	B	A	A	A	A
Approach Delay (s)		20.7			23.4			12.7			8.8	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM 2000 Control Delay		15.2										
HCM 2000 Volume to Capacity ratio		0.64										
Actuated Cycle Length (s)		66.7							13.0			
Intersection Capacity Utilization		83.3%										
Analysis Period (min)		15										
c Critical Lane Group												

Appendix D

2031 Traffic Operations Reports



Timings
1: Riddell Road & Alder Street

2031 AM Peak Hour
200195 - Orangville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↰	↱	↰	↱	↰	↰	↱	↱
Traffic Volume (vph)	17	193	154	70	28	345	168	120	592	17
Future Volume (vph)	17	193	154	70	28	345	168	120	592	17
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		6		2		4		8		8
Permitted Phases	6		2		4		4	8		8
Detector Phase	6	6	2	2	4	4	4	8	8	8
Switch Phase										
Minimum Initial (s)	8.0	8.0	8.0	8.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	31.0	31.0	31.0	31.0	36.0	36.0	36.0	36.0	36.0	36.0
Total Split (s)	31.0	31.0	31.0	31.0	59.0	59.0	59.0	59.0	59.0	59.0
Total Split (%)	34.4%	34.4%	34.4%	34.4%	65.6%	65.6%	65.6%	65.6%	65.6%	65.6%
Yellow Time (s)	5.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	Max	Max	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	24.5	24.5	24.5	24.5	37.1	37.1	37.1	37.1	37.1	37.1
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.50	0.50	0.50	0.50	0.50	0.50
v/c Ratio	0.05	0.51	0.63	0.25	0.22	0.55	0.23	0.38	0.88	0.03
Control Delay	22.6	26.3	36.7	18.1	13.4	15.5	2.0	14.0	29.8	0.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.6	26.3	36.7	18.1	13.4	15.5	2.0	14.0	29.8	0.7
LOS	C	C	D	B	B	B	A	B	C	A
Approach Delay		26.0		28.6		11.2			26.5	
Approach LOS		C		C		B			C	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 74.9
Natural Cycle: 70
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 22.1
Intersection Capacity Utilization 89.7%
Analysis Period (min) 15

Splits and Phases: 1: Riddell Road & Alder Street

← 02	↰ 04
31 s	59 s
→ 06	↱ 08
31 s	59 s

Queues
1: Riddell Road & Alder Street

2031 AM Peak Hour
200195 - Orangville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	21	287	188	144	34	421	205	146	722	21
v/c Ratio	0.05	0.51	0.63	0.25	0.22	0.55	0.23	0.38	0.88	0.03
Control Delay	22.6	26.3	36.7	18.1	13.4	15.5	2.0	14.0	29.8	0.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.6	26.3	36.7	18.1	13.4	15.5	2.0	14.0	29.8	0.7
Queue Length 50th (m)	2.1	32.3	23.2	11.1	2.6	40.1	0.0	12.4	88.5	0.0
Queue Length 95th (m)	8.0	63.2	#56.7	27.6	7.2	54.3	6.2	21.6	112.8	0.6
Internal Link Dist (m)		197.3		149.7		592.2			140.4	
Turn Bay Length (m)	25.0		25.0		95.0		35.0	110.0		40.0
Base Capacity (vph)	413	559	300	567	227	1106	1200	560	1193	1068
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.51	0.63	0.25	0.15	0.38	0.17	0.26	0.61	0.02

Intersection Summary

of lanes shown is within planned capacity, queue may be longer.
Queue shown is maximum over two cycles.

HCM Signalized Intersection Capacity Analysis
1: Riddell Road & Alder Street

2031 AM Peak Hour
200195 - Orangville Intersections

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱	↰	↱	↰	↱
Traffic Volume (vph)	17	193	43	154	70	48	28	345	168	120	592	17
Future Volume (vph)	17	193	43	154	70	48	28	345	168	120	592	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		0.95	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.94		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1691		1679	1655		1582	1532	1583	1671	1652	1462
Flt Permitted	0.67	1.00		0.52	1.00		0.19	1.00	1.00	0.44	1.00	1.00
Satd. Flow (perm)	1264	1691		926	1655		316	1532	1583	775	1652	1462
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	21	235	52	188	85	59	34	421	205	146	722	21
RTOR Reduction (vph)	0	8	0	0	26	0	0	0	103	0	0	11
Lane Group Flow (vph)	21	279	0	188	118	0	34	421	102	146	722	10
Confl. Peds. (#/hr)			52	52			2					2
Heavy Vehicles (%)	0%	9%	0%	2%	2%	16%	14%	24%	2%	8%	15%	8%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4		4	8		8
Actuated Green, G (s)	24.5	24.5		24.5	24.5		37.1	37.1	37.1	37.1	37.1	37.1
Effective Green, g (s)	24.5	24.5		24.5	24.5		37.1	37.1	37.1	37.1	37.1	37.1
Actuated g/C Ratio	0.33	0.33		0.33	0.33		0.50	0.50	0.50	0.50	0.50	0.50
Clearance Time (s)	7.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	0.2	0.2		0.2	0.2		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	415	555		304	543		157	761	787	385	821	727
v/s Ratio Prot		0.16			0.07			0.27			0.44	
v/s Ratio Perm	0.02			0.20			0.11		0.06	0.19		0.01
v/c Ratio	0.05	0.50		0.62	0.22		0.22	0.55	0.13	0.38	0.88	0.01
Uniform Delay, d1	17.1	20.1		21.1	18.1		10.6	13.0	10.1	11.6	16.8	9.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	3.2		9.1	0.9		0.7	0.9	0.1	0.6	10.6	0.0
Delay (s)	17.3	23.4		30.2	19.0		11.3	13.9	10.1	12.2	27.3	9.5
Level of Service	B	C		C	B		B	B	B	B	C	A
Approach Delay (s)		23.0			25.4			12.6			24.4	
Approach LOS		C			C			B			C	

Intersection Summary

HCM 2000 Control Delay	20.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	74.6	Sum of lost time (s)	13.0
Intersection Capacity Utilization	89.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Timings
2: Riddell Road & Spencer Avenue/Centennial Road

2031 AM Peak Hour
200195 - Orangville Intersections

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↰	↱	↰	↱	↰	↱	↰	↱
Traffic Volume (vph)	72	186	138	97	62	321	92	195	543	8
Future Volume (vph)	72	186	138	97	62	321	92	195	543	8
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		8		4		6		6	2	2
Permitted Phases	8		4		6		6	2	2	2
Detector Phase	8	8	4	4	6	6	6	2	2	2
Switch Phase										
Minimum Initial (s)	15.0	15.0	15.0	15.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	31.0	31.0	31.0	31.0	44.0	44.0	44.0	44.0	44.0	44.0
Total Split (s)	44.0	44.0	44.0	44.0	46.0	46.0	46.0	46.0	46.0	46.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	7.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	18.9	18.9	18.9	18.9	39.2	39.2	39.2	39.2	39.2	39.2
Actuated g/C Ratio	0.27	0.27	0.27	0.27	0.55	0.55	0.55	0.55	0.55	0.55
v/c Ratio	0.23	0.68	0.81	0.36	0.17	0.40	0.13	0.37	0.63	0.01
Control Delay	21.8	28.6	57.3	16.5	11.0	12.1	3.0	12.8	16.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.8	28.6	57.3	16.5	11.0	12.1	3.0	12.8	16.1	0.0
LOS	C	C	E	B	B	B	A	B	B	A
Approach Delay		27.4		34.9		10.2			15.0	
Approach LOS		C		C		B			B	

Splits and Phases: 2: Riddell Road & Spencer Avenue/Centennial Road

↰ 02	↱ 04
46 s	44 s
↰ 06	↱ 08
46 s	44 s

Queues
2: Riddell Road & Spencer Avenue/Centennial Road

2031 AM Peak Hour
200195 - Orangville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	74	339	142	173	64	331	95	201	560	8
v/c Ratio	0.23	0.68	0.81	0.36	0.17	0.40	0.13	0.37	0.63	0.01
Control Delay	21.8	28.6	57.3	16.5	11.0	12.1	3.0	12.8	16.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.8	28.6	57.3	16.5	11.0	12.1	3.0	12.8	16.1	0.0
Queue Length 50th (m)	8.1	38.4	18.5	13.5	3.8	22.8	0.0	13.5	45.9	0.0
Queue Length 95th (m)	17.8	52.9	44.4	28.2	13.2	54.3	7.3	37.0	104.9	0.0
Internal Link Dist (m)		130.7		209.9		212.7			592.2	
Turn Bay Length (m)	50.0		40.0		105.0		60.0	165.0		160.0
Base Capacity (vph)	647	967	355	921	376	829	753	545	893	684
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.35	0.40	0.19	0.17	0.40	0.13	0.37	0.63	0.01

Intersection Summary

Queue shown is maximum and may vary.

HCM Signalized Intersection Capacity Analysis
2: Riddell Road & Spencer Avenue/Centennial Road

2031 AM Peak Hour
200195 - Orangville Intersections

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	72	186	101	138	97	71	62	321	92	195	543	8
Future Volume (vph)	72	186	101	138	97	71	62	321	92	195	543	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.94		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1778		1671	1673		1770	1508	1292	1687	1624	1214
Flt Permitted	0.65	1.00		0.38	1.00		0.37	1.00	1.00	0.56	1.00	1.00
Satd. Flow (perm)	1207	1778		663	1673		686	1508	1292	991	1624	1214
Peak-hour factor, PHF	0.97	0.79	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	74	235	104	142	100	73	64	331	95	201	560	8
RTOR Reduction (vph)	0	23	0	0	37	0	0	0	43	0	0	4
Lane Group Flow (vph)	74	316	0	142	136	0	64	331	52	201	560	4
Heavy Vehicles (%)	2%	1%	4%	8%	3%	11%	2%	26%	25%	7%	17%	33%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	8			4			6				2	
Permitted Phases	8			4			6			2		2
Actuated Green, G (s)	18.9	18.9		18.9	18.9		39.2	39.2	39.2	39.2	39.2	39.2
Effective Green, g (s)	18.9	18.9		18.9	18.9		39.2	39.2	39.2	39.2	39.2	39.2
Actuated g/C Ratio	0.27	0.27		0.27	0.27		0.55	0.55	0.55	0.55	0.55	0.55
Clearance Time (s)	6.0	6.0		6.0	6.0		7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	320	472		176	444		378	831	712	546	895	669
v/s Ratio Prot		0.18			0.08			0.22			c0.34	
v/s Ratio Perm	0.06			c0.21			0.09		0.04	0.20		0.00
v/c Ratio	0.23	0.67		0.81	0.31		0.17	0.40	0.07	0.37	0.63	0.01
Uniform Delay, d1	20.4	23.3		24.4	20.9		7.9	9.2	7.5	9.0	10.9	7.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	3.7		23.0	0.4		1.0	1.4	0.2	1.9	3.3	0.0
Delay (s)	20.8	27.0		47.4	21.2		8.9	10.6	7.7	10.9	14.2	7.2
Level of Service	C	C		D	C		A	B	A	B	B	A
Approach Delay (s)		25.9			33.0			9.8			13.3	
Approach LOS		C			C			A			B	

Intersection Summary

HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	71.1	Sum of lost time (s)	13.0
Intersection Capacity Utilization	85.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Timings 2031 PM Peak Hour
1: Riddell Road & Alder Street 200195 - Orangeville Intersections

										
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	19	72	160	122	93	731	225	44	459	34
Future Volume (vph)	19	72	160	122	93	731	225	44	459	34
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	6		2		4		4		8	
Permitted Phases	6		2		4		4		8	
Detector Phase	6	6	2	2	4	4	4	8	8	8
Switch Phase										
Minimum Initial (s)	8.0	8.0	8.0	8.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	31.0	31.0	31.0	31.0	36.0	36.0	36.0	36.0	36.0	36.0
Total Split (s)	31.0	31.0	31.0	31.0	59.0	59.0	59.0	59.0	59.0	59.0
Total Split (%)	34.4%	34.4%	34.4%	34.4%	65.6%	65.6%	65.6%	65.6%	65.6%	65.6%
Yellow Time (s)	5.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	Max	Max	Max	Max	None	None	None	None	None	None
Act Effect Green (s)	24.5	24.5	24.5	24.5	39.0	39.0	39.0	39.0	39.0	39.0
Actuated g/C Ratio	0.32	0.32	0.32	0.32	0.51	0.51	0.51	0.51	0.51	0.51
v/c Ratio	0.05	0.20	0.43	0.35	0.28	0.89	0.27	0.35	0.57	0.04
Control Delay	23.4	18.9	28.1	21.9	12.1	29.6	4.2	18.1	15.2	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.4	18.9	28.1	21.9	12.1	29.6	4.2	18.1	15.2	2.0
LOS	C	B	C	C	B	C	A	B	B	A
Approach Delay	19.6		24.8		22.6		14.6			
Approach LOS	B		C		C		B			

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 76.7
Natural Cycle: 75
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 20.7
Intersection Capacity Utilization 82.6%
Analysis Period (min) 15

Splits and Phases: 1: Riddell Road & Alder Street

↰ Ø2	↱ Ø4
31 s	59 s
↰ Ø6	↱ Ø8
31 s	59 s

Queues 2031 PM Peak Hour
1: Riddell Road & Alder Street 200195 - Orangeville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	21	120	174	201	101	795	245	48	499	37
v/c Ratio	0.05	0.20	0.43	0.35	0.28	0.89	0.27	0.35	0.57	0.04
Control Delay	23.4	18.9	28.1	21.9	12.1	29.6	4.2	18.1	15.2	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.4	18.9	28.1	21.9	12.1	29.6	4.2	18.1	15.2	2.0
Queue Length 50th (m)	2.2	10.0	21.1	20.1	8.1	100.1	6.1	4.0	48.4	0.0
Queue Length 95th (m)	8.7	27.1	47.9	45.9	17.2	152.4	16.3	12.3	73.3	3.0
Internal Link Dist (m)	197.3		149.7		592.2		140.4			
Turn Bay Length (m)	25.0		25.0		95.0		35.0		110.0	
Base Capacity (vph)	383	587	403	582	503	1239	1185	193	1216	1126
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.20	0.43	0.35	0.20	0.64	0.21	0.25	0.41	0.03

Intersection Summary

HCM Signalized Intersection Capacity Analysis 1: Riddell Road & Alder Street

2031 PM Peak Hour
200195 - Orangeville Intersections

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↰	↱	↲	↰	↱	↲	↰	↱	↲
Traffic Volume (vph)	19	72	39	160	122	63	93	731	225	44	459	34
Future Volume (vph)	19	72	39	160	122	63	93	731	225	44	459	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1781		1770	1768		1803	1759	1615	1805	1727	1579
Flt Permitted	0.63	1.00		0.68	1.00		0.38	1.00	1.00	0.14	1.00	1.00
Satd. Flow (perm)	1200	1781		1267	1768		716	1759	1615	273	1727	1579
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	78	42	174	133	68	101	795	245	48	499	37
RTOR Reduction (vph)	0	20	0	0	19	0	0	0	79	0	0	18
Lane Group Flow (vph)	21	100	0	174	182	0	101	795	166	48	499	19
Confl. Peds. (#/hr)			7	7			2					2
Heavy Vehicles (%)	0%	0%	0%	1%	0%	6%	0%	8%	0%	0%	10%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	6			2			4			8		
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	24.5	24.5		24.5	24.5		39.0	39.0	39.0	39.0	39.0	39.0
Effective Green, g (s)	24.5	24.5		24.5	24.5		39.0	39.0	39.0	39.0	39.0	39.0
Actuated g/C Ratio	0.32	0.32		0.32	0.32		0.51	0.51	0.51	0.51	0.51	0.51
Clearance Time (s)	7.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	0.2	0.2		0.2	0.2		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	384	570		405	566		365	896	823	139	880	804
v/s Ratio Prot		0.06			0.10			0.45			0.29	
v/s Ratio Perm	0.02			0.14			0.14		0.10	0.18		0.01
v/c Ratio	0.05	0.18		0.43	0.32		0.28	0.89	0.20	0.35	0.57	0.02
Uniform Delay, d1	18.0	18.7		20.5	19.7		10.7	16.8	10.2	11.2	12.9	9.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.7		3.3	1.5		0.4	10.6	0.1	1.5	0.8	0.0
Delay (s)	18.3	19.4		23.8	21.2		11.1	27.4	10.4	12.7	13.8	9.3
Level of Service	B	B		C	C		B	C	B	B	B	A
Approach Delay (s)		19.2			22.4			22.3			13.4	
Approach LOS		B			C			C			B	

Intersection Summary

HCM 2000 Control Delay	19.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	76.5	Sum of lost time (s)	13.0
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Timings 2: Riddell Road & Spencer Avenue/Centennial Road

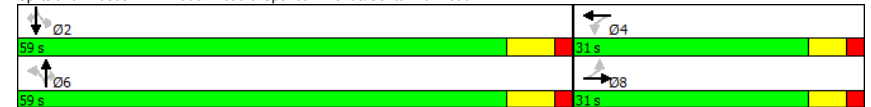
2031 PM Peak Hour
200195 - Orangeville Intersections

										
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	60	145	190	228	186	691	159	109	331	23
Future Volume (vph)	60	145	190	228	186	691	159	109	331	23
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	8		4		6		6		2	
Permitted Phases	8		4		6		6		2	
Detector Phase	8		4		6		6		2	
Switch Phase										
Minimum Initial (s)	15.0	15.0	15.0	15.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	31.0	31.0	31.0	31.0	44.0	44.0	44.0	44.0	44.0	44.0
Total Split (s)	31.0	31.0	31.0	31.0	59.0	59.0	59.0	59.0	59.0	59.0
Total Split (%)	34.4%	34.4%	34.4%	34.4%	65.6%	65.6%	65.6%	65.6%	65.6%	65.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	7.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	20.9	20.9	20.9	20.9	52.1	52.1	52.1	52.1	52.1	52.1
Actuated g/C Ratio	0.24	0.24	0.24	0.24	0.61	0.61	0.61	0.61	0.61	0.61
v/c Ratio	0.37	0.44	0.81	0.71	0.31	0.78	0.19	0.37	0.35	0.03
Control Delay	33.9	28.0	56.4	37.5	10.8	21.4	2.1	14.3	10.4	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.9	28.0	56.4	37.5	10.8	21.4	2.1	14.3	10.4	2.0
LOS	C	C	E	D	B	C	A	B	B	A
Approach Delay	29.4		44.8		16.6		10.9			
Approach LOS	C		D		B		B			
Intersection Summary										
Cycle Length: 90										
Actuated Cycle Length: 86										
Natural Cycle: 80										
Control Type: Semi Act-Uncoord										
Maximum v/c Ratio: 0.81										
Intersection Signal Delay: 23.0										
Intersection Capacity Utilization 93.6%										
Intersection LOS: C										
ICU Level of Service F										
Analysis Period (min) 15										

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 86	
Natural Cycle: 80	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 23.0	Intersection LOS: C
Intersection Capacity Utilization 93.6%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 2: Riddell Road & Spencer Avenue/Centennial Road



Queues
2: Riddell Road & Spencer Avenue/Centennial Road

2031 PM Peak Hour
200195 - Orangeville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	62	200	196	309	192	712	164	112	341	24
v/c Ratio	0.37	0.44	0.81	0.71	0.31	0.78	0.19	0.37	0.35	0.03
Control Delay	33.9	28.0	56.4	37.5	10.8	21.4	2.1	14.3	10.4	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.9	28.0	56.4	37.5	10.8	21.4	2.1	14.3	10.4	2.0
Queue Length 50th (m)	8.9	26.4	32.0	46.3	15.4	87.9	0.0	9.4	28.1	0.0
Queue Length 95th (m)	21.1	46.2	#64.7	74.6	30.6	#163.8	8.0	23.8	48.5	2.3
Internal Link Dist (m)		130.7		209.9		212.7			592.2	
Turn Bay Length (m)	50.0		40.0		105.0		60.0	165.0		160.0
Base Capacity (vph)	199	536	291	520	615	913	847	301	983	749
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.37	0.67	0.59	0.31	0.78	0.19	0.37	0.35	0.03

Intersection Summary

Queue shown is maximum and two-way.

HCM Signalized Intersection Capacity Analysis
2: Riddell Road & Spencer Avenue/Centennial Road

2031 PM Peak Hour
200195 - Orangeville Intersections

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↰	↱	↲	↰	↱	↲	↰	↱	↲
Traffic Volume (vph)	60	145	49	190	228	72	186	691	159	109	331	23
Future Volume (vph)	60	145	49	190	228	72	186	691	159	109	331	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1796		1671	1746		1770	1508	1292	1687	1624	1214
Flt Permitted	0.37	1.00		0.57	1.00		0.55	1.00	1.00	0.28	1.00	1.00
Satd. Flow (perm)	684	1796		998	1746		1017	1508	1292	496	1624	1214
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	62	149	51	196	235	74	192	712	164	112	341	24
RTOR Reduction (vph)	0	14	0	0	13	0	0	0	65	0	0	9
Lane Group Flow (vph)	62	186	0	196	296	0	192	712	99	112	341	15
Heavy Vehicles (%)	2%	1%	4%	8%	3%	11%	2%	26%	25%	7%	17%	33%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		8			4			6			2	
Permitted Phases	8			4			6		6	2		2
Actuated Green, G (s)	20.9	20.9		20.9	20.9		52.1	52.1	52.1	52.1	52.1	52.1
Effective Green, g (s)	20.9	20.9		20.9	20.9		52.1	52.1	52.1	52.1	52.1	52.1
Actuated g/C Ratio	0.24	0.24		0.24	0.24		0.61	0.61	0.61	0.61	0.61	0.61
Clearance Time (s)	6.0	6.0		6.0	6.0		7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	166	436		242	424		616	913	782	300	983	735
v/s Ratio Prot		0.10			0.17			c0.47			0.21	
v/s Ratio Perm	0.09			c0.20			0.19		0.08	0.23		0.01
v/c Ratio	0.37	0.43		0.81	0.70		0.31	0.78	0.13	0.37	0.35	0.02
Uniform Delay, d1	27.1	27.5		30.7	29.7		8.2	12.7	7.2	8.6	8.5	6.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	0.7		17.8	5.0		1.3	6.6	0.3	3.5	1.0	0.0
Delay (s)	28.5	28.2		48.5	34.6		9.6	19.2	7.6	12.2	9.4	6.8
Level of Service	C	C		D	C		A	B	A	B	A	A
Approach Delay (s)		28.2			40.0			15.7			9.9	
Approach LOS		C			D			B			A	

Intersection Summary

HCM 2000 Control Delay	21.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	86.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	93.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Appendix E

Riddell Road and Alder Street Remedial Measures Traffic Operations Reports



Queues
1: Riddell Road & Alder Street

2031 AM Peak Hour w Imp (Alder)
200195 - Orangville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	21	287	188	144	34	421	205	146	743
v/c Ratio	0.04	0.36	0.40	0.18	0.23	0.44	0.31	0.50	0.73
Control Delay	11.2	13.0	15.6	9.0	19.4	17.9	3.9	23.4	22.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.2	13.0	15.6	9.0	19.4	17.9	3.9	23.4	22.8
Queue Length 50th (m)	1.3	19.8	13.9	6.7	3.0	20.7	0.0	14.0	40.7
Queue Length 95th (m)	5.0	38.3	30.5	16.7	8.3	28.1	8.8	25.9	50.7
Internal Link Dist (m)		197.3		149.7		592.2			140.4
Turn Bay Length (m)	25.0		25.0		95.0		35.0	110.0	
Base Capacity (vph)	587	791	475	792	342	2241	1265	685	2410
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.36	0.40	0.18	0.10	0.19	0.16	0.21	0.31
Intersection Summary									

HCM Signalized Intersection Capacity Analysis
1: Riddell Road & Alder Street

2031 AM Peak Hour w Imp (Alder)
200195 - Orangville Intersections

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↰	↱	↲	↰	↱	↲	↰	↱	↲
Traffic Volume (vph)	17	193	43	154	70	48	28	345	168	120	592	17
Future Volume (vph)	17	193	43	154	70	48	28	345	168	120	592	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.95	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	0.94		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1695		1689	1655		1582	2911	1583	1671	3129	
Flt Permitted	0.67	1.00		0.58	1.00		0.27	1.00	1.00	0.51	1.00	
Satd. Flow (perm)	1264	1695		1038	1655		444	2911	1583	890	3129	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	21	235	52	188	85	59	34	421	205	146	722	21
RTOR Reduction (vph)	0	7	0	0	22	0	0	0	138	0	3	0
Lane Group Flow (vph)	21	280	0	188	122	0	34	421	67	146	740	0
Confl. Peds. (#/hr)			52	52			2					2
Heavy Vehicles (%)	0%	9%	0%	2%	2%	16%	14%	24%	2%	8%	15%	8%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		6			2			4		8		
Permitted Phases	6			2			4		4	8		
Actuated Green, G (s)	29.1	29.1		29.1	29.1		20.4	20.4	20.4	20.4	20.4	
Effective Green, g (s)	29.1	29.1		29.1	29.1		20.4	20.4	20.4	20.4	20.4	
Actuated g/C Ratio	0.47	0.47		0.47	0.47		0.33	0.33	0.33	0.33	0.33	
Clearance Time (s)	7.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	0.2	0.2		0.2	0.2		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	588	789		483	770		144	950	516	290	1021	
v/s Ratio Prot		0.17			0.07			0.14			c0.24	
v/s Ratio Perm	0.02			c0.18			0.08		0.04	0.16		
v/c Ratio	0.04	0.35		0.39	0.16		0.24	0.44	0.13	0.50	0.72	
Uniform Delay, d1	9.1	10.7		10.9	9.6		15.4	16.6	14.8	17.0	18.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	1.2		2.4	0.4		0.8	0.3	0.1	1.4	2.6	
Delay (s)	9.2	11.9		13.3	10.1		16.2	16.9	14.9	18.3	21.1	
Level of Service	A	B		B	B		B	B	B	B	C	
Approach Delay (s)		11.8			11.9			16.3			20.7	
Approach LOS		B			B			B			C	
Intersection Summary												
HCM 2000 Control Delay				16.8			HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio				0.53								
Actuated Cycle Length (s)				62.5			Sum of lost time (s)			13.0		
Intersection Capacity Utilization				76.0%			ICU Level of Service			D		
Analysis Period (min)				15								
c Critical Lane Group												

Queues
1: Riddell Road & Alder Street

2031 PM Peak Hour w Imp (Alder)
200195 - Orangeville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	21	120	174	201	101	795	245	48	536
v/c Ratio	0.04	0.16	0.33	0.26	0.35	0.68	0.34	0.28	0.47
Control Delay	12.3	10.2	14.8	11.6	17.2	19.0	3.4	17.7	15.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.3	10.2	14.8	11.6	17.2	19.0	3.4	17.7	15.1
Queue Length 50th (m)	1.3	5.7	12.0	11.4	7.9	37.8	0.0	3.7	22.4
Queue Length 95th (m)	5.7	17.5	30.8	29.3	18.5	53.6	11.2	11.0	33.7
Internal Link Dist (m)	197.3		149.7		592.2		140.4		
Turn Bay Length (m)	25.0		25.0		95.0		35.0		
Base Capacity (vph)	507	769	534	763	757	3088	1510	452	3016
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.16	0.33	0.26	0.13	0.26	0.16	0.11	0.18
Intersection Summary									

HCM Signalized Intersection Capacity Analysis
1: Riddell Road & Alder Street

2031 PM Peak Hour w Imp (Alder)
200195 - Orangeville Intersections

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	72	39	160	122	63	93	731	225	44	459	34
Future Volume (vph)	19	72	39	160	122	63	93	731	225	44	459	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Flrb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flrb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.95		1.00	0.95		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1783		1775	1768		1803	3343	1615	1805	3263	
Flt Permitted	0.63	1.00		0.68	1.00		0.43	1.00	1.00	0.26	1.00	
Satd. Flow (perm)	1200	1783		1270	1768		820	3343	1615	491	3263	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	78	42	174	133	68	101	795	245	48	499	37
RTOR Reduction (vph)	0	17	0	0	16	0	0	0	160	0	10	0
Lane Group Flow (vph)	21	103	0	174	185	0	101	795	85	48	526	0
Confl. Peds. (#/hr)	7		7		2		2		2		2	
Heavy Vehicles (%)	0%	0%	0%	1%	0%	6%	0%	8%	0%	0%	10%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	6		2		2		4		Perm		8	
Permitted Phases	6		2		2		4		4		8	
Actuated Green, G (s)	24.2	24.2		24.2	24.2		19.9	19.9	19.9	19.9	19.9	
Effective Green, g (s)	24.2	24.2		24.2	24.2		19.9	19.9	19.9	19.9	19.9	
Actuated g/C Ratio	0.42	0.42		0.42	0.42		0.35	0.35	0.35	0.35	0.35	
Clearance Time (s)	7.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	0.2	0.2		0.2	0.2		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	508	755		538	749		285	1165	562	171	1137	
v/s Ratio Prot	0.06		0.10		c0.24		c0.24		c0.24		0.16	
v/s Ratio Perm	0.02		c0.14		0.12		0.12		0.05		0.10	
v/c Ratio	0.04	0.14		0.32	0.25		0.35	0.68	0.15	0.28	0.46	
Uniform Delay, d1	9.6	10.1		11.0	10.6		13.8	15.9	12.8	13.4	14.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	0.4		1.6	0.8		0.8	1.7	0.1	0.9	0.3	
Delay (s)	9.8	10.4		12.6	11.4		14.6	17.6	12.9	14.3	14.7	
Level of Service	A	B		B	B		B	B	B	B	B	
Approach Delay (s)	10.3		11.9		16.3		16.3		14.7		14.7	
Approach LOS	B		B		B		B		B		B	
Intersection Summary												
HCM 2000 Control Delay	14.8			HCM 2000 Level of Service					B			
HCM 2000 Volume to Capacity ratio	0.49											
Actuated Cycle Length (s)	57.1			Sum of lost time (s)					13.0			
Intersection Capacity Utilization	64.4%			ICU Level of Service					C			
Analysis Period (min)	15											
c Critical Lane Group												

Appendix F

Riddell Road and Centennial Road/Spencer Avenue Protected Left-Turn Phasing Operations Reports



Queues 2031 AM Peak Hour w Imp (Spencer LT)
2: Riddell Road & Spencer Avenue/Centennial Road 200195 - Orangville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	74	339	142	173	64	331	95	201	560	8
v/c Ratio	0.28	0.83	0.59	0.31	0.56	0.59	0.17	0.78	0.72	0.01
Control Delay	36.5	54.5	34.6	22.6	68.1	32.9	4.5	64.1	29.7	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.5	54.5	34.6	22.6	68.1	32.9	4.5	64.1	29.7	0.0
Queue Length 50th (m)	13.3	66.5	21.4	21.9	13.8	58.8	0.0	41.8	97.8	0.0
Queue Length 95th (m)	26.8	83.8	36.6	39.8	#32.4	94.7	9.1	#76.8	152.2	0.0
Internal Link Dist (m)		130.7		209.9		212.7			592.2	
Turn Bay Length (m)	50.0		40.0		105.0		60.0	165.0		160.0
Base Capacity (vph)	327	496	240	639	119	563	551	294	781	625
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.68	0.59	0.27	0.54	0.59	0.17	0.68	0.72	0.01
Intersection Summary										
Queue shown is maximum and may vary.										

HCM Signalized Intersection Capacity Analysis 2031 AM Peak Hour w Imp (Spencer LT)
2: Riddell Road & Spencer Avenue/Centennial Road 200195 - Orangville Intersections

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↰	↱	↲	↰	↱	↲	↰	↱	↲
Traffic Volume (vph)	72	186	101	138	97	71	62	321	92	195	543	8
Future Volume (vph)	72	186	101	138	97	71	62	321	92	195	543	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		2.0	6.0		3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.94		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1778		1671	1673		1770	1508	1292	1687	1624	1214
Flt Permitted	0.65	1.00		0.23	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1207	1778		397	1673		1770	1508	1292	1687	1624	1214
Peak-hour factor, PHF	0.97	0.79	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	74	235	104	142	100	73	64	331	95	201	560	8
RTOR Reduction (vph)	0	15	0	0	25	0	0	0	59	0	0	4
Lane Group Flow (vph)	74	324	0	142	148	0	64	331	36	201	560	4
Heavy Vehicles (%)	2%	1%	4%	8%	3%	11%	2%	26%	25%	7%	17%	33%
Turn Type	Perm	NA		pm+pt	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		8		7	4		1	6		5		2
Permitted Phases	8			4					6			2
Actuated Green, G (s)	23.0	23.0		33.0	33.0		5.4	39.4	39.4	15.9	49.9	49.9
Effective Green, g (s)	23.0	23.0		33.0	33.0		5.4	39.4	39.4	15.9	49.9	49.9
Actuated g/C Ratio	0.22	0.22		0.32	0.32		0.05	0.38	0.38	0.15	0.48	0.48
Clearance Time (s)	6.0	6.0		2.0	6.0		3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	266	392		223	529		91	569	488	257	776	580
v/s Ratio Prot		c0.18		c0.05	0.09		0.04	0.22		c0.12	c0.34	
v/s Ratio Perm	0.06			0.15					0.03			0.00
v/c Ratio	0.28	0.83		0.64	0.28		0.70	0.58	0.07	0.78	0.72	0.01
Uniform Delay, d1	33.8	38.8		27.9	26.7		48.7	25.9	20.8	42.5	21.7	14.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	13.3		5.8	0.3		21.8	4.3	0.3	14.3	5.7	0.0
Delay (s)	34.3	52.1		33.7	27.0		70.4	30.2	21.1	56.8	27.4	14.3
Level of Service	C	D		C	C		E	C	C	E	C	B
Approach Delay (s)		48.9			30.0			33.7			35.0	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM 2000 Control Delay		36.8										
HCM 2000 Volume to Capacity ratio		0.77										
Actuated Cycle Length (s)		104.3							18.0			
Intersection Capacity Utilization		76.9%										
Analysis Period (min)		15										
c Critical Lane Group												

Queues
1: Riddell Road & Alder Street

2031 PM Peak Hour w Imp (Spencer LT)
200195 - Orangeville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	21	120	174	201	101	795	245	48	536
v/c Ratio	0.04	0.16	0.33	0.26	0.35	0.68	0.34	0.28	0.47
Control Delay	12.3	10.2	14.8	11.6	17.2	19.0	3.4	17.7	15.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.3	10.2	14.8	11.6	17.2	19.0	3.4	17.7	15.1
Queue Length 50th (m)	1.3	5.7	12.0	11.4	7.9	37.8	0.0	3.7	22.4
Queue Length 95th (m)	5.7	17.5	30.8	29.3	18.5	53.6	11.2	11.0	33.7
Internal Link Dist (m)	197.3	149.7	592.2						140.4
Turn Bay Length (m)	25.0	25.0	95.0			35.0	110.0		
Base Capacity (vph)	507	769	534	763	757	3088	1510	452	3016
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.16	0.33	0.26	0.13	0.26	0.16	0.11	0.18
Intersection Summary									

HCM Signalized Intersection Capacity Analysis
1: Riddell Road & Alder Street

2031 PM Peak Hour w Imp (Spencer LT)
200195 - Orangeville Intersections

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SEB	SBR
Lane Configurations													
Traffic Volume (vph)	19	72	39	160	122	63	93	731	225	44	459		34
Future Volume (vph)	19	72	39	160	122	63	93	731	225	44	459		34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		1900
Total Lost time (s)	7.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0		6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95		0.95
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	0.95		1.00	0.95		1.00	1.00	0.85	1.00	0.99		0.99
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00		1.00
Satd. Flow (prot)	1805	1783		1775	1768		1803	3343	1615	1805	3263		3263
Flt Permitted	0.63	1.00		0.68	1.00		0.43	1.00	1.00	0.26	1.00		1.00
Satd. Flow (perm)	1200	1783		1270	1768		820	3343	1615	491	3263		3263
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	78	42	174	133	68	101	795	245	48	499		37
RTOR Reduction (vph)	0	17	0	0	16	0	0	0	160	0	10	0	0
Lane Group Flow (vph)	21	103	0	174	185	0	101	795	85	48	526	0	0
Confl. Peds. (#/hr)			7	7			2						2
Heavy Vehicles (%)	0%	0%	0%	1%	0%	6%	0%	8%	0%	0%	10%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA		NA
Protected Phases		6			2			4		Perm	8		
Permitted Phases	6			2			4		4		8		
Actuated Green, G (s)	24.2	24.2		24.2	24.2		19.9	19.9	19.9	19.9	19.9		19.9
Effective Green, g (s)	24.2	24.2		24.2	24.2		19.9	19.9	19.9	19.9	19.9		19.9
Actuated g/C Ratio	0.42	0.42		0.42	0.42		0.35	0.35	0.35	0.35	0.35		0.35
Clearance Time (s)	7.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0		6.0
Vehicle Extension (s)	0.2	0.2		0.2	0.2		3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	508	755		538	749		285	1165	562	171	1137		
v/s Ratio Prot		0.06			0.10			c0.24					0.16
v/s Ratio Perm	0.02			c0.14			0.12		0.05	0.10			
v/c Ratio	0.04	0.14		0.32	0.25		0.35	0.68	0.15	0.28	0.46		
Uniform Delay, d1	9.6	10.1		11.0	10.6		13.8	15.9	12.8	13.4	14.4		
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.2	0.4		1.6	0.8		0.8	1.7	0.1	0.9	0.3		
Delay (s)	9.8	10.4		12.6	11.4		14.6	17.6	12.9	14.3	14.7		
Level of Service	A	B		B	B		B	B	B	B	B		B
Approach Delay (s)		10.3			11.9			16.3					14.7
Approach LOS		B			B			B					B
Intersection Summary													
HCM 2000 Control Delay				14.8	HCM 2000 Level of Service				B				
HCM 2000 Volume to Capacity ratio				0.49									
Actuated Cycle Length (s)				57.1	Sum of lost time (s)				13.0				
Intersection Capacity Utilization				64.4%	ICU Level of Service				C				
Analysis Period (min)				15									
c Critical Lane Group													

Queues 2031 PM Peak Hour w Imp (Spencer LT)
2: Riddell Road & Spencer Avenue/Centennial Road 200195 - Orangeville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	62	200	196	309	192	712	164	112	341	24
v/c Ratio	0.41	0.67	0.77	0.71	0.73	0.88	0.22	0.84	0.45	0.04
Control Delay	51.4	53.5	55.1	47.0	62.2	38.5	5.6	96.0	24.6	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.4	53.5	55.1	47.0	62.2	38.5	5.6	96.0	24.6	0.1
Queue Length 50th (m)	13.1	41.5	37.2	63.2	42.5	136.5	4.9	25.8	51.5	0.0
Queue Length 95th (m)	27.2	66.5	#63.1	94.6	69.0	#243.4	17.6	#63.1	92.6	0.0
Internal Link Dist (m)		130.7		209.9		212.7			592.2	
Turn Bay Length (m)	50.0		40.0		105.0		60.0	165.0		160.0
Base Capacity (vph)	208	407	256	543	341	805	745	134	755	617
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.49	0.77	0.57	0.56	0.88	0.22	0.84	0.45	0.04
Intersection Summary										
Queue shown is maximum and may vary. Queue may be longer.										

HCM Signalized Intersection Capacity Analysis 2031 PM Peak Hour w Imp (Spencer LT)
2: Riddell Road & Spencer Avenue/Centennial Road 200195 - Orangeville Intersections

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↰	↱	↲	↰	↱	↲	↰	↱	↲
Traffic Volume (vph)	60	145	49	190	228	72	186	691	159	109	331	23
Future Volume (vph)	60	145	49	190	228	72	186	691	159	109	331	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		2.0	6.0		3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1796		1671	1746		1770	1508	1292	1687	1624	1214
Flt Permitted	0.51	1.00		0.38	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	941	1796		676	1746		1770	1508	1292	1687	1624	1214
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	62	149	51	196	235	74	192	712	164	112	341	24
RTOR Reduction (vph)	0	11	0	0	10	0	0	0	55	0	0	13
Lane Group Flow (vph)	62	189	0	196	299	0	192	712	109	112	341	11
Heavy Vehicles (%)	2%	1%	4%	8%	3%	11%	2%	26%	25%	7%	17%	33%
Turn Type	Perm	NA	pm+pt	NA	Prot	NA	Perm	Prot	Perm	Prot	NA	Perm
Protected Phases	8		7	4	1		6			5		2
Permitted Phases	8		4				6					2
Actuated Green, G (s)	18.1	18.1		27.7	27.7		16.9	60.5	60.5	9.0	52.6	52.6
Effective Green, g (s)	18.1	18.1		27.7	27.7		16.9	60.5	60.5	9.0	52.6	52.6
Actuated g/C Ratio	0.16	0.16		0.24	0.24		0.15	0.53	0.53	0.08	0.46	0.46
Clearance Time (s)	6.0	6.0		2.0	6.0		3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	150	287		232	427		264	805	690	134	754	564
v/s Ratio Prot	0.11			c0.06	c0.17		c0.11	c0.47		c0.07		0.21
v/s Ratio Perm	0.07			0.15					0.08			0.01
v/c Ratio	0.41	0.66		0.84	0.70		0.73	0.88	0.16	0.84	0.45	0.02
Uniform Delay, d1	42.8	44.7		39.6	39.0		46.0	23.3	13.4	51.4	20.5	16.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	5.4		23.5	5.1		9.6	13.6	0.5	34.1	2.0	0.1
Delay (s)	44.6	50.0		63.1	44.1		55.5	36.8	13.9	85.4	22.5	16.4
Level of Service	D	D		E	D		E	D	B	F	C	B
Approach Delay (s)		48.8			51.5			36.7			37.0	
Approach LOS		D			D			D			D	
Intersection Summary												
HCM 2000 Control Delay		41.3										
HCM 2000 Volume to Capacity ratio		0.86										
Actuated Cycle Length (s)		113.2							18.0			
Intersection Capacity Utilization		90.5%							E			
Analysis Period (min)		15										
c Critical Lane Group												

Appendix G

Riddell Road and Centennial Road/Spencer Avenue Lane Re-assignment Operations Reports



Queues
2: Riddell Road & Spencer Avenue/Centennial Road
2031 AM Peak Hour (Spencer all Imp)
200195 - Orangville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	74	339	142	173	64	331	95	201	568
v/c Ratio	0.28	0.83	0.57	0.30	0.46	0.60	0.18	0.78	0.40
Control Delay	36.7	55.0	32.4	21.9	58.1	33.8	4.6	64.0	21.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.7	55.0	32.4	21.9	58.1	33.8	4.6	64.0	21.2
Queue Length 50th (m)	13.4	66.9	21.2	21.5	13.6	60.1	0.0	42.2	44.6
Queue Length 95th (m)	26.9	84.5	36.3	39.2	28.3	95.4	9.1	76.8	62.7
Internal Link Dist (m)		130.7		209.9		212.7			592.2
Turn Bay Length (m)	50.0		40.0		105.0		60.0	165.0	
Base Capacity (vph)	322	488	254	649	163	553	542	295	1413
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.69	0.56	0.27	0.39	0.60	0.18	0.68	0.40
Intersection Summary									
Queue shown is maximum and may vary.									

HCM Signalized Intersection Capacity Analysis
2: Riddell Road & Spencer Avenue/Centennial Road
2031 AM Peak Hour (Spencer all Imp)
200195 - Orangville Intersections

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	72	186	101	138	97	71	62	321	92	195	543	8
Future Volume (vph)	72	186	101	138	97	71	62	321	92	195	543	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		2.0	6.0		3.0	7.0	7.0	3.0	7.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	0.95	
Frt	1.00	0.95		1.00	0.94		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1778		1671	1673		1770	1508	1292	1687	3073	
Flt Permitted	0.65	1.00		0.22	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1207	1778		392	1673		1770	1508	1292	1687	3073	
Peak-hour factor, PHF	0.97	0.79	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	74	235	104	142	100	73	64	331	95	201	560	8
RTOR Reduction (vph)	0	15	0	0	25	0	0	0	60	0	1	0
Lane Group Flow (vph)	74	324	0	142	148	0	64	331	35	201	567	0
Heavy Vehicles (%)	2%	1%	4%	8%	3%	11%	2%	26%	25%	7%	17%	33%
Turn Type	Perm	NA		pm+pt	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		8		7	4		1	6		5	2	
Permitted Phases	8			4					6			
Actuated Green, G (s)	22.8	22.8		33.6	33.6		6.9	38.6	38.6	15.9	47.6	
Effective Green, g (s)	22.8	22.8		33.6	33.6		6.9	38.6	38.6	15.9	47.6	
Actuated g/C Ratio	0.22	0.22		0.32	0.32		0.07	0.37	0.37	0.15	0.46	
Clearance Time (s)	6.0	6.0		2.0	6.0		3.0	7.0	7.0	3.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	264	389		234	539		117	559	479	257	1405	
v/s Ratio Prot		c0.18		c0.05	0.09		0.04	c0.22		c0.12	0.18	
v/s Ratio Perm	0.06			0.14					0.03			
v/c Ratio	0.28	0.83		0.61	0.27		0.55	0.59	0.07	0.78	0.40	
Uniform Delay, d1	33.8	38.8		27.3	26.2		47.1	26.4	21.2	42.4	18.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.6	14.2		4.4	0.3		5.1	4.6	0.3	14.3	0.9	
Delay (s)	34.4	53.0		31.7	26.5		52.2	31.0	21.5	56.7	19.7	
Level of Service	C	D		C	C		D	C	C	E	B	
Approach Delay (s)		49.7			28.8			31.9			29.4	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM 2000 Control Delay		34.1										
HCM 2000 Volume to Capacity ratio		0.69										
Actuated Cycle Length (s)		104.1							18.0			
Intersection Capacity Utilization		71.9%										
Analysis Period (min)		15										
c Critical Lane Group												

Queues
2: Riddell Road & Spencer Avenue/Centennial Road
2031 PM Peak Hour (Spencer all Imp)
200195 - Orangeville Intersections

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	62	200	196	309	192	712	164	112	365
v/c Ratio	0.41	0.67	0.77	0.71	0.73	0.88	0.22	0.84	0.26
Control Delay	51.4	53.5	55.1	47.0	62.2	38.5	5.6	96.0	20.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.4	53.5	55.1	47.0	62.2	38.5	5.6	96.0	20.0
Queue Length 50th (m)	13.1	41.5	37.2	63.2	42.5	136.5	4.9	25.8	25.5
Queue Length 95th (m)	27.2	66.5	#63.1	94.6	69.0	#243.4	17.6	#63.1	43.4
Internal Link Dist (m)		130.7		209.9		212.7			592.2
Turn Bay Length (m)	50.0		40.0		105.0		60.0	165.0	
Base Capacity (vph)	208	407	256	543	341	805	745	134	1410
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.49	0.77	0.57	0.56	0.88	0.22	0.84	0.26

Intersection Summary

Queue shown is maximum and may vary.

HCM Signalized Intersection Capacity Analysis
2: Riddell Road & Spencer Avenue/Centennial Road
2031 PM Peak Hour (Spencer all Imp)
200195 - Orangeville Intersections

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	60	145	49	190	228	72	186	691	159	109	331	23
Future Volume (vph)	60	145	49	190	228	72	186	691	159	109	331	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		2.0	6.0		3.0	7.0	7.0	3.0	7.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	0.95	
Frt	1.00	0.96		1.00	0.96		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1796		1671	1746		1770	1508	1292	1687	3028	
Flt Permitted	0.51	1.00		0.38	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	941	1796		676	1746		1770	1508	1292	1687	3028	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	62	149	51	196	235	74	192	712	164	112	341	24
RTOR Reduction (vph)	0	11	0	0	10	0	0	0	55	0	4	0
Lane Group Flow (vph)	62	189	0	196	299	0	192	712	109	112	361	0
Heavy Vehicles (%)	2%	1%	4%	8%	3%	11%	2%	26%	25%	7%	17%	33%
Turn Type	Perm	NA	pm+pt	NA	Prot	NA	Perm	Prot	Perm	Prot	NA	
Protected Phases	8		7	4	1	6		5		2		
Permitted Phases	8		4		6							
Actuated Green, G (s)	18.1	18.1		27.7	27.7		16.9	60.5	60.5	9.0	52.6	
Effective Green, g (s)	18.1	18.1		27.7	27.7		16.9	60.5	60.5	9.0	52.6	
Actuated g/C Ratio	0.16	0.16		0.24	0.24		0.15	0.53	0.53	0.08	0.46	
Clearance Time (s)	6.0	6.0		2.0	6.0		3.0	7.0	7.0	3.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	150	287		232	427		264	805	690	134	1407	
v/s Ratio Prot	0.11		c0.06	c0.17		c0.11	c0.47		c0.07		0.12	
v/s Ratio Perm	0.07		0.15				0.08					
v/c Ratio	0.41	0.66		0.84	0.70		0.73	0.88	0.16	0.84	0.26	
Uniform Delay, d1	42.8	44.7		39.6	39.0		46.0	23.3	13.4	51.4	18.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.8	5.4		23.5	5.1		9.6	13.6	0.5	34.1	0.4	
Delay (s)	44.6	50.0		63.1	44.1		55.5	36.8	13.9	85.4	18.9	
Level of Service	D	D		E	D		E	D	B	F	B	
Approach Delay (s)	48.8			51.5			36.7				34.5	
Approach LOS	D			D			D				C	
Intersection Summary												
HCM 2000 Control Delay	40.8											
HCM 2000 Volume to Capacity ratio	0.86											
Actuated Cycle Length (s)	113.2								18.0			
Intersection Capacity Utilization	90.5%								E			
Analysis Period (min)	15											
c Critical Lane Group												

Appendix H

2031 ARCADY Reports



Junctions 8
ARCADY 8 - Roundabout Module
Version: 8.0.6.541 [19821,26/11/2015] © Copyright TRL Limited, 2020
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Filename: Alder and Riddell.arc8

Path: C:\Users\AdamMorrison\Desktop\Projects\200195 - Arcady

Report generation date: 2020-08-25 8:03:46 PM

Summary of intersection performance

	AM						
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Background 2031						
Intersection 1 - Leg North	0.46	1.04	5.57	0.31	A	11.63	B
Intersection 1 - Leg West	3.41	10.23	15.73	0.76	C		
Intersection 1 - Leg South	0.75	1.07	9.81	0.42	A		
Intersection 1 - Leg East	1.63	1.16	10.01	0.59	B		
Intersection 2 - Leg North	0.46	1.04	5.50	0.30	A	5.46	A
Intersection 2 - Leg West	1.10	?	4.98	0.49	A		
Intersection 2 - Leg South	0.72	1.07	9.34	0.40	A		
Intersection 2 - Leg East	0.71	1.16	4.29	0.38	A		
Intersection 3 - Leg North	0.25	~1	3.03	0.19	A	4.32	A
Intersection 3 - Leg West	1.09	?	4.91	0.49	A		
Intersection 3 - Leg South	0.32	~1	4.18	0.23	A		
Intersection 3 - Leg East	0.70	1.16	4.23	0.38	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Background 2031, PM" model duration: 4:00 PM - 5:30 PM

"D2 - Background 2031, AM " model duration: 8:00 AM - 9:30 AM

Run using Junctions 8.0.6.541 at 2020-08-25 8:03:45 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2020-08-25
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - Background 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Background 2031, AM	Background 2031	AM		ONE HOUR	08:00	09:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	(untitled)	Roundabout	North,West,South,East				11.63	B
2	2	(untitled)	Roundabout	North,West,South,East				5.46	A
3	3	(untitled)	Roundabout	North,West,South,East				4.32	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Alder Street	
1	West	West	Riddell Road	
1	South	South	Alder Street	
1	East	East	Riddell Road	
2	North	North	Alder Street	
2	West	West	Riddell Road	
2	South	South	Alder Street	
2	East	East	Riddell Road	
3	North	North	Alder Street	
3	West	West	Riddell Road	
3	South	South	Alder Street	
3	East	East	Riddell Road	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	South	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00

2	West	0.00	99999.00		0.00
2	South	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	South	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	South	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	3.50	4.50	30.00	20.00	47.50	25.00	
2	West	3.50	8.00	30.00	20.00	47.50	25.00	
2	South	3.50	4.50	30.00	20.00	47.50	25.00	
2	East	3.50	8.00	30.00	20.00	47.50	25.00	
3	North	3.50	8.00	30.00	20.00	55.00	25.00	
3	West	3.50	8.00	30.00	20.00	55.00	25.00	
3	South	3.50	8.00	30.00	20.00	55.00	25.00	
3	East	3.50	8.00	30.00	20.00	55.00	25.00	

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage	Region of Waterloo Standard		90.00
1	West	Percentage	Region of Waterloo Standard		90.00
1	South	Percentage	Region of Waterloo Standard		90.00
1	East	Percentage	Region of Waterloo Standard		90.00
2	North	Percentage	Region of Waterloo Standard		90.00
2	West	Percentage	Region of Waterloo Standard		90.00
2	South	Percentage	Region of Waterloo Standard		90.00
2	East	Percentage	Region of Waterloo Standard		90.00
3	North	Percentage	Region of Waterloo Standard		90.00
3	West	Percentage	Region of Waterloo Standard		90.00
3	South	Percentage	Region of Waterloo Standard		90.00
3	East	Percentage	Region of Waterloo Standard		90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	South		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.558	1221.701
2	West		(calculated)	(calculated)	0.685	1814.551
2	South		(calculated)	(calculated)	0.558	1221.701
2	East		(calculated)	(calculated)	0.685	1814.551
3	North		(calculated)	(calculated)	0.647	1814.551
3	West		(calculated)	(calculated)	0.647	1814.551
3	South		(calculated)	(calculated)	0.647	1814.551
3	East		(calculated)	(calculated)	0.647	1814.551

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
---------------------	------------------------------	------------------------------	-------------------------------	--------------------	------------------------------	-----------------------------	---------------------------------	------------------------------------	------------------------------------	-------------------------------------

		✓	✓	Truck Percentages	2.00				✓	✓
--	--	---	---	-------------------	------	--	--	--	---	---

Entry Flows

General Flows Data

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	272.00	100.000
1	West	ONE HOUR	✓	729.00	100.000
1	South	ONE HOUR	✓	253.00	100.000
1	East	ONE HOUR	✓	541.00	100.000
2	North	ONE HOUR	✓	272.00	100.000
2	West	ONE HOUR	✓	729.00	100.000
2	South	ONE HOUR	✓	253.00	100.000
2	East	ONE HOUR	✓	541.00	100.000
3	North	ONE HOUR	✓	272.00	100.000
3	West	ONE HOUR	✓	729.00	100.000
3	South	ONE HOUR	✓	253.00	100.000
3	East	ONE HOUR	✓	541.00	100.000

Turning Proportions

Turning Counts / Proportions (PCE/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	48.000	70.000	154.000
	West	120.000	0.000	17.000	592.000
	South	193.000	17.000	0.000	43.000
	East	168.000	345.000	28.000	0.000

Turning Proportions (PCE) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.18	0.26	0.57
	West	0.16	0.00	0.02	0.81
	South	0.76	0.07	0.00	0.17
	East	0.31	0.64	0.05	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

		To			
		North	West	South	East
From	North	0.000	48.000	70.000	154.000
	West	120.000	0.000	17.000	592.000
	South	193.000	17.000	0.000	43.000
	East	168.000	345.000	28.000	0.000

Turning Proportions (PCE) - Intersection 2 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.18	0.26	0.57
	West	0.16	0.00	0.02	0.81
	South	0.76	0.07	0.00	0.17
	East	0.31	0.64	0.05	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

		To			
		North	West	South	East
	North	0.000	48.000	70.000	154.000

From	West	120.000	0.000	17.000	592.000
	South	193.000	17.000	0.000	43.000
	East	168.000	345.000	28.000	0.000

Turning Proportions (PCE) - Intersection 3 (for whole period)

From	To				
		North	West	South	East
	North	0.00	0.18	0.26	0.57
	West	0.16	0.00	0.02	0.81
	South	0.76	0.07	0.00	0.17
	East	0.31	0.64	0.05	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

From	To				
		North	West	South	East
	North	1.000	1.160	1.020	1.020
	West	1.080	1.000	1.080	1.150
	South	1.090	1.000	1.000	1.000
	East	1.020	1.240	1.140	1.000

Truck Percentages - Intersection 1 (for whole period)

From	To				
		North	West	South	East
	North	0.0	16.0	2.0	2.0
	West	8.0	0.0	8.0	15.0
	South	9.0	0.0	0.0	0.0
	East	2.0	24.0	14.0	0.0

Average PCE Per Vehicle - Intersection 2 (for whole period)

From	To				
		North	West	South	East
	North	1.000	1.160	1.020	1.020
	West	1.080	1.000	1.080	1.150
	South	1.090	1.000	1.000	1.000
	East	1.020	1.240	1.140	1.000

Truck Percentages - Intersection 2 (for whole period)

From	To				
		North	West	South	East
	North	0.0	16.0	2.0	2.0
	West	8.0	0.0	8.0	15.0
	South	9.0	0.0	0.0	0.0
	East	2.0	24.0	14.0	0.0

Average PCE Per Vehicle - Intersection 3 (for whole period)

From	To				
		North	West	South	East
	North	1.000	1.160	1.020	1.020
	West	1.080	1.000	1.080	1.150
	South	1.090	1.000	1.000	1.000
	East	1.020	1.240	1.140	1.000

Truck Percentages - Intersection 3 (for whole period)

From	To				
		North	West	South	East
	North	0.0	16.0	2.0	2.0
	West	8.0	0.0	8.0	15.0
	South	9.0	0.0	0.0	0.0
	East	2.0	24.0	14.0	0.0

Results

Results Summary for whole modelled period

Intersection	Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
1	North	0.31	5.57	0.46	1.04	A	249.59	374.39	31.05	4.98	0.35	31.05	4.98
1	West	0.76	15.73	3.41	10.23	C	668.94	1003.41	180.56	10.80	2.01	180.59	10.80
1	South	0.42	9.81	0.75	1.07	A	232.16	348.24	44.61	7.69	0.50	44.61	7.69
1	East	0.59	10.01	1.63	1.16	B	496.43	744.65	98.49	7.94	1.09	98.50	7.94
2	North	0.30	5.50	0.46	1.04	A	249.59	374.39	30.74	4.93	0.34	30.74	4.93
2	West	0.49	4.98	1.10	?	A	668.94	1003.41	71.25	4.26	0.79	71.26	4.26
2	South	0.40	9.34	0.72	1.07	A	232.16	348.24	43.10	7.43	0.48	43.10	7.43
2	East	0.38	4.29	0.71	1.16	A	496.43	744.65	47.38	3.82	0.53	47.38	3.82
3	North	0.19	3.03	0.25	~1	A	249.59	374.39	17.68	2.83	0.20	17.68	2.83
3	West	0.49	4.91	1.09	?	A	668.94	1003.41	70.56	4.22	0.78	70.56	4.22
3	South	0.23	4.18	0.32	~1	A	232.16	348.24	21.34	3.68	0.24	21.34	3.68
3	East	0.38	4.23	0.70	1.16	A	496.43	744.65	46.86	3.78	0.52	46.86	3.78

Main Results for each time segment

Main results: (08:00-08:15)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	204.78	51.19	203.78	359.61	291.62	0.00	1052.93	840.41	0.194	0.00	0.25	4.415	A
1	West	548.83	137.21	544.47	306.64	188.75	0.00	1112.46	793.97	0.493	0.00	1.09	7.148	A
1	South	190.47	47.62	189.24	86.08	647.15	0.00	847.16	497.51	0.225	0.00	0.31	5.829	A
1	East	407.29	101.82	404.52	589.69	246.70	0.00	1078.92	907.06	0.378	0.00	0.69	6.153	A
2	North	204.78	51.19	203.78	360.37	292.49	0.00	1058.50	631.06	0.193	0.00	0.25	4.385	A
2	West	548.83	137.21	546.65	307.45	188.82	0.00	1685.25	1405.16	0.326	0.00	0.55	3.587	A
2	South	190.47	47.62	189.27	86.19	649.28	0.00	859.42	256.59	0.222	0.00	0.30	5.722	A
2	East	407.29	101.82	405.78	591.46	247.08	0.00	1645.36	1510.32	0.248	0.00	0.38	3.356	A
3	North	204.78	51.19	204.18	360.78	292.53	0.00	1625.41	1189.09	0.126	0.00	0.15	2.638	A
3	West	548.83	137.21	546.66	307.56	189.15	0.00	1692.25	1136.59	0.324	0.00	0.54	3.565	A
3	South	190.47	47.62	189.80	86.30	649.51	0.00	1394.59	661.49	0.137	0.00	0.17	3.187	A
3	East	407.29	101.82	405.79	591.79	247.53	0.00	1654.51	1338.57	0.246	0.00	0.38	3.331	A

Main results: (08:15-08:30)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	244.52	61.13	244.22	431.26	349.77	0.00	1019.27	840.41	0.240	0.25	0.33	4.838	A
1	West	655.36	163.84	653.04	367.75	226.23	0.00	1090.77	793.97	0.601	1.09	1.67	9.294	A
1	South	227.44	56.86	226.91	103.19	776.08	0.00	772.54	497.51	0.294	0.31	0.44	7.033	A
1	East	486.35	121.59	485.19	707.15	295.84	0.00	1050.48	907.06	0.463	0.69	0.98	7.355	A
2	North	244.52	61.13	244.22	431.75	350.24	0.00	1026.28	631.06	0.238	0.25	0.32	4.794	A
2	West	655.36	163.84	654.59	368.19	226.27	0.00	1659.61	1405.16	0.395	0.55	0.74	4.067	A
2	South	227.44	56.86	226.93	103.26	777.60	0.00	787.82	256.59	0.289	0.30	0.43	6.844	A
2	East	486.35	121.59	485.87	708.42	296.12	0.00	1611.78	1510.32	0.302	0.38	0.50	3.697	A
3	North	244.52	61.13	244.37	431.97	350.27	0.00	1588.08	1189.09	0.154	0.15	0.19	2.791	A
3	West	655.36	163.84	654.61	368.24	226.39	0.00	1668.17	1136.59	0.393	0.54	0.73	4.033	A
3	South	227.44	56.86	227.22	103.30	777.69	0.00	1311.71	661.49	0.173	0.17	0.22	3.542	A
3	East	486.35	121.59	485.88	708.56	296.36	0.00	1622.93	1338.57	0.300	0.38	0.49	3.661	A

Main results: (08:30-08:45)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
--------------	-----	-----------------------	-----------------------------	---------------------	--------------------	---------------------------	----------------------------	-------------------	------------------------------	-----------	-------------------	-----------------	-----------	-----

1	North	299.48	74.87	298.95	526.82	427.58	0.00	974.23	840.41	0.307	0.33	0.46	5.551	A
1	West	802.64	200.66	796.10	449.64	276.89	0.00	1061.45	793.97	0.756	1.67	3.31	15.046	C
1	South	278.56	69.64	277.36	126.20	946.79	0.00	673.74	497.51	0.413	0.44	0.74	9.664	A
1	East	595.65	148.91	593.14	862.89	361.27	0.00	1012.61	907.06	0.588	0.98	1.61	9.871	A
2	North	299.48	74.87	298.96	528.24	428.75	0.00	982.47	631.06	0.305	0.32	0.45	5.486	A
2	West	802.64	200.66	801.20	450.72	276.99	0.00	1624.88	1405.16	0.494	0.74	1.10	4.956	A
2	South	278.56	69.64	277.44	126.41	951.78	0.00	690.64	256.59	0.403	0.43	0.71	9.276	A
2	East	595.65	148.91	594.82	867.05	362.17	0.00	1566.55	1510.32	0.380	0.50	0.70	4.283	A
3	North	299.48	74.87	299.23	528.81	428.81	0.00	1537.29	1189.09	0.195	0.19	0.25	3.030	A
3	West	802.64	200.66	801.23	450.83	277.21	0.00	1635.31	1136.59	0.491	0.73	1.08	4.896	A
3	South	278.56	69.64	278.17	126.48	951.96	0.00	1199.03	661.49	0.232	0.22	0.32	4.170	A
3	East	595.65	148.91	594.84	867.35	362.78	0.00	1579.99	1338.57	0.377	0.49	0.70	4.225	A

Main results: (08:45-09:00)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	299.48	74.87	299.47	529.46	429.33	0.00	973.22	840.41	0.308	0.46	0.46	5.568	A
1	West	802.64	200.66	802.23	451.35	277.44	0.00	1061.13	793.97	0.756	3.31	3.41	15.729	C
1	South	278.56	69.64	278.51	126.60	953.07	0.00	670.10	497.51	0.416	0.74	0.75	9.807	A
1	East	595.65	148.91	595.56	868.35	363.23	0.00	1011.48	907.06	0.589	1.61	1.63	10.010	B
2	North	299.48	74.87	299.47	529.56	429.39	0.00	982.12	631.06	0.305	0.45	0.46	5.495	A
2	West	802.64	200.66	802.62	451.41	277.45	0.00	1624.56	1405.16	0.494	1.10	1.10	4.975	A
2	South	278.56	69.64	278.53	126.61	953.46	0.00	689.70	256.59	0.404	0.71	0.72	9.342	A
2	East	595.65	148.91	595.64	868.68	363.31	0.00	1565.77	1510.32	0.380	0.70	0.71	4.294	A
3	North	299.48	74.87	299.48	529.58	429.39	0.00	1536.92	1189.09	0.195	0.25	0.25	3.031	A
3	West	802.64	200.66	802.62	451.41	277.45	0.00	1635.15	1136.59	0.491	1.08	1.09	4.912	A
3	South	278.56	69.64	278.55	126.62	953.46	0.00	1198.06	661.49	0.233	0.32	0.32	4.178	A
3	East	595.65	148.91	595.64	868.68	363.33	0.00	1579.63	1338.57	0.377	0.70	0.70	4.233	A

Main results: (09:00-09:15)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	244.52	61.13	245.04	435.17	352.39	0.00	1017.75	840.41	0.240	0.46	0.33	4.860	A
1	West	655.36	163.84	661.97	370.33	227.10	0.00	1090.27	793.97	0.601	3.41	1.76	9.691	A
1	South	227.44	56.86	228.63	103.80	785.27	0.00	767.22	497.51	0.296	0.75	0.45	7.150	A
1	East	486.35	121.59	488.83	715.16	298.74	0.00	1048.80	907.06	0.464	1.63	1.02	7.471	A
2	North	244.52	61.13	245.03	433.74	351.24	0.00	1025.72	631.06	0.238	0.46	0.33	4.808	A
2	West	655.36	163.84	656.78	369.27	227.00	0.00	1659.11	1405.16	0.395	1.10	0.75	4.087	A
2	South	227.44	56.86	228.55	103.59	780.19	0.00	786.38	256.59	0.289	0.72	0.44	6.900	A
2	East	486.35	121.59	487.16	710.93	297.82	0.00	1610.62	1510.32	0.302	0.71	0.50	3.710	A
3	North	244.52	61.13	244.77	433.18	351.18	0.00	1587.49	1189.09	0.154	0.25	0.19	2.796	A
3	West	655.36	163.84	656.75	369.16	226.79	0.00	1667.92	1136.59	0.393	1.09	0.74	4.051	A
3	South	227.44	56.86	227.83	103.52	780.02	0.00	1310.21	661.49	0.174	0.32	0.23	3.549	A
3	East	486.35	121.59	487.15	710.63	297.22	0.00	1622.38	1338.57	0.300	0.70	0.50	3.674	A

Main results: (09:15-09:30)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	204.78	51.19	205.09	363.34	294.49	0.00	1051.26	840.41	0.195	0.33	0.25	4.435	A
1	West	548.83	137.21	551.35	309.54	190.04	0.00	1111.71	793.97	0.494	1.76	1.12	7.330	A
1	South	190.47	47.62	191.03	86.78	654.61	0.00	842.84	497.51	0.226	0.45	0.31	5.901	A
1	East	407.29	101.82	408.51	596.32	249.32	0.00	1077.40	907.06	0.378	1.02	0.71	6.241	A
2	North	204.78	51.19	205.08	362.80	293.98	0.00	1057.67	631.06	0.194	0.33	0.25	4.401	A
2	West	548.83	137.21	549.61	309.07	190.00	0.00	1684.45	1405.16	0.326	0.75	0.55	3.605	A
2	South	190.47	47.62	191.00	86.70	652.91	0.00	857.40	256.59	0.222	0.44	0.31	5.771	A
2	East	407.29	101.82	407.78	594.90	249.01	0.00	1644.04	1510.32	0.248	0.50	0.38	3.373	A
3	North	204.78	51.19	204.93	362.56	293.95	0.00	1624.49	1189.09	0.126	0.19	0.15	2.644	A
3	West	548.83	137.21	549.60	309.01	189.87	0.00	1691.78	1136.59	0.324	0.74	0.55	3.582	A
3	South	190.47	47.62	190.69	86.66	652.81	0.00	1392.46	661.49	0.137	0.23	0.17	3.196	A
3	East	407.29	101.82	407.77	594.75	248.75	0.00	1653.71	1338.57	0.246	0.50	0.38	3.344	A

Queueing Delay Results for each time segment

Queueing Delay results: (08:00-08:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	3.66	0.24	4.415	A	A
1	West	15.56	1.04	7.148	A	A
1	South	4.46	0.30	5.829	A	A
1	East	10.02	0.67	6.153	A	A
2	North	3.64	0.24	4.385	A	A
2	West	7.99	0.53	3.587	A	A
2	South	4.38	0.29	5.722	A	A
2	East	5.56	0.37	3.356	A	A
3	North	2.21	0.15	2.638	A	A
3	West	7.94	0.53	3.565	A	A
3	South	2.48	0.17	3.187	A	A
3	East	5.52	0.37	3.331	A	A

Queueing Delay results: (08:15-08:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	4.81	0.32	4.838	A	A
1	West	23.86	1.59	9.294	A	A
1	South	6.43	0.43	7.033	A	A
1	East	14.27	0.95	7.355	A	A
2	North	4.77	0.32	4.794	A	A
2	West	10.82	0.72	4.067	A	A
2	South	6.26	0.42	6.844	A	A
2	East	7.34	0.49	3.697	A	A
3	North	2.80	0.19	2.791	A	A
3	West	10.74	0.72	4.033	A	A
3	South	3.29	0.22	3.542	A	A
3	East	7.27	0.48	3.661	A	A

Queueing Delay results: (08:30-08:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	6.72	0.45	5.551	A	A
1	West	45.10	3.01	15.046	C	B
1	South	10.63	0.71	9.664	A	A
1	East	22.97	1.53	9.871	A	A
2	North	6.64	0.44	5.486	A	A
2	West	16.01	1.07	4.956	A	A
2	South	10.23	0.68	9.276	A	A
2	East	10.35	0.69	4.283	A	A
3	North	3.72	0.25	3.030	A	A
3	West	15.82	1.05	4.896	A	A
3	South	4.73	0.32	4.170	A	A
3	East	10.21	0.68	4.225	A	A

Queueing Delay results: (08:45-09:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	6.90	0.46	5.568	A	A
1	West	50.52	3.37	15.729	C	B
1	South	11.20	0.75	9.807	A	A
1	East	24.39	1.63	10.010	B	B
2	North	6.82	0.45	5.495	A	A
2	West	16.52	1.10	4.975	A	A
2	South	10.71	0.71	9.342	A	A
2	East	10.60	0.71	4.294	A	A
3	North	3.77	0.25	3.031	A	A
3	West	16.31	1.09	4.912	A	A
3	South	4.83	0.32	4.178	A	A
3	East	10.45	0.70	4.233	A	A

Queueing Delay results: (09:00-09:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service

1	North	5.09	0.34	4.860	A	A
1	West	27.95	1.86	9.691	A	A
1	South	7.05	0.47	7.150	A	A
1	East	15.85	1.06	7.471	A	A
2	North	5.03	0.34	4.808	A	A
2	West	11.47	0.76	4.087	A	A
2	South	6.80	0.45	6.900	A	A
2	East	7.70	0.51	3.710	A	A
3	North	2.89	0.19	2.796	A	A
3	West	11.37	0.76	4.051	A	A
3	South	3.44	0.23	3.549	A	A
3	East	7.61	0.51	3.674	A	A

Queueing Delay results: (09:15-09:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	3.87	0.26	4.435	A	A
1	West	17.56	1.17	7.330	A	A
1	South	4.83	0.32	5.901	A	A
1	East	10.98	0.73	6.241	A	A
2	North	3.84	0.26	4.401	A	A
2	West	8.44	0.56	3.605	A	A
2	South	4.72	0.31	5.771	A	A
2	East	5.84	0.39	3.373	A	A
3	North	2.29	0.15	2.644	A	A
3	West	8.38	0.56	3.582	A	A
3	South	2.58	0.17	3.196	A	A
3	East	5.79	0.39	3.344	A	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.25	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	1.09	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	South	0.31	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	0.69	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.25	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	West	0.55	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.30	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	0.38	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.15	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.54	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.17	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.38	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:15-08:30)

									Probability Of	Probability Of
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Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Reaching Or Exceeding Marker	Exactly Reaching Marker
1	North	0.33	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	1.67	0.00	0.00	3.41	4.54			N/A	N/A
1	South	0.44	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	0.98	0.00	0.00	0.00	1.16			N/A	N/A
2	North	0.32	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	West	0.74	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.43	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	0.50	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.19	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.73	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.22	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.49	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:30-08:45)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.46	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	3.31	0.00	0.00	2.27	10.23			N/A	N/A
1	South	0.74	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	1.61	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.45	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	West	1.10	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.71	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	0.70	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.25	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	1.08	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.32	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.70	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:45-09:00)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.46	0.00	0.00	0.00	1.04			N/A	N/A
1	West	3.41	0.00	0.00	0.00	5.68			N/A	N/A
1	South	0.75	0.00	0.00	0.00	1.07			N/A	N/A

1	East	1.63	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.46	0.00	0.00	0.00	1.04			N/A	N/A
2	West	1.10	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.72	0.00	0.00	0.00	1.07			N/A	N/A
2	East	0.71	0.00	0.00	0.00	1.16			N/A	N/A
3	North	0.25	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	1.09	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.32	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.70	0.00	0.00	0.00	1.16			N/A	N/A

Queue Variation results: (09:00-09:15)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.33	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	1.76	0.00	0.00	3.41	4.54			N/A	N/A
1	South	0.45	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	1.02	0.00	0.00	1.16	1.16			N/A	N/A
2	North	0.33	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	West	0.75	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.44	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	0.50	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.19	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.74	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.23	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.50	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:15-09:30)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.25	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	1.12	0.00	0.00	1.14	3.41			N/A	N/A
1	South	0.31	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	0.71	0.00	0.00	0.00	1.16			N/A	N/A
2	North	0.25	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	West	0.55	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.31	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	0.38	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

3	North	0.15	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.55	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.17	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.38	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Junctions 8
ARCADY 8 - Roundabout Module
Version: 8.0.6.541 [19821,26/11/2015] © Copyright TRL Limited, 2020
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Filename: Alder and Riddell.arc8

Path: C:\Users\AdamMorrison\Desktop\Projects\200195 - Arcady

Report generation date: 2020-08-25 8:02:53 PM

Summary of intersection performance

	PM						
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Background 2031						
Intersection 1 - Leg North	1.17	2.03	11.32	0.54	B	51.34	F
Intersection 1 - Leg West	1.61	1.08	9.91	0.60	A		
Intersection 1 - Leg South	0.22	~1	5.49	0.18	A		
Intersection 1 - Leg East	29.95	90.68	91.40	1.02	F		
Intersection 2 - Leg North	1.17	2.03	11.27	0.54	B	6.77	A
Intersection 2 - Leg West	0.68	1.08	4.15	0.39	A		
Intersection 2 - Leg South	0.21	~1	5.36	0.18	A		
Intersection 2 - Leg East	2.16	3.16	6.80	0.67	A		
Intersection 3 - Leg North	0.46	1.02	4.38	0.31	A	5.41	A
Intersection 3 - Leg West	0.67	1.08	4.08	0.38	A		
Intersection 3 - Leg South	0.12	~1	3.00	0.11	A		
Intersection 3 - Leg East	2.14	3.16	6.73	0.67	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Background 2031, PM " model duration: 4:00 PM - 5:30 PM

"D2 - Background 2031, AM" model duration: 8:00 AM - 9:30 AM

Run using Junctions 8.0.6.541 at 2020-08-25 8:02:52 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2020-08-25
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - Background 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Background 2031, PM	Background 2031	PM		ONE HOUR	16:00	17:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	(untitled)	Roundabout	North,West,South,East				51.34	F
2	2	(untitled)	Roundabout	North,West,South,East				6.77	A
3	3	(untitled)	Roundabout	North,West,South,East				5.41	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Alder Street	
1	West	West	Riddell Road	
1	South	South	Alder Street	
1	East	East	Riddell Road	
2	North	North	Alder Street	
2	West	West	Riddell Road	
2	South	South	Alder Street	
2	East	East	Riddell Road	
3	North	North	Alder Street	
3	West	West	Riddell Road	
3	South	South	Alder Street	
3	East	East	Riddell Road	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	South	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00

2	West	0.00	99999.00		0.00
2	South	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	South	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	South	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	3.50	4.50	30.00	20.00	47.50	25.00	
2	West	3.50	8.00	30.00	20.00	47.50	25.00	
2	South	3.50	4.50	30.00	20.00	47.50	25.00	
2	East	3.50	8.00	30.00	20.00	47.50	25.00	
3	North	3.50	8.00	30.00	20.00	55.00	25.00	
3	West	3.50	8.00	30.00	20.00	55.00	25.00	
3	South	3.50	8.00	30.00	20.00	55.00	25.00	
3	East	3.50	8.00	30.00	20.00	55.00	25.00	

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage	Region of Waterloo Standard		90.00
1	West	Percentage	Region of Waterloo Standard		90.00
1	South	Percentage	Region of Waterloo Standard		90.00
1	East	Percentage	Region of Waterloo Standard		90.00
2	North	Percentage	Region of Waterloo Standard		90.00
2	West	Percentage	Region of Waterloo Standard		90.00
2	South	Percentage	Region of Waterloo Standard		90.00
2	East	Percentage	Region of Waterloo Standard		90.00
3	North	Percentage	Region of Waterloo Standard		90.00
3	West	Percentage	Region of Waterloo Standard		90.00
3	South	Percentage	Region of Waterloo Standard		90.00
3	East	Percentage	Region of Waterloo Standard		90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	South		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.558	1221.701
2	West		(calculated)	(calculated)	0.685	1814.551
2	South		(calculated)	(calculated)	0.558	1221.701
2	East		(calculated)	(calculated)	0.685	1814.551
3	North		(calculated)	(calculated)	0.647	1814.551
3	West		(calculated)	(calculated)	0.647	1814.551
3	South		(calculated)	(calculated)	0.647	1814.551
3	East		(calculated)	(calculated)	0.647	1814.551

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
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		✓	✓	Truck Percentages	2.00				✓	✓
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Entry Flows

General Flows Data

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	345.00	100.000
1	West	ONE HOUR	✓	537.00	100.000
1	South	ONE HOUR	✓	130.00	100.000
1	East	ONE HOUR	✓	1049.00	100.000
2	North	ONE HOUR	✓	345.00	100.000
2	West	ONE HOUR	✓	537.00	100.000
2	South	ONE HOUR	✓	130.00	100.000
2	East	ONE HOUR	✓	1049.00	100.000
3	North	ONE HOUR	✓	345.00	100.000
3	West	ONE HOUR	✓	537.00	100.000
3	South	ONE HOUR	✓	130.00	100.000
3	East	ONE HOUR	✓	1049.00	100.000

Turning Proportions

Turning Counts / Proportions (PCE/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	63.000	122.000	160.000
	West	44.000	0.000	34.000	459.000
	South	72.000	19.000	0.000	39.000
	East	225.000	731.000	93.000	0.000

Turning Proportions (PCE) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.18	0.35	0.46
	West	0.08	0.00	0.06	0.85
	South	0.55	0.15	0.00	0.30
	East	0.21	0.70	0.09	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

		To			
		North	West	South	East
From	North	0.000	63.000	122.000	160.000
	West	44.000	0.000	34.000	459.000
	South	72.000	19.000	0.000	39.000
	East	225.000	731.000	93.000	0.000

Turning Proportions (PCE) - Intersection 2 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.18	0.35	0.46
	West	0.08	0.00	0.06	0.85
	South	0.55	0.15	0.00	0.30
	East	0.21	0.70	0.09	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

		To			
		North	West	South	East
	North	0.000	63.000	122.000	160.000

From	West	44.000	0.000	34.000	459.000
	South	72.000	19.000	0.000	39.000
	East	225.000	731.000	93.000	0.000

Turning Proportions (PCE) - Intersection 3 (for whole period)

From	To				
		North	West	South	East
	North	0.00	0.18	0.35	0.46
	West	0.08	0.00	0.06	0.85
	South	0.55	0.15	0.00	0.30
	East	0.21	0.70	0.09	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

From	To				
		North	West	South	East
	North	1.000	1.060	1.000	1.010
	West	1.000	1.000	1.000	1.100
	South	1.000	1.000	1.000	1.000
	East	1.000	1.080	1.000	1.000

Truck Percentages - Intersection 1 (for whole period)

From	To				
		North	West	South	East
	North	0.0	6.0	0.0	1.0
	West	0.0	0.0	0.0	10.0
	South	0.0	0.0	0.0	0.0
	East	0.0	8.0	0.0	0.0

Average PCE Per Vehicle - Intersection 2 (for whole period)

From	To				
		North	West	South	East
	North	1.000	1.060	1.000	1.010
	West	1.000	1.000	1.000	1.100
	South	1.000	1.000	1.000	1.000
	East	1.000	1.080	1.000	1.000

Truck Percentages - Intersection 2 (for whole period)

From	To				
		North	West	South	East
	North	0.0	6.0	0.0	1.0
	West	0.0	0.0	0.0	10.0
	South	0.0	0.0	0.0	0.0
	East	0.0	8.0	0.0	0.0

Average PCE Per Vehicle - Intersection 3 (for whole period)

From	To				
		North	West	South	East
	North	1.000	1.060	1.000	1.010
	West	1.000	1.000	1.000	1.100
	South	1.000	1.000	1.000	1.000
	East	1.000	1.080	1.000	1.000

Truck Percentages - Intersection 3 (for whole period)

From	To				
		North	West	South	East
	North	0.0	6.0	0.0	1.0
	West	0.0	0.0	0.0	10.0
	South	0.0	0.0	0.0	0.0
	East	0.0	8.0	0.0	0.0

Results

Results Summary for whole modelled period

Intersection	Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
1	North	0.54	11.32	1.17	2.03	B	316.58	474.87	67.88	8.58	0.75	67.89	8.58
1	West	0.60	9.91	1.61	1.08	A	492.76	739.14	95.62	7.76	1.06	95.64	7.76
1	South	0.18	5.49	0.22	~1	A	119.29	178.94	14.55	4.88	0.16	14.55	4.88
1	East	1.02	91.40	29.95	90.68	F	962.58	1443.87	899.91	37.40	10.00	900.05	37.40
2	North	0.54	11.27	1.17	2.03	B	316.58	474.87	66.31	8.38	0.74	66.32	8.38
2	West	0.39	4.15	0.68	1.08	A	492.76	739.14	45.16	3.67	0.50	45.16	3.67
2	South	0.18	5.36	0.21	~1	A	119.29	178.94	14.30	4.79	0.16	14.30	4.79
2	East	0.67	6.80	2.16	3.16	A	962.58	1443.87	126.85	5.27	1.41	126.86	5.27
3	North	0.31	4.38	0.46	1.02	A	316.58	474.87	29.84	3.77	0.33	29.84	3.77
3	West	0.38	4.08	0.67	1.08	A	492.76	739.14	44.58	3.62	0.50	44.58	3.62
3	South	0.11	3.00	0.12	~1	A	119.29	178.94	8.32	2.79	0.09	8.32	2.79
3	East	0.67	6.73	2.14	3.16	A	962.58	1443.87	125.93	5.23	1.40	125.94	5.23

Main Results for each time segment

Main results: (16:00-16:15)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	259.73	64.93	257.99	254.40	627.81	0.00	858.35	741.47	0.303	0.00	0.44	6.070	A
1	West	404.28	101.07	401.63	605.67	280.13	0.00	1059.57	822.24	0.382	0.00	0.66	5.909	A
1	South	97.87	24.47	97.41	185.91	495.85	0.00	934.72	576.93	0.105	0.00	0.12	4.298	A
1	East	789.74	197.44	781.12	492.17	101.09	0.00	1163.19	948.97	0.679	0.00	2.16	9.729	A
2	North	259.73	64.93	258.02	255.61	631.87	0.00	869.14	505.46	0.299	0.00	0.43	5.963	A
2	West	404.28	101.07	402.85	609.28	280.61	0.00	1622.40	1436.27	0.249	0.00	0.36	3.198	A
2	South	97.87	24.47	97.41	186.46	497.00	0.00	944.39	340.25	0.104	0.00	0.12	4.249	A
2	East	789.74	197.44	786.28	493.22	101.20	0.00	1745.26	1570.87	0.453	0.00	0.86	3.944	A
3	North	259.73	64.93	258.82	255.71	631.91	0.00	1405.97	1031.22	0.185	0.00	0.23	3.182	A
3	West	404.28	101.07	402.86	609.46	281.27	0.00	1632.69	1189.51	0.248	0.00	0.36	3.171	A
3	South	97.87	24.47	97.59	186.74	497.39	0.00	1492.95	784.91	0.066	0.00	0.07	2.579	A
3	East	789.74	197.44	786.30	493.65	101.32	0.00	1749.04	1396.28	0.452	0.00	0.86	3.928	A

Main results: (16:15-16:30)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	310.15	77.54	309.29	304.50	750.95	0.00	787.08	741.47	0.394	0.44	0.65	7.634	A
1	West	482.75	120.69	481.61	724.60	335.64	0.00	1027.45	822.24	0.470	0.66	0.95	7.137	A
1	South	116.87	29.22	116.72	222.69	594.56	0.00	877.60	576.93	0.133	0.12	0.15	4.731	A
1	East	943.03	235.76	934.29	590.11	121.17	0.00	1151.57	948.97	0.819	2.16	4.34	16.806	C
2	North	310.15	77.54	309.32	306.11	756.62	0.00	799.53	505.46	0.388	0.43	0.63	7.443	A
2	West	482.75	120.69	482.29	729.63	336.31	0.00	1584.26	1436.27	0.305	0.36	0.47	3.539	A
2	South	116.87	29.22	116.73	223.39	595.21	0.00	889.59	340.25	0.131	0.12	0.15	4.658	A
2	East	943.03	235.76	941.50	590.71	121.23	0.00	1731.54	1570.87	0.545	0.86	1.25	4.793	A
3	North	310.15	77.54	309.83	306.15	756.64	0.00	1325.32	1031.22	0.234	0.23	0.31	3.599	A
3	West	482.75	120.69	482.30	729.75	336.72	0.00	1596.83	1189.51	0.302	0.36	0.47	3.500	A
3	South	116.87	29.22	116.79	223.57	595.46	0.00	1429.54	784.91	0.082	0.07	0.09	2.741	A
3	East	943.03	235.76	941.52	590.98	121.27	0.00	1736.14	1396.28	0.543	0.86	1.24	4.768	A

Main results: (16:30-16:45)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
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1	North	379.85	94.96	377.95	361.49	878.27	0.00	713.40	741.47	0.532	0.65	1.13	10.832	B
1	West	591.25	147.81	588.72	850.51	405.70	0.00	986.90	822.24	0.599	0.95	1.58	9.739	A
1	South	143.13	35.78	142.88	267.69	726.73	0.00	801.10	576.93	0.179	0.15	0.22	5.469	A
1	East	1154.97	288.74	1091.50	721.35	148.25	0.00	1135.90	948.97	1.017	4.34	20.21	53.020	F
2	North	379.85	94.96	377.77	374.48	925.33	0.00	705.39	505.46	0.539	0.63	1.15	11.085	B
2	West	591.25	147.81	590.44	892.24	410.87	0.00	1533.20	1436.27	0.386	0.47	0.68	4.137	A
2	South	143.13	35.78	142.89	273.05	728.25	0.00	815.36	340.25	0.176	0.15	0.21	5.352	A
2	East	1154.97	288.74	1151.42	722.74	148.40	0.00	1712.93	1570.87	0.674	1.25	2.13	6.717	A
3	North	379.85	94.96	379.25	374.57	925.39	0.00	1216.21	1031.22	0.312	0.31	0.46	4.364	A
3	West	591.25	147.81	590.46	892.56	412.08	0.00	1548.11	1189.51	0.382	0.47	0.67	4.072	A
3	South	143.13	35.78	143.01	273.58	728.96	0.00	1343.22	784.91	0.107	0.09	0.12	2.999	A
3	East	1154.97	288.74	1151.47	723.48	148.49	0.00	1718.54	1396.28	0.672	1.24	2.11	6.653	A

Main results: (16:45-17:00)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	379.85	94.96	379.67	367.08	897.54	0.00	702.24	741.47	0.541	1.13	1.17	11.317	B
1	West	591.25	147.81	591.14	867.93	409.28	0.00	984.83	822.24	0.600	1.58	1.61	9.909	A
1	South	143.13	35.78	143.13	270.63	729.79	0.00	799.33	576.93	0.179	0.22	0.22	5.485	A
1	East	1154.97	288.74	1115.99	724.29	148.63	0.00	1135.68	948.97	1.017	20.21	29.95	91.403	F
2	North	379.85	94.96	379.78	375.42	928.09	0.00	703.86	505.46	0.540	1.15	1.17	11.269	B
2	West	591.25	147.81	591.24	895.05	412.81	0.00	1531.87	1436.27	0.386	0.68	0.68	4.149	A
2	South	143.13	35.78	143.13	274.12	729.93	0.00	814.42	340.25	0.176	0.21	0.21	5.362	A
2	East	1154.97	288.74	1154.88	724.42	148.63	0.00	1712.77	1570.87	0.674	2.13	2.16	6.801	A
3	North	379.85	94.96	379.84	375.43	928.09	0.00	1214.47	1031.22	0.313	0.46	0.46	4.378	A
3	West	591.25	147.81	591.24	895.06	412.87	0.00	1547.60	1189.51	0.382	0.67	0.67	4.081	A
3	South	143.13	35.78	143.13	274.14	729.96	0.00	1342.57	784.91	0.107	0.12	0.12	3.000	A
3	East	1154.97	288.74	1154.88	724.46	148.64	0.00	1718.45	1396.28	0.672	2.11	2.14	6.733	A

Main results: (17:00-17:15)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	310.15	77.54	311.86	327.84	834.61	0.00	738.66	741.47	0.420	1.17	0.75	8.598	A
1	West	482.75	120.69	485.22	799.29	347.18	0.00	1020.77	822.24	0.473	1.61	0.99	7.320	A
1	South	116.87	29.22	117.12	233.27	599.13	0.00	874.95	576.93	0.134	0.22	0.16	4.751	A
1	East	943.03	235.76	1040.71	594.51	121.74	0.00	1151.24	948.97	0.819	29.95	5.53	47.088	E
2	North	310.15	77.54	312.22	307.51	760.65	0.00	797.28	505.46	0.389	1.17	0.65	7.564	A
2	West	482.75	120.69	483.55	733.74	339.12	0.00	1582.33	1436.27	0.305	0.68	0.48	3.556	A
2	South	116.87	29.22	117.11	224.94	597.73	0.00	888.18	340.25	0.132	0.21	0.15	4.671	A
2	East	943.03	235.76	946.56	593.25	121.60	0.00	1731.29	1570.87	0.545	2.16	1.28	4.858	A
3	North	310.15	77.54	310.74	307.43	760.59	0.00	1322.77	1031.22	0.234	0.46	0.31	3.612	A
3	West	482.75	120.69	483.53	733.42	337.91	0.00	1596.07	1189.51	0.302	0.67	0.47	3.512	A
3	South	116.87	29.22	116.99	224.41	597.03	0.00	1428.52	784.91	0.082	0.12	0.09	2.744	A
3	East	943.03	235.76	946.51	592.50	121.51	0.00	1735.99	1396.28	0.543	2.14	1.27	4.828	A

Main results: (17:15-17:30)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	259.73	64.93	260.91	259.67	644.81	0.00	848.51	741.47	0.306	0.75	0.45	6.233	A
1	West	404.28	101.07	405.52	621.29	284.42	0.00	1057.09	822.24	0.382	0.99	0.68	6.003	A
1	South	97.87	24.47	98.02	189.10	500.84	0.00	931.83	576.93	0.105	0.16	0.12	4.317	A
1	East	789.74	197.44	802.64	497.02	101.84	0.00	1162.76	948.97	0.679	5.53	2.31	10.892	B
2	North	259.73	64.93	260.60	257.18	635.92	0.00	866.87	505.46	0.300	0.65	0.44	6.035	A
2	West	404.28	101.07	404.75	613.36	283.17	0.00	1620.65	1436.27	0.249	0.48	0.36	3.210	A
2	South	97.87	24.47	98.01	187.94	499.98	0.00	942.73	340.25	0.104	0.15	0.12	4.262	A
2	East	789.74	197.44	791.33	496.22	101.77	0.00	1744.86	1570.87	0.453	1.28	0.88	3.987	A
3	North	259.73	64.93	260.06	257.14	635.90	0.00	1403.39	1031.22	0.185	0.31	0.23	3.196	A
3	West	404.28	101.07	404.74	613.24	282.72	0.00	1631.75	1189.51	0.248	0.47	0.36	3.181	A
3	South	97.87	24.47	97.95	187.74	499.72	0.00	1491.44	784.91	0.066	0.09	0.07	2.583	A
3	East	789.74	197.44	791.31	495.94	101.73	0.00	1748.78	1396.28	0.452	1.27	0.88	3.970	A

Queueing Delay Results for each time segment

Queueing Delay results: (16:00-16:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	6.32	0.42	6.070	A	A
1	West	9.57	0.64	5.909	A	A
1	South	1.71	0.11	4.298	A	A
1	East	29.84	1.99	9.729	A	A
2	North	6.21	0.41	5.963	A	A
2	West	5.26	0.35	3.198	A	A
2	South	1.69	0.11	4.249	A	A
2	East	12.59	0.84	3.944	A	A
3	North	3.37	0.22	3.182	A	A
3	West	5.22	0.35	3.171	A	A
3	South	1.03	0.07	2.579	A	A
3	East	12.54	0.84	3.928	A	A

Queueing Delay results: (16:15-16:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	9.46	0.63	7.634	A	A
1	West	13.75	0.92	7.137	A	A
1	South	2.25	0.15	4.731	A	A
1	East	58.02	3.87	16.806	C	B
2	North	9.23	0.62	7.443	A	A
2	West	6.97	0.47	3.539	A	A
2	South	2.22	0.15	4.658	A	A
2	East	18.18	1.21	4.793	A	A
3	North	4.56	0.30	3.599	A	A
3	West	6.90	0.46	3.500	A	A
3	South	1.32	0.09	2.741	A	A
3	East	18.08	1.21	4.768	A	A

Queueing Delay results: (16:30-16:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	16.06	1.07	10.832	B	B
1	West	22.48	1.50	9.739	A	A
1	South	3.17	0.21	5.469	A	A
1	East	203.41	13.56	53.020	F	D
2	North	16.40	1.09	11.085	B	B
2	West	9.92	0.66	4.137	A	A
2	South	3.11	0.21	5.352	A	A
2	East	30.53	2.04	6.717	A	A
3	North	6.73	0.45	4.364	A	A
3	West	9.77	0.65	4.072	A	A
3	South	1.76	0.12	2.999	A	A
3	East	30.25	2.02	6.653	A	A

Queueing Delay results: (16:45-17:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	17.39	1.16	11.317	B	B
1	West	23.93	1.60	9.909	A	A
1	South	3.25	0.22	5.485	A	A
1	East	378.97	25.26	91.403	F	F
2	North	17.49	1.17	11.269	B	B
2	West	10.16	0.68	4.149	A	A
2	South	3.18	0.21	5.362	A	A
2	East	32.24	2.15	6.801	A	A
3	North	6.89	0.46	4.378	A	A
3	West	10.00	0.67	4.081	A	A
3	South	1.78	0.12	3.000	A	A
3	East	31.92	2.13	6.733	A	A

Queueing Delay results: (17:00-17:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service

1	North	11.66	0.78	8.598	A	A
1	West	15.41	1.03	7.320	A	A
1	South	2.37	0.16	4.751	A	A
1	East	191.65	12.78	47.088	E	D
2	North	10.22	0.68	7.564	A	A
2	West	7.31	0.49	3.556	A	A
2	South	2.33	0.16	4.671	A	A
2	East	19.81	1.32	4.858	A	A
3	North	4.77	0.32	3.612	A	A
3	West	7.22	0.48	3.512	A	A
3	South	1.36	0.09	2.744	A	A
3	East	19.68	1.31	4.828	A	A

Queueing Delay results: (17:15-17:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	6.99	0.47	6.233	A	A
1	West	10.48	0.70	6.003	A	A
1	South	1.80	0.12	4.317	A	A
1	East	38.02	2.53	10.892	B	B
2	North	6.76	0.45	6.035	A	A
2	West	5.51	0.37	3.210	A	A
2	South	1.78	0.12	4.262	A	A
2	East	13.50	0.90	3.987	A	A
3	North	3.52	0.23	3.196	A	A
3	West	5.46	0.36	3.181	A	A
3	South	1.07	0.07	2.583	A	A
3	East	13.44	0.90	3.970	A	A

Queue Variation Results for each time segment

Queue Variation results: (16:00-16:15)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.44	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	0.66	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	South	0.12	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	2.16	0.00	1.05	3.16	3.16			N/A	N/A
2	North	0.43	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	West	0.36	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.12	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	0.86	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.23	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.36	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.86	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:15-16:30)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
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1	North	0.65	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	0.95	0.00	0.00	1.08	1.08			N/A	N/A
1	South	0.15	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	4.34	0.00	0.00	10.54	14.76			N/A	N/A
2	North	0.63	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	West	0.47	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.15	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.25	0.00	0.00	2.11	3.16			N/A	N/A
3	North	0.31	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.47	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	1.24	0.00	0.00	2.11	3.16			N/A	N/A

Queue Variation results: (16:30-16:45)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.13	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	1.58	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	South	0.22	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	20.21	0.00	12.65	45.34	59.05			N/A	N/A
2	North	1.15	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	West	0.68	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.21	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	2.13	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.46	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.67	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.12	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	2.11	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:45-17:00)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.17	0.00	0.00	0.00	2.03			N/A	N/A
1	West	1.61	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	South	0.22	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	29.95	0.00	18.98	69.59	90.68			N/A	N/A
2	North	1.17	0.00	0.00	0.00	2.03			N/A	N/A

2	West	0.68	0.00	0.00	0.00	1.08			N/A	N/A
2	South	0.21	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	2.16	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.46	0.00	0.00	0.00	1.02			N/A	N/A
3	West	0.67	0.00	0.00	0.00	1.08			N/A	N/A
3	South	0.12	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	2.14	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:00-17:15)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.75	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	0.99	0.00	0.00	1.08	1.08			N/A	N/A
1	South	0.16	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	5.53	0.00	0.00	12.65	21.09			N/A	N/A
2	North	0.65	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	West	0.48	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.15	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.28	0.00	0.00	1.05	2.11			N/A	N/A
3	North	0.31	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.47	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	1.27	0.00	0.00	1.05	2.11			N/A	N/A

Queue Variation results: (17:15-17:30)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.45	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	0.68	0.00	0.00	0.00	1.08			N/A	N/A
1	South	0.12	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	2.31	0.00	0.00	1.05	6.33			N/A	N/A
2	North	0.44	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	West	0.36	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.12	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	0.88	0.00	0.00	1.05	1.05			N/A	N/A
3	North	0.23	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.36	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

3	East	0.88	0.00	0.00	1.05	1.05			N/A	N/A
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Junctions 8
ARCADY 8 - Roundabout Module
Version: 8.0.6.541 [19821,26/11/2015] © Copyright TRL Limited, 2020
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Filename: Centennial and Riddell.arc8

Path: C:\Users\AdamMorrison\Desktop\Projects\200195 - Arcady

Report generation date: 2020-08-25 7:58:35 PM

Summary of intersection performance

	AM						
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Background 2031						
Intersection 1 - Leg North	0.60	1.07	6.48	0.36	A	13.96	B
Intersection 1 - Leg West	4.24	13.72	19.26	0.80	C		
Intersection 1 - Leg South	1.47	2.04	13.64	0.60	B		
Intersection 1 - Leg East	1.53	1.22	10.70	0.56	B		
Intersection 2 - Leg North	0.59	1.07	6.36	0.36	A	6.74	A
Intersection 2 - Leg West	1.21	?	5.35	0.52	A		
Intersection 2 - Leg South	1.38	2.04	12.72	0.58	B		
Intersection 2 - Leg East	0.67	1.22	4.62	0.36	A		
Intersection 3 - Leg North	0.31	~1	3.34	0.23	A	4.64	A
Intersection 3 - Leg West	1.19	?	5.26	0.51	A		
Intersection 3 - Leg South	0.50	1.02	4.62	0.33	A		
Intersection 3 - Leg East	0.66	1.22	4.53	0.35	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Background 2031, AM " model duration: 8:00 AM - 9:30 AM

"D2 - Background 2031, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2020-08-25 7:58:33 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2020-08-25
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - Background 2031, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Background 2031, AM	Background 2031	AM		ONE HOUR	08:00	09:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	(untitled)	Roundabout	North,West,South,East				13.96	B
2	2	(untitled)	Roundabout	North,West,South,East				6.74	A
3	3	(untitled)	Roundabout	North,West,South,East				4.64	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Alder Street	
1	West	West	Riddell Road	
1	South	South	Alder Street	
1	East	East	Riddell Road	
2	North	North	Alder Street	
2	West	West	Riddell Road	
2	South	South	Alder Street	
2	East	East	Riddell Road	
3	North	North	Alder Street	
3	West	West	Riddell Road	
3	South	South	Alder Street	
3	East	East	Riddell Road	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	South	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00

2	West	0.00	99999.00		0.00
2	South	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	South	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	South	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	3.50	4.50	30.00	20.00	47.50	25.00	
2	West	3.50	8.00	30.00	20.00	47.50	25.00	
2	South	3.50	4.50	30.00	20.00	47.50	25.00	
2	East	3.50	8.00	30.00	20.00	47.50	25.00	
3	North	3.50	8.00	30.00	20.00	55.00	25.00	
3	West	3.50	8.00	30.00	20.00	55.00	25.00	
3	South	3.50	8.00	30.00	20.00	55.00	25.00	
3	East	3.50	8.00	30.00	20.00	55.00	25.00	

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage	Region of Waterloo Standard		90.00
1	West	Percentage	Region of Waterloo Standard		90.00
1	South	Percentage	Region of Waterloo Standard		90.00
1	East	Percentage	Region of Waterloo Standard		90.00
2	North	Percentage	Region of Waterloo Standard		90.00
2	West	Percentage	Region of Waterloo Standard		90.00
2	South	Percentage	Region of Waterloo Standard		90.00
2	East	Percentage	Region of Waterloo Standard		90.00
3	North	Percentage	Region of Waterloo Standard		90.00
3	West	Percentage	Region of Waterloo Standard		90.00
3	South	Percentage	Region of Waterloo Standard		90.00
3	East	Percentage	Region of Waterloo Standard		90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	South		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.558	1221.701
2	West		(calculated)	(calculated)	0.685	1814.551
2	South		(calculated)	(calculated)	0.558	1221.701
2	East		(calculated)	(calculated)	0.685	1814.551
3	North		(calculated)	(calculated)	0.647	1814.551
3	West		(calculated)	(calculated)	0.647	1814.551
3	South		(calculated)	(calculated)	0.647	1814.551
3	East		(calculated)	(calculated)	0.647	1814.551

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
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		✓	✓	Truck Percentages	2.00				✓	✓
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Entry Flows

General Flows Data

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	306.00	100.000
1	West	ONE HOUR	✓	746.00	100.000
1	South	ONE HOUR	✓	359.00	100.000
1	East	ONE HOUR	✓	475.00	100.000
2	North	ONE HOUR	✓	306.00	100.000
2	West	ONE HOUR	✓	746.00	100.000
2	South	ONE HOUR	✓	359.00	100.000
2	East	ONE HOUR	✓	475.00	100.000
3	North	ONE HOUR	✓	306.00	100.000
3	West	ONE HOUR	✓	746.00	100.000
3	South	ONE HOUR	✓	359.00	100.000
3	East	ONE HOUR	✓	475.00	100.000

Turning Proportions

Turning Counts / Proportions (PCE/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	71.000	97.000	138.000
	West	195.000	0.000	8.000	543.000
	South	186.000	72.000	0.000	101.000
	East	92.000	321.000	62.000	0.000

Turning Proportions (PCE) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.23	0.32	0.45
	West	0.26	0.00	0.01	0.73
	South	0.52	0.20	0.00	0.28
	East	0.19	0.68	0.13	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

		To			
		North	West	South	East
From	North	0.000	71.000	97.000	138.000
	West	195.000	0.000	8.000	543.000
	South	186.000	72.000	0.000	101.000
	East	92.000	321.000	62.000	0.000

Turning Proportions (PCE) - Intersection 2 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.23	0.32	0.45
	West	0.26	0.00	0.01	0.73
	South	0.52	0.20	0.00	0.28
	East	0.19	0.68	0.13	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

		To			
		North	West	South	East
	North	0.000	71.000	97.000	138.000

From	West	195.000	0.000	8.000	543.000
	South	186.000	72.000	0.000	101.000
	East	92.000	321.000	62.000	0.000

Turning Proportions (PCE) - Intersection 3 (for whole period)

From	To				
		North	West	South	East
	North	0.00	0.23	0.32	0.45
	West	0.26	0.00	0.01	0.73
	South	0.52	0.20	0.00	0.28
	East	0.19	0.68	0.13	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

From	To				
		North	West	South	East
	North	1.000	1.110	1.030	1.080
	West	1.070	1.000	1.330	1.170
	South	1.010	1.020	1.000	1.040
	East	1.250	1.260	1.020	1.000

Truck Percentages - Intersection 1 (for whole period)

From	To				
		North	West	South	East
	North	0.0	11.0	3.0	8.0
	West	7.0	0.0	33.0	17.0
	South	1.0	2.0	0.0	4.0
	East	25.0	26.0	2.0	0.0

Average PCE Per Vehicle - Intersection 2 (for whole period)

From	To				
		North	West	South	East
	North	1.000	1.110	1.030	1.080
	West	1.070	1.000	1.330	1.170
	South	1.010	1.020	1.000	1.040
	East	1.250	1.260	1.020	1.000

Truck Percentages - Intersection 2 (for whole period)

From	To				
		North	West	South	East
	North	0.0	11.0	3.0	8.0
	West	7.0	0.0	33.0	17.0
	South	1.0	2.0	0.0	4.0
	East	25.0	26.0	2.0	0.0

Average PCE Per Vehicle - Intersection 3 (for whole period)

From	To				
		North	West	South	East
	North	1.000	1.110	1.030	1.080
	West	1.070	1.000	1.330	1.170
	South	1.010	1.020	1.000	1.040
	East	1.250	1.260	1.020	1.000

Truck Percentages - Intersection 3 (for whole period)

From	To				
		North	West	South	East
	North	0.0	11.0	3.0	8.0
	West	7.0	0.0	33.0	17.0
	South	1.0	2.0	0.0	4.0
	East	25.0	26.0	2.0	0.0

Results

Results Summary for whole modelled period

Intersection	Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
1	North	0.36	6.48	0.60	1.07	A	280.79	421.19	39.51	5.63	0.44	39.51	5.63
1	West	0.80	19.26	4.24	13.72	C	684.54	1026.81	211.70	12.37	2.35	211.74	12.37
1	South	0.60	13.64	1.47	2.04	B	329.42	494.14	78.82	9.57	0.88	78.83	9.57
1	East	0.56	10.70	1.53	1.22	B	435.87	653.80	92.10	8.45	1.02	92.11	8.45
2	North	0.36	6.36	0.59	1.07	A	280.79	421.19	38.99	5.55	0.43	39.00	5.56
2	West	0.52	5.35	1.21	?	A	684.54	1026.81	77.17	4.51	0.86	77.18	4.51
2	South	0.58	12.72	1.38	2.04	B	329.42	494.14	75.28	9.14	0.84	75.29	9.14
2	East	0.36	4.62	0.67	1.22	A	435.87	653.80	44.59	4.09	0.50	44.60	4.09
3	North	0.23	3.34	0.31	~1	A	280.79	421.19	21.62	3.08	0.24	21.62	3.08
3	West	0.51	5.26	1.19	?	A	684.54	1026.81	76.24	4.46	0.85	76.25	4.46
3	South	0.33	4.62	0.50	1.02	A	329.42	494.14	32.38	3.93	0.36	32.38	3.93
3	East	0.35	4.53	0.66	1.22	A	435.87	653.80	43.91	4.03	0.49	43.92	4.03

Main Results for each time segment

Main results: (08:00-08:15)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	230.37	57.59	229.14	353.37	340.08	0.00	1024.87	752.87	0.225	0.00	0.31	4.835	A
1	West	561.63	140.41	556.88	346.91	222.31	0.00	1093.03	821.60	0.514	0.00	1.19	7.613	A
1	South	270.27	67.57	268.37	124.95	654.24	0.00	843.05	554.78	0.321	0.00	0.48	6.371	A
1	East	357.60	89.40	355.02	584.18	338.43	0.00	1025.83	866.65	0.349	0.00	0.65	6.526	A
2	North	230.37	57.59	229.15	354.25	341.03	0.00	1031.42	551.99	0.223	0.00	0.31	4.796	A
2	West	561.63	140.41	559.31	347.71	222.47	0.00	1662.21	1398.14	0.338	0.00	0.58	3.724	A
2	South	270.27	67.57	268.41	125.13	656.65	0.00	855.31	311.05	0.316	0.00	0.47	6.238	A
2	East	357.60	89.40	356.19	585.97	339.09	0.00	1582.35	1411.22	0.226	0.00	0.35	3.581	A
3	North	230.37	57.59	229.65	354.72	341.22	0.00	1593.93	1057.16	0.145	0.00	0.18	2.822	A
3	West	561.63	140.41	559.33	348.01	222.86	0.00	1670.45	1182.74	0.336	0.00	0.58	3.697	A
3	South	270.27	67.57	269.29	125.29	656.90	0.00	1389.82	749.75	0.194	0.00	0.25	3.274	A
3	East	357.60	89.40	356.20	586.45	339.74	0.00	1594.88	1266.26	0.224	0.00	0.35	3.545	A

Main results: (08:15-08:30)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	275.09	68.77	274.68	423.76	407.96	0.00	985.59	752.87	0.279	0.31	0.41	5.415	A
1	West	670.64	167.66	667.88	416.09	266.54	0.00	1067.44	821.60	0.628	1.19	1.88	10.230	B
1	South	322.73	80.68	321.72	149.83	784.59	0.00	767.61	554.78	0.420	0.48	0.73	8.218	A
1	East	427.02	106.75	425.93	700.52	405.79	0.00	986.85	866.65	0.433	0.65	0.92	7.818	A
2	North	275.09	68.77	274.68	424.41	408.48	0.00	993.78	551.99	0.277	0.31	0.41	5.356	A
2	West	670.64	167.66	669.79	416.54	266.63	0.00	1631.97	1398.14	0.411	0.58	0.79	4.275	A
2	South	322.73	80.68	321.78	149.93	786.49	0.00	782.86	311.05	0.412	0.47	0.71	7.949	A
2	East	427.02	106.75	426.57	701.94	406.33	0.00	1536.31	1411.22	0.278	0.35	0.47	3.957	A
3	North	275.09	68.77	274.89	424.73	408.61	0.00	1550.35	1057.16	0.177	0.18	0.23	3.020	A
3	West	670.64	167.66	669.81	416.71	266.79	0.00	1642.05	1182.74	0.408	0.58	0.78	4.230	A
3	South	322.73	80.68	322.38	150.00	786.59	0.00	1305.95	749.75	0.247	0.25	0.33	3.734	A
3	East	427.02	106.75	426.58	702.21	406.77	0.00	1551.54	1266.26	0.275	0.35	0.46	3.903	A

Main results: (08:30-08:45)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
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1	North	336.91	84.23	336.16	516.60	498.50	0.00	933.19	752.87	0.361	0.41	0.60	6.445	A
1	West	821.36	205.34	812.65	508.54	326.12	0.00	1032.96	821.60	0.795	1.88	4.06	17.998	C
1	South	395.27	98.82	392.48	183.23	955.54	0.00	668.68	554.78	0.591	0.73	1.43	13.165	B
1	East	522.98	130.75	520.62	853.53	494.48	0.00	935.51	866.65	0.559	0.92	1.51	10.530	B
2	North	336.91	84.23	336.18	518.86	499.81	0.00	942.82	551.99	0.357	0.41	0.59	6.343	A
2	West	821.36	205.34	819.70	509.65	326.34	0.00	1591.09	1398.14	0.516	0.79	1.21	5.324	A
2	South	395.27	98.82	392.69	183.52	962.53	0.00	684.64	311.05	0.577	0.71	1.35	12.471	B
2	East	522.98	130.75	522.19	858.74	496.47	0.00	1474.59	1411.22	0.355	0.47	0.67	4.610	A
3	North	336.91	84.23	336.59	519.86	500.21	0.00	1491.13	1057.16	0.226	0.23	0.31	3.337	A
3	West	821.36	205.34	819.75	510.14	326.65	0.00	1603.34	1182.74	0.512	0.78	1.19	5.243	A
3	South	395.27	98.82	394.59	183.65	962.75	0.00	1192.06	749.75	0.332	0.33	0.50	4.602	A
3	East	522.98	130.75	522.21	859.49	497.85	0.00	1492.65	1266.26	0.350	0.46	0.65	4.524	A

Main results: (08:45-09:00)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	336.91	84.23	336.90	520.49	500.85	0.00	931.83	752.87	0.362	0.60	0.60	6.475	A
1	West	821.36	205.34	820.65	510.77	326.98	0.00	1032.46	821.60	0.796	4.06	4.24	19.264	C
1	South	395.27	98.82	395.09	183.84	963.78	0.00	663.90	554.78	0.595	1.43	1.47	13.645	B
1	East	522.98	130.75	522.88	860.42	498.45	0.00	933.22	866.65	0.560	1.51	1.53	10.702	B
2	North	336.91	84.23	336.90	520.72	500.93	0.00	942.19	551.99	0.358	0.59	0.59	6.364	A
2	West	821.36	205.34	821.33	510.84	326.99	0.00	1590.64	1398.14	0.516	1.21	1.21	5.350	A
2	South	395.27	98.82	395.17	183.86	964.46	0.00	683.56	311.05	0.578	1.35	1.38	12.724	B
2	East	522.98	130.75	522.97	860.94	498.68	0.00	1473.07	1411.22	0.355	0.67	0.67	4.624	A
3	North	336.91	84.23	336.91	520.77	500.95	0.00	1490.64	1057.16	0.226	0.31	0.31	3.338	A
3	West	821.36	205.34	821.33	510.86	327.00	0.00	1603.12	1182.74	0.512	1.19	1.19	5.265	A
3	South	395.27	98.82	395.26	183.87	964.46	0.00	1190.95	749.75	0.332	0.50	0.50	4.615	A
3	East	522.98	130.75	522.97	860.97	498.75	0.00	1492.07	1266.26	0.351	0.65	0.66	4.534	A

Main results: (09:00-09:15)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	275.09	68.77	275.82	429.47	411.48	0.00	983.55	752.87	0.280	0.60	0.42	5.451	A
1	West	670.64	167.66	679.60	419.44	267.86	0.00	1066.67	821.60	0.629	4.24	1.99	10.868	B
1	South	322.73	80.68	325.55	150.76	796.70	0.00	760.60	554.78	0.424	1.47	0.76	8.497	A
1	East	427.02	106.75	429.35	710.65	411.61	0.00	983.48	866.65	0.434	1.53	0.95	7.962	A
2	North	275.09	68.77	275.80	427.14	410.18	0.00	992.83	551.99	0.277	0.59	0.41	5.380	A
2	West	670.64	167.66	672.27	418.34	267.65	0.00	1631.28	1398.14	0.411	1.21	0.80	4.299	A
2	South	322.73	80.68	325.32	150.48	789.45	0.00	781.21	311.05	0.413	1.38	0.73	8.102	A
2	East	427.02	106.75	427.80	705.24	409.52	0.00	1534.13	1411.22	0.278	0.67	0.47	3.974	A
3	North	275.09	68.77	275.41	426.13	409.78	0.00	1549.59	1057.16	0.178	0.31	0.23	3.026	A
3	West	670.64	167.66	672.23	417.85	267.34	0.00	1641.69	1182.74	0.409	1.19	0.80	4.253	A
3	South	322.73	80.68	323.40	150.35	789.23	0.00	1304.25	749.75	0.247	0.50	0.34	3.749	A
3	East	427.02	106.75	427.77	704.49	408.14	0.00	1550.66	1266.26	0.275	0.66	0.47	3.915	A

Main results: (09:15-09:30)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	230.37	57.59	230.80	357.69	343.70	0.00	1022.78	752.87	0.225	0.42	0.31	4.866	A
1	West	561.63	140.41	564.68	350.42	224.07	0.00	1092.02	821.60	0.514	1.99	1.23	7.851	A
1	South	270.27	67.57	271.37	126.04	662.71	0.00	838.15	554.78	0.322	0.76	0.49	6.494	A
1	East	357.60	89.40	358.76	591.45	342.63	0.00	1023.40	866.65	0.349	0.95	0.66	6.624	A
2	North	230.37	57.59	230.79	356.94	343.12	0.00	1030.25	551.99	0.224	0.41	0.31	4.821	A
2	West	561.63	140.41	562.50	349.93	223.97	0.00	1661.18	1398.14	0.338	0.80	0.59	3.751	A
2	South	270.27	67.57	271.28	125.93	660.54	0.00	853.14	311.05	0.317	0.73	0.48	6.325	A
2	East	357.60	89.40	358.06	589.83	341.99	0.00	1580.37	1411.22	0.226	0.47	0.36	3.595	A
3	North	230.37	57.59	230.57	356.59	342.98	0.00	1592.79	1057.16	0.145	0.23	0.18	2.830	A
3	West	561.63	140.41	562.48	349.74	223.81	0.00	1669.84	1182.74	0.336	0.80	0.58	3.719	A
3	South	270.27	67.57	270.63	125.86	660.43	0.00	1387.53	749.75	0.195	0.34	0.25	3.291	A
3	East	357.60	89.40	358.05	589.54	341.52	0.00	1593.73	1266.26	0.224	0.47	0.35	3.559	A

Queueing Delay Results for each time segment

Queueing Delay results: (08:00-08:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	4.50	0.30	4.835	A	A
1	West	16.91	1.13	7.613	A	A
1	South	6.89	0.46	6.371	A	A
1	East	9.32	0.62	6.526	A	A
2	North	4.46	0.30	4.796	A	A
2	West	8.48	0.57	3.724	A	A
2	South	6.75	0.45	6.238	A	A
2	East	5.20	0.35	3.581	A	A
3	North	2.66	0.18	2.822	A	A
3	West	8.42	0.56	3.697	A	A
3	South	3.61	0.24	3.274	A	A
3	East	5.15	0.34	3.545	A	A

Queueing Delay results: (08:15-08:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	6.04	0.40	5.415	A	A
1	West	26.69	1.78	10.230	B	B
1	South	10.55	0.70	8.218	A	A
1	East	13.32	0.89	7.818	A	A
2	North	5.97	0.40	5.356	A	A
2	West	11.62	0.77	4.275	A	A
2	South	10.22	0.68	7.949	A	A
2	East	6.89	0.46	3.957	A	A
3	North	3.41	0.23	3.020	A	A
3	West	11.51	0.77	4.230	A	A
3	South	4.92	0.33	3.734	A	A
3	East	6.80	0.45	3.903	A	A

Queueing Delay results: (08:30-08:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	8.73	0.58	6.445	A	A
1	West	54.14	3.61	17.998	C	B
1	South	20.00	1.33	13.165	B	B
1	East	21.50	1.43	10.530	B	B
2	North	8.59	0.57	6.343	A	A
2	West	17.55	1.17	5.324	A	A
2	South	19.02	1.27	12.471	B	B
2	East	9.77	0.65	4.610	A	A
3	North	4.60	0.31	3.337	A	A
3	West	17.29	1.15	5.243	A	A
3	South	7.37	0.49	4.602	A	A
3	East	9.59	0.64	4.524	A	A

Queueing Delay results: (08:45-09:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	9.01	0.60	6.475	A	A
1	West	62.46	4.16	19.264	C	B
1	South	21.80	1.45	13.645	B	B
1	East	22.87	1.52	10.702	B	B
2	North	8.86	0.59	6.364	A	A
2	West	18.16	1.21	5.350	A	A
2	South	20.48	1.37	12.724	B	B
2	East	10.02	0.67	4.624	A	A
3	North	4.67	0.31	3.338	A	A
3	West	17.87	1.19	5.265	A	A
3	South	7.56	0.50	4.615	A	A
3	East	9.83	0.66	4.534	A	A

Queueing Delay results: (09:00-09:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service

1	North	6.44	0.43	5.451	A	A
1	West	32.21	2.15	10.868	B	B
1	South	11.99	0.80	8.497	A	A
1	East	14.85	0.99	7.962	A	A
2	North	6.35	0.42	5.380	A	A
2	West	12.37	0.82	4.299	A	A
2	South	11.42	0.76	8.102	A	A
2	East	7.24	0.48	3.974	A	A
3	North	3.53	0.24	3.026	A	A
3	West	12.24	0.82	4.253	A	A
3	South	5.16	0.34	3.749	A	A
3	East	7.13	0.48	3.915	A	A

Queueing Delay results: (09:15-09:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	4.79	0.32	4.866	A	A
1	West	19.30	1.29	7.851	A	A
1	South	7.59	0.51	6.494	A	A
1	East	10.24	0.68	6.624	A	A
2	North	4.75	0.32	4.821	A	A
2	West	8.99	0.60	3.751	A	A
2	South	7.38	0.49	6.325	A	A
2	East	5.47	0.36	3.595	A	A
3	North	2.76	0.18	2.830	A	A
3	West	8.91	0.59	3.719	A	A
3	South	3.78	0.25	3.291	A	A
3	East	5.41	0.36	3.559	A	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.31	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	1.19	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	South	0.48	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	0.65	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.31	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	West	0.58	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.47	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	0.35	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.58	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.25	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.35	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:15-08:30)

									Probability Of	Probability Of
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Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Reaching Or Exceeding Marker	Exactly Reaching Marker
1	North	0.41	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	1.88	0.00	0.00	3.43	5.72			N/A	N/A
1	South	0.73	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	0.92	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.41	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	West	0.79	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.71	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	0.47	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.23	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.78	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.33	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.46	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:30-08:45)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.60	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	4.06	0.00	0.00	4.57	13.72			N/A	N/A
1	South	1.43	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	1.51	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.59	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	West	1.21	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	1.35	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	0.67	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.31	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	1.19	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.50	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.65	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:45-09:00)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.60	0.00	0.00	0.00	1.07			N/A	N/A
1	West	4.24	0.00	0.00	1.14	10.29			N/A	N/A

1	South	1.47	0.00	0.00	0.00	2.04			N/A	N/A
1	East	1.53	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.59	0.00	0.00	0.00	1.07			N/A	N/A
2	West	1.21	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	1.38	0.00	0.00	0.00	2.04			N/A	N/A
2	East	0.67	0.00	0.00	0.00	1.22			N/A	N/A
3	North	0.31	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	1.19	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.50	0.00	0.00	0.00	1.02			N/A	N/A
3	East	0.66	0.00	0.00	0.00	1.22			N/A	N/A

Queue Variation results: (09:00-09:15)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.42	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	1.99	0.00	0.00	3.43	5.72			N/A	N/A
1	South	0.76	0.00	0.00	0.00	1.02			N/A	N/A
1	East	0.95	0.00	0.00	0.00	1.22			N/A	N/A
2	North	0.41	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	West	0.80	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.73	0.00	0.00	0.00	1.02			N/A	N/A
2	East	0.47	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.23	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.80	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.34	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.47	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:15-09:30)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.31	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	1.23	0.00	0.00	1.14	3.43			N/A	N/A
1	South	0.49	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	0.66	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.31	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	West	0.59	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.48	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	0.36	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

							small or very big.			
3	West	0.58	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.25	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.35	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Junctions 8
ARCADY 8 - Roundabout Module
Version: 8.0.6.541 [19821,26/11/2015] © Copyright TRL Limited, 2020
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Filename: Centennial and Riddell.arc8

Path: C:\Users\AdamMorrison\Desktop\Projects\200195 - Arcady

Report generation date: 2020-08-25 7:57:39 PM

Summary of intersection performance

	PM						
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Background 2031						
Intersection 1 - Leg North	3.67	11.66	25.70	0.79	D	105.23	F
Intersection 1 - Leg West	1.69	2.30	12.16	0.60	B		
Intersection 1 - Leg South	0.52	1.02	6.77	0.34	A		
Intersection 1 - Leg East	71.44	132.83	208.57	1.12	F		
Intersection 2 - Leg North	4.81	16.96	34.07	0.83	D	13.78	B
Intersection 2 - Leg West	0.69	1.15	4.87	0.37	A		
Intersection 2 - Leg South	0.51	1.02	6.60	0.33	A		
Intersection 2 - Leg East	3.09	4.83	9.92	0.72	A		
Intersection 3 - Leg North	0.93	1.06	6.28	0.47	A	7.18	A
Intersection 3 - Leg West	0.67	1.15	4.74	0.37	A		
Intersection 3 - Leg South	0.26	~1	3.37	0.20	A		
Intersection 3 - Leg East	3.00	4.83	9.63	0.72	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Background 2031, AM" model duration: 8:00 AM - 9:30 AM

"D2 - Background 2031, PM " model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2020-08-25 7:57:37 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2020-08-25
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - Background 2031, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Background 2031, PM	Background 2031	PM		ONE HOUR	16:00	17:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	(untitled)	Roundabout	North,West,South,East				105.23	F
2	2	(untitled)	Roundabout	North,West,South,East				13.78	B
3	3	(untitled)	Roundabout	North,West,South,East				7.18	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Alder Street	
1	West	West	Riddell Road	
1	South	South	Alder Street	
1	East	East	Riddell Road	
2	North	North	Alder Street	
2	West	West	Riddell Road	
2	South	South	Alder Street	
2	East	East	Riddell Road	
3	North	North	Alder Street	
3	West	West	Riddell Road	
3	South	South	Alder Street	
3	East	East	Riddell Road	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	South	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00

2	West	0.00	99999.00		0.00
2	South	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	South	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	South	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	3.50	4.50	30.00	20.00	47.50	25.00	
2	West	3.50	8.00	30.00	20.00	47.50	25.00	
2	South	3.50	4.50	30.00	20.00	47.50	25.00	
2	East	3.50	8.00	30.00	20.00	47.50	25.00	
3	North	3.50	8.00	30.00	20.00	55.00	25.00	
3	West	3.50	8.00	30.00	20.00	55.00	25.00	
3	South	3.50	8.00	30.00	20.00	55.00	25.00	
3	East	3.50	8.00	30.00	20.00	55.00	25.00	

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage	Region of Waterloo Standard		90.00
1	West	Percentage	Region of Waterloo Standard		90.00
1	South	Percentage	Region of Waterloo Standard		90.00
1	East	Percentage	Region of Waterloo Standard		90.00
2	North	Percentage	Region of Waterloo Standard		90.00
2	West	Percentage	Region of Waterloo Standard		90.00
2	South	Percentage	Region of Waterloo Standard		90.00
2	East	Percentage	Region of Waterloo Standard		90.00
3	North	Percentage	Region of Waterloo Standard		90.00
3	West	Percentage	Region of Waterloo Standard		90.00
3	South	Percentage	Region of Waterloo Standard		90.00
3	East	Percentage	Region of Waterloo Standard		90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	South		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.558	1221.701
2	West		(calculated)	(calculated)	0.685	1814.551
2	South		(calculated)	(calculated)	0.558	1221.701
2	East		(calculated)	(calculated)	0.685	1814.551
3	North		(calculated)	(calculated)	0.647	1814.551
3	West		(calculated)	(calculated)	0.647	1814.551
3	South		(calculated)	(calculated)	0.647	1814.551
3	East		(calculated)	(calculated)	0.647	1814.551

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
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		✓	✓	Truck Percentages	2.00				✓	✓
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Entry Flows

General Flows Data

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	490.00	100.000
1	West	ONE HOUR	✓	463.00	100.000
1	South	ONE HOUR	✓	254.00	100.000
1	East	ONE HOUR	✓	1036.00	100.000
2	North	ONE HOUR	✓	490.00	100.000
2	West	ONE HOUR	✓	463.00	100.000
2	South	ONE HOUR	✓	254.00	100.000
2	East	ONE HOUR	✓	1036.00	100.000
3	North	ONE HOUR	✓	490.00	100.000
3	West	ONE HOUR	✓	463.00	100.000
3	South	ONE HOUR	✓	254.00	100.000
3	East	ONE HOUR	✓	1036.00	100.000

Turning Proportions

Turning Counts / Proportions (PCE/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	72.000	228.000	190.000
	West	109.000	0.000	23.000	331.000
	South	145.000	60.000	0.000	49.000
	East	159.000	691.000	186.000	0.000

Turning Proportions (PCE) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.15	0.47	0.39
	West	0.24	0.00	0.05	0.71
	South	0.57	0.24	0.00	0.19
	East	0.15	0.67	0.18	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

		To			
		North	West	South	East
From	North	0.000	72.000	228.000	190.000
	West	109.000	0.000	23.000	331.000
	South	145.000	60.000	0.000	49.000
	East	159.000	691.000	186.000	0.000

Turning Proportions (PCE) - Intersection 2 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.15	0.47	0.39
	West	0.24	0.00	0.05	0.71
	South	0.57	0.24	0.00	0.19
	East	0.15	0.67	0.18	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

		To			
		North	West	South	East
	North	0.000	72.000	228.000	190.000

From	West	109.000	0.000	23.000	331.000
	South	145.000	60.000	0.000	49.000
	East	159.000	691.000	186.000	0.000

Turning Proportions (PCE) - Intersection 3 (for whole period)

From	To				
		North	West	South	East
	North	0.00	0.15	0.47	0.39
	West	0.24	0.00	0.05	0.71
	South	0.57	0.24	0.00	0.19
	East	0.15	0.67	0.18	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

From	To				
		North	West	South	East
	North	1.000	1.110	1.030	1.080
	West	1.070	1.000	1.330	1.170
	South	1.010	1.020	1.000	1.040
	East	1.250	1.260	1.020	1.000

Truck Percentages - Intersection 1 (for whole period)

From	To				
		North	West	South	East
	North	0.0	11.0	3.0	8.0
	West	7.0	0.0	33.0	17.0
	South	1.0	2.0	0.0	4.0
	East	25.0	26.0	2.0	0.0

Average PCE Per Vehicle - Intersection 2 (for whole period)

From	To				
		North	West	South	East
	North	1.000	1.110	1.030	1.080
	West	1.070	1.000	1.330	1.170
	South	1.010	1.020	1.000	1.040
	East	1.250	1.260	1.020	1.000

Truck Percentages - Intersection 2 (for whole period)

From	To				
		North	West	South	East
	North	0.0	11.0	3.0	8.0
	West	7.0	0.0	33.0	17.0
	South	1.0	2.0	0.0	4.0
	East	25.0	26.0	2.0	0.0

Average PCE Per Vehicle - Intersection 3 (for whole period)

From	To				
		North	West	South	East
	North	1.000	1.110	1.030	1.080
	West	1.070	1.000	1.330	1.170
	South	1.010	1.020	1.000	1.040
	East	1.250	1.260	1.020	1.000

Truck Percentages - Intersection 3 (for whole period)

From	To				
		North	West	South	East
	North	0.0	11.0	3.0	8.0
	West	7.0	0.0	33.0	17.0
	South	1.0	2.0	0.0	4.0
	East	25.0	26.0	2.0	0.0

Results

Results Summary for whole modelled period

Intersection	Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
1	North	0.79	25.70	3.67	11.66	D	449.63	674.45	182.03	16.19	2.02	182.08	16.20
1	West	0.60	12.16	1.69	2.30	B	424.86	637.29	98.32	9.26	1.09	98.33	9.26
1	South	0.34	6.77	0.52	1.02	A	233.07	349.61	33.58	5.76	0.37	33.58	5.76
1	East	1.12	208.57	71.44	132.83	F	950.65	1425.98	2445.42	102.89	27.17	2445.75	102.91
2	North	0.83	34.07	4.81	16.96	D	449.63	674.45	197.29	17.55	2.19	197.31	17.55
2	West	0.37	4.87	0.69	1.15	A	424.86	637.29	44.70	4.21	0.50	44.70	4.21
2	South	0.33	6.60	0.51	1.02	A	233.07	349.61	32.92	5.65	0.37	32.92	5.65
2	East	0.72	9.92	3.09	4.83	A	950.65	1425.98	169.99	7.15	1.89	170.01	7.15
3	North	0.47	6.28	0.93	1.06	A	449.63	674.45	56.15	5.00	0.62	56.16	5.00
3	West	0.37	4.74	0.67	1.15	A	424.86	637.29	43.75	4.12	0.49	43.75	4.12
3	South	0.20	3.37	0.26	~1	A	233.07	349.61	17.92	3.07	0.20	17.92	3.07
3	East	0.72	9.63	3.00	4.83	A	950.65	1425.98	166.55	7.01	1.85	166.57	7.01

Main Results for each time segment

Main results: (16:00-16:15)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	368.90	92.22	365.48	307.94	695.29	0.00	819.30	733.01	0.450	0.00	0.85	8.350	A
1	West	348.57	87.14	345.98	611.06	449.71	0.00	961.43	774.46	0.363	0.00	0.65	6.708	A
1	South	191.22	47.81	190.20	325.18	470.51	0.00	949.39	631.24	0.201	0.00	0.26	4.822	A
1	East	779.96	194.99	768.27	425.75	234.96	0.00	1085.71	821.32	0.718	0.00	2.92	13.249	B
2	North	368.90	92.22	365.56	309.37	701.57	0.00	830.24	518.25	0.444	0.00	0.83	8.158	A
2	West	348.57	87.14	347.19	616.02	451.11	0.00	1505.65	1342.37	0.232	0.00	0.35	3.573	A
2	South	191.22	47.81	190.22	326.61	471.69	0.00	958.51	397.78	0.200	0.00	0.25	4.764	A
2	East	779.96	194.99	775.69	426.65	235.26	0.00	1653.46	1378.31	0.472	0.00	1.07	4.929	A
3	North	368.90	92.22	367.33	309.62	701.71	0.00	1360.84	1030.03	0.271	0.00	0.39	3.830	A
3	West	348.57	87.14	347.21	616.41	452.63	0.00	1521.89	1108.38	0.229	0.00	0.34	3.526	A
3	South	191.22	47.81	190.64	327.44	472.40	0.00	1509.11	875.25	0.127	0.00	0.15	2.778	A
3	East	779.96	194.99	775.73	427.43	235.60	0.00	1662.22	1189.09	0.469	0.00	1.06	4.880	A

Main results: (16:15-16:30)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	440.50	110.12	437.92	368.22	828.13	0.00	742.41	733.01	0.593	0.85	1.50	12.429	B
1	West	416.23	104.06	415.00	728.27	537.79	0.00	910.45	774.46	0.457	0.65	0.95	8.346	A
1	South	228.34	57.09	227.98	388.60	564.19	0.00	895.17	631.24	0.255	0.26	0.35	5.491	A
1	East	931.34	232.84	914.66	510.47	281.70	0.00	1058.67	821.32	0.880	2.92	7.09	27.388	D
2	North	440.50	110.12	438.03	370.64	840.44	0.00	752.76	518.25	0.585	0.83	1.45	12.031	B
2	West	416.23	104.06	415.75	737.98	540.49	0.00	1444.44	1342.37	0.288	0.35	0.46	4.028	A
2	South	228.34	57.09	227.99	391.30	564.95	0.00	906.47	397.78	0.252	0.25	0.34	5.399	A
2	East	931.34	232.84	929.20	511.06	281.88	0.00	1621.53	1378.31	0.574	1.07	1.60	6.258	A
3	North	440.50	110.12	439.84	370.75	840.53	0.00	1271.08	1030.03	0.347	0.39	0.56	4.587	A
3	West	416.23	104.06	415.77	738.33	542.04	0.00	1464.08	1108.38	0.284	0.34	0.45	3.952	A
3	South	228.34	57.09	228.17	392.15	565.67	0.00	1448.80	875.25	0.158	0.15	0.19	3.002	A
3	East	931.34	232.84	929.25	511.80	282.03	0.00	1632.19	1189.09	0.571	1.06	1.58	6.165	A

Main results: (16:30-16:45)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
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1	North	539.50	134.88	531.91	432.95	917.20	0.00	690.86	733.01	0.781	1.50	3.40	22.970	C
1	West	509.77	127.44	506.99	814.81	634.30	0.00	854.59	774.46	0.597	0.95	1.65	11.829	B
1	South	279.66	69.91	278.97	453.23	688.05	0.00	823.48	631.24	0.340	0.35	0.52	6.722	A
1	East	1140.66	285.16	1005.64	622.51	344.51	0.00	1022.31	821.32	1.116	7.09	40.85	100.396	F
2	North	539.50	134.88	527.76	453.26	1026.66	0.00	648.85	518.25	0.831	1.45	4.39	29.090	D
2	West	509.77	127.44	508.91	900.45	653.97	0.00	1366.74	1342.37	0.373	0.46	0.68	4.827	A
2	South	279.66	69.91	279.00	474.61	688.27	0.00	837.67	397.78	0.334	0.34	0.50	6.551	A
2	East	1140.66	285.16	1134.94	622.28	344.99	0.00	1578.32	1378.31	0.723	1.60	3.03	9.679	A
3	North	539.50	134.88	538.04	453.52	1026.95	0.00	1150.55	1030.03	0.469	0.56	0.92	6.216	A
3	West	509.77	127.44	508.93	902.20	662.78	0.00	1386.01	1108.38	0.368	0.45	0.66	4.723	A
3	South	279.66	69.91	279.38	479.44	692.28	0.00	1366.94	875.25	0.205	0.19	0.26	3.369	A
3	East	1140.66	285.16	1135.18	626.36	345.29	0.00	1591.29	1189.09	0.717	1.58	2.95	9.419	A

Main results: (16:45-17:00)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	539.50	134.88	538.40	435.89	928.05	0.00	684.58	733.01	0.788	3.40	3.67	25.698	D
1	West	509.77	127.44	509.60	824.34	642.11	0.00	850.08	774.46	0.600	1.65	1.69	12.162	B
1	South	279.66	69.91	279.64	458.65	693.06	0.00	820.59	631.24	0.341	0.52	0.52	6.774	A
1	East	1140.66	285.16	1018.27	627.03	345.66	0.00	1021.64	821.32	1.116	40.85	71.44	208.569	F
2	North	539.50	134.88	537.81	454.67	1031.46	0.00	646.18	518.25	0.835	4.39	4.81	34.070	D
2	West	509.77	127.44	509.74	905.73	663.53	0.00	1360.19	1342.37	0.375	0.68	0.69	4.874	A
2	South	279.66	69.91	279.64	480.32	692.96	0.00	835.05	397.78	0.335	0.50	0.51	6.597	A
2	East	1140.66	285.16	1140.43	626.90	345.70	0.00	1577.83	1378.31	0.723	3.03	3.09	9.923	A
3	North	539.50	134.88	539.46	454.68	1031.48	0.00	1147.62	1030.03	0.470	0.92	0.93	6.275	A
3	West	509.77	127.44	509.76	905.99	664.95	0.00	1384.61	1108.38	0.368	0.66	0.67	4.738	A
3	South	279.66	69.91	279.66	481.09	693.62	0.00	1366.07	875.25	0.205	0.26	0.26	3.372	A
3	East	1140.66	285.16	1140.45	627.56	345.71	0.00	1591.02	1189.09	0.717	2.95	3.00	9.634	A

Main results: (17:00-17:15)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	440.50	110.12	447.05	388.98	934.54	0.00	680.82	733.01	0.647	3.67	2.03	16.755	C
1	West	416.23	104.06	418.90	813.50	568.09	0.00	892.91	774.46	0.466	1.69	1.02	8.794	A
1	South	228.34	57.09	229.02	415.56	571.44	0.00	890.97	631.24	0.256	0.52	0.35	5.543	A
1	East	931.34	232.84	1040.07	517.00	283.46	0.00	1057.65	821.32	0.881	71.44	44.26	202.314	F
2	North	440.50	110.12	453.48	372.73	847.35	0.00	748.91	518.25	0.588	4.81	1.56	13.450	B
2	West	416.23	104.06	417.08	745.74	555.09	0.00	1434.45	1342.37	0.290	0.69	0.47	4.079	A
2	South	228.34	57.09	228.99	399.97	572.20	0.00	902.43	397.78	0.253	0.51	0.35	5.448	A
2	East	931.34	232.84	937.07	518.19	283.00	0.00	1620.76	1378.31	0.575	3.09	1.66	6.412	A
3	North	440.50	110.12	441.96	372.48	847.05	0.00	1266.86	1030.03	0.348	0.93	0.57	4.634	A
3	West	416.23	104.06	417.06	743.80	545.21	0.00	1462.03	1108.38	0.285	0.67	0.46	3.971	A
3	South	228.34	57.09	228.62	394.56	567.71	0.00	1447.48	875.25	0.158	0.26	0.19	3.006	A
3	East	931.34	232.84	936.83	513.63	282.70	0.00	1631.76	1189.09	0.571	3.00	1.63	6.305	A

Main results: (17:15-17:30)

Intersection	Leg	Total Demand (PCE/hr)	Intersection Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	368.90	92.22	372.64	336.54	843.83	0.00	733.33	733.01	0.503	2.03	1.10	10.690	B
1	West	348.57	87.14	349.91	729.22	487.25	0.00	939.70	774.46	0.371	1.02	0.69	7.044	A
1	South	191.22	47.81	191.60	360.14	477.02	0.00	945.62	631.24	0.202	0.35	0.26	4.862	A
1	East	779.96	194.99	943.35	431.61	237.02	0.00	1084.53	821.32	0.719	44.26	3.42	56.492	F
2	North	368.90	92.22	371.68	311.60	707.43	0.00	826.98	518.25	0.446	1.56	0.87	8.435	A
2	West	348.57	87.14	349.07	621.61	457.51	0.00	1501.27	1342.37	0.232	0.47	0.35	3.598	A
2	South	191.22	47.81	191.59	330.72	475.85	0.00	956.19	397.78	0.200	0.35	0.26	4.796	A
2	East	779.96	194.99	782.22	430.63	236.81	0.00	1652.39	1378.31	0.472	1.66	1.09	5.008	A
3	North	368.90	92.22	369.58	311.47	707.33	0.00	1357.20	1030.03	0.272	0.57	0.40	3.868	A
3	West	348.57	87.14	349.04	621.21	455.70	0.00	1519.90	1108.38	0.229	0.46	0.34	3.541	A
3	South	191.22	47.81	191.40	329.74	475.01	0.00	1507.42	875.25	0.127	0.19	0.15	2.786	A
3	East	779.96	194.99	782.16	429.76	236.64	0.00	1661.54	1189.09	0.469	1.63	1.08	4.957	A

Queueing Delay Results for each time segment

Queueing Delay results: (16:00-16:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	12.16	0.81	8.350	A	A
1	West	9.33	0.62	6.708	A	A
1	South	3.72	0.25	4.822	A	A
1	East	39.43	2.63	13.249	B	B
2	North	11.90	0.79	8.158	A	A
2	West	5.06	0.34	3.573	A	A
2	South	3.68	0.25	4.764	A	A
2	East	15.44	1.03	4.929	A	A
3	North	5.74	0.38	3.830	A	A
3	West	5.00	0.33	3.526	A	A
3	South	2.17	0.14	2.778	A	A
3	East	15.29	1.02	4.880	A	A

Queueing Delay results: (16:15-16:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	21.13	1.41	12.429	B	B
1	West	13.80	0.92	8.346	A	A
1	South	5.08	0.34	5.491	A	A
1	East	88.87	5.92	27.388	D	C
2	North	20.51	1.37	12.031	B	B
2	West	6.83	0.46	4.028	A	A
2	South	5.00	0.33	5.399	A	A
2	East	23.21	1.55	6.258	A	A
3	North	8.19	0.55	4.587	A	A
3	West	6.70	0.45	3.952	A	A
3	South	2.81	0.19	3.002	A	A
3	East	22.88	1.53	6.165	A	A

Queueing Delay results: (16:30-16:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	44.75	2.98	22.970	C	C
1	West	23.33	1.56	11.829	B	B
1	South	7.55	0.50	6.722	A	A
1	East	371.40	24.76	100.396	F	F
2	North	55.12	3.67	29.090	D	C
2	West	9.95	0.66	4.827	A	A
2	South	7.37	0.49	6.551	A	A
2	East	42.48	2.83	9.679	A	A
3	North	13.41	0.89	6.216	A	A
3	West	9.74	0.65	4.723	A	A
3	South	3.85	0.26	3.369	A	A
3	East	41.42	2.76	9.419	A	A

Queueing Delay results: (16:45-17:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	53.48	3.57	25.698	D	C
1	West	25.15	1.68	12.162	B	B
1	South	7.82	0.52	6.774	A	A
1	East	843.19	56.21	208.569	F	F
2	North	69.58	4.64	34.070	D	C
2	West	10.26	0.68	4.874	A	A
2	South	7.62	0.51	6.597	A	A
2	East	46.01	3.07	9.923	A	A
3	North	13.95	0.93	6.275	A	A
3	West	10.00	0.67	4.738	A	A
3	South	3.92	0.26	3.372	A	A
3	East	44.73	2.98	9.634	A	A

Queueing Delay results: (17:00-17:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service

1	North	33.09	2.21	16.755	C	B
1	West	16.05	1.07	8.794	A	A
1	South	5.44	0.36	5.543	A	A
1	East	867.81	57.85	202.314	F	F
2	North	26.56	1.77	13.450	B	B
2	West	7.25	0.48	4.079	A	A
2	South	5.34	0.36	5.448	A	A
2	East	26.00	1.73	6.412	A	A
3	North	8.77	0.58	4.634	A	A
3	West	7.06	0.47	3.971	A	A
3	South	2.91	0.19	3.006	A	A
3	East	25.56	1.70	6.305	A	A

Queueing Delay results: (17:15-17:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	17.41	1.16	10.690	B	B
1	West	10.65	0.71	7.044	A	A
1	South	3.98	0.27	4.862	A	A
1	East	234.73	15.65	56.492	F	E
2	North	13.62	0.91	8.435	A	A
2	West	5.34	0.36	3.598	A	A
2	South	3.92	0.26	4.796	A	A
2	East	16.85	1.12	5.008	A	A
3	North	6.09	0.41	3.868	A	A
3	West	5.25	0.35	3.541	A	A
3	South	2.25	0.15	2.786	A	A
3	East	16.67	1.11	4.957	A	A

Queue Variation Results for each time segment

Queue Variation results: (16:00-16:15)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.85	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	0.65	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	South	0.26	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	2.92	0.00	1.21	4.83	6.04			N/A	N/A
2	North	0.83	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	West	0.35	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.25	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.07	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.39	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.34	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.15	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	1.06	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:15-16:30)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
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1	North	1.50	0.00	0.00	2.12	3.18			N/A	N/A
1	West	0.95	0.00	0.00	0.00	1.15			N/A	N/A
1	South	0.35	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	7.09	0.00	2.42	16.91	22.94			N/A	N/A
2	North	1.45	0.00	0.00	2.12	4.24			N/A	N/A
2	West	0.46	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.34	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.60	0.00	0.00	2.42	3.62			N/A	N/A
3	North	0.56	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.45	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.19	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	1.58	0.00	0.00	2.42	3.62			N/A	N/A

Queue Variation results: (16:30-16:45)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	3.40	0.00	0.00	5.30	11.66			N/A	N/A
1	West	1.65	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	South	0.52	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	40.85	10.87	36.23	68.83	82.11			N/A	N/A
2	North	4.39	0.00	0.00	8.48	15.90			N/A	N/A
2	West	0.68	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.50	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	3.03	0.00	0.00	0.00	4.83			N/A	N/A
3	North	0.92	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.66	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.26	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	2.95	0.00	0.00	0.00	4.83			N/A	N/A

Queue Variation results: (16:45-17:00)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	3.67	0.00	0.00	2.12	10.60			N/A	N/A
1	West	1.69	0.00	0.00	0.00	2.30			N/A	N/A
1	South	0.52	0.00	0.00	0.00	1.02			N/A	N/A
1	East	71.44	25.36	65.21	114.71	132.83			N/A	N/A
2	North	4.81	0.00	0.00	6.36	16.96			N/A	N/A
2	West	0.69	0.00	0.00	0.00	1.15			N/A	N/A
2	South	0.51	0.00	0.00	0.00	1.02			N/A	N/A
2	East	3.09	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.93	0.00	0.00	0.00	1.06			N/A	N/A
3	West	0.67	0.00	0.00	0.00	1.15			N/A	N/A
3	South	0.26	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	3.00	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:00-17:15)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	2.03	0.00	0.00	4.24	6.36			N/A	N/A
1	West	1.02	0.00	0.00	1.15	1.15			N/A	N/A
1	South	0.35	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	44.26	14.49	39.85	72.45	84.53			N/A	N/A
2	North	1.56	0.00	0.00	3.18	4.24			N/A	N/A
2	West	0.47	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.35	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.66	0.00	0.00	2.42	3.62			N/A	N/A
3	North	0.57	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.46	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.19	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	1.63	0.00	0.00	2.42	3.62			N/A	N/A

Queue Variation results: (17:15-17:30)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.10	0.00	0.00	1.06	3.18			N/A	N/A
1	West	0.69	0.00	0.00	0.00	1.15			N/A	N/A
1	South	0.26	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	3.42	0.00	0.00	1.21	9.66			N/A	N/A
2	North	0.87	0.00	0.00	0.00	2.12			N/A	N/A
2	West	0.35	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	South	0.26	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.09	0.00	0.00	1.21	2.42			N/A	N/A
3	North	0.40	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	West	0.34	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	South	0.15	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	1.08	0.00	0.00	1.21	2.42			N/A	N/A