TRANSPORTATION IMPACT STUDY

41 PARK STREET WEST

COMMUNITY OF CLIFFORD
TOWN OF MINTO
WELLINGTON COUNTY

PREPARED FOR:

CLIFFORD (PARK ST) DEVELOPMENTS

PREPARED BY:

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Revision Number	Date	Comments
Rev.0	August 2024	First TIS Submission

Executive Summary

C.F. Crozier & Associates Inc. (Crozier) was retained by Clifford (Park St) Developments ("the client") to prepare a Transportation Impact Study (TIS) to support the proposed residential development located at 41 Park Street West in the Community of Clifford, Town of Minto, Wellington County.

The Concept Plan dated July 25, 2024 proposes 116 single detached units and 72 townhouse units. Access to the site is proposed through two full-moves entrances to Park Street West. The western entrance (Street 'A') will form a four-legged intersection with the unopened Cecilia Street right-of-way and the eastern entrance (Street 'B') will form a T-intersection with Park Street West.

The Transportation Impact Study (TIS) considers the following study intersections:

- Park Street West and Minto Street South
- Elora Street South and Park Street West/Mill Street East
- Allan Street West and Minto Street South
- Proposed Site Accesses on Park Street West

Under 2024 existing conditions, the unsignalized intersections within the study road network are operating with Levels of Service (LOS) 'B' or better with minimal control delays and volume-to-capacity ratios.

A growth rate of 1.5 percent compounded annually was used for this study based on the agreed Terms of Reference.

Under 2034 future background conditions the study intersections are expected to continue operating similarly to the existing conditions, with a forecasted LOS 'B' or better and minimal control delay and volume-to-capacity ratio. It is highlighted that based on a review of 2034 future background traffic volumes at the intersection of Elora Street South and Park Street West/Mill Street East, a southbound left-turn lane was found to be warranted. As these are future background volumes, the southbound left-turn lane warrant is not related to site generated traffic. The feasibility of implementing a southbound left-turn lane is limited given the culvert and property constraints. It is therefore recommended the Town continue monitoring the intersection to assess if or when a left-turn lane may be needed, and the feasibility of implementation.

The proposed development is forecast to generate a total of 117 and 153 primary vehicle trips in the weekday a.m. and p.m. peak hours, respectively.

Based on OTM Justification 7, signals are not warranted for the Elora Street South and Park Street West/Mill Street East under 2034 future total conditions.

Left-turn lanes are not warranted at the site accesses given the low volumes on Park Street West. The volumes on Elora Street South exceed the minimum threshold for a northbound auxiliary left-turn lane. Based on a preliminary feasibility review, the implementation of a northbound left-turn lane appears challenging, and potentially not feasible given the existing culvert location. A slip lane for the northbound traffic could be explored which limits the extent of the widening but allows northbound traffic to pass a vehicle waiting to turn left. A more detailed review should be completed at the design stage.

It is noted that approximately 85 units can be constructed prior to a left-turn lane being warranted. The exact number of units is dependent on the mix of single detached and townhouse units, given their different trip generation rates.

All the study intersections are expected to continue operating with good levels of service under 2034 future total traffic volume conditions. The additional site generated traffic is expected to have a minimal impact on the operations of the boundary road network. Accordingly, the proposed development can be supported from an operations perspective.

Collision data provided by the OPP for the intersection of Elora Street South and Park Street West/Mill Street East indicated four incidents between 2003 and 2008, and nothing reported since then. Additionally, traffic analysis found that future total traffic volumes do not warrant signalization and the intersection is forecast to continue operating acceptably. Field observations as well as a review of camera footage at the intersection indicated that drivers are familiar with how to navigate the intersection and treated it as a standard four-legged intersection. For these reasons, realignment is not considered necessary as part of the proposed development. Should the Town feel that realignment is needed in the future, it would be appropriate for any changes to be a Town led project given the existing culvert and property constraints at the intersection.

The available sight distance to the east and west Site Access A and Site Access B exceeds the minimum sight distance requirements. Accordingly, the proposed site accesses can be supported from an intersection and stopping sight distance perspective.

It is noted that should Park Street West be extended further to the west of Site Access A, proper sightlines should be provided. Although drivers can't access Park Street further west, sightlines were assessed to the east in the event the road is extended, and the left-turn movement is feasible.

Park Street West does not currently provide pedestrian facilities, therefore sidewalk facilities along Park Street West could be considered with the build-out of the development to provide connectivity to the Clifford Trail. It is noted that Minto Street South and Ann Street South do not provide sidewalks, limiting connectivity opportunities within the community.

The results and conclusions contained within this report are based on the most recent Concept Plan dated July 25, 2024. Any minor changes to the Plan are not expected to materially affect the conclusions contained within this report.

In summary, the Subject Development can be supported from a transportation perspective with the implementation of the noted recommendations.

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1.0 Introduction

C.F. Crozier & Associates Inc. (Crozier) was retained by Clifford (Park St) Developments ("the client") to prepare a Transportation Impact Study (TIS) to support the proposed development at 41 Park Street West in the Community of Clifford, Town of Minto (Wellington County).

1.1 Developments Lands

The site is located at 41 Park Street West in the Community of Clifford, Town of Minto in Wellington County. The site is bound by Park Street West to the north and agricultural lands to the south, west and east. The Site Location Plan is included in **Figure 1.**

The site is currently zoned "Future Development Area (FD)" and "Agricultural (A-1)" per Wellington County Official Plan and Zoning By-Law. Relevant excerpts from the Town of Minto Zoning By-Law and Official Plan have been included in **Appendix A.**

1.2 Development Proposal

Based on the Concept Plan dated July 25, 2024, the development proposal consists of 116 single detached units and 72 townhouse units.

Access to the site is proposed through two full-moves entrances to Park Street West. The western entrance (Street 'A') will form a four-legged intersection with the unopened Cecilia Street right-of-way and the eastern entrance (Street 'B') will form a T-intersection with Park Street West. The latest Concept Plan has been included as **Figure 2.**

1.3 Study Purpose and Scope

The purpose of the study is to evaluate the transportation-related impacts of the proposed residential development on the boundary road network and to recommend any required mitigation measures, if warranted.

The study reviews the following aspects of the proposed development from a transportation engineering perspective:

- Existing, future background, and future total traffic operations of the study intersections during the weekday a.m. and p.m. peak hours;
- Forecasted trip generation of the proposed development;
- Sight distance assessment at the proposed site accesses;
- Auxiliary turn-lane warrants at the intersection of Elora Street/Park Street West/Mill Street East;
- Signal warrants at the intersection of Elora Street/Park Street West/Mill Street East based on OTM Book 12 Manual procedures;
- Collision history at the intersection of Elora Street/Park Street West/Mill Street East.

The study has been completed in accordance with the Wellington County "Guidelines for Traffic Impact Studies" (October 29, 2021). **Appendix B** contains the Terms of Reference correspondence with the County and Town.

As confirmed in the Terms of Reference, this Transportation Impact Study considers the following study intersections:

- Park Street West and Minto Street South
- Elora Street South and Park Street West/Mill Street East
- Allan Street West and Minto Street South
- Proposed Site Accesses on Park Street West

For the purposes of this study, it has been assumed that the development will be built out by 2029. The Wellington County guidelines require analysis of the full build-out and five-year horizons from the estimated year of full build-out. Therefore, the 2029 and 2034 horizon years were analyzed. These horizon years were confirmed through the Terms of Reference correspondence.

2.0 Existing Conditions

This section outlines the current conditions of the transportation network in the vicinity of the site. Details of the study road network, including traffic controls, lane configurations, speed limits, transit routes and stops, active transportation infrastructure and other relevant transportation elements are identified. The existing traffic operations are also summarized.

2.1 Study Road Network

The study road network consists of the existing road network near the site, which includes the study intersections and the adjoining roadway segments. **Table 1** and **Table 2** delineates the study roadways. **Figure 3** illustrates the study road network, including the lane configurations and intersection control at the study intersections.

Table 1: Study Roadways (North-South direction)

Feature	Roadways		
	Elora Street South	**Minto Street South**	**Cecilia Street North**
Direction	Two-way (North-South)	Two-way (North-South)	Two-way (North-South)
Classification	MTO Connecting Link Highway	- Local Road (Park Street West to Queen Street West) - County Road (north beyond Anne Street)	Local Road
Jurisdiction	Town of Minto (MTO Connecting Link)	- Township of Minto (Park Street West to Queen Street West) - Wellington County (north beyond Anne Street)	Town of Minto
Speed Limit	- 60 km/h from MJ Homes Renovation to Mill Street East. - 50 km/h from Mill St East to West Heritage Street. - 60 km/h from West Heritage Street to Kettles Back Home Cookin'. - 80 km/h north of Kettles Back Home Cookin'.	50 km/h[1]	50 km/h[1]
Number of travel lanes[2]	Two	Two	Two
Median type	None	None	None
Active Transportation	- 2.75 m sidewalks on both sides of the roadway from Park Street West/Mill Street East to James Street. - 2.0 m sidewalk on the south side of the roadway from James St to Wightman Telecom	None	None

Note[1]: A jurisdictional speed limit of 50 km/h is assumed on the roadways with no posted speed limit.
Note[2]: One each way

Table 2: Study Roadways (East-West direction)

Feature	Roadways		
	Park Street West	**Mill Street East/County Road 2**	**Allan Street West**
Direction	Two-way (East-West)	Two-way (East-West)	Two-way (East-West)
Classification	Local Road	County Road	Local Road
Jurisdiction	Town of Minto	Wellington County	Town of Minto
Speed Limit	50 km/h	- 50 km/h for ~500 m east of Elora Street South. - 80 km/h beyond 500 m east of Elora Street South.	50 km/h[1]
Number of travel lanes[2]	Two	Two	Two
Median type	None	None	None
Active Transportation	None	None	- 1.75 m sidewalk on north side of the roadway to the Clifford Rotary Celebration Square - 1.5 m sidewalks on both sides of the roadway from the Clifford Rotary Celebration Square to Ann Street

Note[1]: A jurisdictional speed limit of 50 km/h is assumed on the roadways with no posted speed limit.
Note[2]: One each way

2.2 Transportation Data

Turning movement counts at the intersections of Elora Street South and Park Street West/Mill Street East and Minto Street South and Park Street West were undertaken by Spectrum Traffic Data Inc. from 6:00 a.m. to 10:00 a.m. and from 3:00 p.m. to 7:00 p.m. on Tuesday, June 25, 2024. Turning movement counts at the intersection of Minto Street South and Allan Street West were collected at the same times on Wednesday July 17, 2024. **Table 3** summarizes the study intersections, date of data collection and peak hour factors.

Appendix C contains the traffic data.

Table 3: Traffic Data

Intersection	TMC Date	Time Intervals	Peak Hour Factor
Elora Street South and Park Street West and Mill Street East	Tuesday, June 25, 2024	6:00 a.m. – 10:00 a.m.	0.96
		3:00 p.m. – 7:00 p.m.	0.94
Minto Street South and Park Street West		6:00 a.m. – 10:00 a.m.	0.75
		3:00 p.m. – 7:00 p.m.	0.72
Minto Street South and Allan Street West	Wednesday July 17, 2024	6:00 a.m. – 10:00 a.m.	0.70
		3:00 p.m. – 7:00 p.m.	0.93

2.3 Traffic Modelling and Assumptions

Unless otherwise noted, the existing traffic conditions on the study road network were modelled in Synchro 11 based on "Highway Capacity Manual (HCM)" methodology and using the default Synchro parameters. Roadway geometrics were modelled based on the existing study road network description outlined in **Section 2.1**.

The assessment of the study intersections is based on the "Highway Capacity Manual (HCM)" methodology, which prescribes a method for estimating the Level of Service, control delay, and volume-to-capacity of an intersection along with the approaches and movements of the intersection. The Level of Service (LOS) metric provides a general performance measure of the quality of the service from a driver's perspective and ranges a letter from "A" to "F"; "A" representing best performance and "F" representing worst performance. **Appendix D** contains the Level of Service definitions. Control delay is the additional time added per vehicle as a result of the intersection and its associated control (ie. Traffic Light / Stop Control) compared to the average speed on the adjoining roadway segments. Finally, volume-to-capacity ratio indicates the fraction of the capacity for a particular movement used by traffic volumes at an intersection.

2.4 Intersection Operations

Table 4 outline the 2024 existing conditions traffic operations at the study intersections. Synchro 11 was used to determine intersection operations at the unsignalized study intersections. **Figure 4** illustrates the 2024 existing conditions traffic volumes used in the operational analysis. **Appendix E** contains the detailed capacity analysis worksheets.

Table 4: 2024 Existing Conditions Traffic Operations

Intersection	Performance Metrics						
	Movement	LOS[1]		Delay (s)		v/c ratio[2]	
		AM	PM	AM	PM	AM	PM
Elora Street South and Park Street West/Mill Street East (TWSC)	**Overall**	**B**	**B**	**11.1**	**12.2**	**0.07**	**0.08**
	EBLTR	B	B	11.1	12.2	0.04	0.02
	WBLTR	B	B	10.6	11.6	0.07	0.08
	NBLTR	A	A	0.1	0.2	0.00	0.01
	SBLTR	A	A	1.1	2.0	0.02	0.05
Minto Street South and Park Street West (T-stop)	**Overall**	**A**	**A**	**8.7**	**8.6**	**0.01**	**0.01**
	EBLT	A	-	3.6	0.0	0.00	0.00
	WBTR	-	-	0.0	0.0	0.00	0.01
	SBLR	A	A	8.7	8.6	0.01	0.01
Minto Street South and Allan Street West (AWSC)	**Overall**	**A**	**A**	**7.1**	**7.2**	**0.04**	**0.04**
	EBLTR	A	A	7.2	7.3	0.04	0.04
	WBLTR	A	A	6.8	7.0	0.01	0.04
	NBLTR	A	A	7.0	7.1	0.03	0.02
	SBLTR	A	A	7.1	7.2	0.03	0.04

Note[1]: The Level of Service of an unsignalized intersection is based on the control delay for the minor movement.
Note[2]: All v/c ratios above critical thresholds are bolded, all v/c ratios greater than 1.00 are bolded with red text.

Under 2024 existing conditions, the unsignalized intersections within the study road network are operating with Levels of Service (LOS) 'B' or better with minimal control delays and volume-to-capacity ratios.

3.0 Future Background Conditions

This section summarizes the future background conditions of the study road network and provides details relating to growth rates, future transportation network improvements and background developments within the study area. As described in **Section 1.3** (per the Terms of Reference), this study considers the 2029 and 2034 horizon years, the results of which are summarized herein in **Section 3.3.**

3.1 Future Transportation Network

No capacity improvements have been identified for the study roadways within the study horizons. Any external improvements triggered by the proposed development are discussed in **Section 5.0.**

3.2 Growth Rates

A growth rate of 1.5 percent compounded annually was used for this study based on the agreed Terms of Reference.

3.3 Intersection Operations

Table 5 and **Table 6** outline the 2029 and 2034 future background traffic operations, respectively, for the study intersections. Synchro 11 was used to determine intersection operations. **Figure 5** and **Figure 6** illustrate the 2029 and 2034 future background traffic operations, respectively.

Appendix E contains the detailed capacity analysis worksheets.

Table 5: 2029 Future Background Traffic Operations

Intersection	Performance Metrics						
	Movement	LOS[1]		Delay (s)		v/c ratio[2]	
		AM	PM	AM	PM	AM	PM
Elora Street South and Park Street West/Mill Street East (TWSC)	**Overall**	**B**	**B**	**11.3**	**12.6**	**0.08**	**0.08**
	EBLTR	B	B	11.4	12.8	0.04	0.02
	WBLTR	B	B	10.9	11.9	0.08	0.08
	NBLTR	A	A	0.1	0.2	0.00	0.01
	SBLTR	A	A	1.1	2.0	0.03	0.05
Minto Street South and Park Street West (T-stop)	**Overall**	**A**	**A**	**8.7**	**8.6**	**0.01**	**0.01**
	EBLT	A	-	3.6	0.0	0.00	0.00
	WBTR	-	-	0.0	0.0	0.00	0.01
	SBLR	A	A	8.7	8.6	0.01	0.01
Minto Street South and Allan Street West (AWSC)	**Overall**	**A**	**A**	**7.1**	**7.2**	**0.04**	**0.05**
	EBLTR	A	A	7.2	7.3	0.04	0.05
	WBLTR	A	A	6.8	7.0	0.01	0.05
	NBLTR	A	A	7.0	7.1	0.03	0.02
	SBLTR	A	A	7.2	7.2	0.03	0.04

Note[1]: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro).
Note[2]: All v/c ratios above critical thresholds are bolded, all v/c ratios greater than 1.00 are bolded with red text.

Table 6: 2034 Future Background Traffic Operations

Intersection	Performance Metrics						
	Movement	LOS[1]		Delay (s)		v/c ratio[2]	
		AM	PM	AM	PM	AM	PM
Elora Street South and Park Street West/Mill Street East (TWSC)	**Overall**	**B**	**B**	**11.7**	**12.6**	**0.09**	**0.09**
	EBLTR	B	B	11.7	13.0	0.05	0.02
	WBLTR	B	B	11.1	12.6	0.09	0.10
	NBLTR	A	A	0.1	0.2	0.00	0.01
	SBLTR	A	A	1.2	2.1	0.03	0.06
Minto Street South and Park Street West (T-stop)	**Overall**	**A**	**A**	**8.7**	**8.6**	**0.01**	**0.01**
	EBLT	A	-	3.6	0.0	0.00	0.00
	WBTR	-	-	0.0	0.0	0.00	0.01
	SBLR	A	A	8.7	8.6	0.01	0.01
Minto Street South and Allan Street West (AWSC)	**Overall**	**A**	**A**	**7.1**	**7.2**	**0.04**	**0.05**
	EBLTR	A	A	7.2	7.4	0.04	0.05
	WBLTR	A	A	6.8	7.0	0.02	0.05
	NBLTR	A	A	7.0	7.1	0.03	0.02
	SBLTR	A	A	7.2	7.2	0.03	0.05

Note[1]: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro).
Note[2]: All v/c ratios above critical thresholds are bolded, all v/c ratios greater than 1.00 are bolded with red text.

The metrics summarized above indicate that the study intersections are expected to continue operating similarly to the existing conditions, with a forecasted LOS 'B' or better and minimal control delay and volume-to-capacity ratio.

Based on a review of 2034 future background traffic volumes, it was found that a southbound left-turn lane is warranted with 15m of storage. It is recommended that the Town continues monitoring the intersection to determine if or when it is necessary to implement a southbound left-turn lane. As the warrant is based on background traffic volumes, the requirement for a southbound left-turn lane is unrelated to site generated traffic. As discussed later in this report, feasibility for widening through the intersection is limited given right-of-way constraints. Further investigation would be required to assess the opportunities for widening.

4.0 Site Generated Traffic

The proposed development will result in additional turning movements at the study intersections. Therefore, this section describes the trip forecasting methodology and results of this forecast for the development proposal.

The site generated traffic forecasting methodology for this study consists of two steps. The first step, trip generation, projects the number of trips that originate or are destined for the proposed development, while the second step, trip distribution and assignment, assigns trips to the study road network based on the expected distribution of trips to catchment areas and expected shortest paths for trips destined for particular locations.

4.1 Trip Generation

As noted, the development is proposed to consist of the following:

- 116 Single-detached Units
- 72 Townhouse Units

The trip generation of the proposed residential dwellings was forecasted using published data from the Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition.

The applicable fitted curve equations for Land Use Category (LUC) 210 "Single Family Detached Housing" and LUC 215 "Single-Family Attached Housing" were applied to the proposed residential dwelling units.

Relevant excerpts from the ITE Trip Generation Manual, 11th have been included in **Appendix F.** The forecasted trip generation of the proposed mixed-use development is summarized in **Table 7.**

Table 7: Trip Generation

Land Use (Units/GFA)	AM				PM			
	Equation/Rate	Trips		Total	Equation/ Rate	Trips		Total
		In	Out			In	Out	
210: Single-Family Detached Housing (116 Units)	Ln(T) = 0.91Ln(X) + 0.12	21	64	85	Ln(T) = 0.94Ln(X) + 0.27	72	42	114
215: Single-Family Attached Housing (72 Units)	T = 0.52(X) – 5.70	8	24	32	T = 0.60(X) – 3.93	23	16	39
Net Trips	**-**	**29**	**88**	**117**	**-**	**95**	**58**	**153**

The full buildout of the proposed development is forecast to generate 117 and 153 two-way trips during the weekday a.m. and p.m. peak hours, respectively.

4.2 Trip Distribution and Assignment

The trips generated by the proposed development were distributed to the study road network based on existing travel patterns and anticipated catchment areas.

The distribution to the study road network is listed below:

- 50% travelling to and from the south on Elora Street South/County Road 9
- 40% travelling to and from the north on Elora Street South/County Road
- 5% travelling to and from the east on Mill Street East
- 5% travelling to and from the east on Allan Street West via Minto Street South

To assess the proposed site accesses, the volumes exiting/entering the development were split with 75% assigned to Street B and 25% to Street A. As the majority of site traffic is anticipated to travel east towards Elora Street, the majority of traffic was assigned to Street B. It is noted that there are several houses that proposed with driveways on Park Street West. To be conservative, all site traffic was assigned to the proposed site accesses.

While high volumes were not assigned to Minto Street South and Allan Street West, it is noted that the intersection of Allan Street West and Elora Street South is signalized, providing an alternative route for travellers to the north and to the commercial downtown of Clifford. While the operations at Park Street West and Elora Street South are acceptable, drivers may choose to divert north through the community. Given the excellent operations forecast for Minto Street South and Park Street West, and Minto Street South and Allan Street West, a change in driver travel patterns from what is contained in this report is not anticipated to impact the surrounding road network or study intersections.

Figure 7 outlines the trip distribution for the development. The associated primary trip assignment is illustrated in **Figure 8.**

5.0 Future Total Conditions

This section will summarize the future total conditions of the study road network. The future total traffic volumes for the horizon years consist of the following components:

- Future background traffic volumes from the corresponding horizon year.
- Proposed development site generated traffic volumes.

The resulting total volumes in the horizon years 2029 and 2034 are presented in **Figure 9** and **Figure 10**, respectively.

5.1 Signal Warrant Assessment

Signal warrants were conducted for the intersection of Elora Street South and Park Street West/Mill Street East under the 2034 future total scenario using the Ontario Traffic Manual (OTM) Book 12 (March 2012) Signal Warrant Justification 7 (Projected Volumes).

The signal warrant analysis herein, assumes an "urban" operating environment with a posted speed of 50 km/h. The results of the signal warrants are summarized in **Table 8.** Based on OTM Justification 7, signals are not warranted for the Elora Street South and Park Street West/Mill Street East under 2034 future total conditions. **Appendix G** contains the signal warrant reports.

Table 8: Signal Warrant

Intersections	Operating Environment	Major Road	# of Lanes of Major Road[1]	Signals Warranted (Volume along Minor Street)
Elora Street South and Park Street West/Mill Street East	Urban	Elora Street South	2	No

Note[1]: Number of lanes for each direction.

5.2 Auxiliary Turn-Lane Warrants Assessment

Auxiliary left-turn lane warrants were undertaken for the following intersections:

- Elora Street South and Park Street West/Mill Street East – NBL movement
- Park Street West and Street A – WBL movement
- Park Street West and Street B – WBL movement

The warrants were completed using the MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads. As discussed in **Section 2.1,** Elora Street South has a posted speed of 50 km/h through the intersection accordingly a design speed of 60 km/h was selected, reflecting the engineering convention of 10 km/h increase on lower speed roadways.

A speed of 50 km/h has been assumed for Park Street West, accordingly a design speed of 60 km/h was selected.

Table 9 summarizes the results of the left-turn lane analyses. The auxiliary left-turn lane warrant charts for the 2034 horizon year have been included in **Appendix H** for reference.

Table 9: Auxiliary Turn Lane Warrant at the Site Access

Intersection	Peak Hour	V_A	% Left Turns in V_A	V_O	Warranted	Minimum Storage	Reference
Northbound							
Elora Street South and Park Street West/Mill Street East	A.M.	251	7%	304	No	N/A	9A-11
	P.M.	436	13%	363	Yes	15 m	9A-10
Westbound							
Park Street West and Street A	A.M.	19	89%	2	No	N/A	9A-10
	P.M.	59	97%	2	No	N/A	9A-10
Westbound							
Park Street West and Street B	A.M.	28	18%	32	No	N/A	9A-8
	P.M.	23	13%	109	No	N/A	9A-8

Left-turn lanes are not warranted at the site accesses given the low volumes on Park Street West. The p.m. peak hour volumes on Elora Street South exceed the minimum threshold for a northbound auxiliary left-turn lane. Based on a preliminary feasibility review, the implementation of a northbound left-turn lane appears challenging, and potentially not feasible given the existing culvert location. A slip lane for the northbound traffic could be explored which limits the extent of the widening but allows northbound traffic to pass a vehicle waiting to turn left. A more detailed review should be completed at the design stage.

It is noted that approximately 85 units can be constructed without warranting a northbound left-turn lane. The exact number of units is dependent on the mix of single-detached and townhouse units, given the two uses have different trip generation rates.

The analysis contained in **Section 5.3** was completed based on the existing lane configuration. The implementation of a northbound left-turn lane has a minimal impact on the overall intersection operations.

5.3 Intersection Operations

Table 10 and **Table 11** outline the 2029 and 2034 future total traffic operations, respectively. Synchro 11 was used to determine intersection operations. **Figure 9** and **Figure 10** illustrate the 2028 and 2034 future total traffic operations, respectively.

Appendix E contains the detailed capacity analysis worksheets.

Table 10: 2029 Future Total Traffic Operations

Intersection	Performance Metrics						
	Movement	LOS[1]		Delay (s)		v/c ratio[2]	
		AM	PM	AM	PM	AM	PM
Elora Street South and Park Street West/Mill Street East (TWSC)	**Overall**	**B**	**C**	**14.6**	**17.7**	**0.23**	**0.19**
	EBLTR	B	C	14.6	17.7	0.23	0.19
	WBLTR	B	B	11.4	13.8	0.09	0.12
	NBLTR	A	A	0.7	1.5	0.01	0.05
	SBLTR	A	A	1.1	1.9	0.03	0.05
Minto Street South and Park Street West (T-stop)	**Overall**	**A**	**A**	**9.1**	**9.1**	**0.02**	**0.06**
	EBLT	A	A	0.7	0.6	0.00	0.00
	WBTR	-	-	0.0	0.0	0.02	0.06
	SBLR	A	A	9.1	9.1	0.02	0.02
Minto Street South and Allan Street West (AWSC)	**Overall**	**A**	**A**	**7.1**	**7.1**	**0.04**	**0.05**
	EBLTR	A	A	7.2	7.2	0.04	0.05
	WBLTR	A	A	6.9	7.1	0.02	0.05
	NBLTR	A	A	6.9	7.0	0.03	0.02
	SBLTR	A	A	7.2	7.2	0.03	0.04
Park Street West and Cecilia Street/Street A (T-stop)	**Overall**	**A**	**A**	**8.5**	**8.4**	**0.05**	**0.04**
	EBLTR	-	-	0.0	0.0	0.00	0.00
	WBLTR	A	A	6.5	7.1	0.01	0.04
	NBLTR	A	A	8.5	8.4	0.05	0.04
	SBLTR	A	A	0.0	0.0	0.00	0.00
Park Street West and Street B (T-stop)	**Overall**	**A**	**A**	**8.7**	**8.6**	**0.03**	**0.03**
	EBLT	-	-	0.0	0.0	0.03	0.03
	WBTR	A	A	2.8	2.7	0.03	0.03

Intersection	Performance Metrics						
	Movement	LOS[1]		Delay (s)		v/c ratio[2]	
		AM	PM	AM	PM	AM	PM
	NBLR	A	A	8.7	8.6	0.02	0.02

Note[1]: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro).
Note[2]: All v/c ratios above critical thresholds are bolded, all v/c ratios greater than 1.00 are bolded with red text.

Table 11: 2034 Future Total Traffic Operations

Intersection	Performance Metrics						
	Movement	LOS[1]		Delay (s)		v/c ratio[2]	
		AM	PM	AM	PM	AM	PM
Elora Street South and Park Street West/Mill Street East (TWSC)	**Overall**	**C**	**C**	**15.4**	**19.2**	**0.25**	**0.21**
	EBLTR	C	C	15.4	19.2	0.25	0.21
	WBLTR	B	B	11.7	14.8	0.10	0.14
	NBLTR	A	A	0.7	1.5	0.01	0.05
	SBLTR	A	A	1.2	0.2	0.03	0.06
Minto Street South and Park Street West (T-stop)	**Overall**	**A**	**A**	**9.1**	**9.1**	**0.02**	**0.06**
	EBLT	A	A	0.7	0.6	0.00	0.00
	WBTR	-	-	0.0	0.0	0.02	0.06
	SBLR	A	A	9.1	9.1	0.02	0.02
Minto Street South and Allan Street West (AWSC)	**Overall**	**A**	**A**	**7.1**	**7.2**	**0.04**	**0.06**
	EBLTR	A	A	7.2	7.4	0.04	0.05
	WBLTR	A	A	6.9	7.1	0.02	0.06
	NBLTR	A	A	7.0	7.0	0.04	0.02
	SBLTR	A	A	7.2	7.2	0.03	0.05
Park Street West and Cecilia Street/Street A (T-stop)	**Overall**	**A**	**A**	**8.5**	**8.4**	**0.05**	**0.04**
	EBLTR	-	-	0.0	0.0	0.00	0.00
	WBLTR	A	A	6.5	7.1	0.01	0.04
	NBLTR	A	A	8.5	8.4	0.05	0.04
	SBLTR	A	A	0.0	0.0	0.00	0.00
Park Street West and Street B (T-stop)	**Overall**	**A**	**A**	**8.7**	**8.6**	**0.04**	**0.03**
	EBLT	-	-	0.0	0.0	0.04	0.03
	WBTR	A	A	2.8	2.7	0.01	0.03
	NBLR	A	A	8.7	8.6	0.04	0.02

Note[1]: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro).
Note[2]: All v/c ratios above critical thresholds are bolded, all v/c ratios greater than 1.00 are bolded with red text.

All the study intersections are expected to continue operating with good levels of service under 2034 future total traffic volume conditions. The additional traffic generated by the proposed development is expected to have a minimal impact on the operations of the boundary road network. Accordingly, the proposed development can be supported from an operations perspective.

6.0 Elora Street South and Park Street West Intersection Review

A review was completed of the Elora Street South and Park Street West/Mill Street East intersection to assess the impacts of the current offset and identify if any safety concerns are present. Field measurements indicate that the offset is approximately 9.0 m between the centrelines of Park Street West and Mill Street East. This assessment included a review of historical collision data at the intersection, signal warrant results (**Section 5.1**), as well as existing driver behaviours.

6.1 Collision Data

Historical collision data was obtained from the Ontario Provincial Police (OPP) for the Elora Street South and Park Street West/Mill Street East intersection to assess safety at the existing offset intersection. The data provided included any accidents recorded between 2003 – 2024. Collision data was also provided for additional intersections in Town, but data did not indicate any safety concerns. **Table 12** outlines the number of collisions with corresponding years.

Table 12: Collision Data Record

Intersection	Number of Collisions	Years
Elora Street South and Park Street West/Mill Street East	4	2003 - 2008
Ann Street South and Nelson Street West	1	2015
Minto Street South and Park Street West	1	2017
Ann Street South and Park Street West	1	2018

Although there is a misalignment of approximately 9 m between the centrelines of Mill Street East and Park Street West, collision history indicates that there is not a pattern of collision at the intersection. Therefore, there are no existing safety concerns at the intersection.

Appendix I contains the collision data provided by the OPP.

6.2 Site Impacts

The site generated traffic for the inbound and outbound movements at the intersection of Elora Street South and Park Street West/Mill Street East represents approximately 15% of the 2034 future total traffic volumes in the intersection. This is similar to the inbound and outbound movements to and from Mill Street East, which represents 14% of the 2034 future total traffic volumes at the intersection.

As detailed in **Section 5.1**, the intersection of Elora Street South and Park Street West/Mill Street East is not warranted for signalization. Furthermore, the operations summarized in **Section 5.3** indicate that the intersection is anticipated to continue operating acceptably in the future with the addition of site generated traffic.

Observations made through both a site visit and a review of camera footage found that drivers understood how to navigate the intersection and treated it as a standard 4-legged intersection.

Based on the above analysis and observations, re-alignment is not considered necessary to support the addition of site generated traffic. Should the Town feel that realignment is necessary in the future, it would be appropriate for the improvements to be a Town lead project given the culvert at property constraints at the intersection.

7.0 Site Access Safety Review

The development proposal includes two site accesses along Park Street West that will provide transportation servicing to and from the site. This section evaluates the suitability of the site accesses from a transportation safety perspective and recommends mitigation measures, if warranted. The safety review of the accesses includes an assessment of whether turning maneuvers can be made safely at the site accesses without issues related to sight lines and intersection spacing.

7.1 Intersection Sight Distance

Section 9.9 of the TAC GDGCR provides intersection sight distance for different intersection control types. The calculated and design sight distances are further summarized in TAC GDGCR Tables 9.9.4, 9.9.6 and 9.9.12 for vehicles turning left from stop, turning right from stop, or turning left from the major road, respectively.

Park Street West has an assumed speed limit of 50 km/h. Accordingly, a design speed of 60 km/h was selected, reflecting the convention of a 10 km/h increase to the posted speed limit for local residential speed roads.

Case B1 (Left Turn from the Minor Road) and Case B2/B3 (Right Turn / Crossing Maneuver from the Minor Road) were used to evaluate sight distance adequacy for the site accesses. The passenger design vehicle was used for the assessment given that this vehicle is expected to be the most constrained vehicle profile to use the site accesses. **Table 13** outlines the sight distance requirements and compares them to the available sight distance, which was measured in the field during a site visit. **Appendix J** contains the sight distance drawings. **Appendix K** contains relevant TAC GDGCR excerpts.

Table 13: Intersection Sight Distance Assessment

Park Street West and Site Access A Assumed Speed = 50 km/h Design Speed = 60 km/h		
Formula	**ISD = 0.278 * V_{major} * t_g**	
Feature	**Case B1 – Left Turn**	**Case B2/B3 – Right Turn**
Time Gap[1]	Left Turn: 7.5s + 0.0s = **7.5s**	Right Turn: 6.5s + 0.0s = **6.5s**
Required Sight Distance	130 m (looking right)	110 m (looking left)
Available Sight Distance	~180 m (looking right)	N/A
Park Street West and Site Access A Assumed Speed = 50 km/h Design Speed = 60 km/h		
Formula (TAC	**ISD = 0.278 * V_{major} * t_g**	
Feature	**Case B1 – Left Turn**	**Case B2/B3 – Right Turn**
Time Gap[1]	Left Turn: 7.5s + 0.0s = **7.5s**	Right Turn: 6.5s + 0.0s = **6.5s**
Required Sight Distance	130 m (looking right)	110 m (looking left)
Available Sight Distance	>300 m (looking right)	~123 m (looking left)

Note[1]: To calculate Time Gap, base time gap is required. This default parameter is based on particular turning cases (such as Case B1 and Case B2/B3) and particular design vehicles. Roadways with more than one lane per direction require additions of 0.5s and 0.7s per addition lane for passenger car and truck design vehicles, respectively. For minor street approach upgrades that exceed 3%, additions of 0.2s and 0.1s for Case B1 and Case B2/B3, respectively, are required per percent grade. Refer to Section 9.9 of TAC-GDGCR for additional details.

The available sight distance on Site Access A and Site Access B to the east and west of the site accesses exceeds the minimum sight distance requirements. Accordingly, the proposed site accesses can be supported from an intersection sight distance perspective.

It is noted that should Park Street West be extended further to the west of Site Access A, proper sightlines should be provided. Although drivers can't access Park Street further west, sightlines were assessed to the east in the event the road is extended, and the left-turn movement is feasible.

7.2 Stopping Sight Distance

For level roadways, the stopping sight distance requirements are tabulated in TAC GDGCR Table 2.5.2. The requirements are detailed in **Table 14**.

Table 14: Stopping Sight Distance Assessment

Park Street West and Site Access A Assumed Speed = 50 km/h Design Speed = 60 km/h	
Formula (TAC GDGCR 2.5.2)	**SSD = 0.278 * V * t + 0.039 * (V^2/a)**
Design Speed (V)	60 km/h
Brake Reaction Time (t)	2.5 s
Deceleration Rate (a)	3.4 m/s^2
Required Stopping Sight Distance	85 m
Minimum Available Sight Distance (East Side)	~188m (looking from east side along Park Street West)
Park Street West and Site Access B Assumed Speed = 50 km/h Design Speed = 60 km/h	
Formula (TAC GDGCR 2.5.2)	**SSD = 0.278 * V * t + 0.039 * (V^2/a)**
Design Speed (V)	60 km/h
Brake Reaction Time (t)	2.5 s
Deceleration Rate (a)	3.4 m/s^2
Required Stopping Sight Distance	85 m
Minimum Available Sight Distance (East Side)	~350m (looking from east side along Park Street West)
Minimum Available Sight Distance (West Side)	123 m (looking from west side along Park Street West)

Per TAC GDGCR Table 2.5.2, the minimum stopping sight distance for level roadways with a design speed of 60 km/h is 85 metres. Clear visibility in excess of 85 metres is available for vehicles approaching the site accesses from the east and west. Accordingly, there is sufficient stopping sight distance for vehicles approaching from the east and west of the site access. **Appendix K** contains relevant TAC GDGCR excerpts.

It is noted that should Park Street West be extended further to the west of Site Access A, proper sightlines should be provided. Although drivers can't access Park Street further west, sightlines were assessed to the east in the event the road is extended, and the left-turn movement is feasible.

8.0 Active Transportation

During the site visit, it was identified that the Clifford Trail System is located about 100 m east of the property adjacent to Minto Street South. The Clifford Trail System extends from West Heritage Street to 13 Line. Residents will have access to the Clifford Trail System via Park Street as it is located about 55 m east of the proposed Street B access. There are currently no pedestrian facilities nor cycling facilities within the study intersections.

RIDE WELL is an on-demand transit program that offers door-to-door service in Wellington County and Guelph. Residents can opt to use the rideshare program to access the employment and commercial pockets in Wellington County and Guelph.

Traffic data collected in July 2024 indicates negligible number of pedestrians and cyclists at the study intersection during peak and off-peak hours. Park Street West does not currently provide any pedestrian facilities along its entire length therefore, sidewalk facilities along Park Street West could be considered with the build-out of the development to provide connectivity to the Clifford Trail. It is noted that Minto Street South and Ann Street South do not provide sidewalks, limiting connectivity opportunities within the community.

9.0 Conclusions

The analysis contained within this study has resulted in the following key findings:

- Under the 2024 existing conditions scenario, the study intersections are operating with a LOS 'B' or better with minimal control delays and volume-to-capacity ratios.
- A growth rate of 1.5 percent compounded annually was used.
- Under 2034 future background conditions, the study intersections are forecast to continue operating at a LOS 'B' with minimal change in control delay and volume-to-capacity ratio.
    - A southbound left-turn lane is warranted under 2034 future background conditions for the intersection of Elora Street South and Park Street West/Mill Street East. The requirement for a southbound left-turn lane is not a result of site generated traffic.
        - The feasibility of implementing a southbound left-turn lane is limited given the culvert and property constraints. It is therefore recommended the Town continue monitoring the intersection to assess if or when a left-turn lane may be needed, and the feasibility of implementation.
- The proposed development is forecast to generate a total of 117 and 153 primary vehicle trips in the weekday a.m. and p.m. peak hours, respectively.
- Based on OTM Justification 7, signals are not warranted at the intersection of Elora Street South and Park Street West/Mill Street East under 2034 future total conditions.
- The left-turn warrant analysis resulted in the following:
    - Left-turn lanes are not warranted at the site accesses given the low volumes on Park Street West.
    - The 2034 future total p.m. peak hour volumes on Elora Street South exceed the minimum threshold for a northbound auxiliary left-turn lane.
        - The implementation of a northbound left-turn lane appears challenging, and potentially not feasible given the existing culvert location. A slip lane for the northbound traffic could be explored which limits the extent of the widening but allows northbound traffic to pass a vehicle waiting to turn left. A more detailed review should be completed at the design stage.

  - It is noted that approximately 85 units can be constructed without warranting a northbound left-turn lane, although the exact number of units is dependent on the mix of single-detached and townhouse units given their differing trip generation rates.

- Under the 2034 future total conditions, the study intersections are forecast to continue operating with a LOS 'C' or better with acceptable delays and volume-to-capacity ratios.

- Realignment of the intersection of Elora Street South and Park Street West/Mill Street East is not considered necessary as part of the proposed development for the below noted reasons. Should the Town feel that realignment is needed in the future, it would be appropriate for any changes to be a Town led project given the existing culvert and property constraints at the intersection.

    - Collision data provided by the OPP for the intersection of Elora Street South and Park Street West/Mill Street East indicated four incidents between 2003 and 2008, and nothing reported since then.

    - Traffic analysis found that future total traffic volumes do not warrant signalization and the intersection is forecast to continue operating acceptably.

    - Field observations as well as a review of camera footage at the intersection indicated that drivers are familiar with how to navigate the intersection and treated it as a standard four-legged intersection.

- The available sight distance to the east and west of Site Access A and Site Access B exceeds the minimum sight distance requirements. Accordingly, the proposed site accesses can be supported from an intersection and stopping sight distance perspective.

- Sidewalk facilities along Park Street West could be considered with the build-out of the development to provide connectivity to the Clifford Trail. It is noted that Minto Street South, Ann Street South and Park Street West do not provide sidewalks, limiting connectivity opportunities within the community.

The analysis undertaken herein was prepared using the most recent Concept Plan (July 25, 2024). Any minor changes to the Plan will not materially affect the conclusions contained within this report. In conclusion, the proposed residential development can be supported from a traffic operations and safety perspective.

Respectfully submitted by,

C.F. CROZIER & ASSOCIATES INC.

Diego Bustamante EIT
Transportation

C.F. CROZIER & ASSOCIATES INC.

Madeleine Ferguson, P. Eng.
Manager of Transportation (Planning)

MF/db:rl

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APPENDIX A

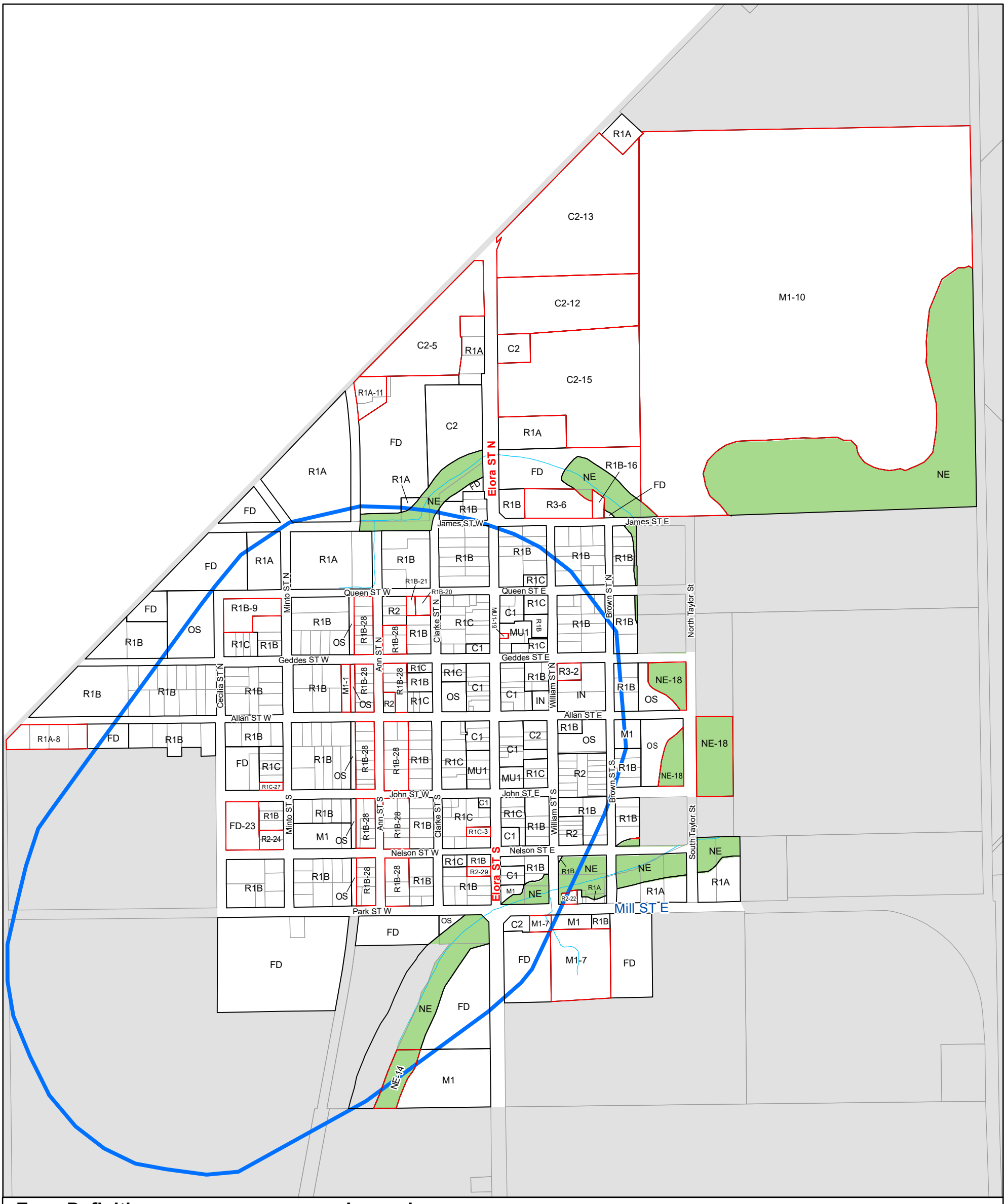
Town of Minto Official Plan and Zoning By-Law

CORPORATION OF THE TOWN OF MINTO

ZONING BY-LAW 01-86

August 2022 Consolidation

The Corporation of the Town of Minto
5941 Highway 89
R.R. #1
Harriston, ON N0G 1Z0



Zone Definitions

	AGRICULTURAL
R1A	UNSERVICED RESIDENTIAL
R1B	LOW DENSITY RESIDENTIAL
R1C	LOW DENSITY RESIDENTIAL
R2	MEDIUM DENSITY RESIDENTIAL
R3	HIGH DENSITY RESIDENTIAL
ER	ESTATE RESIDENTIAL
MH	MOBILE HOME PARK
C1	CENTRAL COMMERCIAL
C2	HIGHWAY COMMERCIAL
C3	NEIGHBOURHOOD COMMERCIAL
C4	SHOPPING CENTRE COMMERCIAL
C5	HAMLET COMMERCIAL
MU1	MIXED USE
MU2	MAIN STREET MIXED USE
AC	AGRICULTURAL COMMERCIAL
M1	INDUSTRIAL
M2	LIGHT INDUSTRIAL
RIN	RURAL INDUSTRIAL
EI	EXTRACTIVE INDUSTRIAL
IN	INSTITUTIONAL
OS	OPEN SPACE
FD	FUTURE DEVELOPMENT
NE	NATURAL ENVIRONMENT
FL	FLOOD WAY
FF1	FLOOD FRINGE OVERLAY ZONE ONE
FF2	FLOOD FRINGE OVERLAY ZONE TWO
(H)	HOLDING PROVISION

Legend

- Wellhead Protection Area Overlay
- Site Specific Exception
- Zone Boundary
- Natural Environment
- Property Line
- Watercourse

0 100 200 400

Metres

CLIFFORD
Town of Minto
Schedule 'A'
Map 2

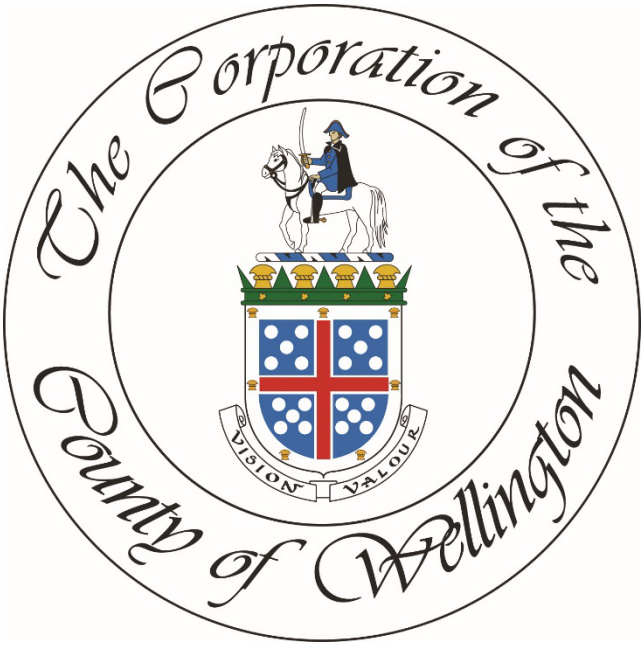
Produced by:
County of Wellington
Planning & Development Department

Sources:
County of Wellington
Planning and Development Department 2019.
Ministry of Natural Resources 2008.

Consolidation Date: August 2022
Date printed: August 2022

Document Path: F:\LIS\Projects\Zoning\Municipal Zoning By-law Schedules\Minto\ZBL SCHEDULES\Schedule A-2 (Clifford)_Minto Zoning By-law.mxd

COUNTY OF WELLINGTON
Official Plan



OFFICE CONSOLIDATION

This is an office consolidation of the Wellington County Official Plan which was adopted by Wellington County Council on September 24, 1998, approved by the Ministry of Municipal Affairs on April 13, 1999 and came into effect on May 6, 1999.

Last Updated: February 2024

Land Use

CLIFFORD

MINTO

Legend

- Residential
- Central Business District
- Residential Transition Area
- Highway Commercial
- Industrial
- Recreational
- Future Development
- PA — Policy Area
- Core Greenlands
- Greenlands
- Waste Water Facility
- Built Boundary
- Watercourse

N

PA5-11

PA5-12

PA5-5

West Heritage ST

Elora ST N

James ST E

Brown ST N

Queen ST E

William ST N

James ST W

Geddes ST E

Allan ST E

Brown ST S

Clarke ST N

William ST S

Nelson ST E

John ST E

Mill ST E

Queen ST W

Ann ST N

John ST W

Nelson ST W

Elora ST S

Minto ST N

Geddes ST W

Clarke ST S

Ann ST S

Cecilia ST N

Allan ST W

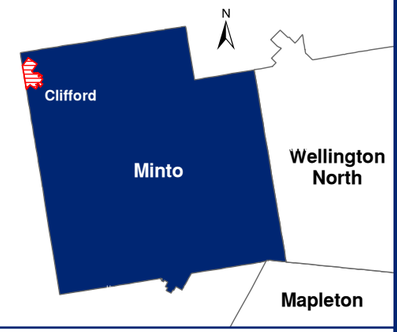
John ST W

Minto ST S

Nelson ST W

Park ST W

Under Way RD



Sources:
County of Wellington 2024,
Ministry of Natural Resources and Forestry,
Saugeen Valley Conservation Authority
Maitland Valley Conservation Authority
Teranet 2002,

Last Revised: February 2024

0 125 250 500 m

Schedule B5-1
County of Wellington Official Plan

F:\LIS\Projects\Official Plan\Official Plan Amendments Mapping and Data\OPA 119\Provincial Approval No 2 (Bill 150)\Schedule B5-1_Clifford_Land Use_WORKING.mxd

APPENDIX B

Terms of Reference

Diego Bustamante

From: Chris Clark <cclark@tritoneng.on.ca>
Sent: July 4, 2024 4:23 PM
To: Madeleine Ferguson
Cc: sama@town.minto.on.ca; Diego Bustamante; Dustin Lyttle
Subject: RE: 41 Park Street W, Clifford - TIS Terms of Reference

Hi Madeleine,

I spoke to Diego and can confirm that the Town will need counts at the Allan Street and Minto Street intersection as this intersection will route traffic from the Elora Street and Allan Street intersection traffic signals or from West Heritage Road. We will need pre-development counts at this location.

Trust this helps to provide clarification.

Thanks,
Chris

Chris Clark, M.A.Sc., P.Eng.

Triton Engineering Services Limited
The Old Post - 39 Elora Street South, Units 7, 8 & 9
P.O. Box 159, Harriston, ON N0G 1Z0
(519) 993-7918 • www.tritoneng.on.ca

Celebrating 60 Years in 2024

From: Madeleine Ferguson <mferguson@cfcrozier.ca>
Sent: Thursday, July 4, 2024 2:00 PM
To: Chris Clark <cclark@tritoneng.on.ca>
Cc: sama@town.minto.on.ca; Diego Bustamante <dbustamante@cfcrozier.ca>; Dustin Lyttle <dlyttle@tritoneng.on.ca>
Subject: RE: 41 Park Street W, Clifford - TIS Terms of Reference

Hi Chris,

Thanks for providing the feedback, just have a couple points of clarification but Diego will try giving you a call to quickly discuss.

We appreciate the quick response.
Maddie

Madeleine Ferguson, P.Eng.

Manager (Planning), Transportation
Office: 705.434.3418
Collingwood | Milton | Toronto | Bradford | Guelph

Proudly named one of Canada's Top Small & Medium Employers for 2024. Read more here.

CROZIER

From: Chris Clark <cclark@tritoneng.on.ca>
Sent: Thursday, July 4, 2024 1:30 PM
To: Madeleine Ferguson <mferguson@cfcrozier.ca>
Cc: sama@town.minto.on.ca; Diego Bustamante <dbustamante@cfcrozier.ca>; Dustin Lyttle <dlyttle@tritoneng.on.ca>
Subject: RE: 41 Park Street W, Clifford - TIS Terms of Reference

Hi Madeleine,

Please see our comments in green below and let me know if you have any questions.

Regards,

Chris

Chris Clark, M.A.Sc., P.Eng.
Triton Engineering Services Limited
The Old Post - 39 Elora Street South, Units 7, 8 & 9
P.O. Box 159, Harriston, ON N0G 1Z0
(519) 993-7918 • www.tritoneng.on.ca

Celebrating 60 Years in 2024

From: Madeleine Ferguson <mferguson@cfcrozier.ca>
Sent: Friday, June 28, 2024 12:02 PM
To: Chris Clark <cclark@tritoneng.on.ca>
Cc: sama@town.minto.on.ca; Diego Bustamante <dbustamante@cfcrozier.ca>
Subject: 41 Park Street W, Clifford - TIS Terms of Reference

Hi Chris,

Further to your call with Diego earlier this week, C.F. Crozier & Associates has been retained by Clifford (Park St) Developments to complete a Transportation Impact Study (TIS) for the proposed 41 Park Street West development in the Community of Clifford located in the Town of Minto, Wellington County. The development envisions 116 single

detached units and 72 townhouse units. Just as a note we will be forwarding the below Terms of Reference to County staff as well in case there is further input.

1. The following intersections will be analyzed based on discussion with Triton Engineering staff:
    - Park St W and Minto St S
    - Elora St S and Park St W and Mill St E
    - Proposed Site Accesses on Park St W

Counts were completed this week, prior to schools being closed.

The Town would also like a count completed at the Minto Road and Allen Street intersection for consideration and comment, summer counts (no school) can be considered acceptable for this location as school bus routes can be utilized to account for normal school bus traffic at this location.

2. The proposed development is expected to be completed by 2029. Accordingly, the horizon years of 2029, as well as five years (2034) beyond build-out will be analyzed. Agreed.

3. The background traffic growth was determined to be 1% based on regression analysis of historical MTO Provincial Highways 1988-2019 AADT for the segments of Highway 9 to the northwest and southeast of Clifford.
    - We kindly request the Town confirm this growth rate is acceptable, and identify if there are any developments to be included in the background traffic volume forecasts. We consider 2% to be a more conservative growth rate, and current policies and demands may see higher growth rates in future than the period prior to 2019. In overall consideration of the location, we request that a 1.5% growth rate be used for this study.

3. The trip generation characteristics of the development will be forecast using the Institute of Traffic Engineers (ITE) trip generation rates. Trips will be applied to the boundary road network based on existing travel patterns and anticipated destinations. Agreed.

4. Traffic operations (capacity, delay) will be analyzed using Synchro 11 modelling software. OTM Book 12 will be used to determine whether signals are required at the Elora St S/Park St W/Mill St E. Agreed.

6. Review collision data (to be requested from the MTO) at Elora St/Park St W/Mill St E and provide commentary on whether the misalignment of the intersection is a major factor of collision. In addition to the collision analysis, provide additional commentary on potential operational issues arising from the misalignment, and impact of additional traffic.

5. Review of sight distance and auxiliary turn-lane requirements where applicable and compare them to the standards set out in the MTO Design Supplement and/or Transportation Association of Canada (TAC) Geometric Design Guide. Agreed.

6. Summarize active transportation opportunities in the area such as sidewalk connectivity from Park St W to Elora St S. Agreed.

We look forward to hearing back from you. If you have any questions, please reach out to us.

Regards,
Maddie

Madeleine Ferguson, P.Eng.
Manager (Planning), Transportation
Office: 705.434.3418
Collingwood | Milton | Toronto | Bradford | Guelph

Medium Employers for 2024. Read more here.

Diego Bustamante

From: Pasquale Costanzo <pasqualec@wellington.ca>
Sent: July 5, 2024 9:34 AM
To: Madeleine Ferguson
Cc: Diego Bustamante; Chris Clark
Subject: RE: 41 Park Street W, Clifford - TIS Terms of Reference

Hi Maddie,

The Town consultant Triton has provided comments for the TOR below and they will be reviewing the TIS on the County's behalf as well. I have no comments to provide.

Take care

Pasquale Costanzo, C.E.T., CMMII Infrastructure Specialist
Technical Services Supervisor
County of Wellington, Roads Division
74 Woolwich Street Guelph ON N1H 3T9
T 519.837.2601 x 2250
E pasqualec@wellington.ca
W www.wellington.ca

From: Madeleine Ferguson <mferguson@cfcrozier.ca>
Sent: Friday, June 28, 2024 12:04 PM
To: Pasquale Costanzo <pasqualec@wellington.ca>
Cc: Diego Bustamante <dbustamante@cfcrozier.ca>
Subject: FW: 41 Park Street W, Clifford - TIS Terms of Reference

Hi Pasquale,

I hope you are doing well. It has been a few years since we last were in contact, so if you are not the correct person for this correspondence please let me know. We have been retained to prepare a TIS for the site located at 41 Park Street W in the Community of Clifford. While the site is not located on a County road, the TIS includes analysis of the intersection of Elora St S and Park St W and Mill St E. Below are the Terms of Reference that we have circulated with the Town and their Peer Reviewer (Chris Clark from Triton Engineering). We spoke with Chris earlier this week to confirm the study intersections given the time constraints with the school year ending and upcoming long weekend.

Please let us know if the County has any thoughts on the TOR, otherwise we will continue to work directly with the Town and Triton to finalize the scope.

Feel free to give me or my colleague Diego (705-434-3421) a call if there is anything you wish to discuss.

I hope you have a nice long weekend and look forward to hearing from you.

Regards,
Maddie

Madeleine Ferguson, P.Eng.
Manager (Planning), Transportation
Office: 705.434.3418
Collingwood | Milton | Toronto | Bradford | Guelph

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CROZIER

From: Madeleine Ferguson
Sent: Friday, June 28, 2024 12:02 PM
To: cclark@tritoneng.on.ca
Cc: sama@town.minto.on.ca; Diego Bustamante <dbustamante@cfcrozier.ca>
Subject: 41 Park Street W, Clifford - TIS Terms of Reference

Hi Chris,

Further to your call with Diego earlier this week, C.F. Crozier & Associates has been retained by Clifford (Park St) Developments to complete a Transportation Impact Study (TIS) for the proposed 41 Park Street West development in the Community of Clifford located in the Town of Minto, Wellington County. The development envisions 116 single detached units and 72 townhouse units. Just as a note we will be forwarding the below Terms of Reference to County staff as well in case there is further input.

We have proposed the following terms of reference (TOR) for the TIS for your review:

1. The following intersections will be analyzed based on discussion with Triton Engineering staff:
    - Park St W and Minto St S
    - Elora St S and Park St W and Mill St E
    - Proposed Site Accesses on Park St W

   Counts were completed this week, prior to schools being closed.

2. The proposed development is expected to be completed by 2029. Accordingly, the horizon years of 2029, as well as five years (2034) beyond build-out will be analyzed.

3. The background traffic growth was determined to be 1% based on regression analysis of historical MTO Provincial Highways 1988-2019 AADT for the segments of Highway 9 to the northwest and southeast of Clifford.
    - We kindly request the Town confirm this growth rate is acceptable, and identify if there are any developments to be included in the background traffic volume forecasts.

4. The trip generation characteristics of the development will be forecast using the Institute of Traffic Engineers (ITE) trip generation rates. Trips will be applied to the boundary road network based on existing travel patterns and anticipated destinations.

5. Traffic operations (capacity, delay) will be analyzed using Synchro 11 modelling software. OTM Book 12 will be used to determine whether signals are required at the Elora St S/Park St W/Mill St E.

6. Review collision data (to be requested from the MTO) at Elora St/Park St W/Mill St E and provide commentary on whether the misalignment of the intersection is a major factor of collision.

7. Review of sight distance and auxiliary turn-lane requirements where applicable and compare them to the standards set out in the MTO Design Supplement and/or Transportation Association of Canada (TAC) Geometric Design Guide.

8. Summarize active transportation opportunities in the area such as sidewalk connectivity from Park St W to Elora St S.

We look forward to hearing back from you. If you have any questions, please reach out to us.

Regards,
Maddie

APPENDIX C

Traffic Data

Spectrum

Turning Movement Count
Location Name: ELORA ST S & MILL ST E (COUNTY ROAD 2) / PARK ST W
Date: Tue, Jun 25, 2024 Deployment Lead: David Chu

Crozier & Associates
ACCOUNTS PAYABLE
TORONTO - SELECT PROVINCE -, M1W1Y6
- SELECT COUNTRY -

Turning Movement Count (2 . ELORA ST S & MILL ST E (COUNTY ROAD 2) / PARK ST W)

Start Time	N Approach ELORA ST S						E Approach MILL ST E						S Approach ELORA ST S						W Approach PARK ST W						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total		
07:00:00	1	38	4	0	0	43	3	1	2	0	0	6	0	28	1	0	1	29	1	1	0	0	0	2	80	
07:15:00	0	62	8	0	0	70	8	0	2	0	0	10	1	31	0	0	0	32	0	1	0	0	0	1	113	
07:30:00	0	52	16	0	0	68	7	1	3	0	0	11	0	48	2	0	0	50	1	2	0	0	0	3	132	
07:45:00	1	46	3	0	0	50	6	0	2	0	0	8	3	38	0	0	0	41	3	2	0	0	0	5	104	429
08:00:00	0	42	13	0	0	55	9	1	3	0	0	13	0	60	1	0	0	61	4	2	1	0	0	7	136	485
08:15:00	0	60	7	0	0	67	8	0	1	0	0	9	0	50	0	0	0	50	6	0	1	0	0	7	133	505
08:30:00	1	62	3	0	0	66	12	0	1	0	0	13	0	51	0	0	0	51	5	2	1	0	0	8	138	511
08:45:00	0	57	7	0	0	64	11	0	4	0	0	15	1	40	1	0	0	42	0	1	0	0	0	1	122	529
09:00:00	1	70	2	0	0	73	5	1	2	0	0	8	1	42	1	0	0	44	3	0	0	0	0	3	128	521
09:15:00	1	59	5	0	0	65	7	3	1	0	0	11	1	34	0	0	0	35	1	0	1	0	1	2	113	501
09:30:00	1	44	4	0	0	49	6	1	4	0	0	11	2	41	0	0	0	43	2	1	0	0	0	3	106	469
09:45:00	0	64	7	0	0	71	5	0	0	0	0	5	3	49	1	0	0	53	1	0	0	0	0	1	130	477
BREAK																										
15:00:00	1	69	11	0	0	81	10	2	0	0	0	12	0	48	2	0	0	50	3	0	0	0	0	3	146	
15:15:00	0	62	9	0	0	71	8	0	2	0	0	10	2	66	5	0	0	73	0	0	0	0	0	0	154	
15:30:00	0	55	6	0	1	61	10	2	1	0	0	13	2	53	4	0	0	59	2	0	0	0	0	2	135	
15:45:00	0	65	7	0	0	72	18	2	2	0	0	22	1	71	3	0	0	75	2	1	1	0	0	4	173	608
16:00:00	0	60	6	0	0	66	12	2	0	0	0	14	2	65	5	0	0	72	0	0	0	0	0	0	152	614
16:15:00	0	45	4	0	0	49	7	0	0	0	0	7	3	74	0	0	0	77	0	0	1	0	0	1	134	594
16:30:00	0	61	10	0	0	71	12	1	1	0	0	14	5	74	2	0	0	81	0	0	1	0	0	1	167	626
16:45:00	2	59	14	0	0	75	8	2	1	0	0	11	3	85	0	0	0	88	3	0	0	0	0	3	177	630
17:00:00	0	48	17	0	0	65	6	0	1	0	0	7	5	79	0	0	0	84	2	1	1	0	0	4	160	638
17:15:00	1	55	13	0	0	69	9	1	1	0	0	11	2	75	5	0	0	82	0	0	0	0	0	0	162	666
17:30:00	0	50	5	0	0	55	11	1	1	0	0	13	1	77	2	0	0	80	1	0	1	0	0	2	150	649
17:45:00	0	48	4	0	0	52	7	3	0	0	0	10	1	64	4	0	0	69	1	1	1	0	0	3	134	606
18:00:00	0	33	2	0	0	35	6	1	0	0	0	7	3	56	0	0	0	59	5	0	2	0	0	7	108	554
18:15:00	1	34	9	0	2	44	9	0	1	0	0	10	2	71	4	0	0	77	0	0	0	0	0	0	131	523
18:30:00	0	40	6	0	0	46	9	2	1	0	0	12	2	51	1	0	0	54	1	0	0	0	0	1	113	486
18:45:00	2	40	3	0	0	45	0	1	1	0	0	2	1	48	0	0	0	49	1	1	0	0	0	2	98	450
Grand Total	13	1480	205	0	3	1698	229	28	38	0	0	295	47	1569	44	0	1	1660	48	16	12	0	1	76	**3729**	-
Approach%	0.8%	87.2%	12.1%	0%		-	77.6%	9.5%	12.9%	0%		-	2.8%	94.5%	2.7%	0%		-	63.2%	21.1%	15.8%	0%		-	**-**	-
Totals %	0.3%	39.7%	5.5%	0%		45.5%	6.1%	0.8%	1%	0%		7.9%	1.3%	42.1%	1.2%	0%		44.5%	1.3%	0.4%	0.3%	0%		2%	**-**	-
Heavy	0	128	23	0		-	27	3	1	0		-	0	87	1	0		-	3	0	2	0		-	**-**	-
Heavy %	0%	8.6%	11.2%	0%		-	11.8%	10.7%	2.6%	0%		-	0%	5.5%	2.3%	0%		-	6.3%	0%	16.7%	0%		-	**-**	-
Bicycles	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	**-**	-
Bicycle %	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	**-**	-

Peak Hour: 08:00 AM - 09:00 AM Weather: Scattered Clouds (16.78 °C)

Start Time	N Approach ELORA ST S						E Approach MILL ST E						S Approach ELORA ST S						W Approach PARK ST W						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
08:00:00	0	42	13	0	0	55	9	1	3	0	0	13	0	60	1	0	0	61	4	2	1	0	0	7	136
08:15:00	0	60	7	0	0	67	8	0	1	0	0	9	0	50	0	0	0	50	6	0	1	0	0	7	133
08:30:00	1	62	3	0	0	66	12	0	1	0	0	13	0	51	0	0	0	51	5	2	1	0	0	8	138
08:45:00	0	57	7	0	0	64	11	0	4	0	0	15	1	40	1	0	0	42	0	1	0	0	0	1	122
Grand Total	1	221	30	0	0	252	40	1	9	0	0	50	1	201	2	0	0	204	15	5	3	0	0	23	**529**
Approach%	0.4%	87.7%	11.9%	0%		-	80%	2%	18%	0%		-	0.5%	98.5%	1%	0%		-	65.2%	21.7%	13%	0%		-	**-**
Totals %	0.2%	41.8%	5.7%	0%		47.6%	7.6%	0.2%	1.7%	0%		9.5%	0.2%	38%	0.4%	0%		38.6%	2.8%	0.9%	0.6%	0%		4.3%	**-**
PHF	0.25	0.89	0.58	0		0.94	0.83	0.25	0.56	0		0.83	0.25	0.84	0.5	0		0.84	0.63	0.63	0.75	0		0.72	**-**
Heavy	0	19	5	0		24	6	0	0	0		6	0	15	0	0		15	2	0	1	0		3	**-**
Heavy %	0%	8.6%	16.7%	0%		9.5%	15%	0%	0%	0%		12%	0%	7.5%	0%	0%		7.4%	13.3%	0%	33.3%	0%		13%	**-**
Lights	1	202	25	0		228	34	1	9	0		44	1	186	2	0		189	13	5	2	0		20	**-**
Lights %	100%	91.4%	83.3%	0%		90.5%	85%	100%	100%	0%		88%	100%	92.5%	100%	0%		92.6%	86.7%	100%	66.7%	0%		87%	**-**
Single-Unit Trucks	0	2	2	0		4	2	0	0	0		2	0	7	0	0		7	0	0	0	0		0	**-**
Single-Unit Trucks %	0%	0.9%	6.7%	0%		1.6%	5%	0%	0%	0%		4%	0%	3.5%	0%	0%		3.4%	0%	0%	0%	0%		0%	**-**
Buses	0	1	2	0		3	1	0	0	0		1	0	1	0	0		1	2	0	1	0		3	**-**
Buses %	0%	0.5%	6.7%	0%		1.2%	2.5%	0%	0%	0%		2%	0%	0.5%	0%	0%		0.5%	13.3%	0%	33.3%	0%		13%	**-**
Articulated Trucks	0	16	1	0		17	3	0	0	0		3	0	7	0	0		7	0	0	0	0		0	**-**
Articulated Trucks %	0%	7.2%	3.3%	0%		6.7%	7.5%	0%	0%	0%		6%	0%	3.5%	0%	0%		3.4%	0%	0%	0%	0%		0%	**-**
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	**-**
Pedestrians%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		**-**

Spectrum

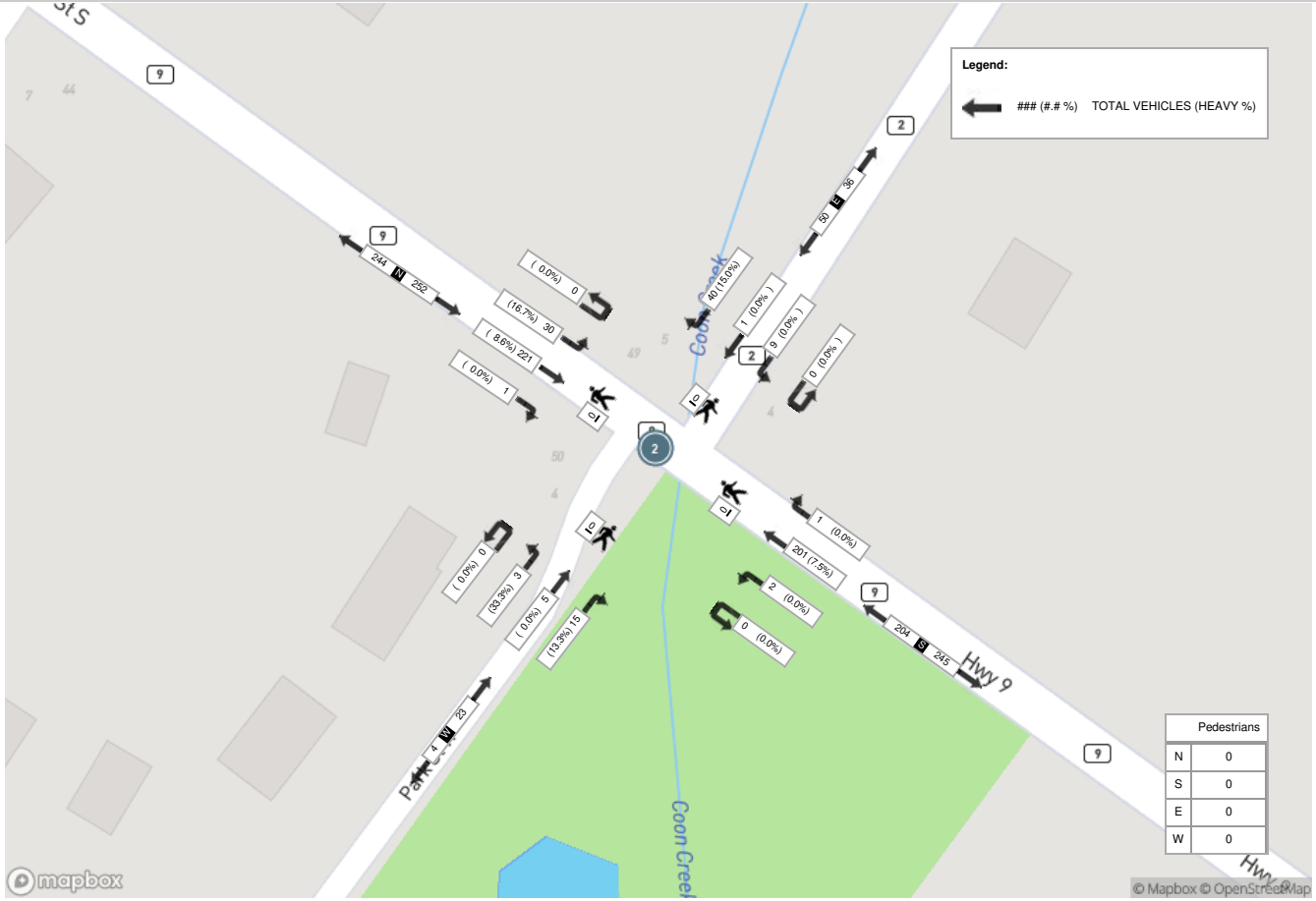
Turning Movement Count
Location Name: ELORA ST S & MILL ST E (COUNTY ROAD 2) / PARK ST W
Date: Tue, Jun 25, 2024 Deployment Lead: David Chu

Crozier & Associates
ACCOUNTS PAYABLE
TORONTO - SELECT PROVINCE -, M1W1Y6
- SELECT COUNTRY -

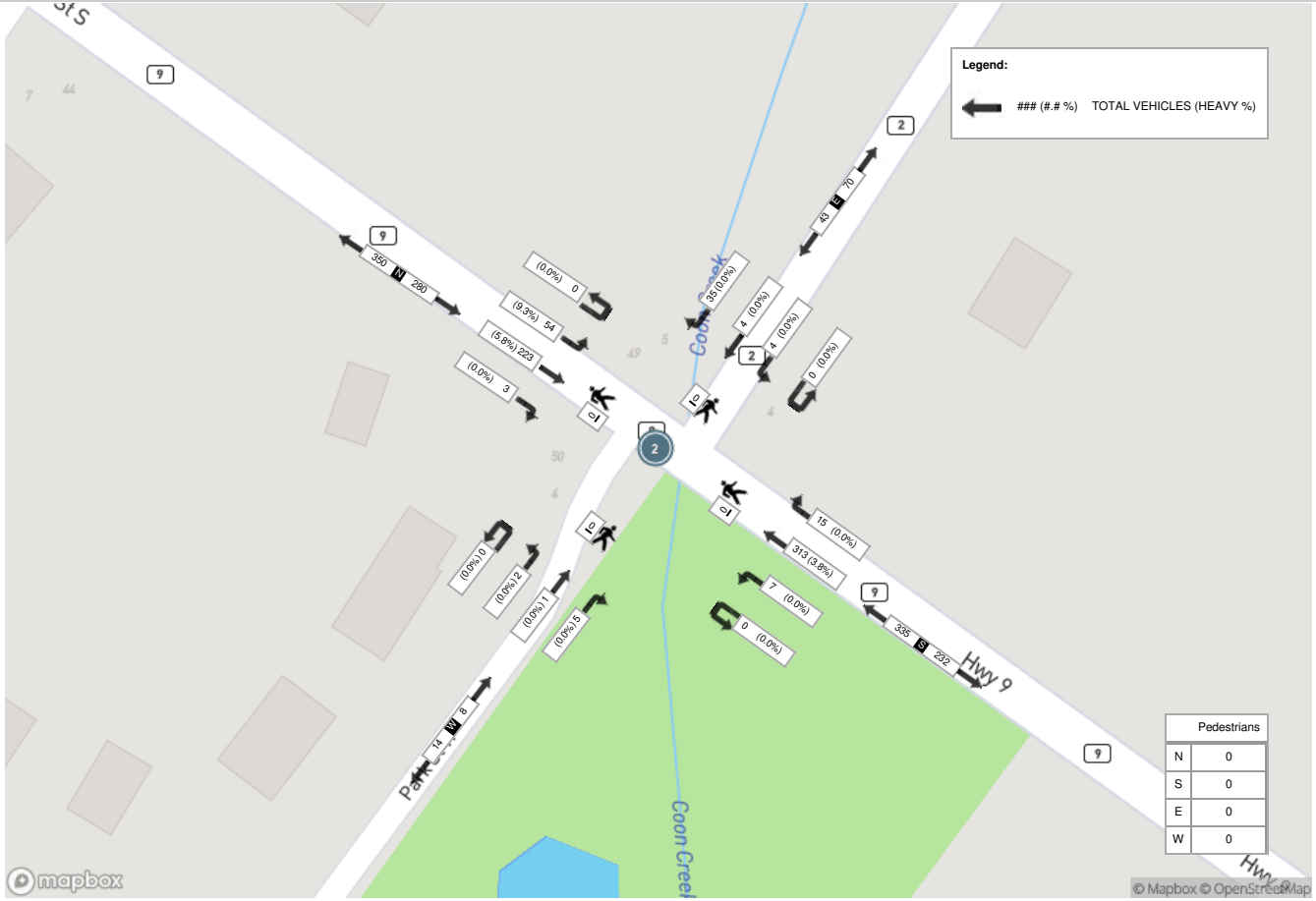
Peak Hour: 04:30 PM - 05:30 PM Weather: Overcast Clouds (22.83 °C)

Start Time	N Approach ELORA ST S						E Approach MILL ST E						S Approach ELORA ST S						W Approach PARK ST W						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
16:30:00	0	61	10	0	0	71	12	1	1	0	0	14	5	74	2	0	0	81	0	0	1	0	0	1	167
16:45:00	2	59	14	0	0	75	8	2	1	0	0	11	3	85	0	0	0	88	3	0	0	0	0	3	177
17:00:00	0	48	17	0	0	65	6	0	1	0	0	7	5	79	0	0	0	84	2	1	1	0	0	4	160
17:15:00	1	55	13	0	0	69	9	1	1	0	0	11	2	75	5	0	0	82	0	0	0	0	0	0	162
Grand Total	3	223	54	0	0	280	35	4	4	0	0	43	15	313	7	0	0	335	5	1	2	0	0	8	**666**
Approach%	1.1%	79.6%	19.3%	0%		-	81.4%	9.3%	9.3%	0%		-	4.5%	93.4%	2.1%	0%		-	62.5%	12.5%	25%	0%		-	**-**
Totals %	0.5%	33.5%	8.1%	0%		42%	5.3%	0.6%	0.6%	0%		6.5%	2.3%	47%	1.1%	0%		50.3%	0.8%	0.2%	0.3%	0%		1.2%	**-**
PHF	0.38	0.91	0.79	0		0.93	0.73	0.5	1	0		0.77	0.75	0.92	0.35	0		0.95	0.42	0.25	0.5	0		0.5	**-**
Heavy	0	13	5	0		18	0	0	0	0		0	0	12	0	0		12	0	0	0	0		0	**-**
Heavy %	0%	5.8%	9.3%	0%		6.4%	0%	0%	0%	0%		0%	0%	3.8%	0%	0%		3.6%	0%	0%	0%	0%		0%	**-**
Lights	3	210	49	0		262	35	4	4	0		43	15	301	7	0		323	5	1	2	0		8	**-**
Lights %	100%	94.2%	90.7%	0%		93.6%	100%	100%	100%	0%		100%	100%	96.2%	100%	0%		96.4%	100%	100%	100%	0%		100%	**-**
Single-Unit Trucks	0	6	2	0		8	0	0	0	0		0	0	2	0	0		2	0	0	0	0		0	**-**
Single-Unit Trucks %	0%	2.7%	3.7%	0%		2.9%	0%	0%	0%	0%		0%	0%	0.6%	0%	0%		0.6%	0%	0%	0%	0%		0%	**-**
Buses	0	0	1	0		1	0	0	0	0		0	0	1	0	0		1	0	0	0	0		0	**-**
Buses %	0%	0%	1.9%	0%		0.4%	0%	0%	0%	0%		0%	0%	0.3%	0%	0%		0.3%	0%	0%	0%	0%		0%	**-**
Articulated Trucks	0	7	2	0		9	0	0	0	0		0	0	9	0	0		9	0	0	0	0		0	**-**
Articulated Trucks %	0%	3.1%	3.7%	0%		3.2%	0%	0%	0%	0%		0%	0%	2.9%	0%	0%		2.7%	0%	0%	0%	0%		0%	**-**
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	**-**
Pedestrians%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		**-**

Peak Hour: 08:00 AM - 09:00 AM **Weather: Scattered Clouds (16.78 °C)**



Peak Hour: 04:30 PM - 05:30 PM Weather: Overcast Clouds (22.83 °C)



Spectrum

Turning Movement Count
Location Name: PARK ST W & MINTO ST S
Date: Tue, Jun 25, 2024 Deployment Lead: David Chu

Crozier & Associates
ACCOUNTS PAYABLE
TORONTO - SELECT PROVINCE -, M1W1Y6
- SELECT COUNTRY -

Turning Movement Count (1 . PARK ST W & MINTO ST S)

Start Time	N Approach MINTO ST S						E Approach PARK ST W						S Approach PRIVATE DRIVEWAY						W Approach PARK ST W						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total		
07:00:00	0	0	1	0	0	1	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	3	
07:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
07:30:00	0	0	1	0	0	1	2	0	0	0	0	2	1	1	0	0	0	2	1	0	0	0	0	1	6	
07:45:00	1	0	2	0	0	3	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4	13
08:00:00	0	0	3	0	0	3	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	5	15
08:15:00	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	3	18
08:30:00	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	14
08:45:00	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	11
09:00:00	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	8
09:15:00	0	0	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	3	8
09:30:00	0	0	1	0	0	1	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	3	9
09:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
BREAK																										
15:00:00	0	0	2	0	0	2	1	1	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	1	5	
15:15:00	0	0	3	0	0	3	6	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	9	
15:30:00	0	0	2	0	0	2	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4	
15:45:00	0	0	1	0	0	1	5	1	0	0	0	6	0	0	0	0	0	0	0	1	0	0	0	1	8	26
16:00:00	0	0	0	0	0	0	3	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3	24
16:15:00	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	16
16:30:00	0	0	2	0	0	2	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4	16
16:45:00	0	0	1	0	0	1	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	3	11
17:00:00	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	10
17:15:00	0	0	0	0	0	0	5	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	5	14
17:30:00	0	0	1	0	1	1	3	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	4	14
17:45:00	0	0	3	0	0	3	4	0	1	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	8	19
18:00:00	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	19
18:15:00	0	0	0	0	0	0	3	1	0	0	0	4	0	0	0	0	0	0	0	0	1	0	0	1	5	19
18:30:00	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	1	3	18
18:45:00	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2	12
Grand Total	2	0	35	0	2	37	47	4	1	0	1	52	1	1	0	0	0	2	1	6	2	0	2	9	**100**	-
Approach%	5.4%	0%	94.6%	0%		-	90.4%	7.7%	1.9%	0%		-	50%	50%	0%	0%		-	11.1%	66.7%	22.2%	0%		-	-	-
Totals %	2%	0%	35%	0%		37%	47%	4%	1%	0%		52%	1%	1%	0%	0%		2%	1%	6%	2%	0%		9%	-	-
Heavy	0	0	1	0		-	3	0	0	0		-	0	0	0	0		-	0	0	0	0		-	-	-
Heavy %	0%	0%	2.9%	0%		-	6.4%	0%	0%	0%		-	0%	0%	0%	0%		-	0%	0%	0%	0%		-	-	-
Bicycles	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-
Bicycle %	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-

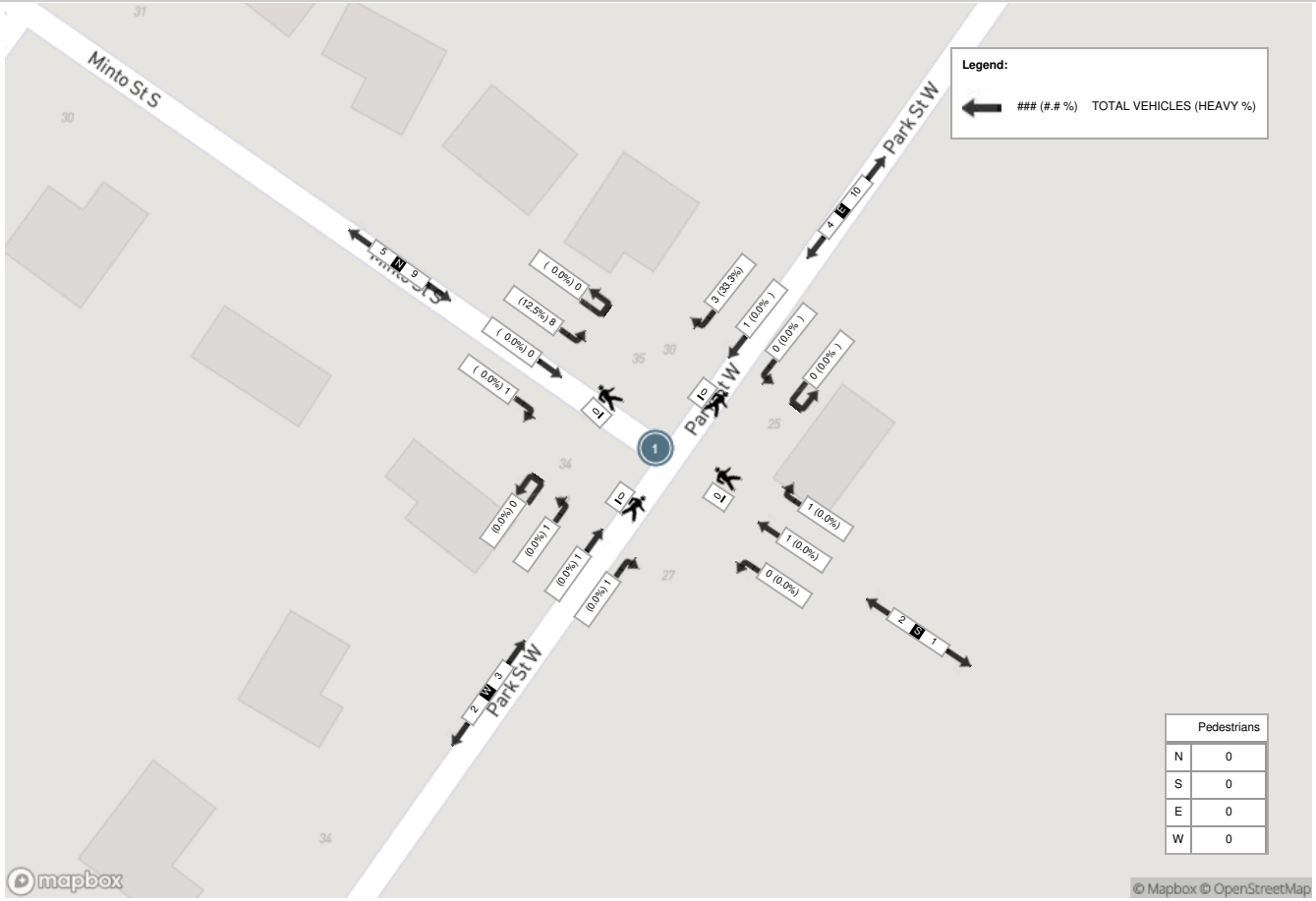
Peak Hour: 07:30 AM - 08:30 AM Weather: Scattered Clouds (16.78 °C)

Start Time	N Approach MINTO ST S						E Approach PARK ST W						S Approach PRIVATE DRIVEWAY						W Approach PARK ST W						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
07:30:00	0	0	1	0	0	1	2	0	0	0	0	2	1	1	0	0	0	2	1	0	0	0	0	1	6
07:45:00	1	0	2	0	0	3	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4
08:00:00	0	0	3	0	0	3	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	5
08:15:00	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	3
Grand Total	1	0	8	0	0	9	3	1	0	0	0	4	1	1	0	0	0	2	1	1	1	0	0	3	**18**
Approach%	11.1%	0%	88.9%	0%		-	75%	25%	0%	0%		-	50%	50%	0%	0%		-	33.3%	33.3%	33.3%	0%		-	**-**
Totals %	5.6%	0%	44.4%	0%		50%	16.7%	5.6%	0%	0%		22.2%	5.6%	5.6%	0%	0%		11.1%	5.6%	5.6%	5.6%	0%		16.7%	**-**
PHF	0.25	0	0.67	0		0.75	0.38	0.25	0	0		0.5	0.25	0.25	0	0		0.25	0.25	0.25	0.25	0		0.75	**-**
Heavy	0	0	1	0		1	1	0	0	0		1	0	0	0	0		0	0	0	0	0		0	**-**
Heavy %	0%	0%	12.5%	0%		11.1%	33.3%	0%	0%	0%		25%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	**-**
Lights	1	0	7	0		8	2	1	0	0		3	1	1	0	0		2	1	1	1	0		3	**-**
Lights %	100%	0%	87.5%	0%		88.9%	66.7%	100%	0%	0%		75%	100%	100%	0%	0%		100%	100%	100%	100%	0%		100%	**-**
Single-Unit Trucks	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	**-**
Single-Unit Trucks %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	**-**
Buses	0	0	1	0		1	1	0	0	0		1	0	0	0	0		0	0	0	0	0		0	**-**
Buses %	0%	0%	12.5%	0%		11.1%	33.3%	0%	0%	0%		25%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	**-**
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	**-**
Pedestrians%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		**-**

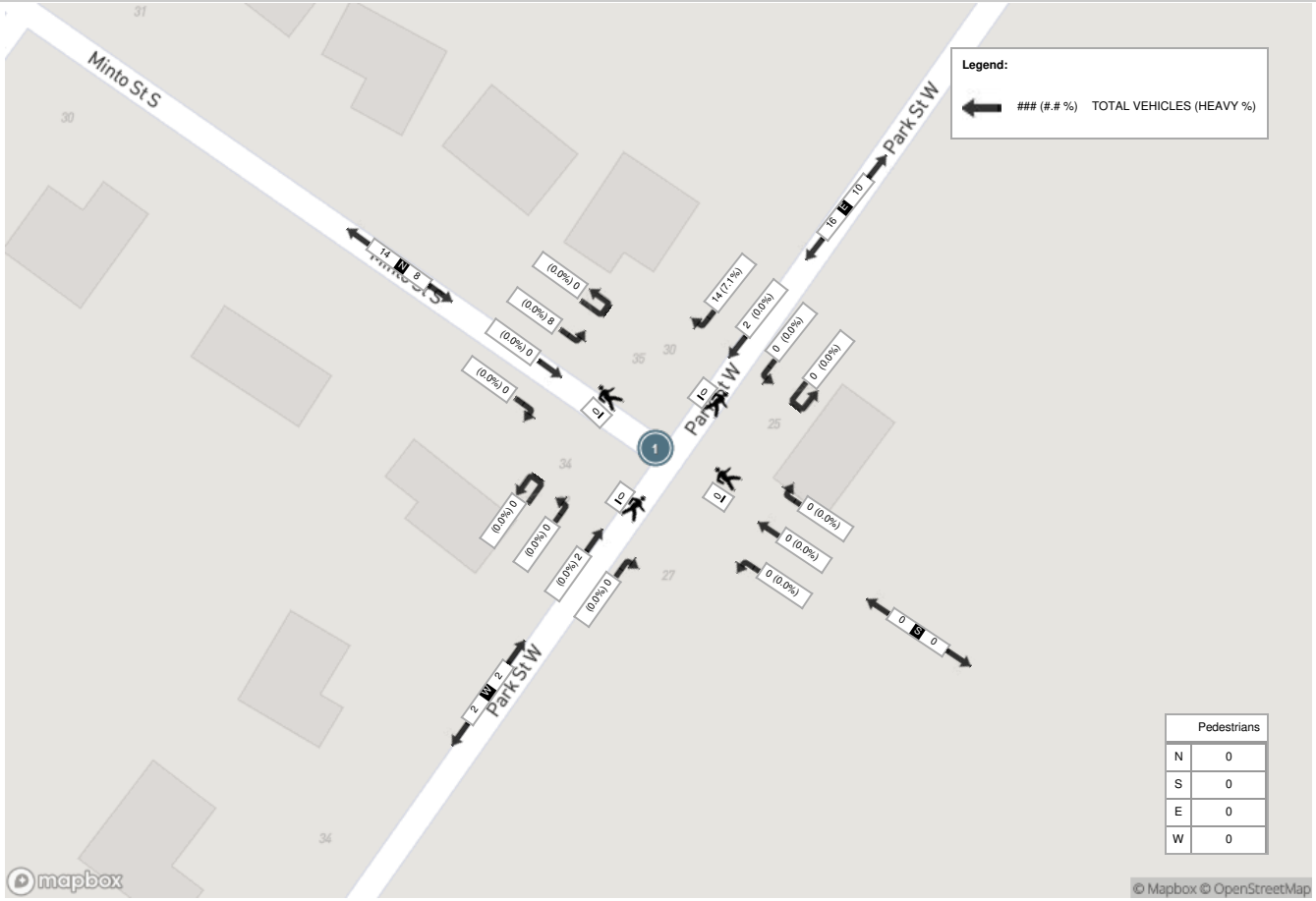
Peak Hour: 03:00 PM - 04:00 PM Weather: Overcast Clouds (22.83 °C)

Start Time	N Approach MINTO ST S						E Approach PARK ST W						S Approach PRIVATE DRIVEWAY						W Approach PARK ST W						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
15:00:00	0	0	2	0	0	2	1	1	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	1	5
15:15:00	0	0	3	0	0	3	6	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	9
15:30:00	0	0	2	0	0	2	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4
15:45:00	0	0	1	0	0	1	5	1	0	0	0	6	0	0	0	0	0	0	0	1	0	0	0	1	8
Grand Total	0	0	8	0	0	8	14	2	0	0	0	16	0	0	0	0	0	0	0	2	0	0	0	2	**26**
Approach%	0%	0%	100%	0%		-	87.5%	12.5%	0%	0%		-	0%	0%	0%	0%		-	0%	100%	0%	0%		-	**-**
Totals %	0%	0%	30.8%	0%		30.8%	53.8%	7.7%	0%	0%		61.5%	0%	0%	0%	0%		0%	0%	7.7%	0%	0%		7.7%	**-**
PHF	0	0	0.67	0		0.67	0.58	0.5	0	0		0.67	0	0	0	0		0	0	0.5	0	0		0.5	**-**
Heavy	0	0	0	0		0	1	0	0	0		1	0	0	0	0		0	0	0	0	0		0	**-**
Heavy %	0%	0%	0%	0%		0%	7.1%	0%	0%	0%		6.3%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	**-**
Lights	0	0	8	0		8	13	2	0	0		15	0	0	0	0		0	0	2	0	0		2	**-**
Lights %	0%	0%	100%	0%		100%	92.9%	100%	0%	0%		93.8%	0%	0%	0%	0%		0%	0%	100%	0%	0%		100%	**-**
Single-Unit Trucks	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	**-**
Single-Unit Trucks %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	**-**
Buses	0	0	0	0		0	1	0	0	0		1	0	0	0	0		0	0	0	0	0		0	**-**
Buses %	0%	0%	0%	0%		0%	7.1%	0%	0%	0%		6.3%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	**-**
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	**-**
Pedestrians%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		**-**

Peak Hour: 07:30 AM - 08:30 AM **Weather: Scattered Clouds (16.78 °C)**



Peak Hour: 03:00 PM - 04:00 PM Weather: Overcast Clouds (22.83 °C)



Spectrum

Turning Movement Count
Location Name: MINTO ST S & ALLAN ST W
Date: Wed, Jul 17, 2024 Deployment Lead: David Chu

Crozier & Associates
ACCOUNTS PAYABLE
TORONTO - SELECT PROVINCE -, M1W1Y6
- SELECT COUNTRY -

Turning Movement Count (1 . MINTO ST S & ALLAN ST W)

Start Time	N Approach MINTO ST S						E Approach ALLAN ST W						S Approach MINTO ST S						W Approach ALLAN ST W						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total		
07:00:00	1	0	4	0	0	5	1	1	0	0	0	2	2	7	0	0	0	9	0	3	4	0	0	7	23	
07:15:00	0	0	2	0	0	2	1	1	0	0	0	2	1	2	0	0	0	3	1	6	1	0	0	8	15	
07:30:00	0	0	3	0	0	3	1	2	0	0	0	3	1	1	0	0	0	2	0	3	1	0	0	4	12	
07:45:00	2	2	2	0	0	6	1	1	0	0	0	2	0	2	1	0	0	3	0	3	0	0	0	3	14	64
08:00:00	2	1	3	0	0	6	5	2	0	0	0	7	0	1	0	0	0	1	0	2	1	0	0	3	17	58
08:15:00	0	1	0	0	0	1	2	7	0	0	0	9	2	0	0	0	1	2	0	3	0	0	0	3	15	58
08:30:00	2	1	0	0	0	3	0	3	0	0	0	3	0	1	0	0	0	1	0	1	1	0	0	2	9	55
08:45:00	0	1	2	0	0	3	2	3	0	0	1	5	1	0	0	0	0	1	0	2	2	0	0	4	13	54
09:00:00	1	1	3	0	0	5	2	1	0	0	0	3	0	0	1	0	0	1	0	5	0	0	1	5	14	51
09:15:00	3	0	2	0	0	5	1	2	0	0	0	3	0	2	0	0	0	2	0	4	0	0	0	4	14	50
09:30:00	0	1	0	0	0	1	2	2	1	0	0	5	0	0	0	0	1	0	0	1	0	0	0	1	7	48
09:45:00	1	0	2	0	0	3	3	4	1	0	0	8	1	0	0	0	0	1	0	2	0	0	0	2	14	49
BREAK																										
15:00:00	2	3	4	0	0	9	4	2	2	0	0	8	0	0	1	0	0	1	0	2	2	0	0	4	22	
15:15:00	0	2	4	0	0	6	3	5	0	0	0	8	0	2	1	0	0	3	0	3	0	0	0	3	20	
15:30:00	1	3	7	0	0	11	3	3	1	0	0	7	1	2	0	0	0	3	0	1	3	0	0	4	25	
15:45:00	1	2	3	0	0	6	1	2	0	0	0	3	2	0	0	0	0	2	0	4	2	0	0	6	17	84
16:00:00	3	3	2	0	0	8	2	3	2	0	0	7	2	5	1	0	0	8	1	4	0	0	0	5	28	90
16:15:00	1	1	1	0	0	3	5	3	2	0	0	10	2	2	0	0	0	4	0	2	1	0	0	3	20	90
16:30:00	0	0	6	0	0	6	4	8	2	0	0	14	0	6	1	0	0	7	0	9	0	0	0	9	36	101
16:45:00	2	3	1	0	0	6	0	2	1	0	0	3	0	0	0	0	0	0	0	5	1	0	0	6	15	99
17:00:00	2	0	8	0	0	10	5	7	0	0	0	12	0	1	0	0	0	1	1	3	0	0	0	4	27	98
17:15:00	6	3	4	0	0	13	3	3	1	0	0	7	1	3	1	0	2	5	0	2	4	1	1	7	32	110
17:30:00	2	1	4	0	0	7	2	4	1	0	0	7	1	2	2	0	0	5	0	7	3	0	0	10	29	103
17:45:00	0	2	1	0	0	3	6	6	0	0	0	12	1	1	0	0	0	2	0	5	9	0	0	14	31	119
18:00:00	3	1	3	0	0	7	1	0	0	0	0	1	0	0	0	0	1	0	1	4	1	0	0	6	14	106
18:15:00	3	0	4	0	3	7	3	1	0	0	0	4	0	1	1	0	0	2	0	2	2	0	0	4	17	91
18:30:00	2	0	3	0	0	5	6	3	0	0	0	9	0	2	0	0	0	2	2	5	4	0	0	11	27	89
18:45:00	0	0	0	0	0	0	5	1	0	0	0	6	0	2	0	0	3	2	0	5	2	0	0	7	15	73
Grand Total	40	32	78	0	3	150	74	82	14	0	1	170	18	45	10	0	8	73	6	98	44	1	2	149	**542**	-
Approach%	26.7%	21.3%	52%	0%		-	43.5%	48.2%	8.2%	0%		-	24.7%	61.6%	13.7%	0%		-	4%	65.8%	29.5%	0.7%		-	**-**	-
Totals %	7.4%	5.9%	14.4%	0%		27.7%	13.7%	15.1%	2.6%	0%		31.4%	3.3%	8.3%	1.8%	0%		13.5%	1.1%	18.1%	8.1%	0.2%		27.5%	**-**	-
Heavy	0	1	1	0		-	2	4	2	0		-	1	3	0	0		-	0	5	1	0		-	**-**	-
Heavy %	0%	3.1%	1.3%	0%		-	2.7%	4.9%	14.3%	0%		-	5.6%	6.7%	0%	0%		-	0%	5.1%	2.3%	0%		-	**-**	-
Bicycles	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	**-**	-
Bicycle %	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	**-**	-

Peak Hour: 07:00 AM - 08:00 AM Weather: Broken Clouds (16.6 °C)

Start Time	N Approach MINTO ST S						E Approach ALLAN ST W						S Approach MINTO ST S						W Approach ALLAN ST W						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
07:00:00	1	0	4	0	0	5	1	1	0	0	0	2	2	7	0	0	0	9	0	3	4	0	0	7	23
07:15:00	0	0	2	0	0	2	1	1	0	0	0	2	1	2	0	0	0	3	1	6	1	0	0	8	15
07:30:00	0	0	3	0	0	3	1	2	0	0	0	3	1	1	0	0	0	2	0	3	1	0	0	4	12
07:45:00	2	2	2	0	0	6	1	1	0	0	0	2	0	2	1	0	0	3	0	3	0	0	0	3	14
Grand Total	3	2	11	0	0	16	4	5	0	0	0	9	4	12	1	0	0	17	1	15	6	0	0	22	**64**
Approach%	18.8%	12.5%	68.8%	0%		-	44.4%	55.6%	0%	0%		-	23.5%	70.6%	5.9%	0%		-	4.5%	68.2%	27.3%	0%		-	**-**
Totals %	4.7%	3.1%	17.2%	0%		25%	6.3%	7.8%	0%	0%		14.1%	6.3%	18.8%	1.6%	0%		26.6%	1.6%	23.4%	9.4%	0%		34.4%	**-**
PHF	0.38	0.25	0.69	0		0.67	1	0.63	0	0		0.75	0.5	0.43	0.25	0		0.47	0.25	0.63	0.38	0		0.69	**-**
Heavy	0	0	0	0		0	0	0	0	0		0	0	2	0	0		2	0	2	0	0		2	**-**
Heavy %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	16.7%	0%	0%		11.8%	0%	13.3%	0%	0%		9.1%	**-**
Lights	3	2	11	0		16	4	5	0	0		9	4	10	1	0		15	1	13	6	0		20	**-**
Lights %	100%	100%	100%	0%		100%	100%	100%	0%	0%		100%	100%	83.3%	100%	0%		88.2%	100%	86.7%	100%	0%		90.9%	**-**
Single-Unit Trucks	0	0	0	0		0	0	0	0	0		0	0	1	0	0		1	0	2	0	0		2	**-**
Single-Unit Trucks %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	8.3%	0%	0%		5.9%	0%	13.3%	0%	0%		9.1%	**-**
Articulated Trucks	0	0	0	0		0	0	0	0	0		0	0	1	0	0		1	0	0	0	0		0	**-**
Articulated Trucks %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	8.3%	0%	0%		5.9%	0%	0%	0%	0%		0%	**-**
Bicycles on Road	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	**-**
Bicycles on Road %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	**-**
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	**-**
Pedestrians%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		**-**
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	**-**
Bicycles on Crosswalk%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		**-**

Spectrum

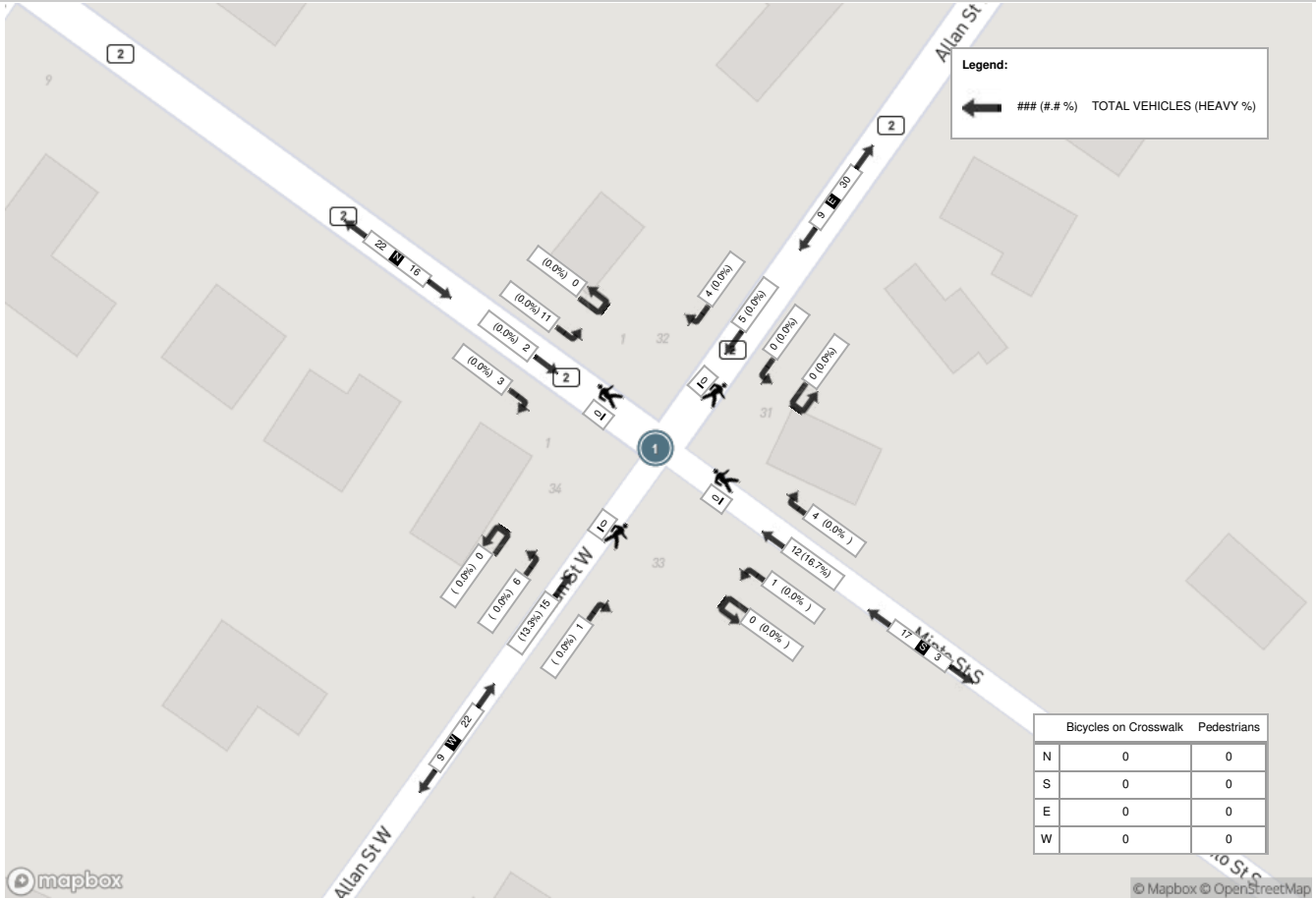
Turning Movement Count
Location Name: MINTO ST S & ALLAN ST W
Date: Wed, Jul 17, 2024 Deployment Lead: David Chu

Crozier & Associates
ACCOUNTS PAYABLE
TORONTO - SELECT PROVINCE -, M1W1Y6
- SELECT COUNTRY -

Peak Hour: 05:00 PM - 06:00 PM Weather: Scattered Clouds (22.6 °C)

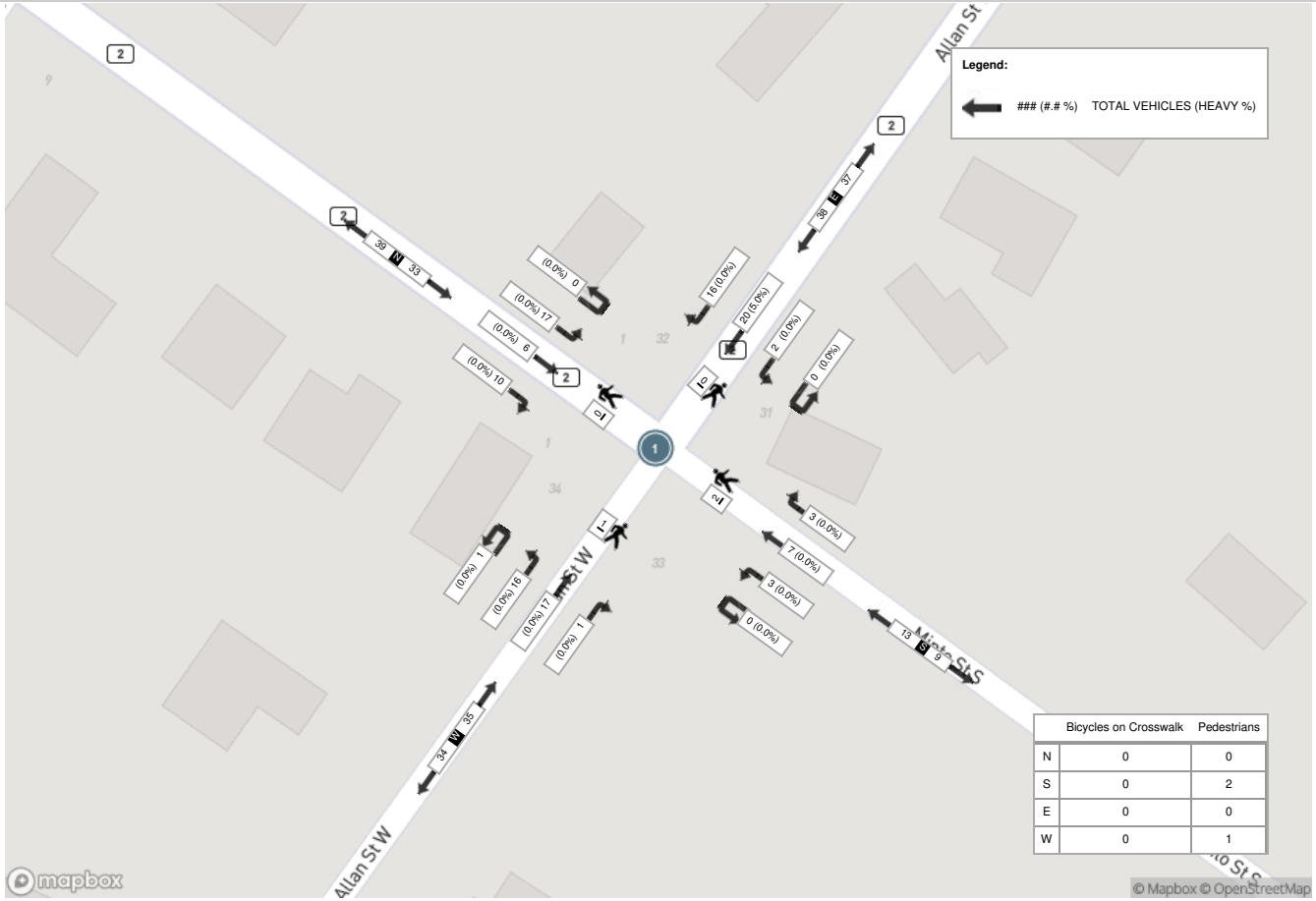
Start Time	N Approach MINTO ST S						E Approach ALLAN ST W						S Approach MINTO ST S						W Approach ALLAN ST W						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
17:00:00	2	0	8	0	0	10	5	7	0	0	0	12	0	1	0	0	0	1	1	3	0	0	0	4	27
17:15:00	6	3	4	0	0	13	3	3	1	0	0	7	1	3	1	0	2	5	0	2	4	1	1	7	32
17:30:00	2	1	4	0	0	7	2	4	1	0	0	7	1	2	2	0	0	5	0	7	3	0	0	10	29
17:45:00	0	2	1	0	0	3	6	6	0	0	0	12	1	1	0	0	0	2	0	5	9	0	0	14	31
Grand Total	10	6	17	0	0	33	16	20	2	0	0	38	3	7	3	0	2	13	1	17	16	1	1	35	**119**
Approach%	30.3%	18.2%	51.5%	0%		-	42.1%	52.6%	5.3%	0%		-	23.1%	53.8%	23.1%	0%		-	2.9%	48.6%	45.7%	2.9%		-	**-**
Totals %	8.4%	5%	14.3%	0%		27.7%	13.4%	16.8%	1.7%	0%		31.9%	2.5%	5.9%	2.5%	0%		10.9%	0.8%	14.3%	13.4%	0.8%		29.4%	**-**
PHF	0.42	0.5	0.53	0		0.63	0.67	0.71	0.5	0		0.79	0.75	0.58	0.38	0		0.65	0.25	0.61	0.44	0.25		0.63	**-**
Heavy	0	0	0	0		0	0	1	0	0		1	0	0	0	0		0	0	0	0	0		0	**-**
Heavy %	0%	0%	0%	0%		0%	0%	5%	0%	0%		2.6%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	**-**
Lights	10	6	17	0		33	16	19	2	0		37	3	7	3	0		13	1	17	16	1		35	**-**
Lights %	100%	100%	100%	0%		100%	100%	95%	100%	0%		97.4%	100%	100%	100%	0%		100%	100%	100%	100%	100%		100%	**-**
Single-Unit Trucks	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	**-**
Single-Unit Trucks %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	**-**
Articulated Trucks	0	0	0	0		0	0	1	0	0		1	0	0	0	0		0	0	0	0	0		0	**-**
Articulated Trucks %	0%	0%	0%	0%		0%	0%	5%	0%	0%		2.6%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	**-**
Bicycles on Road	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	**-**
Bicycles on Road %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	**-**
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	1	-	**-**
Pedestrians%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	66.7%		-	-	-	-	33.3%		**-**
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	**-**
Bicycles on Crosswalk%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		**-**

Peak Hour: 07:00 AM - 08:00 AM **Weather: Broken Clouds (16.6 °C)**



	Bicycles on Crosswalk	Pedestrians
N	0	0
S	0	0
E	0	0
W	0	0

Peak Hour: 05:00 PM - 06:00 PM **Weather: Scattered Clouds (22.6 °C)**



	Bicycles on Crosswalk	Pedestrians
N	0	0
S	0	2
E	0	0
W	0	1

APPENDIX D

Level of Service Definitions

Level of Service Definitions

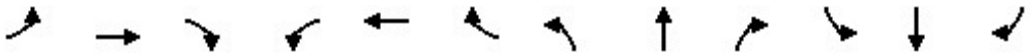
Two-Way Stop Controlled Intersections

Level of Service	Control Delay per Vehicle (seconds)	Interpretation
A	≤ 10	EXCELLENT. Large and frequent gaps in traffic on the main roadway. Queuing on the minor street is rare.
B	> 10 and ≤ 15	VERY GOOD. Many gaps exist in traffic on the main roadway. Queuing on the minor street is minimal.
C	> 15 and ≤ 25	GOOD. Fewer gaps exist in traffic on the main roadway. Delay on minor approach becomes more noticeable.
D	> 25 and ≤ 35	FAIR. Infrequent and shorter gaps in traffic on the main roadway. Queue lengths develop on the minor street.
E	> 35 and ≤ 50	POOR. Very infrequent gaps in traffic on the main roadway. Queue lengths become noticeable.
F	> 50	UNSATISFACTORY. Very few gaps in traffic on the main roadway. Excessive delay with significant queue lengths on the minor street.

Adapted from Highway Capacity Manual 2000, Transportation Research Board

APPENDIX E

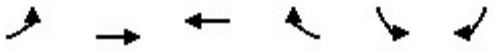
Detailed Capacity Analysis Worksheets



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	5	15	9	1	40	2	201	1	30	221	1
Future Volume (Veh/h)	3	5	15	9	1	40	2	201	1	30	221	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	3	5	16	9	1	42	2	209	1	31	230	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	548	506	230	524	506	210	231			210		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	548	506	230	524	506	210	231			210		
tC, single (s)	7.4	6.5	6.3	7.1	6.5	6.4	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.8	4.0	3.4	3.5	4.0	3.4	2.2			2.4		
p0 queue free %	99	99	98	98	100	95	100			98		
cM capacity (veh/h)	373	459	782	444	459	799	1349			1276		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	24	52	212	262
Volume Left	3	9	2	31
Volume Right	16	42	1	1
cSH	610	693	1349	1276
Volume to Capacity	0.04	0.07	0.00	0.02
Queue Length 95th (m)	1.0	1.9	0.0	0.6
Control Delay (s)	11.1	10.6	0.1	1.1
Lane LOS	B	B	A	A
Approach Delay (s)	11.1	10.6	0.1	1.1
Approach LOS	B	B		

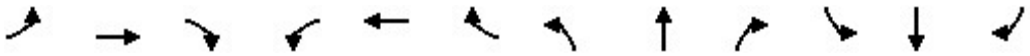
Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	38.6%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	1	1	3	8	1
Future Volume (Veh/h)	1	1	1	3	8	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	1	1	1	4	11	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	5				6	3
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	5				6	3
tC, single (s)	4.1				6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1630				987	1087

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	2	5	12
Volume Left	1	0	11
Volume Right	0	4	1
cSH	1630	1700	995
Volume to Capacity	0.00	0.00	0.01
Queue Length 95th (m)	0.0	0.0	0.3
Control Delay (s)	3.6	0.0	8.7
Lane LOS	A		A
Approach Delay (s)	3.6	0.0	8.7
Approach LOS			A

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	6	15	1	0	5	4	1	12	4	11	2	3
Future Volume (vph)	6	15	1	0	5	4	1	12	4	11	2	3
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	9	21	1	0	7	6	1	17	6	16	3	4

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	31	13	24	23
Volume Left (vph)	9	0	1	16
Volume Right (vph)	1	6	6	4
Hadj (s)	0.19	-0.28	0.06	0.03
Departure Headway (s)	4.2	3.8	4.1	4.1
Degree Utilization, x	0.04	0.01	0.03	0.03
Capacity (veh/h)	841	940	860	873
Control Delay (s)	7.4	6.8	7.2	7.2
Approach Delay (s)	7.4	6.8	7.2	7.2
Approach LOS	A	A	A	A

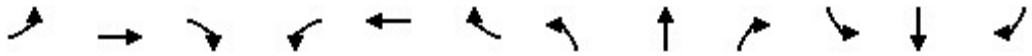
Intersection Summary			
Delay	7.2		
Level of Service	A		
Intersection Capacity Utilization	18.0%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Intersection Delay, s/veh	7.1
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	15	1	0	5	4	1	12	4	11	2	3
Future Vol, veh/h	6	15	1	0	5	4	1	12	4	11	2	3
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Heavy Vehicles, %	0	13	0	0	0	0	0	17	0	0	0	0
Mvmt Flow	9	21	1	0	7	6	1	17	6	16	3	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.2	6.8	7	7.1
HCM LOS	A	A	A	A

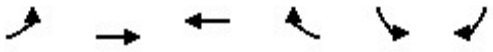
Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	6%	27%	0%	69%
Vol Thru, %	71%	68%	56%	12%
Vol Right, %	24%	5%	44%	19%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	17	22	9	16
LT Vol	1	6	0	11
Through Vol	12	15	5	2
RT Vol	4	1	4	3
Lane Flow Rate	24	31	13	23
Geometry Grp	1	1	1	1
Degree of Util (X)	0.026	0.035	0.013	0.026
Departure Headway (Hd)	3.864	4.019	3.739	4.02
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	927	892	957	891
Service Time	1.886	2.04	1.764	2.041
HCM Lane V/C Ratio	0.026	0.035	0.014	0.026
HCM Control Delay	7	7.2	6.8	7.1
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.1	0	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	1	5	4	4	35	7	313	15	54	223	3
Future Volume (Veh/h)	2	1	5	4	4	35	7	313	15	54	223	3
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	2	1	5	4	4	37	7	333	16	57	237	3
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	746	716	238	713	709	341	240			349		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	746	716	238	713	709	341	240			349		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	99	100	99	99	99	95	99			95		
cM capacity (veh/h)	299	339	805	332	342	706	1339			1172		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	8	45	356	297
Volume Left	2	4	7	57
Volume Right	5	37	16	3
cSH	505	591	1339	1172
Volume to Capacity	0.02	0.08	0.01	0.05
Queue Length 95th (m)	0.4	2.0	0.1	1.2
Control Delay (s)	12.2	11.6	0.2	2.0
Lane LOS	B	B	A	A
Approach Delay (s)	12.2	11.6	0.2	2.0
Approach LOS	B	B		

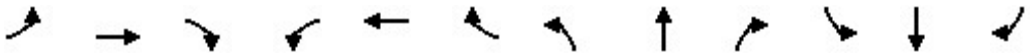
Intersection Summary				
Average Delay	1.8			
Intersection Capacity Utilization	46.0%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	2	2	14	8	0
Future Volume (Veh/h)	0	2	2	14	8	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72
Hourly flow rate (vph)	0	3	3	19	11	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	22				16	12
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	22				16	12
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1607				1008	1074

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	3	22	11
Volume Left	0	0	11
Volume Right	0	19	0
cSH	1607	1700	1008
Volume to Capacity	0.00	0.01	0.01
Queue Length 95th (m)	0.0	0.0	0.3
Control Delay (s)	0.0	0.0	8.6
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.6
Approach LOS			A

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	16	17	1	2	20	16	3	7	3	17	6	10
Future Volume (vph)	16	17	1	2	20	16	3	7	3	17	6	10
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	17	18	1	2	22	17	3	8	3	18	6	11

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	36	41	14	35
Volume Left (vph)	17	2	3	18
Volume Right (vph)	1	17	3	11
Hadj (s)	0.08	-0.19	-0.09	-0.09
Departure Headway (s)	4.1	3.8	4.0	4.0
Degree Utilization, x	0.04	0.04	0.02	0.04
Capacity (veh/h)	856	918	868	880
Control Delay (s)	7.3	7.0	7.1	7.2
Approach Delay (s)	7.3	7.0	7.1	7.2
Approach LOS	A	A	A	A

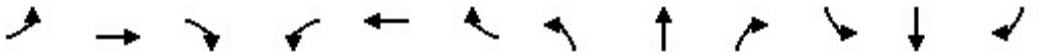
Intersection Summary				
Delay	7.1			
Level of Service	A			
Intersection Capacity Utilization	18.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Intersection	
Intersection Delay, s/veh	7.2
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	17	1	2	20	16	3	7	3	17	6	10
Future Vol, veh/h	16	17	1	2	20	16	3	7	3	17	6	10
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	0	0	0	0	5	0	0	0	0	0	0	0
Mvmt Flow	17	18	1	2	22	17	3	8	3	18	6	11
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.3	7	7.1	7.2
HCM LOS	A	A	A	A

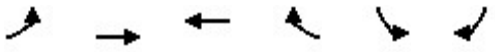
Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	23%	47%	5%	52%
Vol Thru, %	54%	50%	53%	18%
Vol Right, %	23%	3%	42%	30%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	13	34	38	33
LT Vol	3	16	2	17
Through Vol	7	17	20	6
RT Vol	3	1	16	10
Lane Flow Rate	14	37	41	35
Geometry Grp	1	1	1	1
Degree of Util (X)	0.015	0.042	0.043	0.039
Departure Headway (Hd)	3.968	4.093	3.771	3.964
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	899	874	948	901
Service Time	2.007	2.119	1.799	1.999
HCM Lane V/C Ratio	0.016	0.042	0.043	0.039
HCM Control Delay	7.1	7.3	7	7.2
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0	0.1	0.1	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	5	16	10	1	43	2	217	1	32	238	1
Future Volume (Veh/h)	3	5	16	10	1	43	2	217	1	32	238	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	3	5	17	10	1	45	2	226	1	33	248	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	590	546	248	564	546	226	249			227		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	590	546	248	564	546	226	249			227		
tC, single (s)	7.4	6.5	6.3	7.1	6.5	6.4	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.8	4.0	3.4	3.5	4.0	3.4	2.2			2.4		
p0 queue free %	99	99	98	98	100	94	100			97		
cM capacity (veh/h)	347	436	764	416	436	782	1328			1258		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	25	56	229	282
Volume Left	3	10	2	33
Volume Right	17	45	1	1
cSH	590	668	1328	1258
Volume to Capacity	0.04	0.08	0.00	0.03
Queue Length 95th (m)	1.1	2.2	0.0	0.6
Control Delay (s)	11.4	10.9	0.1	1.1
Lane LOS	B	B	A	A
Approach Delay (s)	11.4	10.9	0.1	1.1
Approach LOS	B	B		

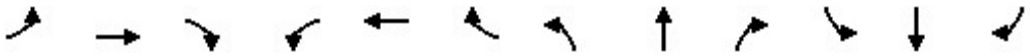
Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	40.9%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	1	1	3	9	1
Future Volume (Veh/h)	1	1	1	3	9	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	1	1	1	4	12	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	5				6	3
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	5				6	3
tC, single (s)	4.1				6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1630				987	1087

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	2	5	13
Volume Left	1	0	12
Volume Right	0	4	1
cSH	1630	1700	994
Volume to Capacity	0.00	0.00	0.01
Queue Length 95th (m)	0.0	0.0	0.3
Control Delay (s)	3.6	0.0	8.7
Lane LOS	A		A
Approach Delay (s)	3.6	0.0	8.7
Approach LOS			A

Intersection Summary			
Average Delay	6.0		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	6	16	1	0	5	4	1	13	4	12	2	3
Future Volume (vph)	6	16	1	0	5	4	1	13	4	12	2	3
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	9	23	1	0	7	6	1	19	6	17	3	4

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	33	13	26	24
Volume Left (vph)	9	0	1	17
Volume Right (vph)	1	6	6	4
Hadj (s)	0.19	-0.28	0.08	0.04
Departure Headway (s)	4.2	3.8	4.1	4.1
Degree Utilization, x	0.04	0.01	0.03	0.03
Capacity (veh/h)	839	937	855	870
Control Delay (s)	7.4	6.8	7.2	7.2
Approach Delay (s)	7.4	6.8	7.2	7.2
Approach LOS	A	A	A	A

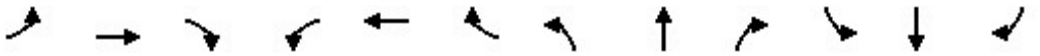
Intersection Summary				
Delay		7.2		
Level of Service		A		
Intersection Capacity Utilization		18.6%	ICU Level of Service	A
Analysis Period (min)		15		

Intersection	
Intersection Delay, s/veh	7.1
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	16	1	0	5	4	1	13	4	12	2	3
Future Vol, veh/h	6	16	1	0	5	4	1	13	4	12	2	3
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Heavy Vehicles, %	0	13	0	0	0	0	0	17	0	0	0	0
Mvmt Flow	9	23	1	0	7	6	1	19	6	17	3	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.2	6.8	7	7.2
HCM LOS	A	A	A	A

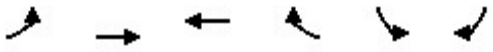
Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	6%	26%	0%	71%
Vol Thru, %	72%	70%	56%	12%
Vol Right, %	22%	4%	44%	18%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	18	23	9	17
LT Vol	1	6	0	12
Through Vol	13	16	5	2
RT Vol	4	1	4	3
Lane Flow Rate	26	33	13	24
Geometry Grp	1	1	1	1
Degree of Util (X)	0.028	0.037	0.013	0.027
Departure Headway (Hd)	3.875	4.023	3.746	4.033
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	924	890	955	888
Service Time	1.898	2.045	1.772	2.057
HCM Lane V/C Ratio	0.028	0.037	0.014	0.027
HCM Control Delay	7	7.2	6.8	7.2
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.1	0	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	1	5	4	4	38	8	337	16	58	240	3
Future Volume (Veh/h)	2	1	5	4	4	38	8	337	16	58	240	3
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	2	1	5	4	4	40	9	359	17	62	255	3
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	808	774	256	772	768	368	258			376		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	808	774	256	772	768	368	258			376		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	99	100	99	99	99	94	99			95		
cM capacity (veh/h)	268	311	787	302	314	682	1318			1145		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	8	48	385	320
Volume Left	2	4	9	62
Volume Right	5	40	17	3
cSH	470	567	1318	1145
Volume to Capacity	0.02	0.08	0.01	0.05
Queue Length 95th (m)	0.4	2.2	0.2	1.4
Control Delay (s)	12.8	11.9	0.2	2.0
Lane LOS	B	B	A	A
Approach Delay (s)	12.8	11.9	0.2	2.0
Approach LOS	B	B		

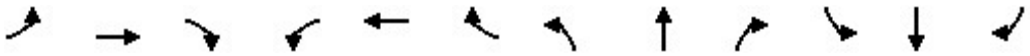
Intersection Summary				
Average Delay	1.9			
Intersection Capacity Utilization	48.5%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	2	2	15	9	0
Future Volume (Veh/h)	0	2	2	15	9	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72
Hourly flow rate (vph)	0	3	3	21	12	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	24				16	14
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	24				16	14
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1604				1007	1072

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	3	24	12
Volume Left	0	0	12
Volume Right	0	21	0
cSH	1604	1700	1007
Volume to Capacity	0.00	0.01	0.01
Queue Length 95th (m)	0.0	0.0	0.3
Control Delay (s)	0.0	0.0	8.6
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.6
Approach LOS			A

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	17	18	1	2	22	17	3	8	3	18	6	11
Future Volume (vph)	17	18	1	2	22	17	3	8	3	18	6	11
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	18	19	1	2	24	18	3	9	3	19	6	12

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	38	44	15	37
Volume Left (vph)	18	2	3	19
Volume Right (vph)	1	18	3	12
Hadj (s)	0.08	-0.19	-0.08	-0.09
Departure Headway (s)	4.1	3.9	4.0	4.0
Degree Utilization, x	0.04	0.05	0.02	0.04
Capacity (veh/h)	854	915	863	878
Control Delay (s)	7.3	7.0	7.1	7.2
Approach Delay (s)	7.3	7.0	7.1	7.2
Approach LOS	A	A	A	A

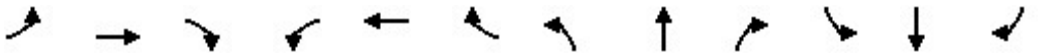
Intersection Summary			
Delay	7.2		
Level of Service	A		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Intersection Delay, s/veh	7.2
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	18	1	2	22	17	3	8	3	18	6	11
Future Vol, veh/h	17	18	1	2	22	17	3	8	3	18	6	11
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	0	0	0	0	5	0	0	0	0	0	0	0
Mvmt Flow	18	19	1	2	24	18	3	9	3	19	6	12
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.3	7	7.1	7.2
HCM LOS	A	A	A	A

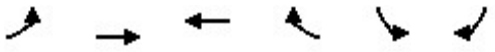
Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	21%	47%	5%	51%
Vol Thru, %	57%	50%	54%	17%
Vol Right, %	21%	3%	41%	31%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	14	36	41	35
LT Vol	3	17	2	18
Through Vol	8	18	22	6
RT Vol	3	1	17	11
Lane Flow Rate	15	39	44	38
Geometry Grp	1	1	1	1
Degree of Util (X)	0.017	0.044	0.046	0.041
Departure Headway (Hd)	3.985	4.101	3.78	3.968
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	895	872	945	900
Service Time	2.025	2.131	1.812	2.004
HCM Lane V/C Ratio	0.017	0.045	0.047	0.042
HCM Control Delay	7.1	7.3	7	7.2
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.1	0.1	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	6	17	10	1	46	2	233	1	35	256	1
Future Volume (Veh/h)	3	6	17	10	1	46	2	233	1	35	256	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	3	6	18	10	1	48	2	243	1	36	267	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	636	588	268	608	588	244	268			244		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	636	588	268	608	588	244	268			244		
tC, single (s)	7.4	6.5	6.3	7.1	6.5	6.4	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.8	4.0	3.4	3.5	4.0	3.4	2.2			2.4		
p0 queue free %	99	99	98	97	100	94	100			97		
cM capacity (veh/h)	320	411	745	387	411	764	1307			1239		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	27	59	246	304
Volume Left	3	10	2	36
Volume Right	18	48	1	1
cSH	561	648	1307	1239
Volume to Capacity	0.05	0.09	0.00	0.03
Queue Length 95th (m)	1.2	2.4	0.0	0.7
Control Delay (s)	11.7	11.1	0.1	1.2
Lane LOS	B	B	A	A
Approach Delay (s)	11.7	11.1	0.1	1.2
Approach LOS	B	B		

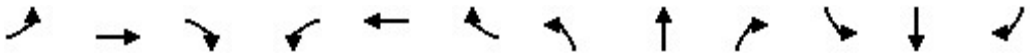
Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	43.2%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	1	1	3	9	1
Future Volume (Veh/h)	1	1	1	3	9	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	1	1	1	4	12	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	5				6	3
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	5				6	3
tC, single (s)	4.1				6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1630				987	1087

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	2	5	13
Volume Left	1	0	12
Volume Right	0	4	1
cSH	1630	1700	994
Volume to Capacity	0.00	0.00	0.01
Queue Length 95th (m)	0.0	0.0	0.3
Control Delay (s)	3.6	0.0	8.7
Lane LOS	A		A
Approach Delay (s)	3.6	0.0	8.7
Approach LOS			A

Intersection Summary			
Average Delay	6.0		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	7	17	1	0	6	5	1	14	5	13	2	3
Future Volume (vph)	7	17	1	0	6	5	1	14	5	13	2	3
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	10	24	1	0	9	7	1	20	7	19	3	4

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	35	16	28	26
Volume Left (vph)	10	0	1	19
Volume Right (vph)	1	7	7	4
Hadj (s)	0.19	-0.26	0.06	0.05
Departure Headway (s)	4.2	3.8	4.1	4.1
Degree Utilization, x	0.04	0.02	0.03	0.03
Capacity (veh/h)	836	930	855	863
Control Delay (s)	7.4	6.9	7.2	7.2
Approach Delay (s)	7.4	6.9	7.2	7.2
Approach LOS	A	A	A	A

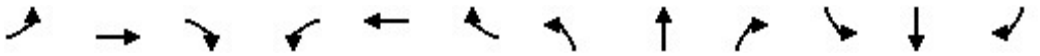
Intersection Summary				
Delay		7.2		
Level of Service		A		
Intersection Capacity Utilization		20.3%	ICU Level of Service	A
Analysis Period (min)		15		

Intersection	
Intersection Delay, s/veh	7.1
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	17	1	0	6	5	1	14	5	13	2	3
Future Vol, veh/h	7	17	1	0	6	5	1	14	5	13	2	3
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Heavy Vehicles, %	0	13	0	0	0	0	0	17	0	0	0	0
Mvmt Flow	10	24	1	0	9	7	1	20	7	19	3	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.2	6.8	7	7.2
HCM LOS	A	A	A	A

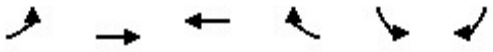
Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	28%	0%	72%
Vol Thru, %	70%	68%	55%	11%
Vol Right, %	25%	4%	45%	17%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	20	25	11	18
LT Vol	1	7	0	13
Through Vol	14	17	6	2
RT Vol	5	1	5	3
Lane Flow Rate	29	36	16	26
Geometry Grp	1	1	1	1
Degree of Util (X)	0.031	0.04	0.016	0.029
Departure Headway (Hd)	3.869	4.038	3.748	4.056
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	925	886	953	883
Service Time	1.894	2.063	1.778	2.08
HCM Lane V/C Ratio	0.031	0.041	0.017	0.029
HCM Control Delay	7	7.2	6.8	7.2
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.1	0	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	1	6	5	5	41	8	363	17	63	259	3
Future Volume (Veh/h)	2	1	6	5	5	41	8	363	17	63	259	3
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	2	1	6	5	5	44	9	386	18	67	276	3
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	871	834	278	831	826	395	279			404		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	871	834	278	831	826	395	279			404		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	99	100	99	98	98	93	99			94		
cM capacity (veh/h)	239	286	766	273	289	659	1295			1118		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	9	54	413	346
Volume Left	2	5	9	67
Volume Right	6	44	18	3
cSH	457	527	1295	1118
Volume to Capacity	0.02	0.10	0.01	0.06
Queue Length 95th (m)	0.5	2.7	0.2	1.5
Control Delay (s)	13.0	12.6	0.2	2.1
Lane LOS	B	B	A	A
Approach Delay (s)	13.0	12.6	0.2	2.1
Approach LOS	B	B		

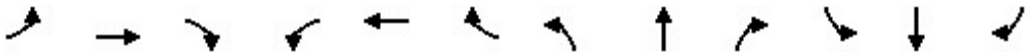
Intersection Summary				
Average Delay	2.0			
Intersection Capacity Utilization	51.3%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	2	2	16	9	0
Future Volume (Veh/h)	0	2	2	16	9	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72
Hourly flow rate (vph)	0	3	3	22	12	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	25				17	14
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	25				17	14
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1603				1006	1072

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	3	25	12
Volume Left	0	0	12
Volume Right	0	22	0
cSH	1603	1700	1006
Volume to Capacity	0.00	0.01	0.01
Queue Length 95th (m)	0.0	0.0	0.3
Control Delay (s)	0.0	0.0	8.6
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.6
Approach LOS			A

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	19	20	1	2	23	19	3	8	3	20	7	12
Future Volume (vph)	19	20	1	2	23	19	3	8	3	20	7	12
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	20	22	1	2	25	20	3	9	3	22	8	13

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	43	47	15	43
Volume Left (vph)	20	2	3	22
Volume Right (vph)	1	20	3	13
Hadj (s)	0.08	-0.20	-0.08	-0.08
Departure Headway (s)	4.1	3.9	4.1	4.0
Degree Utilization, x	0.05	0.05	0.02	0.05
Capacity (veh/h)	849	911	856	870
Control Delay (s)	7.4	7.1	7.1	7.2
Approach Delay (s)	7.4	7.1	7.1	7.2
Approach LOS	A	A	A	A

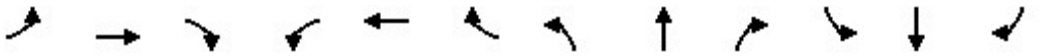
Intersection Summary				
Delay		7.2		
Level of Service		A		
Intersection Capacity Utilization		20.4%	ICU Level of Service	A
Analysis Period (min)		15		

Intersection	
Intersection Delay, s/veh	7.2
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	19	20	1	2	23	19	3	8	3	20	7	12
Future Vol, veh/h	19	20	1	2	23	19	3	8	3	20	7	12
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	0	0	0	0	5	0	0	0	0	0	0	0
Mvmt Flow	20	22	1	2	25	20	3	9	3	22	8	13
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.4	7	7.1	7.2
HCM LOS	A	A	A	A

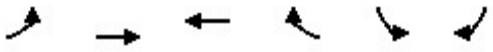
Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	21%	47%	5%	51%
Vol Thru, %	57%	50%	52%	18%
Vol Right, %	21%	3%	43%	31%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	14	40	44	39
LT Vol	3	19	2	20
Through Vol	8	20	23	7
RT Vol	3	1	19	12
Lane Flow Rate	15	43	47	42
Geometry Grp	1	1	1	1
Degree of Util (X)	0.017	0.049	0.05	0.046
Departure Headway (Hd)	4.002	4.114	3.78	3.985
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	890	869	944	895
Service Time	2.047	2.146	1.815	2.025
HCM Lane V/C Ratio	0.017	0.049	0.05	0.047
HCM Control Delay	7.1	7.4	7	7.2
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.2	0.2	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	10	60	10	2	43	17	217	1	32	238	13
Future Volume (Veh/h)	38	10	60	10	2	43	17	217	1	32	238	13
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	40	10	62	10	2	45	18	226	1	33	248	14
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	630	584	255	650	590	226	262			227		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	630	584	255	650	590	226	262			227		
tC, single (s)	7.4	6.5	6.3	7.1	6.5	6.4	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.8	4.0	3.4	3.5	4.0	3.4	2.2			2.4		
p0 queue free %	88	98	92	97	100	94	99			97		
cM capacity (veh/h)	322	409	758	336	406	782	1314			1258		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	112	57	245	295
Volume Left	40	10	18	33
Volume Right	62	45	1	14
cSH	486	618	1314	1258
Volume to Capacity	0.23	0.09	0.01	0.03
Queue Length 95th (m)	7.1	2.4	0.3	0.6
Control Delay (s)	14.6	11.4	0.7	1.1
Lane LOS	B	B	A	A
Approach Delay (s)	14.6	11.4	0.7	1.1
Approach LOS	B	B		

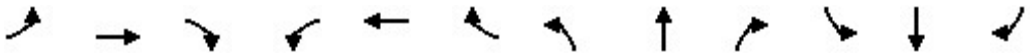
Intersection Summary				
Average Delay	3.9			
Intersection Capacity Utilization	40.6%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	50	17	3	9	2
Future Volume (Veh/h)	5	50	17	3	9	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	7	67	23	4	12	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	27				106	25
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	27				106	25
tC, single (s)	4.1				6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1600				862	1057

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	74	27	15
Volume Left	7	0	12
Volume Right	0	4	3
cSH	1600	1700	895
Volume to Capacity	0.00	0.02	0.02
Queue Length 95th (m)	0.1	0.0	0.4
Control Delay (s)	0.7	0.0	9.1
Lane LOS	A		A
Approach Delay (s)	0.7	0.0	9.1
Approach LOS			A

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	16.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	6	16	1	1	5	4	1	13	8	12	2	3
Future Volume (vph)	6	16	1	1	5	4	1	13	8	12	2	3
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	9	23	1	1	7	6	1	19	11	17	3	4

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	33	14	31	24
Volume Left (vph)	9	1	1	17
Volume Right (vph)	1	6	11	4
Hadj (s)	0.19	-0.24	-0.03	0.04
Departure Headway (s)	4.2	3.8	4.0	4.1
Degree Utilization, x	0.04	0.01	0.03	0.03
Capacity (veh/h)	836	925	877	868
Control Delay (s)	7.4	6.9	7.1	7.2
Approach Delay (s)	7.4	6.9	7.1	7.2
Approach LOS	A	A	A	A

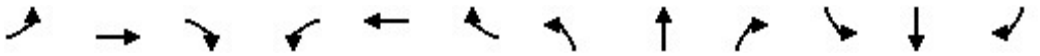
Intersection Summary				
Delay	7.2			
Level of Service	A			
Intersection Capacity Utilization	16.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Intersection	
Intersection Delay, s/veh	7.1
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	16	1	1	5	4	1	13	8	12	2	3
Future Vol, veh/h	6	16	1	1	5	4	1	13	8	12	2	3
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Heavy Vehicles, %	0	13	0	0	0	0	0	17	0	0	0	0
Mvmt Flow	9	23	1	1	7	6	1	19	11	17	3	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.2	6.9	6.9	7.2
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	26%	10%	71%
Vol Thru, %	59%	70%	50%	12%
Vol Right, %	36%	4%	40%	18%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	22	23	10	17
LT Vol	1	6	1	12
Through Vol	13	16	5	2
RT Vol	8	1	4	3
Lane Flow Rate	31	33	14	24
Geometry Grp	1	1	1	1
Degree of Util (X)	0.033	0.037	0.015	0.027
Departure Headway (Hd)	3.791	4.035	3.802	4.041
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	944	888	941	886
Service Time	1.815	2.056	1.828	2.065
HCM Lane V/C Ratio	0.033	0.037	0.015	0.027
HCM Control Delay	6.9	7.2	6.9	7.2
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.1	0	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	2	0	17	2	0	0	0	53	0	0	0
Future Volume (Veh/h)	0	2	0	17	2	0	0	0	53	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	2	0	18	2	0	0	0	58	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	2			2			40	40	2	98	40	2
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2			2			40	40	2	98	40	2
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	95	100	100	100
cM capacity (veh/h)	1620			1620			956	843	1082	830	843	1082

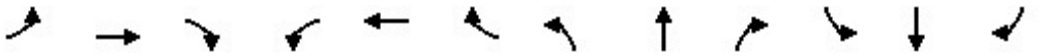
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	2	20	58	0
Volume Left	0	18	0	0
Volume Right	0	0	58	0
cSH	1620	1620	1082	1700
Volume to Capacity	0.00	0.01	0.05	0.00
Queue Length 95th (m)	0.0	0.3	1.4	0.0
Control Delay (s)	0.0	6.5	8.5	0.0
Lane LOS		A	A	A
Approach Delay (s)	0.0	6.5	8.5	0.0
Approach LOS			A	A

Intersection Summary				
Average Delay	7.8			
Intersection Capacity Utilization	17.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	59	0	12	20	0	35
Future Volume (Veh/h)	59	0	12	20	0	35
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	64	0	13	22	0	38
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			64		112	64
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			64		112	64
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	96
cM capacity (veh/h)			1538		877	1000

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	64	35	38
Volume Left	0	13	0
Volume Right	0	0	38
cSH	1700	1538	1000
Volume to Capacity	0.04	0.01	0.04
Queue Length 95th (m)	0.0	0.2	0.9
Control Delay (s)	0.0	2.8	8.7
Lane LOS		A	A
Approach Delay (s)	0.0	2.8	8.7
Approach LOS			A

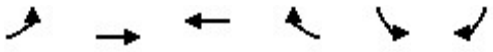
Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	18.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	4	34	4	9	38	56	337	16	58	240	41
Future Volume (Veh/h)	25	4	34	4	9	38	56	337	16	58	240	41
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	27	4	36	4	10	40	60	359	17	62	255	44
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	934	897	277	926	910	368	299			376		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	934	897	277	926	910	368	299			376		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	87	98	95	98	96	94	95			95		
cM capacity (veh/h)	210	254	767	219	249	682	1274			1145		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	67	54	436	361
Volume Left	27	4	60	62
Volume Right	36	40	17	44
cSH	350	461	1274	1145
Volume to Capacity	0.19	0.12	0.05	0.05
Queue Length 95th (m)	5.6	3.2	1.2	1.4
Control Delay (s)	17.7	13.8	1.5	1.9
Lane LOS	C	B	A	A
Approach Delay (s)	17.7	13.8	1.5	1.9
Approach LOS	C	B		

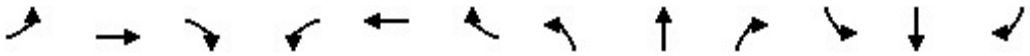
Intersection Summary				
Average Delay	3.6			
Intersection Capacity Utilization	44.5%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	34	55	15	9	4
Future Volume (Veh/h)	3	34	55	15	9	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72
Hourly flow rate (vph)	4	47	76	21	12	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	97				142	86
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	97				142	86
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	99
cM capacity (veh/h)	1509				854	978

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	51	97	18
Volume Left	4	0	12
Volume Right	0	21	6
cSH	1509	1700	891
Volume to Capacity	0.00	0.06	0.02
Queue Length 95th (m)	0.1	0.0	0.5
Control Delay (s)	0.6	0.0	9.1
Lane LOS	A		A
Approach Delay (s)	0.6	0.0	9.1
Approach LOS			A

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	14.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	17	18	11	6	22	17	3	8	6	18	6	11
Future Volume (vph)	17	18	11	6	22	17	3	8	6	18	6	11
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	18	19	12	6	24	18	3	9	6	19	6	12

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	49	48	18	37
Volume Left (vph)	18	6	3	19
Volume Right (vph)	12	18	6	12
Hadj (s)	-0.07	-0.16	-0.17	-0.09
Departure Headway (s)	4.0	3.9	4.0	4.0
Degree Utilization, x	0.05	0.05	0.02	0.04
Capacity (veh/h)	883	903	872	868
Control Delay (s)	7.2	7.1	7.1	7.2
Approach Delay (s)	7.2	7.1	7.1	7.2
Approach LOS	A	A	A	A

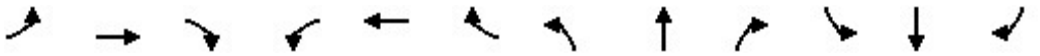
Intersection Summary				
Delay		7.2		
Level of Service		A		
Intersection Capacity Utilization		17.5%	ICU Level of Service	A
Analysis Period (min)		15		

Intersection	
Intersection Delay, s/veh	7.1
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	18	11	6	22	17	3	8	6	18	6	11
Future Vol, veh/h	17	18	11	6	22	17	3	8	6	18	6	11
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	0	0	0	0	5	0	0	0	0	0	0	0
Mvmt Flow	18	19	12	6	24	18	3	9	6	19	6	12
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.2	7.1	7	7.2
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	18%	37%	13%	51%
Vol Thru, %	47%	39%	49%	17%
Vol Right, %	35%	24%	38%	31%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	17	46	45	35
LT Vol	3	17	6	18
Through Vol	8	18	22	6
RT Vol	6	11	17	11
Lane Flow Rate	18	49	48	38
Geometry Grp	1	1	1	1
Degree of Util (X)	0.02	0.054	0.052	0.042
Departure Headway (Hd)	3.921	3.963	3.833	3.997
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	908	902	931	892
Service Time	1.966	1.996	1.867	2.038
HCM Lane V/C Ratio	0.02	0.054	0.052	0.043
HCM Control Delay	7	7.2	7.1	7.2
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.2	0.2	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	2	0	57	2	0	0	0	35	0	0	0
Future Volume (Veh/h)	0	2	0	57	2	0	0	0	35	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	2	0	62	2	0	0	0	38	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	2			2			128	128	2	166	128	2
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2			2			128	128	2	166	128	2
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			100	100	96	100	100	100
cM capacity (veh/h)	1620			1620			820	733	1082	748	733	1082

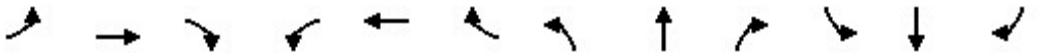
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	2	64	38	0
Volume Left	0	62	0	0
Volume Right	0	0	38	0
cSH	1620	1620	1082	1700
Volume to Capacity	0.00	0.04	0.04	0.00
Queue Length 95th (m)	0.0	1.0	0.9	0.0
Control Delay (s)	0.0	7.1	8.4	0.0
Lane LOS		A	A	A
Approach Delay (s)	0.0	7.1	8.4	0.0
Approach LOS			A	A

Intersection Summary				
Average Delay	7.4			
Intersection Capacity Utilization	19.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	43	0	38	70	0	23
Future Volume (Veh/h)	43	0	38	70	0	23
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	47	0	41	76	0	25
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			47		205	47
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			47		205	47
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		100	98
cM capacity (veh/h)			1560		763	1022

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	47	117	25
Volume Left	0	41	0
Volume Right	0	0	25
cSH	1700	1560	1022
Volume to Capacity	0.03	0.03	0.02
Queue Length 95th (m)	0.0	0.6	0.6
Control Delay (s)	0.0	2.7	8.6
Lane LOS		A	A
Approach Delay (s)	0.0	2.7	8.6
Approach LOS			A

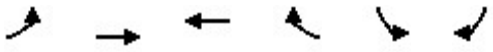
Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	22.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	11	61	10	2	46	17	233	1	35	256	13
Future Volume (Veh/h)	38	11	61	10	2	46	17	233	1	35	256	13
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	40	11	64	10	2	48	18	243	1	36	267	14
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	674	626	274	695	632	244	281			244		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	674	626	274	695	632	244	281			244		
tC, single (s)	7.4	6.5	6.3	7.1	6.5	6.4	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.8	4.0	3.4	3.5	4.0	3.4	2.2			2.4		
p0 queue free %	87	97	91	97	99	94	99			97		
cM capacity (veh/h)	297	386	739	311	383	764	1293			1239		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	115	60	262	317
Volume Left	40	10	18	36
Volume Right	64	48	1	14
cSH	461	599	1293	1239
Volume to Capacity	0.25	0.10	0.01	0.03
Queue Length 95th (m)	7.8	2.7	0.3	0.7
Control Delay (s)	15.4	11.7	0.7	1.2
Lane LOS	C	B	A	A
Approach Delay (s)	15.4	11.7	0.7	1.2
Approach LOS	C	B		

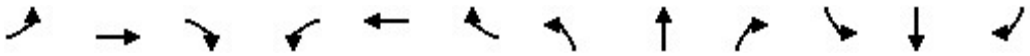
Intersection Summary				
Average Delay	4.0			
Intersection Capacity Utilization	43.2%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	50	17	3	9	2
Future Volume (Veh/h)	5	50	17	3	9	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	7	67	23	4	12	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	27				106	25
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	27				106	25
tC, single (s)	4.1				6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1600				862	1057

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	74	27	15
Volume Left	7	0	12
Volume Right	0	4	3
cSH	1600	1700	895
Volume to Capacity	0.00	0.02	0.02
Queue Length 95th (m)	0.1	0.0	0.4
Control Delay (s)	0.7	0.0	9.1
Lane LOS	A		A
Approach Delay (s)	0.7	0.0	9.1
Approach LOS			A

Intersection Summary			
Average Delay		1.6	
Intersection Capacity Utilization		16.8%	ICU Level of Service A
Analysis Period (min)		15	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	7	17	1	1	6	5	1	14	9	13	2	3
Future Volume (vph)	7	17	1	1	6	5	1	14	9	13	2	3
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	10	24	1	1	9	7	1	20	13	19	3	4

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	35	17	34	26
Volume Left (vph)	10	1	1	19
Volume Right (vph)	1	7	13	4
Hadj (s)	0.19	-0.24	-0.05	0.05
Departure Headway (s)	4.2	3.8	4.0	4.1
Degree Utilization, x	0.04	0.02	0.04	0.03
Capacity (veh/h)	832	919	879	861
Control Delay (s)	7.4	6.9	7.1	7.2
Approach Delay (s)	7.4	6.9	7.1	7.2
Approach LOS	A	A	A	A

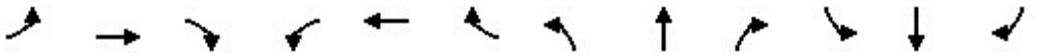
Intersection Summary				
Delay	7.2			
Level of Service	A			
Intersection Capacity Utilization	17.1%	ICU Level of Service	A	
Analysis Period (min)	15			

Intersection	
Intersection Delay, s/veh	7.1
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	17	1	1	6	5	1	14	9	13	2	3
Future Vol, veh/h	7	17	1	1	6	5	1	14	9	13	2	3
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Heavy Vehicles, %	0	13	0	0	0	0	0	17	0	0	0	0
Mvmt Flow	10	24	1	1	9	7	1	20	13	19	3	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.2	6.9	7	7.2
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	4%	28%	8%	72%
Vol Thru, %	58%	68%	50%	11%
Vol Right, %	38%	4%	42%	17%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	24	25	12	18
LT Vol	1	7	1	13
Through Vol	14	17	6	2
RT Vol	9	1	5	3
Lane Flow Rate	34	36	17	26
Geometry Grp	1	1	1	1
Degree of Util (X)	0.036	0.04	0.018	0.029
Departure Headway (Hd)	3.795	4.048	3.797	4.062
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	943	884	941	881
Service Time	1.821	2.074	1.827	2.089
HCM Lane V/C Ratio	0.036	0.041	0.018	0.03
HCM Control Delay	7	7.2	6.9	7.2
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.1	0.1	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	2	0	17	2	0	0	0	53	0	0	0
Future Volume (Veh/h)	0	2	0	17	2	0	0	0	53	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	2	0	18	2	0	0	0	58	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	2			2			40	40	2	98	40	2
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2			2			40	40	2	98	40	2
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	95	100	100	100
cM capacity (veh/h)	1620			1620			956	843	1082	830	843	1082

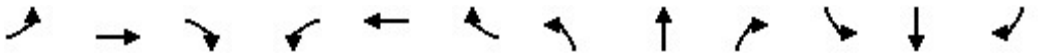
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	2	20	58	0
Volume Left	0	18	0	0
Volume Right	0	0	58	0
cSH	1620	1620	1082	1700
Volume to Capacity	0.00	0.01	0.05	0.00
Queue Length 95th (m)	0.0	0.3	1.4	0.0
Control Delay (s)	0.0	6.5	8.5	0.0
Lane LOS		A	A	A
Approach Delay (s)	0.0	6.5	8.5	0.0
Approach LOS			A	A

Intersection Summary				
Average Delay	7.8			
Intersection Capacity Utilization	17.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	59	0	12	20	0	35
Future Volume (Veh/h)	59	0	12	20	0	35
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	64	0	13	22	0	38
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			64		112	64
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			64		112	64
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	96
cM capacity (veh/h)			1538		877	1000

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	64	35	38
Volume Left	0	13	0
Volume Right	0	0	38
cSH	1700	1538	1000
Volume to Capacity	0.04	0.01	0.04
Queue Length 95th (m)	0.0	0.2	0.9
Control Delay (s)	0.0	2.8	8.7
Lane LOS		A	A
Approach Delay (s)	0.0	2.8	8.7
Approach LOS			A

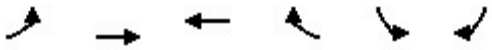
Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	18.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	4	35	5	10	41	56	363	17	63	259	41
Future Volume (Veh/h)	25	4	35	5	10	41	56	363	17	63	259	41
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	27	4	37	5	11	44	60	386	18	67	276	44
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	996	956	298	986	969	395	320			404		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	996	956	298	986	969	395	320			404		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	85	98	95	97	95	93	95			94		
cM capacity (veh/h)	186	233	746	197	229	659	1251			1118		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	68	60	464	387
Volume Left	27	5	60	67
Volume Right	37	44	18	44
cSH	321	428	1251	1118
Volume to Capacity	0.21	0.14	0.05	0.06
Queue Length 95th (m)	6.3	3.9	1.2	1.5
Control Delay (s)	19.2	14.8	1.5	2.0
Lane LOS	C	B	A	A
Approach Delay (s)	19.2	14.8	1.5	2.0
Approach LOS	C	B		

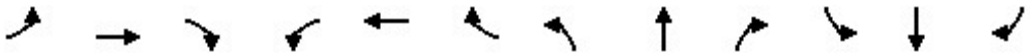
Intersection Summary				
Average Delay	3.7			
Intersection Capacity Utilization	46.1%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	34	55	16	9	4
Future Volume (Veh/h)	3	34	55	16	9	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72
Hourly flow rate (vph)	4	47	76	22	12	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	98				142	87
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	98				142	87
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	99
cM capacity (veh/h)	1508				853	977

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	51	98	18
Volume Left	4	0	12
Volume Right	0	22	6
cSH	1508	1700	891
Volume to Capacity	0.00	0.06	0.02
Queue Length 95th (m)	0.1	0.0	0.5
Control Delay (s)	0.6	0.0	9.1
Lane LOS	A		A
Approach Delay (s)	0.6	0.0	9.1
Approach LOS			A

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	14.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	19	20	1	6	23	19	3	8	6	20	7	12
Future Volume (vph)	19	20	1	6	23	19	3	8	6	20	7	12
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	20	22	1	6	25	20	3	9	6	22	8	13

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	43	51	18	43
Volume Left (vph)	20	6	3	22
Volume Right (vph)	1	20	6	13
Hadj (s)	0.08	-0.17	-0.17	-0.08
Departure Headway (s)	4.2	3.9	4.0	4.0
Degree Utilization, x	0.05	0.06	0.02	0.05
Capacity (veh/h)	846	902	872	867
Control Delay (s)	7.4	7.1	7.1	7.2
Approach Delay (s)	7.4	7.1	7.1	7.2
Approach LOS	A	A	A	A

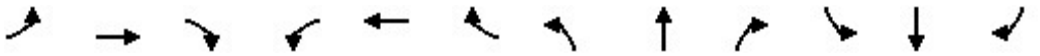
Intersection Summary				
Delay	7.2			
Level of Service	A			
Intersection Capacity Utilization	18.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Intersection	
Intersection Delay, s/veh	7.2
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	19	20	1	6	23	19	3	8	6	20	7	12
Future Vol, veh/h	19	20	1	6	23	19	3	8	6	20	7	12
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	0	0	0	0	5	0	0	0	0	0	0	0
Mvmt Flow	20	22	1	6	25	20	3	9	6	22	8	13
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.4	7.1	7	7.2
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	18%	47%	12%	51%
Vol Thru, %	47%	50%	48%	18%
Vol Right, %	35%	3%	40%	31%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	17	40	48	39
LT Vol	3	19	6	20
Through Vol	8	20	23	7
RT Vol	6	1	19	12
Lane Flow Rate	18	43	52	42
Geometry Grp	1	1	1	1
Degree of Util (X)	0.02	0.049	0.055	0.047
Departure Headway (Hd)	3.919	4.123	3.823	3.995
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	908	866	933	892
Service Time	1.966	2.158	1.86	2.037
HCM Lane V/C Ratio	0.02	0.05	0.056	0.047
HCM Control Delay	7	7.4	7.1	7.2
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.2	0.2	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	2	0	57	2	0	0	0	35	0	0	0
Future Volume (Veh/h)	0	2	0	57	2	0	0	0	35	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	2	0	62	2	0	0	0	38	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	2			2			128	128	2	166	128	2
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2			2			128	128	2	166	128	2
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			100	100	96	100	100	100
cM capacity (veh/h)	1620			1620			820	733	1082	748	733	1082

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	2	64	38	0
Volume Left	0	62	0	0
Volume Right	0	0	38	0
cSH	1620	1620	1082	1700
Volume to Capacity	0.00	0.04	0.04	0.00
Queue Length 95th (m)	0.0	1.0	0.9	0.0
Control Delay (s)	0.0	7.1	8.4	0.0
Lane LOS		A	A	A
Approach Delay (s)	0.0	7.1	8.4	0.0
Approach LOS			A	A

Intersection Summary				
Average Delay	7.4			
Intersection Capacity Utilization	19.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	43	0	38	71	0	23
Future Volume (Veh/h)	43	0	38	71	0	23
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	47	0	41	77	0	25
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			47		206	47
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			47		206	47
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		100	98
cM capacity (veh/h)			1560		762	1022

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	47	118	25
Volume Left	0	41	0
Volume Right	0	0	25
cSH	1700	1560	1022
Volume to Capacity	0.03	0.03	0.02
Queue Length 95th (m)	0.0	0.6	0.6
Control Delay (s)	0.0	2.7	8.6
Lane LOS		A	A
Approach Delay (s)	0.0	2.7	8.6
Approach LOS			A

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	22.5%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX F

ITE Trip Gen 11th Edition Excerpts

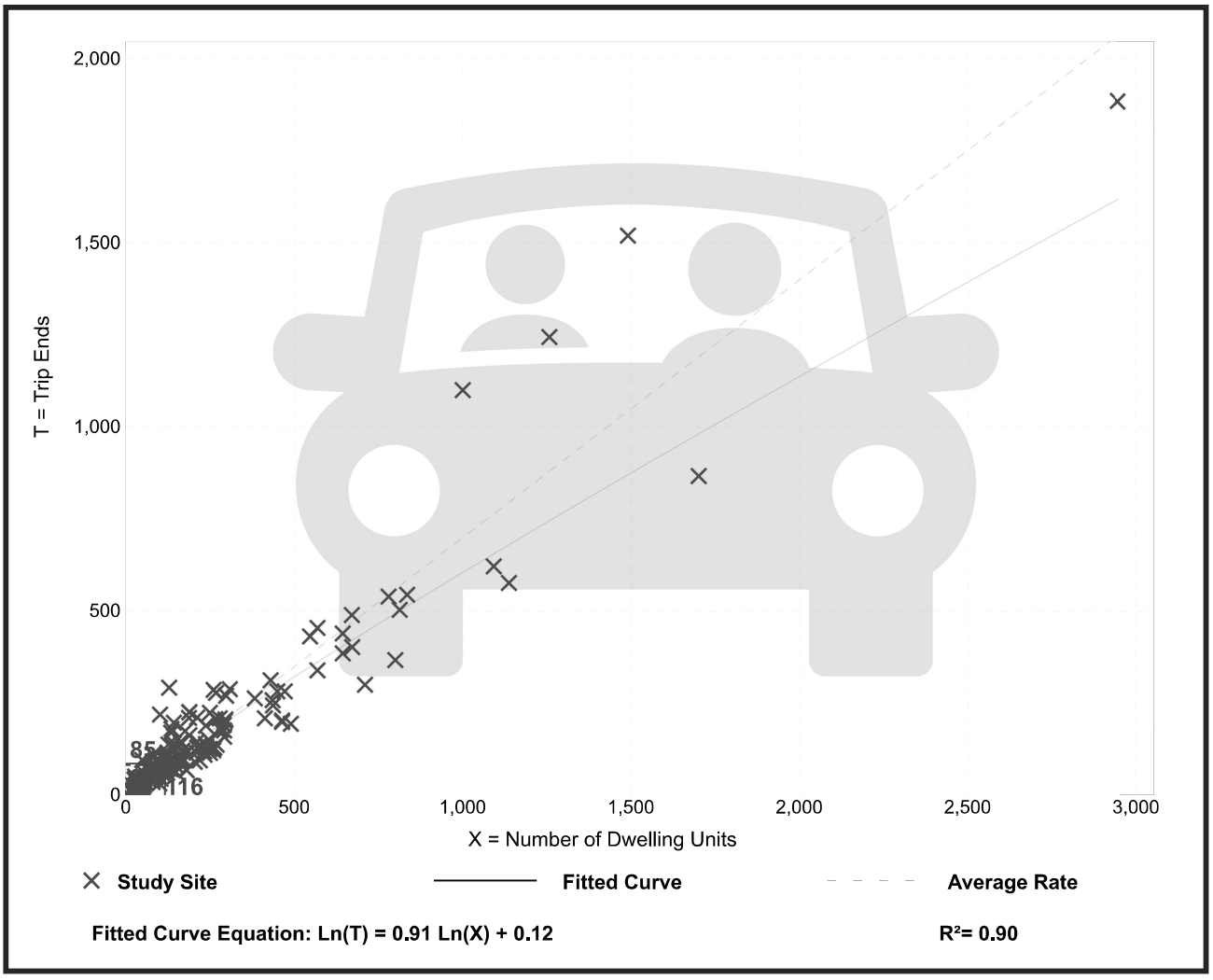
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 192
Avg. Num. of Dwelling Units: 226
Directional Distribution: 25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.70	0.27 - 2.27	0.24

Data Plot and Equation



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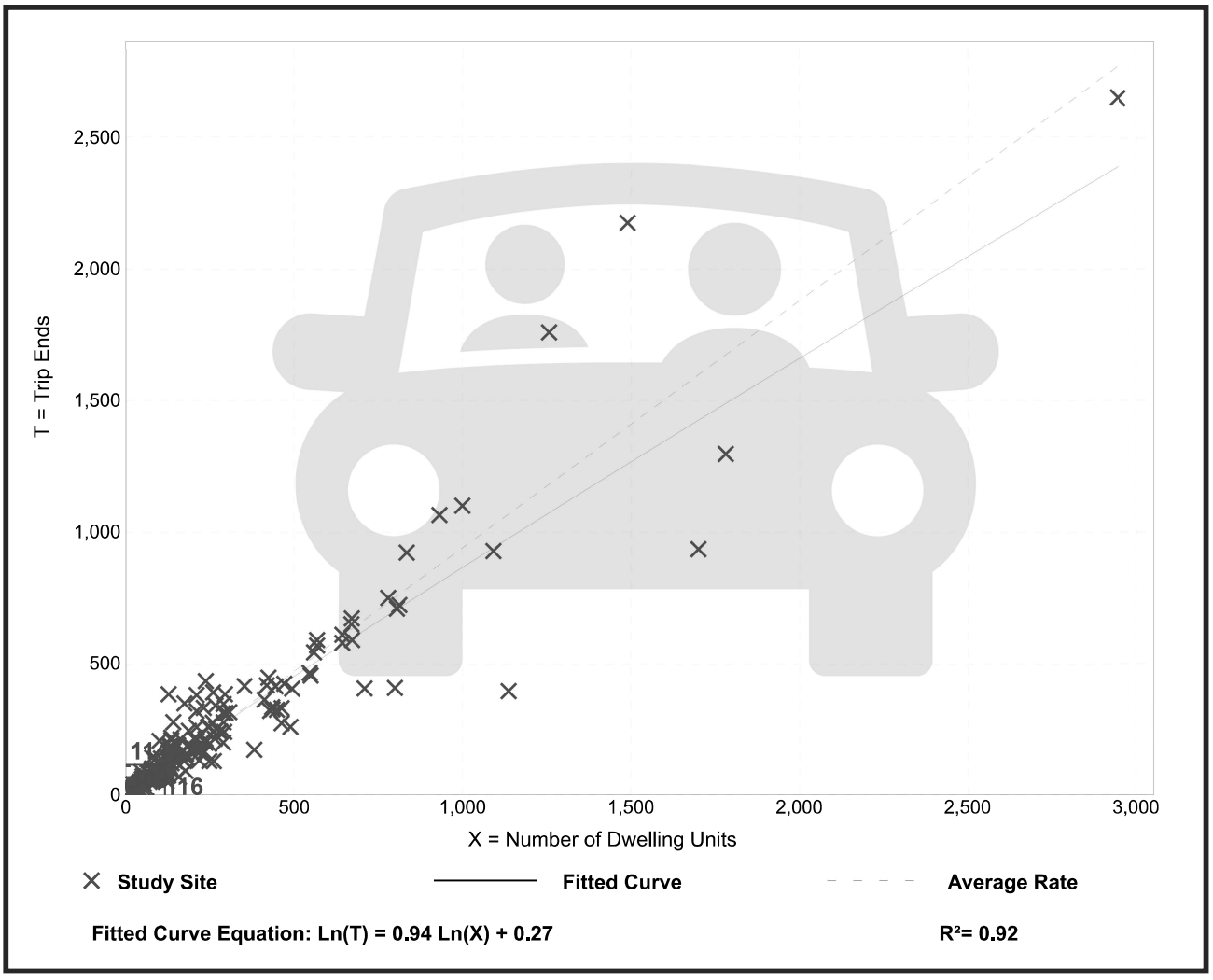
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 208
Avg. Num. of Dwelling Units: 248
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.94	0.35 - 2.98	0.31

Data Plot and Equation



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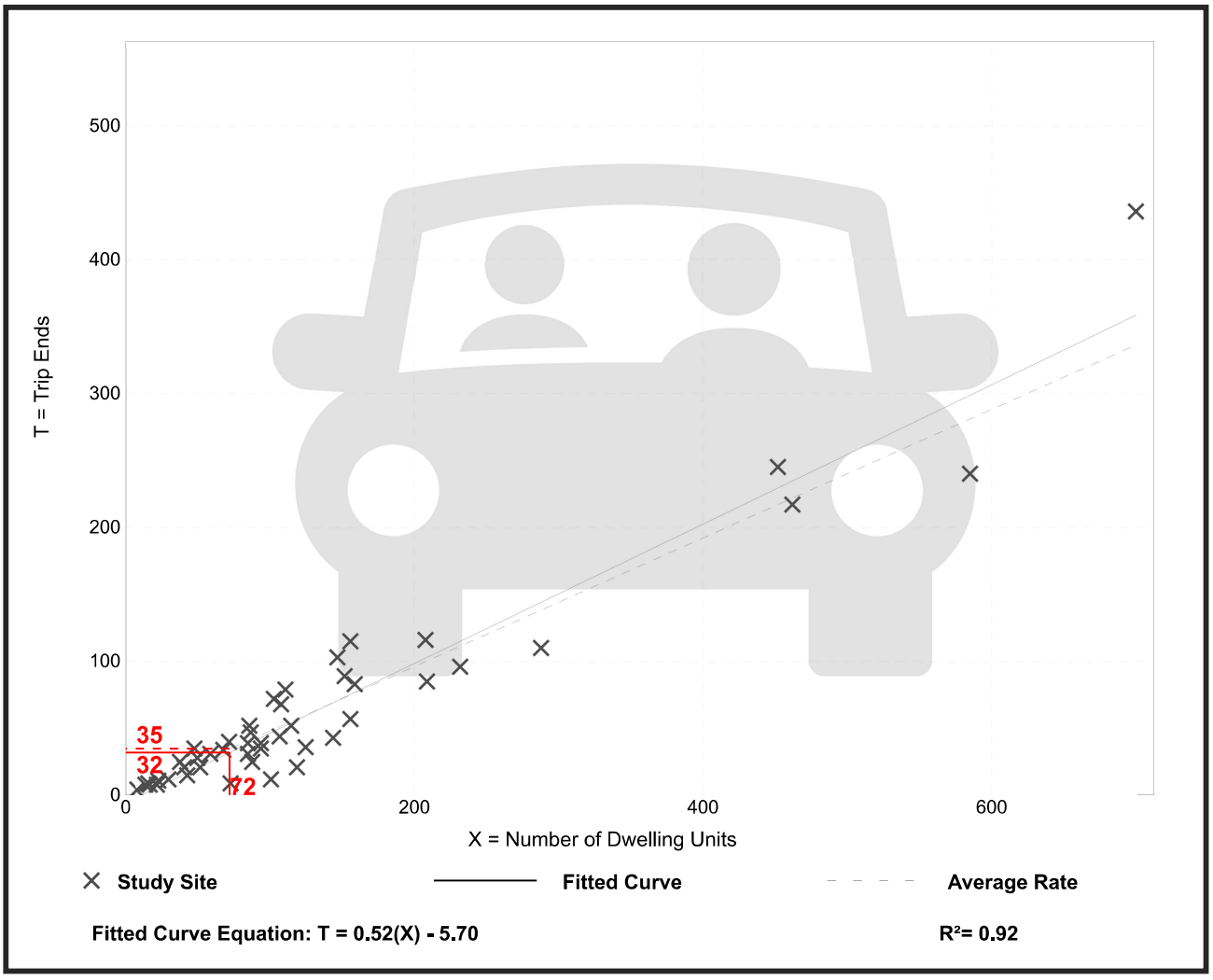
Single-Family Attached Housing
(215)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 46
Avg. Num. of Dwelling Units: 135
Directional Distribution: 25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.48	0.12 - 0.74	0.14

Data Plot and Equation



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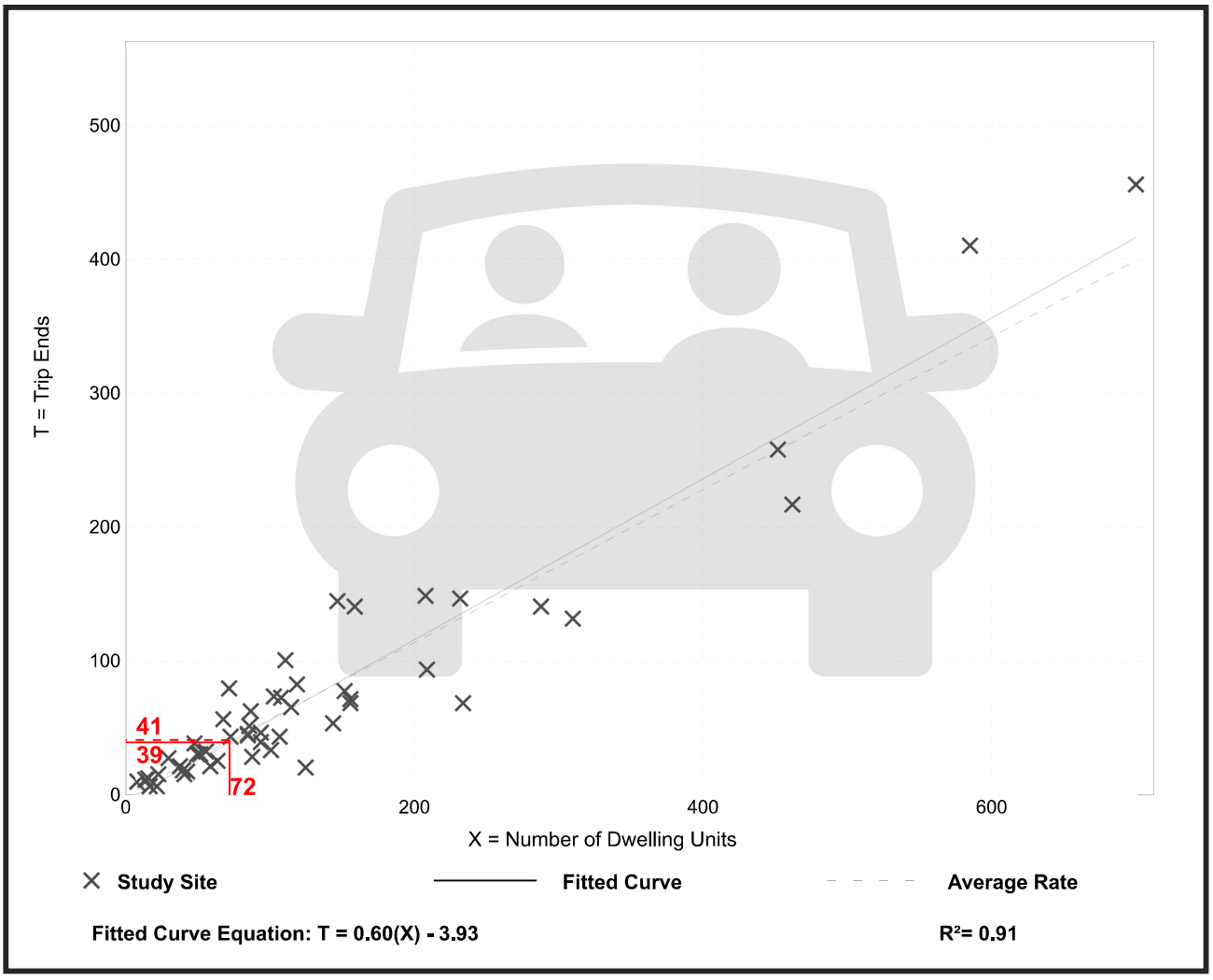
Single-Family Attached Housing
(215)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 51
Avg. Num. of Dwelling Units: 136
Directional Distribution: 59% entering, 41% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.57	0.17 - 1.25	0.18

Data Plot and Equation



Trip Gen Manual, 11th Edition ● Institute of Transportation Engineers

APPENDIX G

Signal Warrants Reports

TRAFFIC SIGNAL WARRANTS - JUSTIFICATION 7 (PROJECTED VOLUMES)
PER OTM BOOK 12

Project and Scenario Summary

Project	41 Park Street West	**Project Number**	1484-7153
		Date	2024-07-30
Horizon	2034	**Analyst**	DB

Study Intersection Summary

Major Street	Elora Street South	**Direction**	North/South
Minor Street	Park Street West/Mill Street East	**Direction**	East/West

Intersection Details for Warrant Parameters

Flow Conditions	Restricted Flow (Urban)	**Number of Lanes**	1
T-Intersection?	No	**Intersection Type**	Existing

Notes: Free Flow (Rural) is used when the operating speed is greater than or equal to 70km/h. Restricted Flow (Urban) is used otherwise.
The Number of Lanes greater than 1 only needs to be for one direction along the major road.
An intersection is considered New if at least 1-leg is added to an existing intersection.

Input Volumes and Average Hourly Volume Determination

Peak Hour	Major: Elora Street South						Minor: Park Street West/Mill Street East						Pedestrians Crossing Major Street
	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	
AM	17	233	1	35	256	13	38	11	61	10	2	46	0
PM	56	363	17	63	259	41	25	4	35	5	10	41	0
AHV	18	149	5	25	129	14	16	4	24	4	3	22	0

The AHV is determined by the availability of the peak hour estimates. If both Peak 1 and Peak 2 Peak Hour Volume estimates are available then AHV = (Peak1phv + Peak2phv)/4. In only the case that one estimate is available then AHV = Peak1phv/2 **or** Peak2phv/2.

Justification 7 - OTM Book 12

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENT 1 LANE HIGHWAYS		MINIMUM REQUIREMENT 2 OR MORE LANE HIGHWAYS		COMPLIANCE		
						Sectional		Entire Percentage
		Free Flow	Restricted Flow	Free Flow	Restricted Flow	Numerical	Percentage	
1. Minimum Vehicular Volume	A. Vehicle Volume, All Approaches (Avg. Hour)	480	720	600	900	413	57.4%	42.9%
	B. Vehicle Volume, Along Minor Streets (Avg. Hour)	120	170	120	170	73	42.9%	
2. Delay to Cross Traffic	A. Vehicle Volume, Major Street (Avg. Hour)	480	720	600	900	340	47.2%	32.0%
	B. Combined Vehicle and Pedestrian Volume Crossing Artery From Minor Streets (Avg. Hour)	50	75	50	75	24	32.0%	
Applicable Threshold			X					

Note: For T-intersections the thresholds for 1B have been increased by 50% per OTM Book 12.
Existing Intersections Require 120% Justification
New/Proposed Intersections Require 150% Justification

Percent Compliance: 42.9%
Percentage Required to be Justified: 120%

Signal Justification 7 Met: [ ] **Yes** [X] **No**

TRAFFIC SIGNAL WARRANTS - JUSTIFICATION 7 (PROJECTED VOLUMES)
PER OTM BOOK 12

Project and Scenario Summary

Project	41 Park Street West	**Project Number**	1484-7153
		Date	2024-07-30
Horizon	2034	**Analyst**	DB

Study Intersection Summary

Major Street	Park Street West	**Direction**	East/West
Minor Street	Street A	**Direction**	North/South

Intersection Details for Warrant Parameters

Flow Conditions	Restricted Flow (Urban)	**Number of Lanes**	1
T-Intersection?	Yes	**Intersection Type**	New

Notes: Free Flow (Rural) is used when the operating speed is greater than or equal to 70km/h. Restricted Flow (Urban) is used otherwise.
The Number of Lanes greater than 1 only needs to be for one direction along the major road.
An intersection is considered New if at least 1-leg is added to an existing intersection.

Input Volumes and Average Hourly Volume Determination

Peak Hour	Major: Park Street West						Minor: Street A						Pedestrians Crossing Major Street
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
AM	0	2	0	17	2	0	0	0	22	0	0	0	0
PM	0	2	0	57	2	0	0	0	15	0	0	0	0
AHV	0	1	0	19	1	0	0	0	9	0	0	0	0

The AHV is determined by the availability of the peak hour estimates. If both Peak 1 and Peak 2 Peak Hour Volume estimates are available then AHV = (Peak1phv + Peak2phv)/4. In only the case that one estimate is available then AHV = Peak1phv/2 **or** Peak2phv/2.

Justification 7 - OTM Book 12

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENT 1 LANE HIGHWAYS		MINIMUM REQUIREMENT 2 OR MORE LANE HIGHWAYS		COMPLIANCE		
						Sectional		Entire Percentage
		Free Flow	Restricted Flow	Free Flow	Restricted Flow	Numerical	Percentage	
1. Minimum Vehicular Volume	A. Vehicle Volume, All Approaches (Avg. Hour)	480	720	600	900	30	4.2%	3.5%
	B. Vehicle Volume, Along Minor Streets (Avg. Hour)	180	255	180	255	9	3.5%	
2. Delay to Cross Traffic	A. Vehicle Volume, Major Street (Avg. Hour)	480	720	600	900	21	2.9%	0.0%
	B. Combined Vehicle and Pedestrian Volume Crossing Artery From Minor Streets (Avg. Hour)	50	75	50	75	0	0.0%	
Applicable Threshold			X					

Note: For T-intersections the thresholds for 1B have been increased by 50% per OTM Book 12.
Existing Intersections Require 120% Justification
New/Proposed Intersections Require 150% Justification

Percent Compliance: 3.5%
Percentage Required to be Justified: 150%

Signal Justification 7 Met: [ ] **Yes** [X] **No**

TRAFFIC SIGNAL WARRANTS - JUSTIFICATION 7 (PROJECTED VOLUMES)
PER OTM BOOK 12

Project and Scenario Summary

Project	41 Park Street West	**Project Number**	1484-7153
		Date	2024-07-30
Horizon	2034	**Analyst**	DB

Study Intersection Summary

Major Street	Park Street West	**Direction**	East/West
Minor Street	Street B	**Direction**	North/South

Intersection Details for Warrant Parameters

Flow Conditions	Restricted Flow (Urban)	**Number of Lanes**	1
T-Intersection?	Yes	**Intersection Type**	New

Notes: Free Flow (Rural) is used when the operating speed is greater than or equal to 70km/h. Restricted Flow (Urban) is used otherwise.
The Number of Lanes greater than 1 only needs to be for one direction along the major road.
An intersection is considered New if at least 1-leg is added to an existing intersection.

Input Volumes and Average Hourly Volume Determination

Peak Hour	Major: Park Street West						Minor: Street B						Pedestrians Crossing Major Street
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
AM	0	28	0	12	20	0	0	0	66	0	0	0	0
PM	0	23	0	38	71	0	0	0	43	0	0	0	0
AHV	0	13	0	13	23	0	0	0	27	0	0	0	0

The AHV is determined by the availability of the peak hour estimates. If both Peak 1 and Peak 2 Peak Hour Volume estimates are available then AHV = (Peak1phv + Peak2phv)/4. In only the case that one estimate is available then AHV = Peak1phv/2 **or** Peak2phv/2.

Justification 7 - OTM Book 12

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENT 1 LANE HIGHWAYS		MINIMUM REQUIREMENT 2 OR MORE LANE HIGHWAYS		COMPLIANCE		
						Sectional		Entire Percentage
		Free Flow	Restricted Flow	Free Flow	Restricted Flow	Numerical	Percentage	
1. Minimum Vehicular Volume	A. Vehicle Volume, All Approaches (Avg. Hour)	480	720	600	900	76	10.6%	10.6%
	B. Vehicle Volume, Along Minor Streets (Avg. Hour)	180	255	180	255	27	10.6%	
2. Delay to Cross Traffic	A. Vehicle Volume, Major Street (Avg. Hour)	480	720	600	900	49	6.8%	0.0%
	B. Combined Vehicle and Pedestrian Volume Crossing Artery From Minor Streets (Avg. Hour)	50	75	50	75	0	0.0%	
Applicable Threshold			X					

Note: For T-intersections the thresholds for 1B have been increased by 50% per OTM Book 12.
Existing Intersections Require 120% Justification
New/Proposed Intersections Require 150% Justification

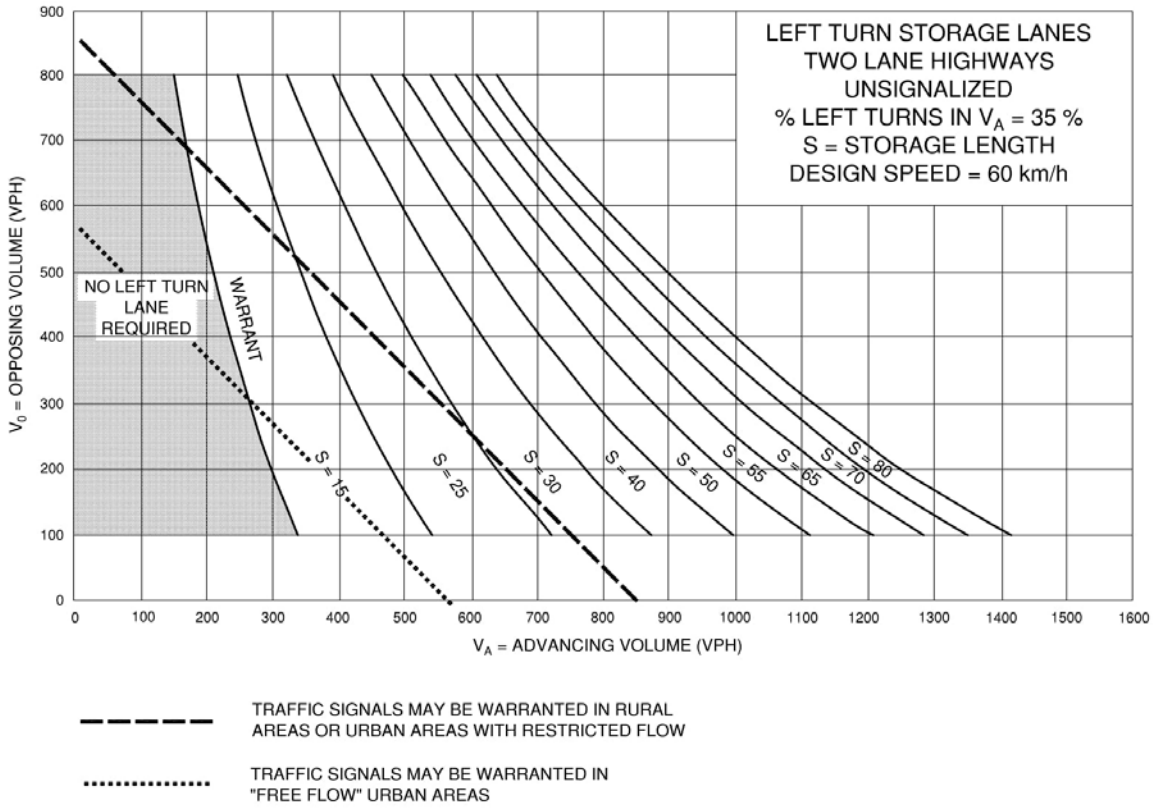
Percent Compliance: 10.6%
Percentage Required to be Justified: 150%

Signal Justification 7 Met: [ ] **Yes** [X] **No**

APPENDIX H

Left-Turn Lane Warrants

Exhibit 9A-10



A.M.

P.M.

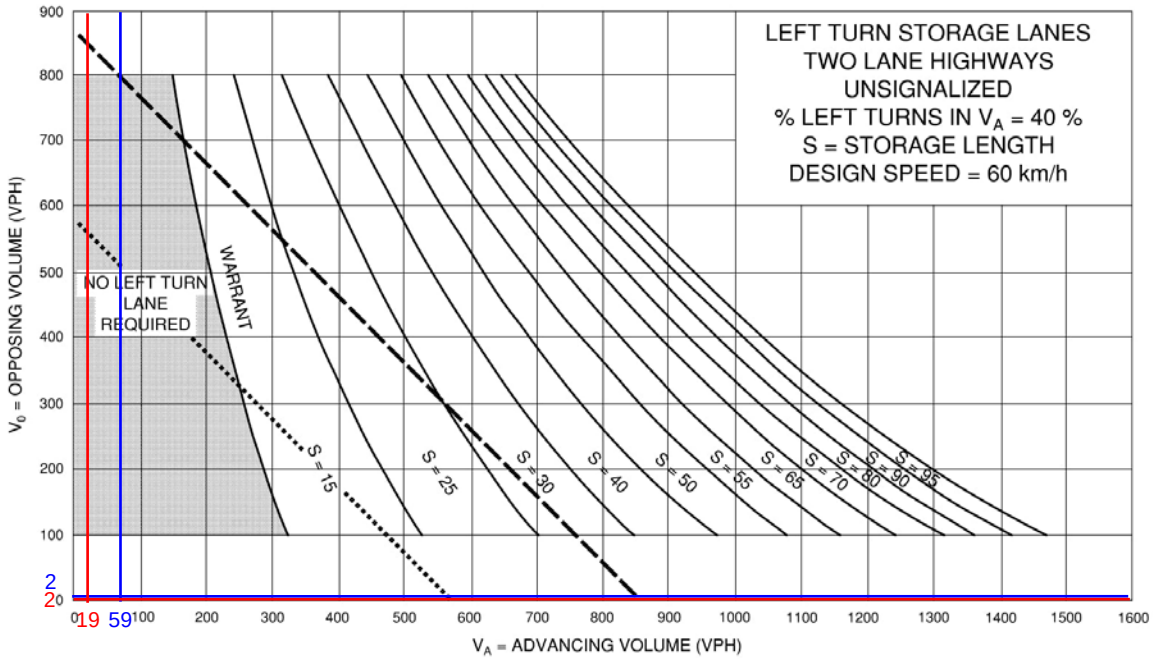
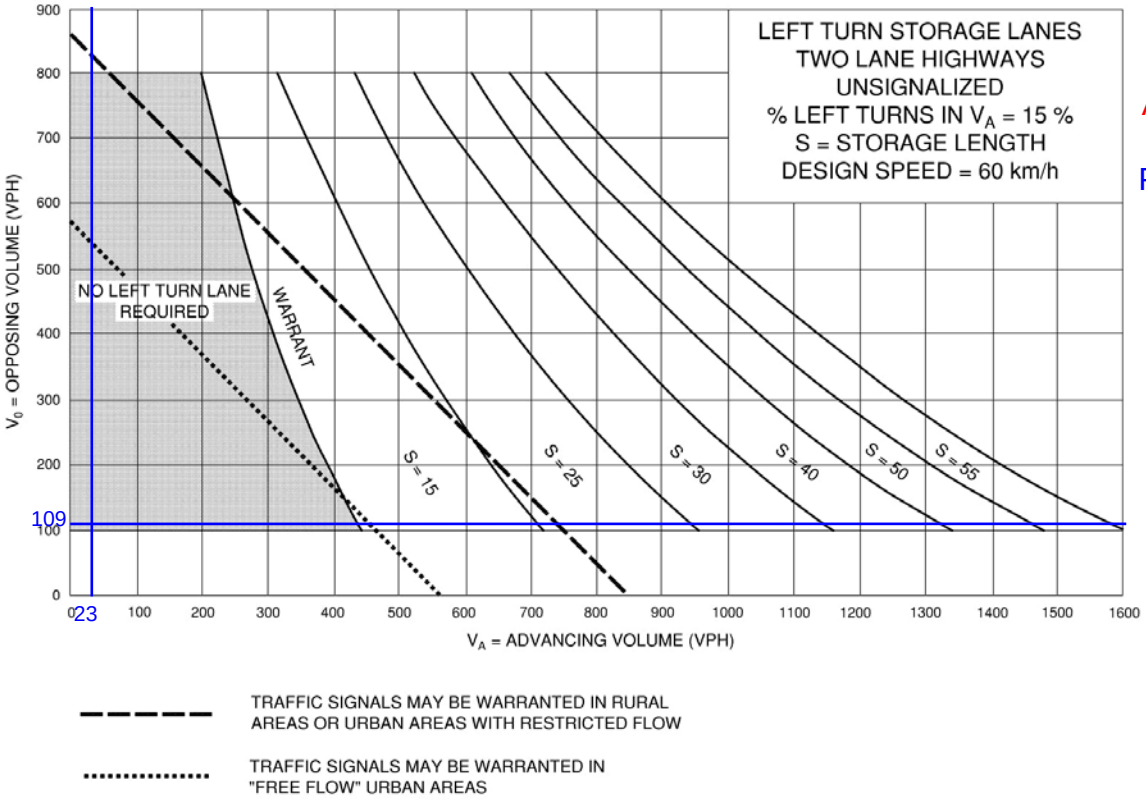


Exhibit 9A-8


LEFT TURN STORAGE LANES
TWO LANE HIGHWAYS
UNSIGNALIZED
% LEFT TURNS IN V_A = 15 %
S = STORAGE LENGTH
DESIGN SPEED = 60 km/h
NO LEFT TURN LANE REQUIRED
WARRANT
S=15
S=25
S=30
S=40
S=50
S=55
V_0 = OPPOSING VOLUME (VPH)
V_A = ADVANCING VOLUME (VPH)
A.M.
P.M.
109
23
TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW
TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

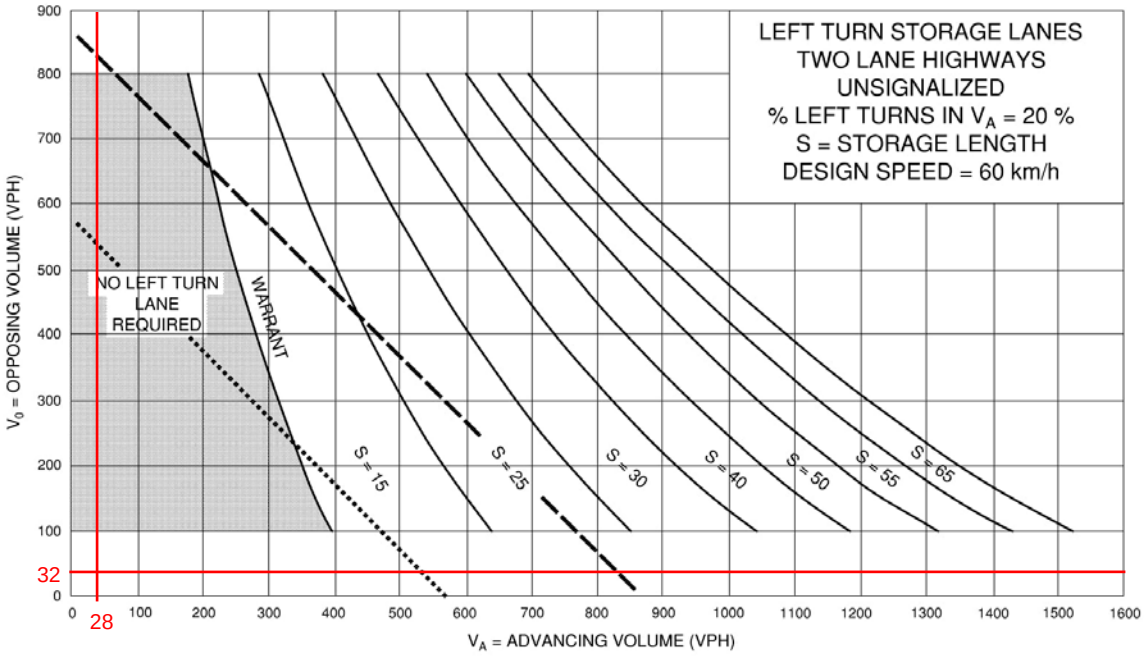
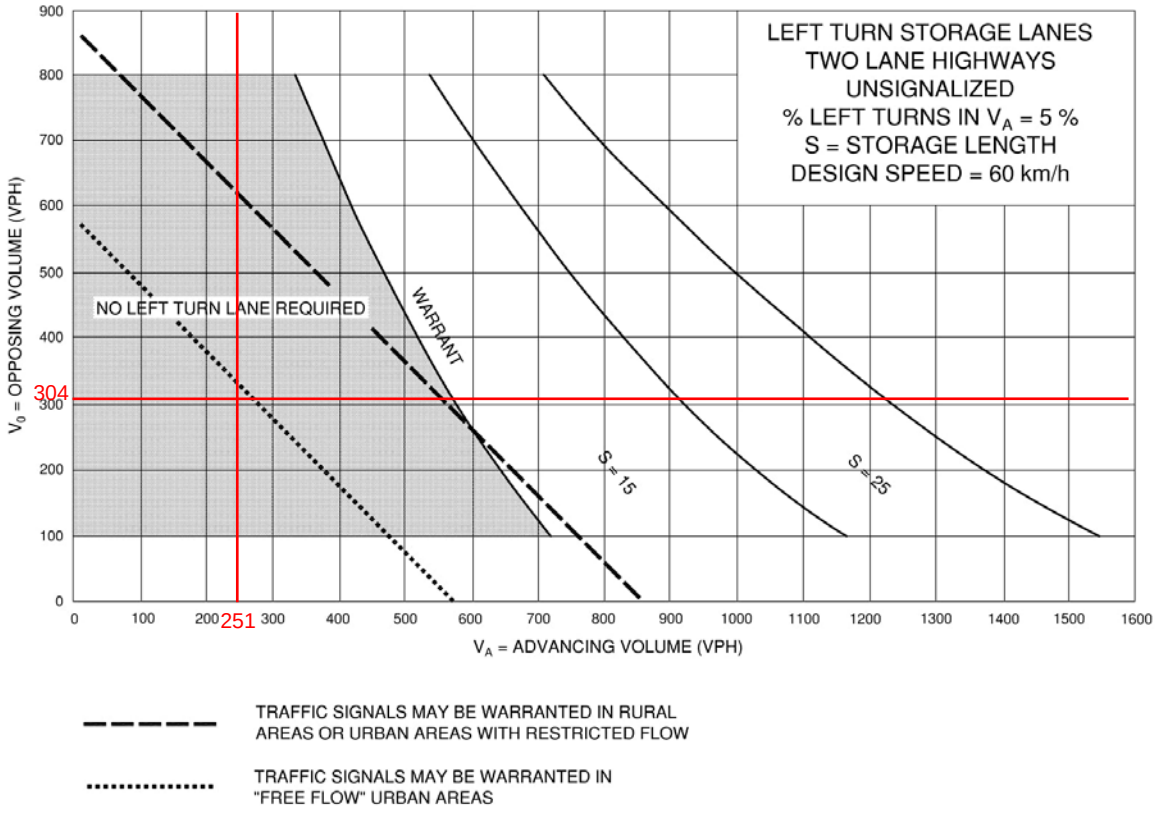

LEFT TURN STORAGE LANES
TWO LANE HIGHWAYS
UNSIGNALIZED
% LEFT TURNS IN V_A = 20 %
S = STORAGE LENGTH
DESIGN SPEED = 60 km/h
NO LEFT TURN LANE REQUIRED
WARRANT
S=15
S=25
S=30
S=40
S=50
S=55
S=65
V_0 = OPPOSING VOLUME (VPH)
V_A = ADVANCING VOLUME (VPH)
32
28

Exhibit 9A-7



A.M.

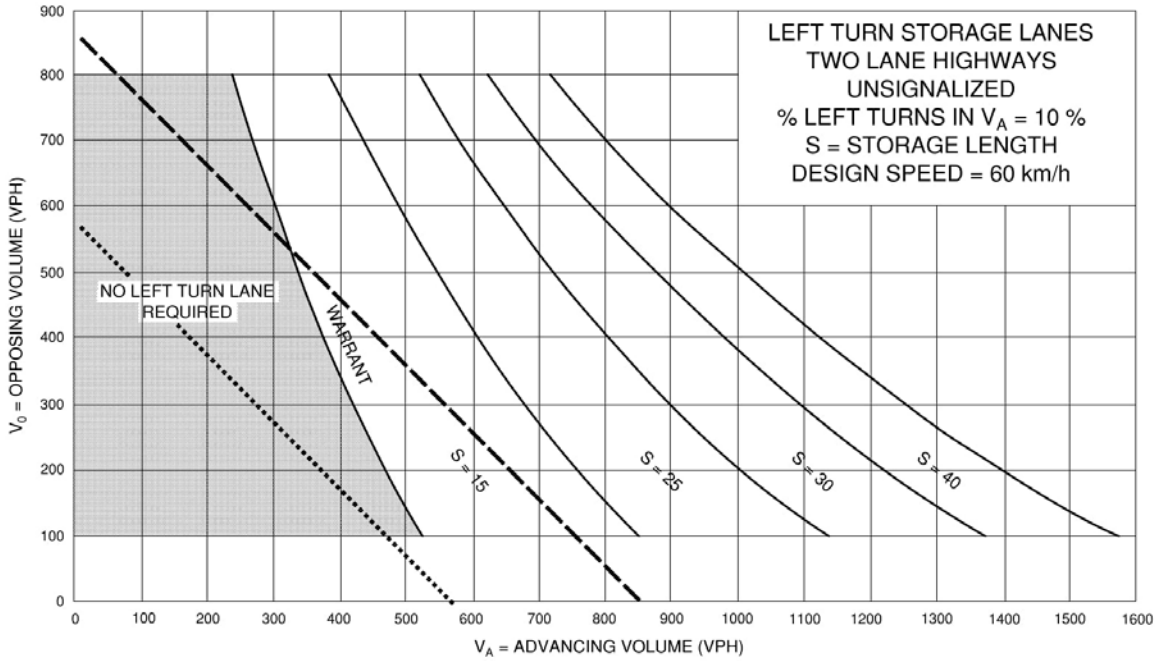
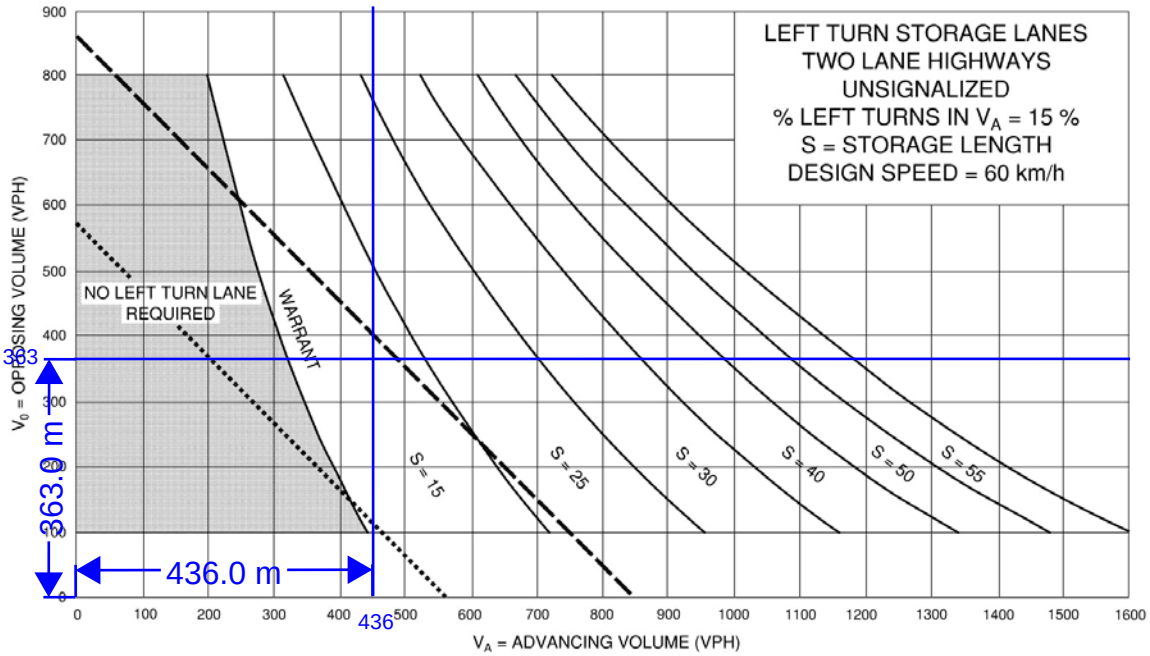


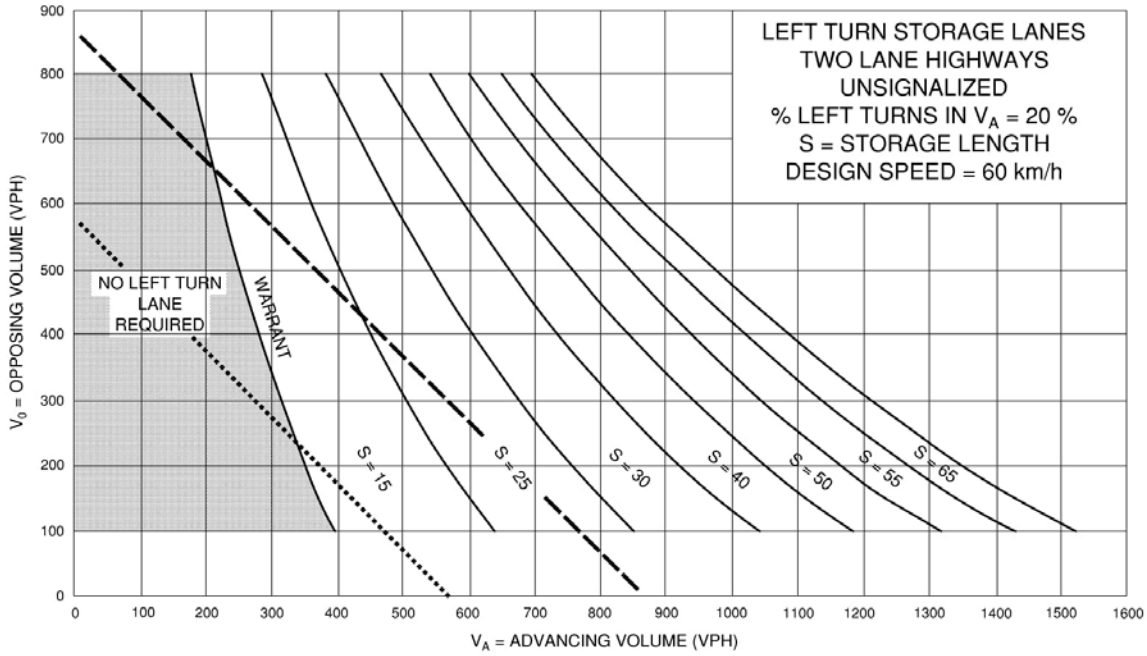
Exhibit 9A-8



P.M.

TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS



APPENDIX I

Collision Data

Diego Bustamante

From: Vranic, Adam (OPP) <Adam.Vranic@opp.ca>
Sent: July 25, 2024 2:29 PM
To: Diego Bustamante
Subject: RE: Elora Street South and Park Street West/Mill Street (Collision Data)

Hi Diego,

As you figured over the phone not many collisions at this location. Grand total of 7 since 2003. I broke it down further below.

Elora Street South and Patrick Street West – 4 collisions between 2003 to 2008

Ann Street between Nelson Street West and Park Street West – 1 collision in 2015

Minto Street South and Park Street West – 1 collision in 2017

Ann Street West and Park Street South – 1 collision in 2018

Let me know if you need anything else,

Adam Vranic
Detachment Administration Clerk
County of Wellington OPP
519-846-5930
Vnet 506-4701

From: Diego Bustamante <dbustamante@cfcrozier.ca>
Sent: Wednesday, July 24, 2024 11:40 AM
To: Vranic, Adam (OPP) <Adam.Vranic@opp.ca>
Cc: Madeleine Ferguson <mferguson@cfcrozier.ca>
Subject: Elora Street South and Park Street West/Mill Street (Collision Data)

Hi Adam,

Just to follow-up on our conversation, I work for C.F. Crozier & Associates and I'm working on a residential project on Park Street West in the Community of Clifford, Town of Minto, Wellington County.

I'm requesting available collision data at the intersection in the subject line. Could you please provide us with that data for the last 5 – 10 years (whichever you have available)?

Thank you for your assistance,

Diego Bustamante, EIT
Engineering Intern, Transportation
Office: 705.434.3421
Collingwood | Milton | Toronto | Bradford | Guelph

Proudly named one of Canada's Top Small & Medium Employers for 2024. Read more here.

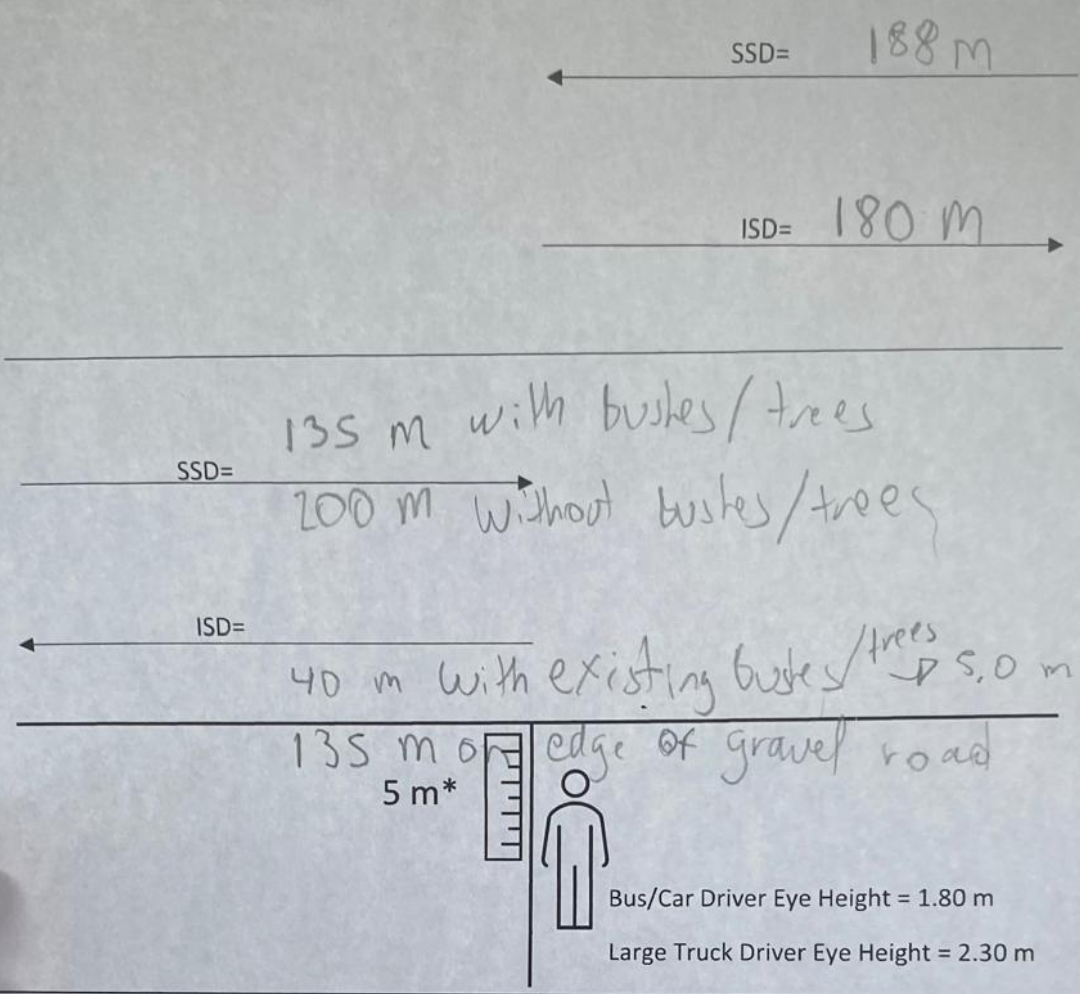
CROZIER

APPENDIX J

Sight Distance Field Notes

Street A Left-turn

Sight Distance Measurements



Top of Car = 1.30 m
SSD Object Hight = 0.15 m
SSD Brake Light = 0.60 m

ISD is to be measure from the driver exiting to the furthest point the top of car ban be seen on the roadway in the direction of the arrow.

SSD is to be measured on the roadway at the furthest distance the vehicle exiting can be seen in the direction of travel.

* While 5 m is recommended for sight triangles, it is understood this is not always possible. 3-5 m from the edge of pavement should be attempted

Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance (m)
30	35	65
40	60	85
50	65	105
60	85	130
70	105	150
80	130	170
90	160	190
100	185	210
110	220	230
120	285	255

NOTE:
Some municipalities have their own access guidelines and sight distance requirements. Confirm if this is the case before completing the assessment.

Street B

Sight Distance Measurements

Minto St. edge to edge = 7.2 m

Minto & Nelson ROW

hydro pole to hydro pole (18 m) → Probably their property.

SSD= 350 m

ISD= 350 m

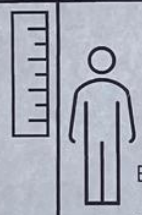
SSD= 187 m

Park street west = 16.5 m ROW

Pavement = 6.6 m

ISD=

@ 5.0m from edge of pavement < 123 m



Bus/Car Driver Eye Height = 1.80 m

Large Truck Driver Eye Height = 2.30 m

Top of Car = 1.30 m
SSD Object Hight = 0.15 m
SSD Brake Light = 0.60 m

ISD is to be measure from the driver exiting to the furthest point the top of car ban be seen on the roadway in the direction of the arrow.

SSD is to be measured on the roadway at the furthest distance the vehicle exiting can be seen in the direction of travel.

* While 5 m is recommended for sight triangles, it is understood this is not always possible. 3-5 m from the edge of pavement should be attempted

Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance (m)
30	35	65
40	60	85
50	65	105
60	85	130
70	105	150
80	130	170
90	160	190
100	185	210
110	220	230
120	285	255

NOTE:
Some municipalities have their own access guidelines and sight distance requirements. Confirm if this is the case before completing the assessment.

APPENDIX K

TAC GDGCR Excerpts

2.5.2.1 Object Height

In calculating sight distance, the designer must consider the type of object that is likely to be encountered on the roadway, which a driver will have to avoid by stopping or maneuvering. Because of the potential variation in object type, selection of object height has significantly more impact on sight distance requirements than, for example, driver eye height.

Table 2.5.1 presents commonly used object heights for various design scenarios.

Table 2.5.1: Object Height Design Domain

Object Height (m)	Applicability
0.00	Stopping sight distance for: • Risk of road washouts • Pavement markings in critical locations
0.15	Stopping sight distance for: • Risk of fallen trees or rocks • Risk of log or construction debris fallen from truck • Risk of fallen person Decision sight distance for most applications (see **Section 2.5.5**)
0.38	Stopping sight distance for: • Vehicle tail or brake light from 1999 TAC *Geometric Design Guide for Canadian Roads* • This value can be used if a more conservative approach is required.
0.60	Stopping sight distance for: • Vehicle tail or brake light • Research indicates that 95% of tail light heights and 90% of headlight heights exceed this value. • This value has been used in this guide to determine stopping sight distance requirements outlined in Tables 2.5.2 and 2.5.3
1.30	Passing sight distance for: • Top of car*

* Note: Some jurisdictions use an object height of 1.15 m for the top of a car, based on the premise that a driver needs to see at least 150 mm of the vehicle to discern its presence. This is supported by a study of driver visual capabilities which suggested that a high contrast object 150 mm high is the minimum height **detectable** at AASHTO stopping sight distances, and that drivers do not have the capability to **recognize** objects that are less than 300 mm in height, regardless of contrast, at or beyond minimum stopping sight distances.[51] This practice is not widely used.

In applying object heights less than 0.15 m the following points should be considered.

- The frequency of collisions occurring as a result of vehicles striking objects less than 0.15 m in height has been shown to be very low.[52]
- As discussed above, a driver's ability to discern small objects at a distance is limited.
- In general, a driver must see at least the top 0.15 m of an object in order to detect its presence.
- If such an object is of limited lateral size (e.g., a rock) a driver may well be able to take evasive action rather than stop, particularly on a roadway with low traffic volumes.
- Evasion might not be possible if the object were a fallen tree, but in many parts of the country this is an unlikely hazard since trees are not present or because local jurisdictions do not allow trees to remain close to the roadway. In areas where logging trucks are present, the designer should consider the possibility of a log falling onto the roadway from a truck.

The designer should adopt an object height based on the probability of a particular object occurring on the roadway, as shown on **Table 2.5.1**. If fallen trees or rocks are a real risk, an object height of 0.15 m is recommended. Otherwise, for stopping sight distance, a tail light height of 0.60 m is recommended. For passing sight distance, an object height of 1.30 m will allow the driver to discern the top of an oncoming typical car. A zero object height is recommended where road washouts are a serious risk, for example on approaches to bridges and culverts in mountainous areas. It is only recommended for pavement markings in critical situations such as at intersections or interchanges, as the driver's ability to discern the markings cannot be relied upon, and traffic signs should be used instead.

2.5.2.2 Deceleration Rate

Approximately 90 percent of all drivers decelerate at rates greater than 3.4 m/s^2. Such deceleration is within a driver's capability to stay within their lane and maintain steering control during the braking maneuver on wet surfaces. Therefore 3.4 m/s^2 is a comfortable deceleration for most drivers and is recommended as the deceleration threshold for determining stopping sight distance.[53]

Most vehicle braking systems and the tire-pavement friction levels of most roadways are capable of providing a deceleration rate of at least 3.4 m/s^2. Also, the friction available on most wet pavement surfaces and the capabilities of most vehicle braking systems can provide braking friction that exceeds this deceleration rate.

2.5.3 STOPPING SIGHT DISTANCE

Braking distance is the distance that it takes to stop a vehicle once the brakes have been applied. On a level roadway this distance can be determined using the following formula:

$$d_b = 0.039 \frac{V^2}{a} \qquad (2.5.1)$$

Where:

d_b = Braking distance (m)
V = Design speed (km/h)
a = Deceleration rate (m/s^2)

Stopping sight distance is the sum of the distance travelled during the perception and reaction time and the braking distance.

$$SSD = 0.278Vt + 0.039 \frac{V^2}{a} \quad (2.5.2)$$

Where:

SSD = Stopping sight distance (m)
t = Brake reaction time, 2.5 s
V = Design speed (km/h)
a = Deceleration rate (m/s^2)

Table 2.5.2 gives the minimum stopping sight distances on level grade, on wet pavement, for a range of design speeds. These values are used for vertical curve design, intersection geometry and the placement of traffic control devices. The stopping sight distances quoted in **Table 2.5.2** may need to be increased for a variety of reasons related to grade and vehicle type as noted below.

Table 2.5.2: Stopping Sight Distance on level roadways for Automobiles[54]

Design speed (km/h)	Brake reaction distance (m)	Braking distance on level (m)	Stopping sight distance	
			Calculated (m)	Design (m)
20	13.9	4.6	18.5	20
30	20.9	10.3	31.2	35
40	27.8	18.4	46.2	50
50	34.8	28.7	63.5	65
60	41.7	41.3	83.0	85
70	48.7	56.2	104.9	105
80	55.6	73.4	129.0	130
90	62.6	92.9	155.5	160
100	69.5	114.7	184.2	185
110	76.5	138.8	215.3	220
120	83.4	165.2	248.6	250
130	90.4	193.8	284.2	285

Note: Brake reaction distance predicated on a time of 2.5 s; deceleration rate of 3.4 m/s^2 used to determine calculated sight distance.

The Effect of Grade

Braking distances will increase on downgrades and decrease on upgrades. When the roadway is on a grade, formula 2.5.1 for braking distance is modified as follows:

$$d_b = \frac{V^2}{254\,[(a/9.81) + G]} \quad (2.5.3)$$

Where:

d_b = Braking distance (m)
V = Design speed (km/h)
a = Deceleration rate (m/s^2)
G = Grade (m/m) (G is positive if vehicles uphill and negative if downhill)

It has been noted that many drivers, particularly those in automobiles, do not compensate completely (i.e., by acceleration or deceleration) for the changes in speed caused by grade. It should also be noted that in many cases the sight distance available on downgrades is greater than on upgrades, which can help to provide the necessary corrections for grade. The following **Table 2.5.3** summarizes the stopping sight distances on grades for a variety of design speeds.

Table 2.5.3: Stopping Sight Distance on Grades[55]

Design Speed (km/h)	Stopping Sight Distance (m)					
	Downgrades (%)			Upgrades (%)		
	3	6	9	3	6	9
20	20	20	20	19	18	18
30	35	35	35	31	30	29
40	50	50	53	45	44	43
50	66	70	74	61	59	58
60	87	92	97	80	77	75
70	110	116	124	100	97	93
80	136	144	154	123	118	114
90	164	174	187	148	141	136
100	194	207	223	174	167	160
110	227	243	262	203	194	186
120	263	281	304	234	223	214
130	302	323	350	267	254	243

Revised June 2019

2.5.3.1 Stopping Sight Distance: Variations for Trucks

The stopping sight distance outlined in **Tables 2.5.2** and **2.5.3** are based on passenger car operations and do not explicitly consider design for truck operations. In general trucks need longer stopping sight distances for a given speed than passenger vehicles. However, one balancing factor is that a truck driver can generally see further than a passenger car driver due to an eye height advantage. As a result, a separate stopping sight distances for trucks are not generally used in highway design.

In some instances the higher eye height is not an advantage or maybe a disadvantage — for example, trucks have no advantage when a sightline obstruction is located on inside of a horizontal curve. Also, trucks are at a disadvantage on sag vertical curves where visibility is “cut off” by an overpass and at the end of long downgrades. In these situations it is desirable to provide stopping sight distances that exceed the values in **Tables 2.5.2** and **2.5.3**.

- Case B1 – Left turn from the minor road
- Case B2 – Right turn from the minor road
- Case B3 – Crossing maneuver from the minor road
- Case C – Intersections with yield control on the minor road
- Case C1 – Crossing maneuver from the minor road
- Case C2 – Left or right turn from the minor road
- Case D – Intersections with traffic signal control
- Case E – Intersections with all-way stop control
- Case F – Left turns from the major road

Case A – Intersections with No Control

For intersections not controlled by yield signs, stop signs, or traffic signals, the driver of a vehicle approaching an intersection should be able to see potentially conflicting vehicles in sufficient time to stop before reaching the intersection. The location of the decision point (driver's eye) of the sight triangles on each approach is determined from a model that is analogous to the stopping sight distance model, with slightly different assumptions.

While some perceptual tasks at intersections may need substantially less time, the detection and recognition of a vehicle that is a substantial distance away on an intersecting approach, and is near the limits of the driver's peripheral vision, may take up to 2.5 s. The distance to brake to a stop can be determined from the same braking coefficients used to determine the stopping sight distance in **Table 2.5.2** (see Section 2.5 of this Guide).

Field observations indicate that vehicles approaching uncontrolled intersections typically slow to approximately 50% of their mid-block running speed. This occurs even when no potentially conflicting vehicles are present.[67] This initial slowing typically occurs at deceleration rates up to 1.5 m/s^2. Deceleration at this gradual rate has been observed to begin even before a potentially conflicting vehicle comes into view. Braking at greater deceleration rates, which can approach those assumed in stopping sight distance, can begin up to 2.5 s after a vehicle on the intersecting approach comes into view. Thus, approaching vehicles may be traveling at less than their mid-block running speed during all or part of the perception-reaction time and can, therefore, where needed, brake to a stop from a speed less than the mid-block running speed.

Table 9.9.1 shows the distance traveled by an approaching vehicle during perception-reaction and braking time, as a function of the design speed of the roadway on which the intersection approach is located. These distances should be used as the legs of the sight triangles shown in **Figure 9.9.1** as dimensions a_1 and b. Distance a_2 is longer than distance a_1, as defined in **Section 9.2.1**. Referring to **Figure 9.9.1**, a major roadway with an assumed design speed of 80 km/h and a minor roadway with an assumed design speed of 50 km/h needs a clear sight triangle with legs extending at least 75 m and 45 m along the major and minor roadways, respectively.

Table 9.9.1: Length of Sight Triangle Leg – Case A, No Traffic Control

Design Speed	Length of Leg (m)
20	20
30	25
40	35
50	45
60	55
70	65
80	75
90	90
100	105
110	120
120	135
130	150

Where the grade along an intersection approach exceeds 3%, the leg of the clear sight triangle along that approach should be adjusted by multiplying the appropriate sight distance from **Table 9.9.1** by the appropriate adjustment factor from **Table 9.9.2**.

Table 9.9.2: Adjustment Factors for Sight Distance Based on Approach Grade

Approach Grade (%)	Design Speed (km/h)													
	20	30	40	50	60	70	80	90	100	110	120	130	—	—
-6	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	—	—
-5	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	—	—
-4	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	—	—
-3 to +3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	—	—
+4	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	—	—
+5	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	—	—
+6	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	—	—

The departure sight triangle like that shown in **Figure 9.9.2** is typically not needed at an uncontrolled intersection since these intersections typically have very low traffic volumes. If a motorist needs to stop at an uncontrolled intersection because of a conflicting vehicle on an intersecting approach, it is very unlikely another potentially conflicting vehicle will be encountered as the first vehicle departs the intersection.

This clear triangular area will allow the vehicles on either road to stop, if needed, before reaching the intersection. If the design speed of any approach is not known, it can be estimated by using the 85th percentile of the mid-block running speeds for that approach.

The distances shown in **Table 9.9.1** are generally less than the corresponding values of stopping sight distance for the same design speed. This relationship is illustrated in **Figure 9.9.3**. Where a clear sight triangle has legs that correspond to the stopping sight distances on their respective approaches, an even greater margin of efficient operation is provided. However, since field observations show that motorists slow down to some extent on approaches to uncontrolled intersections, it is not essential to provide a clear sight triangle with legs equal to the full stopping sight distance.

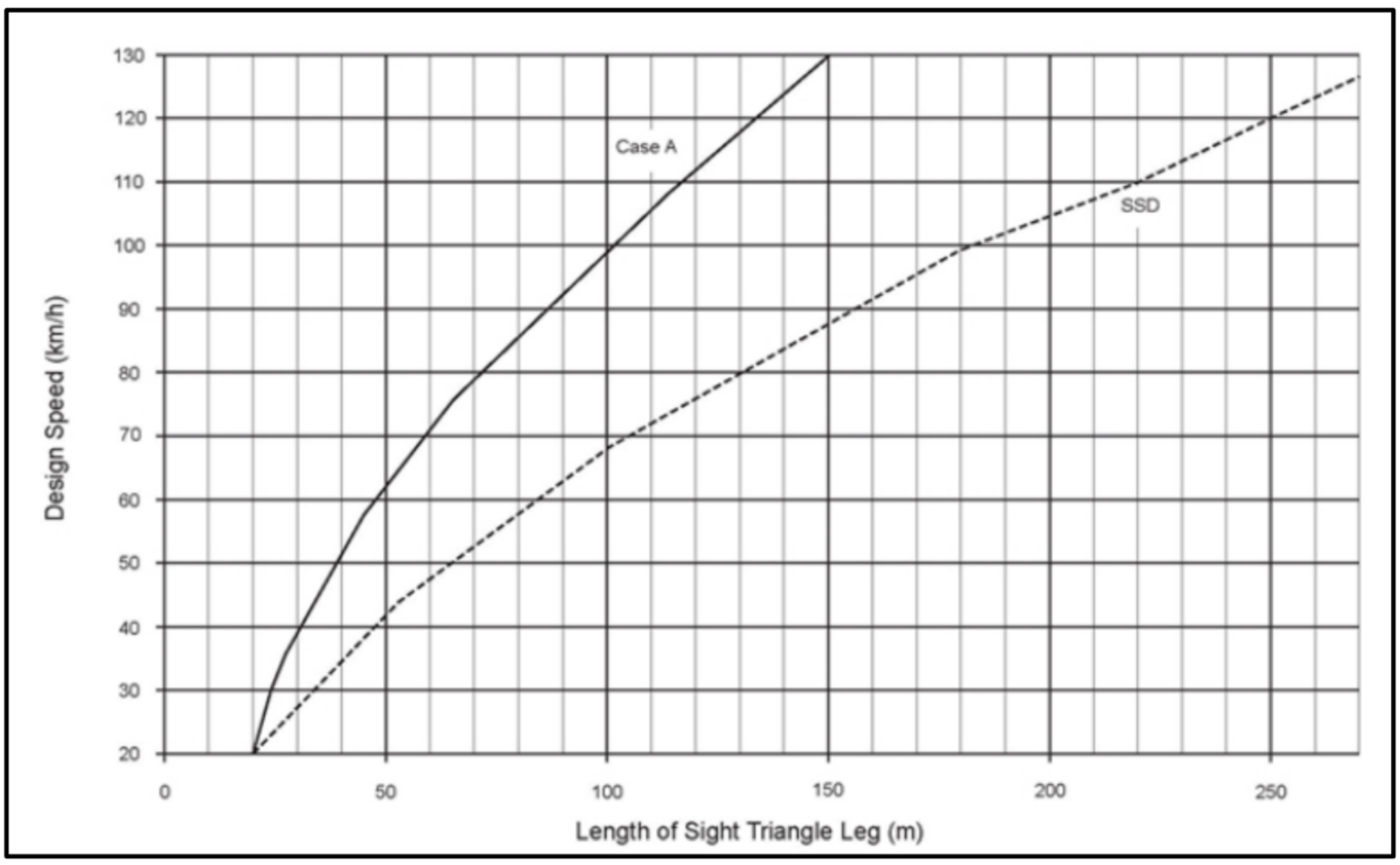


Figure 9.9.3: Length of Sight Triangle Leg – Case A, No Traffic Control

Case B – Intersections with Stop Control on the Minor Road

Departure sight triangles for intersections with stop control on the minor road should be considered for three situations:

- Case B1 – Left turns from the minor road
- Case B2 – Right turns from the minor road
- Case B3 – Crossing the major road from a minor-road approach

Intersection sight distance criteria for stop-controlled intersections are longer than the minimum stopping sight distance to allow the intersection to operate smoothly. Minor-road vehicle operators can wait until they can proceed safely without forcing a major-road vehicle to slow to less than 70% of their initial speed.

Case B1 – Left Turn from the Minor Road

Departure sight triangles for traffic approaching from either the right or the left, like those shown in **Figure 9.9.2**, should be provided for left turns from the minor road onto the major road for all stop-controlled approaches. The length of the leg of the departure sight triangle along the major road in both directions, shown as distance b in **Figure 9.9.2**, is the recommended intersection sight distance for Case B1.

The vertex (decision point) of the departure sight triangle on the minor road should be 4.4 m from the edge of the major-road traveled way. This represents the typical position of the minor-road driver's eye when a vehicle is stopped relatively close to the major road. Field observations of vehicle stopping positions found that, where needed, drivers will stop with the front of their vehicle 2.0 m or less from the edge of the major-road traveled way. Measurements of passenger cars indicate that the distance from the front of the vehicle to the driver's eye for the current North American passenger car population is nearly always 2.4 m or less.[68] Where practical, it is desirable to increase the distance from the edge of the major-road traveled way to the vertex of the clear sight triangle from 4.4 m to 5.4 m. This increase allows 3.0 m from the edge of the major-road traveled way to the front of the stopped vehicle, providing a larger sight triangle. The length of the sight triangle along the minor road (distance a in **Figure 9.9.2**) is the sum of the distance from the major road plus ½ lane width for vehicles approaching from the left, or 1½ lane widths for vehicles approaching from the right.

Field observations of the gaps in major-road traffic actually accepted by drivers turning onto the major road have shown that the values in **Table 9.9.3** provide sufficient time for the minor-road vehicle to accelerate from a stop and complete a left turn without unduly interfering with major-road traffic operations. The time gap acceptance time does not vary with approach speed on the major road. A constant value of time gap, independent of approach speed, can be used as a basis for intersection sight distance determinations. Observations have also shown that major-road drivers will reduce their speed to some extent when minor-road vehicles turn onto the major road. Where the time gap acceptance values in **Table 9.9.3** are used to determine the length of the leg of the departure sight triangle, most major-road drivers should not need to reduce speed to less than 70% of their initial speed.[69]

The intersection sight distance in both directions should be equal to the distance traveled at the design speed of the major road during a period of time equal to the time gap. In applying **Table 9.9.3**, it can usually be assumed that the minor-road vehicle is a passenger car; however, road authorities may provide more precise guidance on selection of the required design vehicle. Where substantial volumes of heavy vehicles enter the major road (e.g., from a ramp terminal), the use of tabulated values for single-unit or combination trucks should be considered.

Table 9.9.3 includes appropriate adjustments to the gap times for the number of lanes on the major road and for the approach grade of the minor road. The adjustment for the grade of the minor-road approach is needed only if the rear wheels of the design vehicle would be on an upgrade that exceeds 3% when the vehicle is at the stop line of the minor-road approach.

Table 9.9.3: Time Gap for Case B1, Left Turn from Stop

Design Vehicle	Time Gap (t_g)(s) at Design Speed of Major Road
Passenger car	7.5
Single-unit truck	9.5
Combination truck (WB 19 and WB 20)	11.5
Longer truck	To be established by road authority

Notes: Time gaps are for a stopped vehicle to turn left onto a two-lane highway with no median and with grades of 3% or less. The table values should be adjusted as follows:

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- For multi-lane highways: For left turns onto highways with more than a single lane in each direction, add 0.5 s for passenger cars and 0.7 s for trucks for each additional lane, from the left, in excess of one, to be crossed by the turning vehicle.
- For minor approach grades: If the approach grade is an upgrade that exceeds 3%, add 0.2 s for each percent grade for left turns.
- Some road authorities use higher values for certain specialized vehicles (e.g., Alberta uses 22 s for very long log trucks).

The intersection sight distance along the major road (distance b in **Figure 9.9.2**) is determined by:

$$ISD = 0.278\ V_{major}\ t_g \qquad (9.9.1)$$

Where:

ISD = intersection sight distance (length of the leg of sight triangle along the major road) (m)
V_{major} = design speed of the major road (km/h)
t_g = time gap for minor road vehicle to enter the major road (s)

For example, a passenger car turning left onto a two-lane major road should be provided sight distance equivalent to a time gap of 7.5 s in major-road traffic. If the design speed of the major road is 100 km/h, this corresponds to a sight distance of 0.278(100)(7.5) = 208.5 or 210 m, rounded for design.

A passenger car turning left onto a four-lane undivided roadway will need to cross two near lanes, rather than one. This increases the recommended gap in major-road traffic from 7.5 to 8.0 s. The corresponding value of sight distance for this example would be 223 m. If the minor-road approach to such an intersection is located on a 4% upgrade, then the time gap selected for intersection sight distance design for left turns should be increased from 8.0 to 8.8 s, equivalent to an increase of 0.2 s for each percent grade.

The design values for intersection sight distance for passenger cars are shown in **Table 9.9.4**. **Figure 9.9.4** includes design values, based on the time gaps for the design vehicles included in **Table 9.9.3**.

No adjustment of the recommended sight distance values for the major-road grade is generally needed because both the major- and minor-road vehicle will be on the same grade when departing from the intersection. However, if the minor-road design vehicle is a heavy truck and the intersection is located near a sag vertical curve with grades over 3%, then an adjustment to extend the recommended sight distance based on the major-road grade should be considered.

Table 9.9.4: Design Intersection Sight Distance – Case B1, Left Turn From Stop

Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance for Passenger Cars	
		Calculated (m)	Design (m)
20	20	41.7	45
30	35	62.6	65
40	50	83.4	85
50	65	104.3	105
60	85	125.1	130
70	105	146.0	150
80	130	166.8	170
90	160	187.7	190
100	185	208.5	210
110	220	229.4	230
120	250	250.2	255
130	285	271.1	275

Note: Intersection sight distance shown is for a stopped passenger car to turn left onto a two-lane highway with no median and grades 3% or less. For other conditions, the time gap should be adjusted and the sight distance recalculated.

Sight distance design for left turns at divided-highway intersections should consider multiple design vehicles and median width. If the design vehicle used to determine sight distance for a divided-highway intersection is larger than a passenger car, then sight distance for left turns will need to be checked for that selected design vehicle and for smaller design vehicles as well. If the divided-highway median is wide enough to store the design vehicle with a clearance to the through lanes of approximately 1 m at both ends of the vehicle, no separate analysis for the departure sight triangle for left turns is needed on the minor-road approach for the near roadway to the left. In most cases, the departure sight triangle for right turns (case B2) will provide sufficient sight distance for a passenger car to cross the near roadway to reach the median. Possible exceptions are addressed in the discussion of case B3.

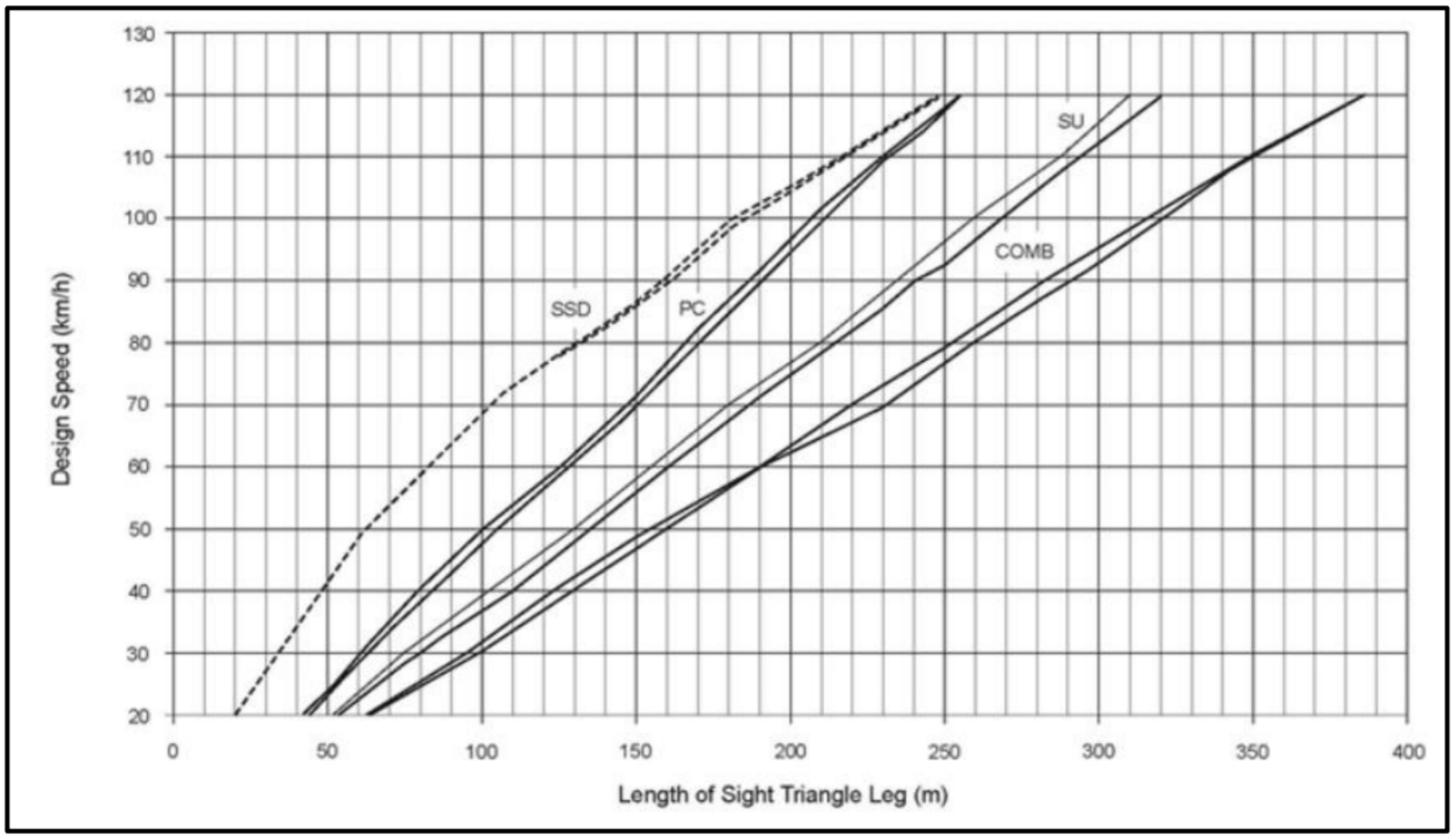


Figure 9.9.4: Intersection Sight Distance – Case B1, Left Turn from Stop (Calculated and Design Values Plotted)

If the design vehicle can be stored in the median with adequate clearance to the through lanes, a departure sight triangle to the right for left turns should be provided for that design vehicle turning left from the median roadway. Where the median is not wide enough to store the design vehicle, a departure sight triangle should be provided for that design vehicle to turn left from the minor-road approach.

The median width should be considered in determining the number of lanes to be crossed. The median width should be converted to equivalent lanes. For example, a 7.2-m median should be considered as two additional lanes to be crossed in applying the multilane highway adjustment for time gaps in **Table 9.9.3**. Furthermore, a departure sight triangle for left turns from the median roadway should be provided for the largest design vehicle that can be stored on the median roadway with adequate clearance to the through lanes. If a divided highway intersection has a 12 m median width and the design vehicle for sight distance is a 22 m combination truck, departure sight triangles should be provided for the combination truck turning left from the minor-road approach and through the median. In addition, a departure sight triangle should also be provided to the right for a 9 m single unit truck turning left from a stopped position in the median.

Case B2 – Right Turn from the Minor Road

A departure sight triangle for traffic approaching from the left like that shown in **Figure 9.9.2** should be provided for right turns from the minor road onto the major road. The intersection sight distance for right turns is determined in the same manner as for case B1, except that the time gaps (t_g) in **Table 9.9.3** should be adjusted. Field observations indicate that, in making right turns, drivers generally accept gaps that are slightly shorter than those accepted in making left turns.[70]

The time gaps in **Table 9.9.3** can be decreased by 1.0 s for right-turn maneuvers without undue interference with major-road traffic. These adjusted time gaps for the right turn from the minor road are shown in **Table 9.9.5**. Design values based on these adjusted time gaps are shown in **Table 9.9.6** for passenger cars. **Figure 9.9.5** includes the design values for the design vehicles for each of the time gaps in **Table 9.9.5**.

Table 9.9.5: Time Gap for Case B2—Right Turn from Stop and Case B3—Crossing Maneuver

Design Vehicle	Time Gap (t_g)(s) at Design Speed of Major Road
Passenger car	6.5
Single-unit truck	8.5
Combination truck (WB 19 and WB 20)	10.5

Note: Time gaps are for a stopped vehicle to turn left onto a two-lane highway with no median and with grades of 3% or less. The table values should be adjusted as follows:

- For multi-lane highways: For left turns onto two-lane highways with more than two lanes, add 0.5 s for passenger cars and 0.7 s for trucks for each additional lane, from the left, in excess of one, to be crossed by the turning vehicle.
- For minor approach grades: If the approach grade is an upgrade that exceeds 3%, add 0.1 s for each percent grade for left turns.

Table 9.9.6: Design Intersection Sight Distance – Case B2, Right Turn from Stop, and Case B3, Crossing Maneuver

Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance for Passenger Cars	
		Calculated (m)	Design (m)
20	20	36.1	40
30	35	54.2	55
40	50	72.3	75
50	65	90.4	95
60	85	108.4	110
70	105	126.5	130
80	130	144.6	145
90	160	162.6	165
100	185	180.7	185
110	220	198.8	200
120	250	216.8	220
130	285	234.9	235

Note: Intersection sight distance shown is for a stopped passenger car to turn right onto or to cross a two-lane highway with no median and with grades of 3% or less. For other conditions, the time gap should be adjusted and the sight distance recalculated.

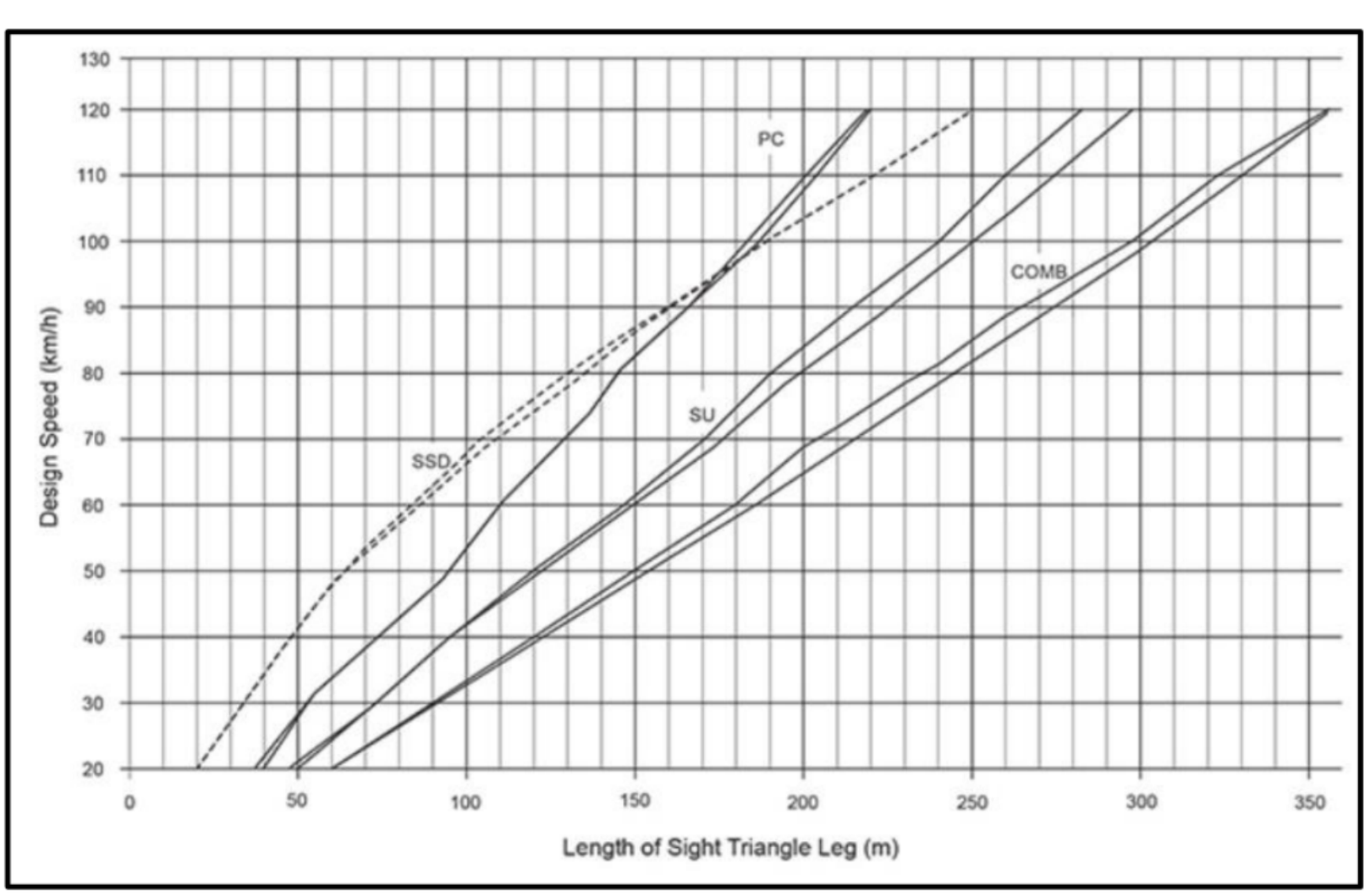


Figure 9.9.5: Intersection Sight Distance – Case B2, Right Turn from Stop, and Case B3, Crossing Maneuver (Calculated and Design Values Plotted)

Case B3 – Crossing Maneuver from the Minor Road

In most cases, the departure sight triangles for left and right turns onto the major road, as described for cases B1 and B2, will also provide more than adequate sight distance for minor-road vehicles to cross the major road. However, in the following situations, it is advisable to check the availability of sight distance for crossing maneuvers:

- where left or right turns, or both, are not permitted from a particular approach and the crossing maneuver is the only legal maneuver, or
- where the crossing vehicle would cross the equivalent width of more than six lanes, or
- where substantial volumes of heavy vehicles cross the highway and steep grades that might slow the vehicle while its back portion is still in the intersection are present on the departure roadway on the far side of the intersection.

The equation for intersection sight distance in case B1 is used again for the crossing maneuver except that time gaps (t_g) are obtained from **Table 9.9.5**, which presents time gaps and appropriate adjustment factors to determine the intersection sight distance along the major road that will accommodate crossing maneuvers. At divided highway intersections, depending on the relative magnitudes of the median width and the length of the design vehicle, intersection sight distance may need to be considered for crossing both roadways of the divided highway or for crossing the near roadway only and stopping in the median before proceeding. The application of adjustment factors for median width and grade is discussed under case B1.

Table 9.9.6 shows the design values for passenger cars for the crossing maneuver based on the unadjusted time gaps in **Table 9.9.5**. **Figure 9.9.5** includes the design values based on the time gaps for the design vehicles in **Table 9.9.5**.

Case C – Intersections with Yield Control on the Minor Road

Drivers approaching yield signs are permitted to enter or cross the major road without stopping, if there are no potentially conflicting vehicles on the major road. The sight distances needed by drivers on yield-controlled approaches exceed those for stop-controlled approaches.

For four-legged intersections with yield control on the minor road, two separate pairs of approach sight triangles like those shown in **Figure 9.9.1** should be provided. One set of approach sight triangles is needed to accommodate crossing the major road and a separate set of sight triangles is needed to accommodate left and right turns onto the major road. Both sets of sight triangles should be checked for potential sight obstructions.

For three-legged intersections with yield control on the minor road, only the approach sight triangles to accommodate left- and right-turn maneuvers need be considered, because the crossing maneuver does not exist.

Case C1 – Crossing Maneuver from the Minor Road

The length of the leg of the approach sight triangle along the minor road to accommodate the crossing maneuver from a yield-controlled approach (distance a_1 in **Figure 9.9.1**) is given in **Table 9.9.7**. Distance a_2 is longer than distance a_1, as defined in **Section 9.2.1**. The distances in **Table 9.9.7** are based on the same assumptions as those for case A except that, based on field observations, minor-road vehicles that do not stop are assumed to decelerate to 60% of the minor-road design speed rather than 50%.

Sufficient travel time for the major road vehicle should be provided to allow the minor-road vehicle: (1) to travel from the decision point to the intersection, while decelerating at the rate of 1.5 m/s^2 to 60% of

FIGURES

Project

41 PARK STREET WEST - COMMUNITY OF CLIFFORD

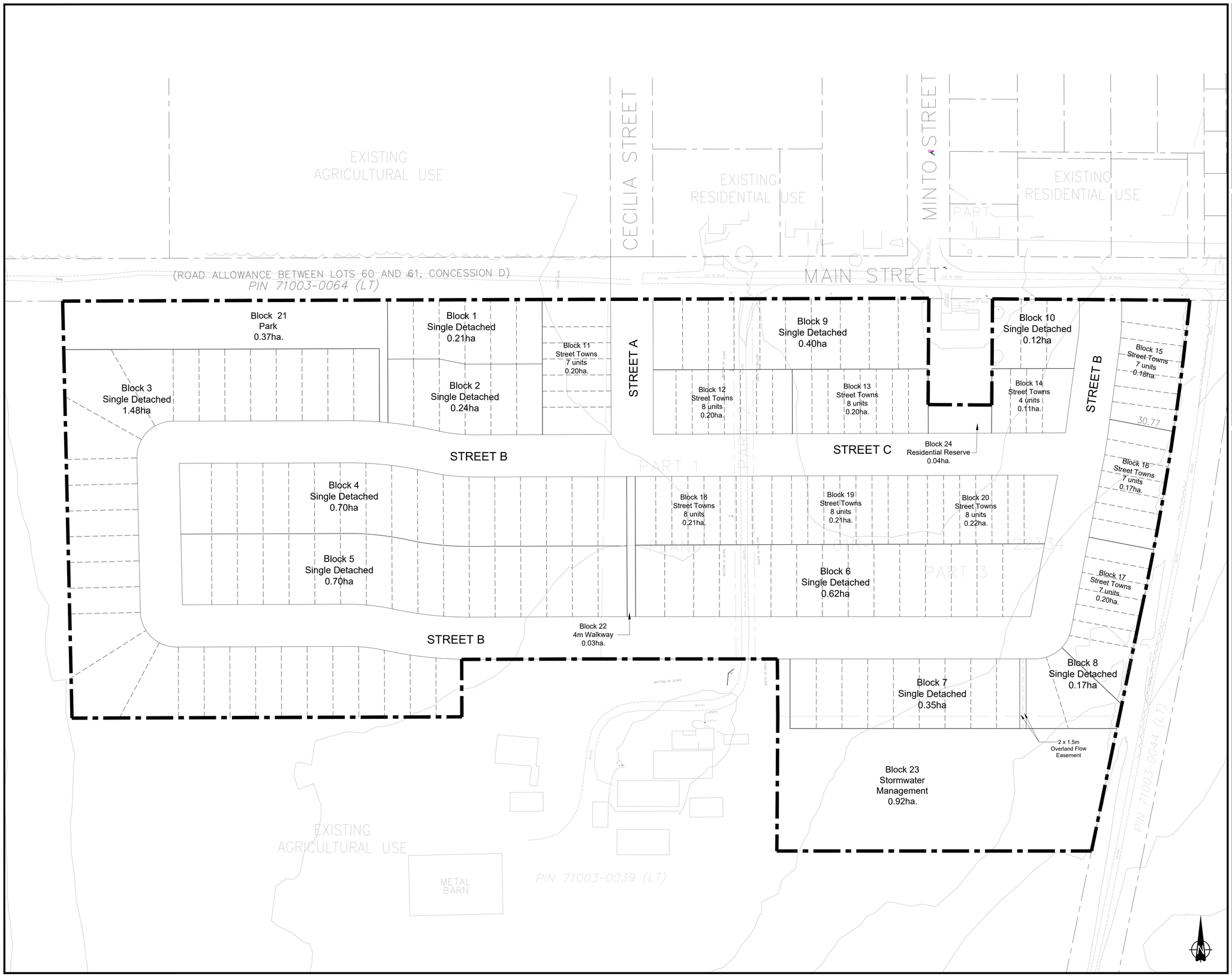
Drawing

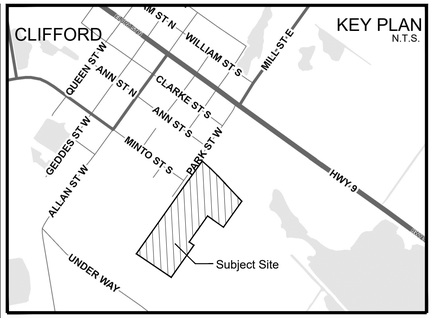
SITE LOCATION PLAN

CROZIER CONSULTING ENGINEERS
70 HURON STREET, SUITE 100
COLLINGWOOD, ON L9Y 4L4
705-446-3510 T
WWW.CFCROZIER.CA

Drawn By	Design By	Project
D.B.	D.B.	1484-7153

Scale	Date	Check By	Drawing
N.T.S.	30/07/2024	M.F.	FIG. 1





DRAFT PLAN OF SUBDIVISION

Part of Lot ???
Concession ???
Town of Minto
County of Wellington

LAND USE SCHEDULE

DESCRIPTION	LOTS/BLKS.	UNITS	AREA (ha.)
Single Detached Residential	1 - 10	116	5.06
Street Townhouses	11-20	72	1.90
Park	21		0.37
Walkway	22		0.03
Stormwater Management	23		0.92
Residential Reserve	24		0.04
Roads			2.33
Total		188	10.65

ADDITIONAL INFORMATION

(UNDER SECTION 51(17) OF THE PLANNING ACT)

INFORMATION REQUIRED BY CLAUSES a,b,c,d,e,f,g,j and I ARE AS SHOWN ON THE DRAFT PLAN.
h) Municipal water supply
i)
k) All sanitary and storm sewers as required

OWNER'S CERTIFICATE

I AUTHORIZE THE GSP GROUP INC. TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO

OWNER _____ DATE _____

SURVEYOR'S CERTIFICATE

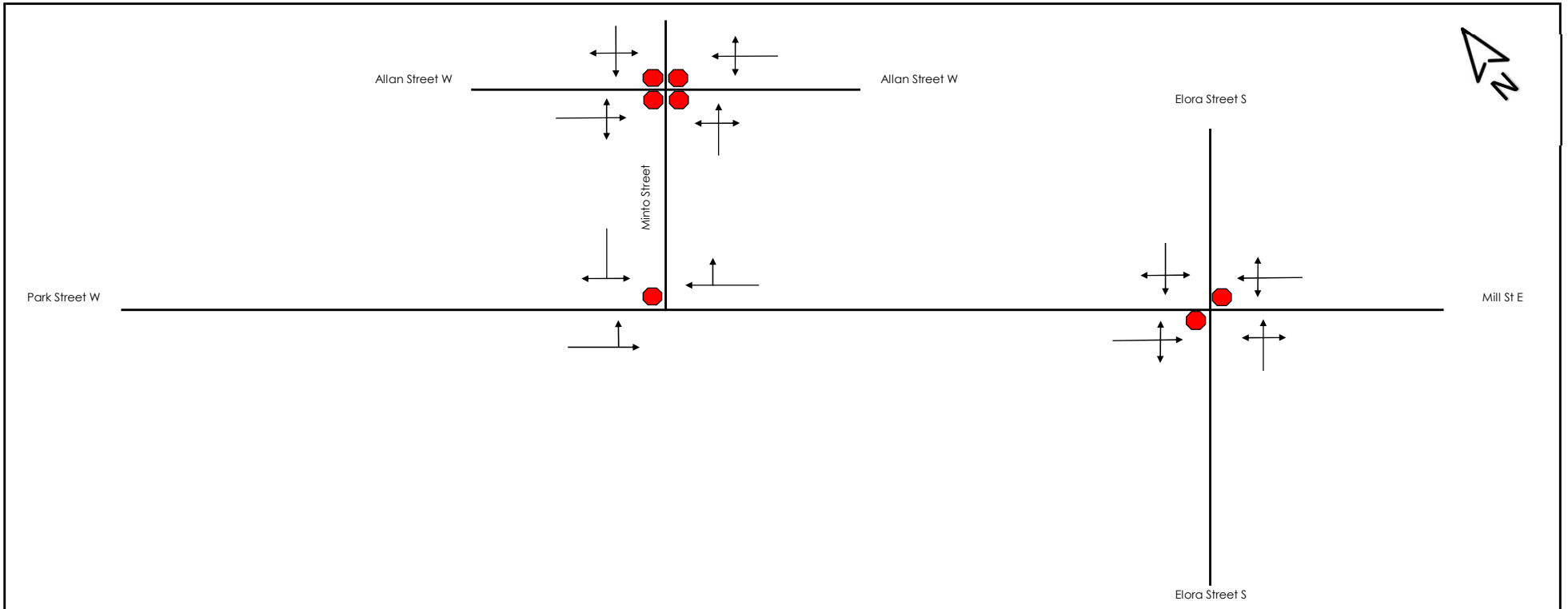
I CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE CORRECTLY SHOWN.

SURVEYOR _____ DATE _____

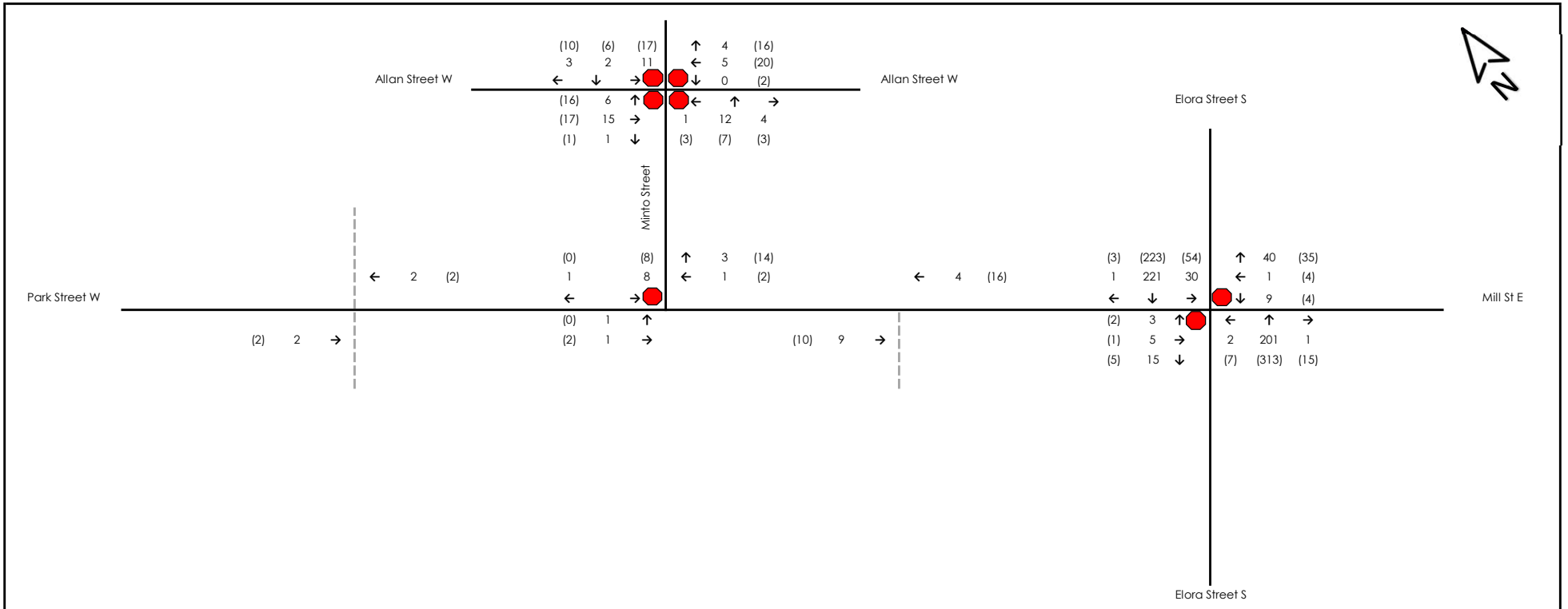
GSP group
PLANNING I URBAN DESIGN I LANDSCAPE ARCHITECTURE
gspgroup.ca

REVISIONS

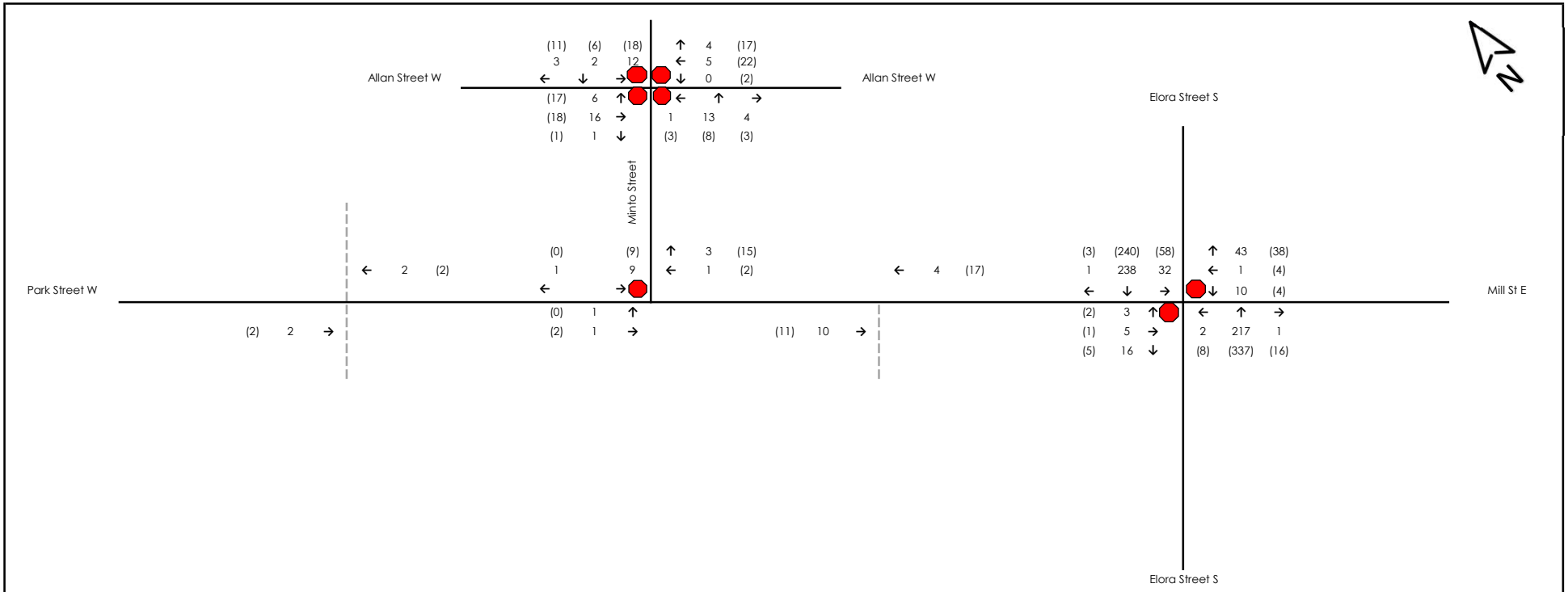
Date: July 25, 2024	Drawn By: MN	Dwg. File Name:dp21364b.dwg
Scale: 1: 800	Project No.: 24127	



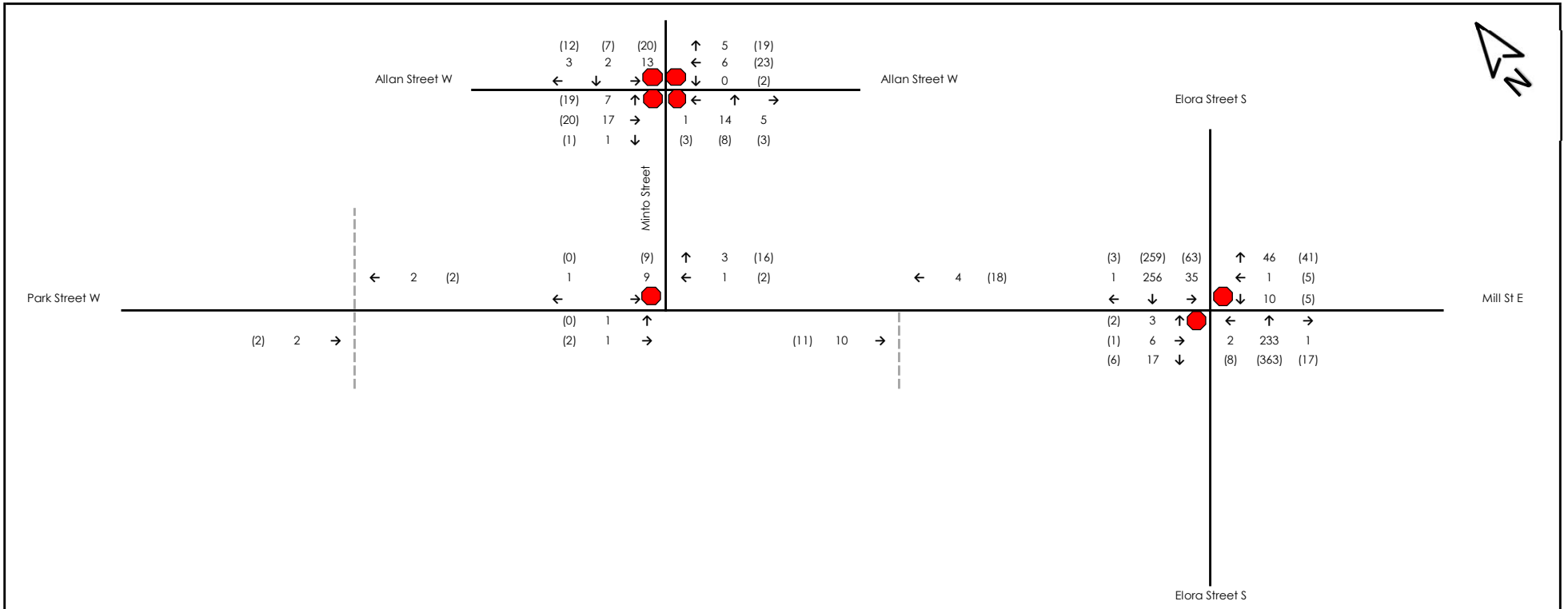
LEGEND STOP CONTROL AM(PM) PEAK HOUR VOLUMES	PROJECT: 41 PARK STREET WEST - COMMUNITY OF CLIFFORD DRAWING: EXISTING LANE AND CONTROLS CONFIGURATION	DRAWING: D.B. CHECK BY: M.F. SCALE: N.T.S.	CROZIER CONSULTING ENGINEERS 70 HURON STREET, SUITE 100 COLLINGWOOD, ON L9Y 4L4 705-446-3510 WWW.CFCROZIER.CA PROJECT: 1484-7153 FIGURE: **FIG. 3**



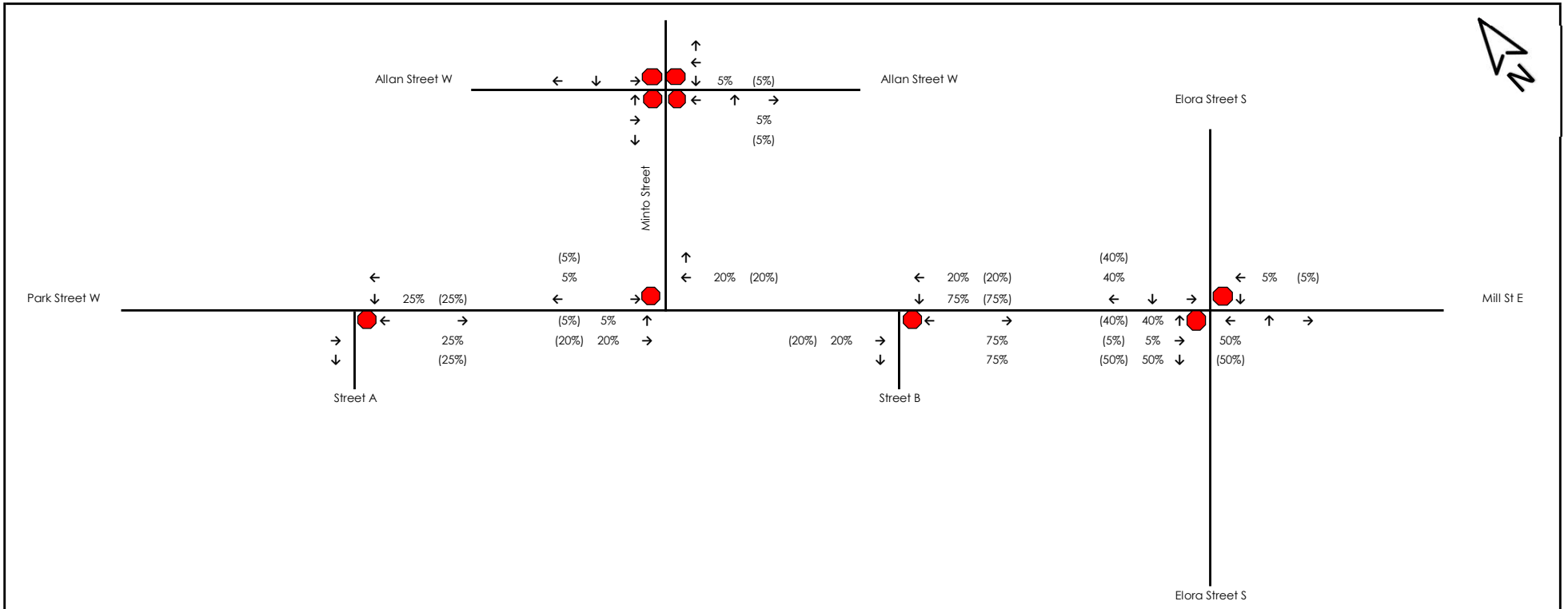
LEGEND	PROJECT: 41 PARK STREET WEST - COMMUNITY OF CLIFFORD	DRAWING: D.B.	CROZIER CONSULTING ENGINEERS
STOP CONTROL		CHECK BY: M.F.	70 HURON STREET, SUITE 100 COLLINGWOOD, ON L9Y 4L4 705-446-3510 WWW.CFCROZIER.CA
AM(PM) PEAK HOUR VOLUMES	DRAWING: 2024 EXISTING CONDITIONS	SCALE: N.T.S.	PROJECT: 1484-7153 FIGURE: **FIG. 4**



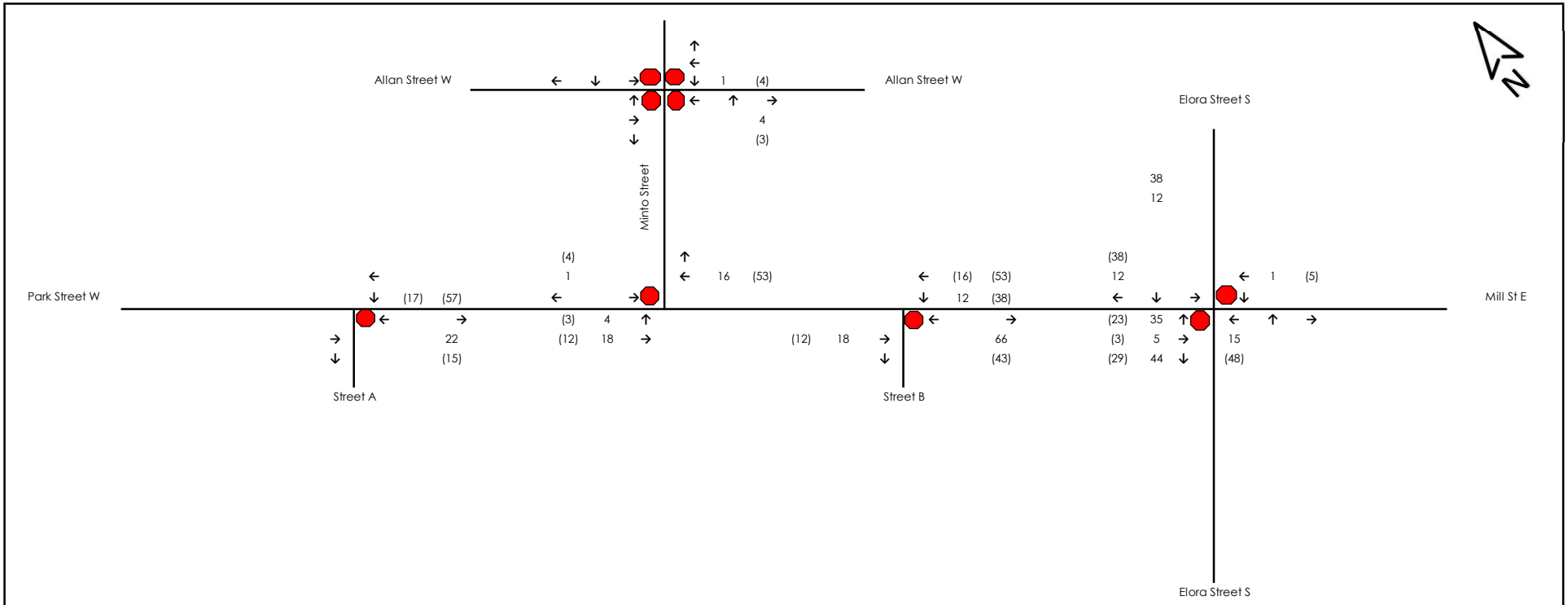
LEGEND	PROJECT: 41 PARK STREET WEST - COMMUNITY OF CLIFFORD	DRAWING: D.B.	CROZIER CONSULTING ENGINEERS 70 HURON STREET, SUITE 100 COLLINGWOOD, ON L9Y 4L4 705-446-3510 WWW.CFCROZIER.CA
STOP CONTROL		CHECK BY: M.F.	
AM(PM) PEAK HOUR VOLUMES	DRAWING: 2029 FUTURE BACKGROUND VOLUMES	SCALE: N.T.S.	PROJECT: 1484-7153 FIGURE: **FIG. 5**



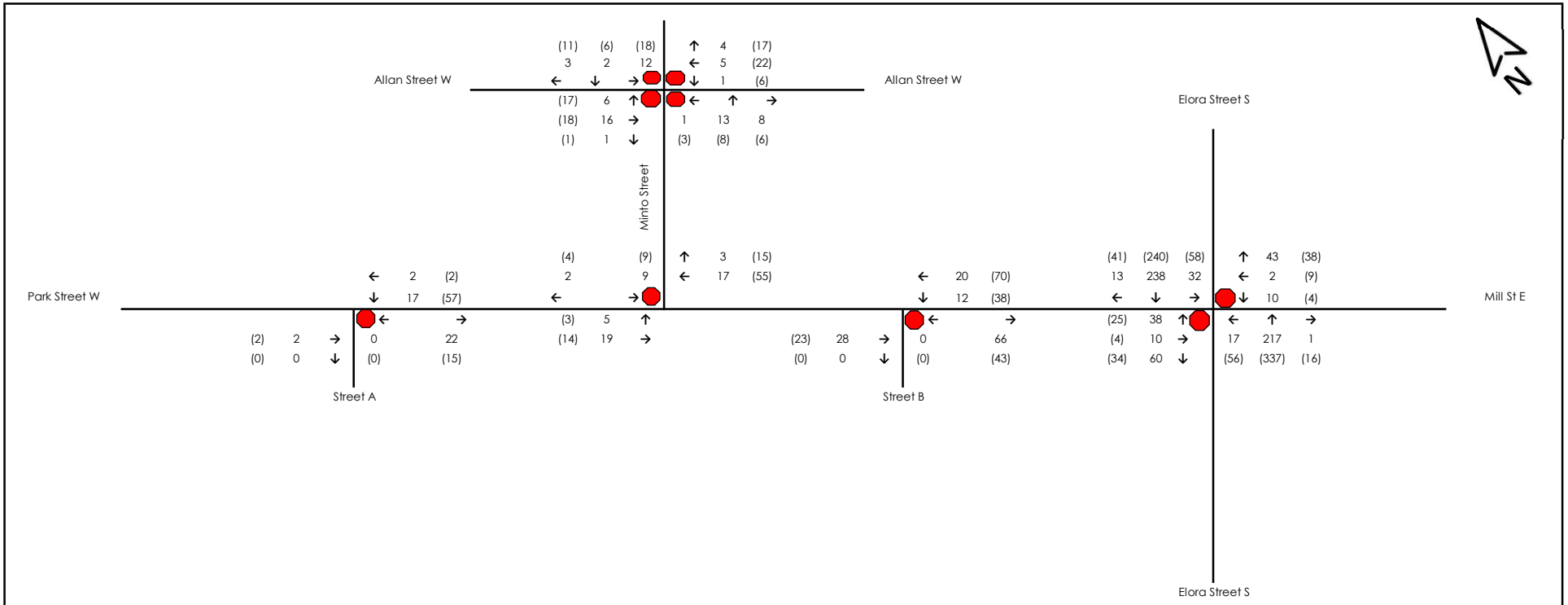
LEGEND	PROJECT: 41 PARK STREET WEST - COMMUNITY OF CLIFFORD	DRAWING: D.B.	CROZIER CONSULTING ENGINEERS 70 HURON STREET, SUITE 100 COLLINGWOOD, ON L9Y 4L4 705-446-3510 WWW.CFCROZIER.CA
STOP CONTROL		CHECK BY: M.F.	
AM(PM) PEAK HOUR VOLUMES	DRAWING: 2034 FUTURE BACKGROUND VOLUMES	SCALE: N.T.S.	PROJECT: 1484-7153 FIGURE: **FIG. 6**



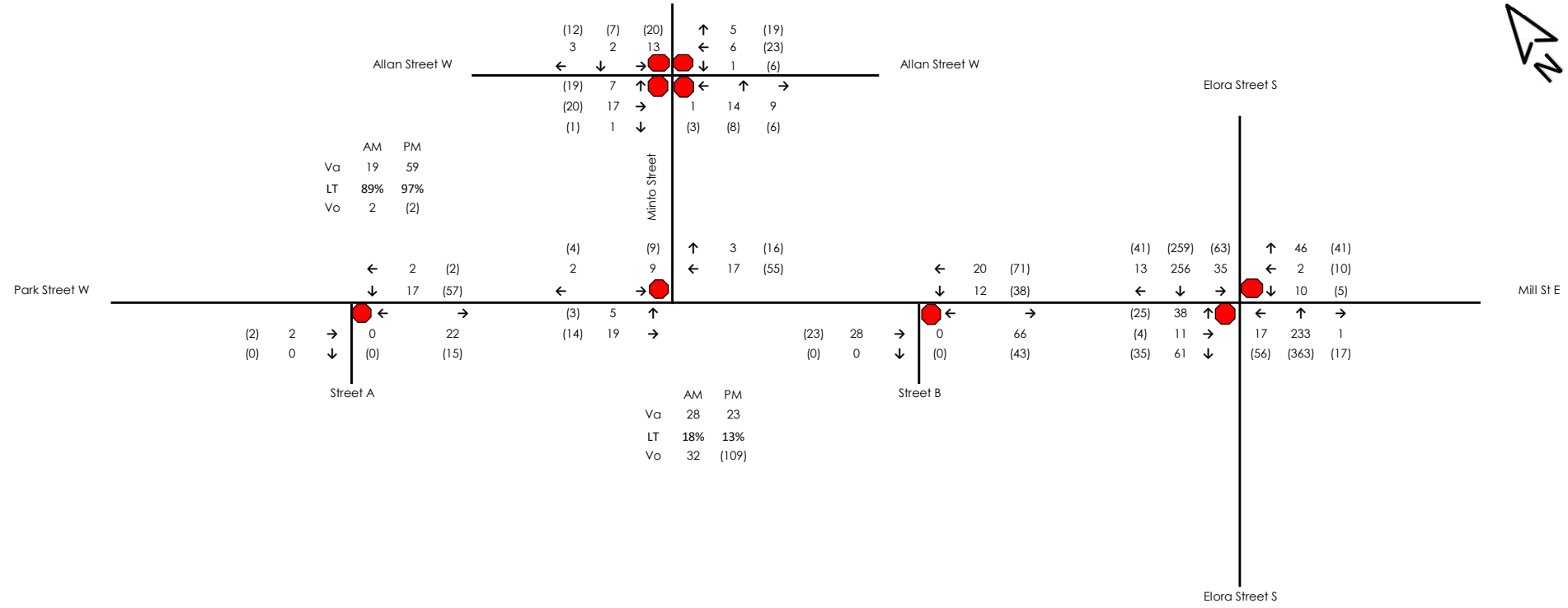
LEGEND	PROJECT: 41 PARK STREET WEST - COMMUNITY OF CLIFFORD	DRAWING: D.B.	CROZIER CONSULTING ENGINEERS 70 HURON STREET, SUITE 100 COLLINGWOOD, ON L9Y 4L4 705-446-3510 WWW.CFCROZIER.CA
STOP CONTROL		CHECK BY: M.F.	
AM(PM) PEAK HOUR VOLUMES	DRAWING: TRIP DISTRIBUTION	SCALE: N.T.S.	PROJECT: 1484-7153 FIGURE: **FIG. 7**



LEGEND STOP CONTROL AM(PM) PEAK HOUR VOLUMES	PROJECT: 41 PARK STREET WEST - COMMUNITY OF CLIFFORD DRAWING: TRIP ASSIGNMENT	DRAWING: D.B. CHECK BY: M.F. SCALE: N.T.S.	CROZIER CONSULTING ENGINEERS 70 HURON STREET, SUITE 100 COLLINGWOOD, ON L9Y 4L4 705-446-3510 WWW.CFCROZIER.CA PROJECT: 1484-7153 FIGURE: **FIG. 8**



LEGEND	PROJECT: 41 PARK STREET WEST - COMMUNITY OF CLIFFORD	DRAWING: D.B.	CROZIER CONSULTING ENGINEERS, 70 HURON STREET, SUITE 100, COLLINGWOOD, ON L9Y 4L4, 705-446-3510, WWW.CFCROZIER.CA
STOP CONTROL		CHECK BY: M.F.	
AM(PM) PEAK HOUR VOLUMES	DRAWING: 2029 FUTURE TOTAL VOLUMES	SCALE: N.T.S.	PROJECT: 1484-7153 FIGURE: **FIG. 9**



LEGEND	PROJECT: 41 PARK STREET WEST - COMMUNITY OF CLIFFORD	DRAWING: D.B.	CROZIER CONSULTING ENGINEERS, 70 HURON STREET, SUITE 100, COLLINGWOOD, ON L9Y 4L4, 705-446-3510, WWW.CFCROZIER.CA
STOP CONTROL		CHECK BY: M.F.	
AM(PM) PEAK HOUR VOLUMES	DRAWING: 2034 FUTURE TOTAL VOLUMES	SCALE: N.T.S.	PROJECT: 1484-7153 FIGURE: **FIG. 10**