



Elora Street Development Harriston, Ontario Transportation Impact Study

Paradigm Transportation Solutions Limited

July 2019



Project Summary



Project Number
190338

**Elora Street Development, Harriston, Ontario
Transportation Impact Study**

July 2019

Client

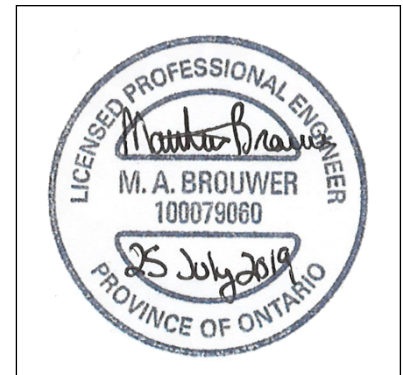
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Executive Summary

Content

Moorefield Excavating retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study for a proposed residential development located in the community of Harriston, Town of Minto, County of Wellington.

This Transportation Impact Study (TIS) includes an analysis of existing traffic conditions, a description of the proposed development, traffic forecasts for the date of expected full-occupancy (2034), and any recommendations required to improve future traffic conditions.

Development Concept

The subject site is located on the west side of Elora Street at the southern terminus of John Street in the community of Harriston, Town of Minto, County of Wellington. The site is bounded by single-family dwellings to the north, a creek to the west, agricultural land to the south, and Elora Street to the east.

The proposed development consists of approximately:

- ▶ 77 single family dwellings;
- ▶ 22 semi-detached dwellings; and
- ▶ 30 townhouses.

The proposed development is anticipated to be developed with the following phasing:

- ▶ **Phase 1** includes the John Street and Anne Street extensions, as well the construction of Street C to the storm pond. The expected timing for build-out is 5-7 years;
- ▶ **Phase 2** includes the construction of Street B and Street D, and the East Site Access connection to Elora Street. The expected timing of build-out is 10-12 years; and
- ▶ **Phase 3** includes the remainder of the development. The expected build-out is 10-15 years.

Vehicular access is proposed by two new municipal roadway connections. Anne Street will be extended westerly to form a T-intersection with John Street, which will be extended southerly into the subject site. A second site access is proposed on Elora Street south of the Jessie Street intersection.



Conclusions

Based on the investigations carried out, it is concluded that:

- ▶ Under existing 2019 traffic conditions, all turning movements at all study area intersections operate within acceptable levels;
- ▶ The development is forecast to generate 90 and 120 new trips during the AM and PM peak hours, respectively;
- ▶ Under 2034 background traffic conditions, all turning movements at all study area intersections are forecast to operate within acceptable levels;
- ▶ Under 2034 total traffic conditions, all turning movements at all study area intersections are forecast to operate within acceptable levels;
- ▶ Left-turn lanes are not forecast to be warranted on study area roads under 2034 total volumes during the AM or PM peak hours;
- ▶ Under the scenario with all Phase 1 traffic using the Elora Street and Anne Street intersection to access the development a second access is constructed in Phase 2, all turning movements at all study area intersections are forecast to operate within acceptable levels and left-turn lanes are not warranted; and
- ▶ The County of Wellington should consider implementing a northbound left-turn lane on Elora Street South at Anne Street, to occupy the space created by the shadow lane opposite of the existing southbound left-turn lane at this intersection. Since a left-turn lane is not forecast to be warranted, this is not a requirement, but a suggestion to be considered. As the left-turn is not forecast to be warranted, any left-turn lane implemented should therefore not be the responsibility of the developer.

Recommendations

Based on the findings of this study, it is recommended that the site be approved as planned with no conditions related to off-site transportation improvements.



Contents

1	Introduction	1
1.1	Overview	1
1.2	Purpose and Scope	1
2	Existing Conditions	3
2.1	Road Network	3
2.2	Transit Service.....	3
2.3	Traffic Volumes	3
2.4	Traffic Operations	7
3	Development Concept	9
3.1	Development Description	9
3.2	Development Trip Generation	9
3.3	Development Trip Distribution and Assignment	10
4	Evaluation of Future Traffic Conditions.....	13
4.1	Forecast Traffic Volumes.....	13
4.1.1	General Background Growth	13
4.1.2	Other Developments	13
4.2	2034 Background Traffic Operations.....	13
4.3	2034 Total Horizon	16
4.3.1	Rerouted Existing Traffic Volumes Resulting from the John Street and Anne Street Extensions	16
4.3.2	2034 Total Traffic Operations	16
5	Remedial Measures.....	20
5.1	Left-turn Lanes	20
5.2	Sensitivity Analysis – Phase 1 Impact on Study Area.....	21
6	Conclusions and Recommendations	22
6.1	Conclusions.....	22
6.2	Recommendations	22



Appendices

Appendix A	Existing Traffic Counts
Appendix B	Synchro 2019 Existing Traffic Operations Reports
Appendix C	Synchro 2034 Background Traffic Operations Reports
Appendix D	Synchro 2034 Total Traffic Operations Reports
Appendix E	Left-Turn Lane Warrant Nomographs
Appendix F	Phase 1 Traffic Operations and Left-Turn Lane Warrant Nomographs

Figures

Figure 1.1:	Study Area and Subject Development Location2
Figure 2.1:	Traffic Control and Lane Configuration.....5
Figure 2.2:	2019 Existing Peak Hour Traffic Volumes6
Figure 3.1:	Proposed Site Plan.....11
Figure 3.2:	Site Generated Peak Hour Traffic Volumes.....12
Figure 4.1:	2034 Background Peak Hour Traffic Volumes14
Figure 4.2:	Rerouted Peak Hour Volumes from John Street and Anne Street Extensions17
Figure 4.3:	2034 Total Peak Hour Traffic Volumes18

Tables

Table 2.1:	2019 Existing Peak Hour Traffic Operations8
Table 3.1:	Site Generated Trip Estimates.....10
Table 3.2:	Estimated Peak Hour Trip Distribution10
Table 4.1:	2034 Background Traffic Operations15
Table 4.2:	Rerouted Traffic Trip Generation Estimates16
Table 4.3:	2034 Total Traffic Operations19



1 Introduction

1.1 Overview

Moorefield Excavating retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study for a proposed residential development located in the community of Harriston, Town of Minto, County of Wellington. **Figure 1.1** details the subject development location.

1.2 Purpose and Scope

The purpose of the study is to:

- ▶ determine and assess the current study area traffic conditions;
- ▶ forecast the additional traffic generated by the proposed development;
- ▶ analyze the impacts of this additional traffic on the study area street network; and
- ▶ recommend any necessary remedial measures required to mitigate these impacts.

The study scope developed in consultation with the Town of Minto and the County of Wellington via e-mail in June 2019 is aimed at evaluating the anticipated traffic impact of the proposed development and includes:

- ▶ AM and PM peak hour traffic conditions analyses for existing (2019), 2034 background (without development) and 2034 total (with development) planning horizons;
- ▶ Adjacent street network assessments at the intersections of:
 - Elora Street and Anne Street;
 - Proposed intersection of John Street / North Site Access and Anne Street; and
 - Proposed intersection of Elora Street and East Site Access.
- ▶ Recommendations to mitigate anticipated traffic impacts, if required, at the above locations and the site accesses.





Study Area and Subject Development Location

Elora Street, Harriston TIS
190338

Figure 1.1

2 Existing Conditions

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

Figure 1.1 illustrates the subject site location.

2.1 Road Network

The main roads near the subject site considered in assessing the traffic impacts of the development include:

- ▶ **Elora Street (County Road 109)**, is under the jurisdiction of the County of Wellington. For the purposes of this study, the road is considered to be oriented north/south. The road has a 2-lane urban cross-section, sidewalk facilities on both sides of the road, and a posted speed limit of 50 km/h throughout the study area;
- ▶ **Anne Street** is under the jurisdiction of the Town of Minto. For the purposes of this study, the road is considered to be oriented east/west. The road has a 2-lane urban cross-section with curbs on the north side of the road and a discontinuous sidewalk on the south side of the road. A posted speed limit of 50 km/h is present throughout the study area; and
- ▶ **John Street**, is under the jurisdiction of the Town of Minto. For the purposes of this study, the road is considered to be oriented north/south. The road has a 2-lane urban cross-section, sidewalk facilities the east side of the road, and a posted speed limit of 50 km/h throughout the study area.

Figure 2.1 illustrates the existing lane configuration and traffic control at study area intersections.

2.2 Transit Service

There is currently no transit service available within the study area.

2.3 Traffic Volumes

Figure 2.2 displays the existing AM and PM weekday peak hour turning movement traffic volumes collected in June 2019.

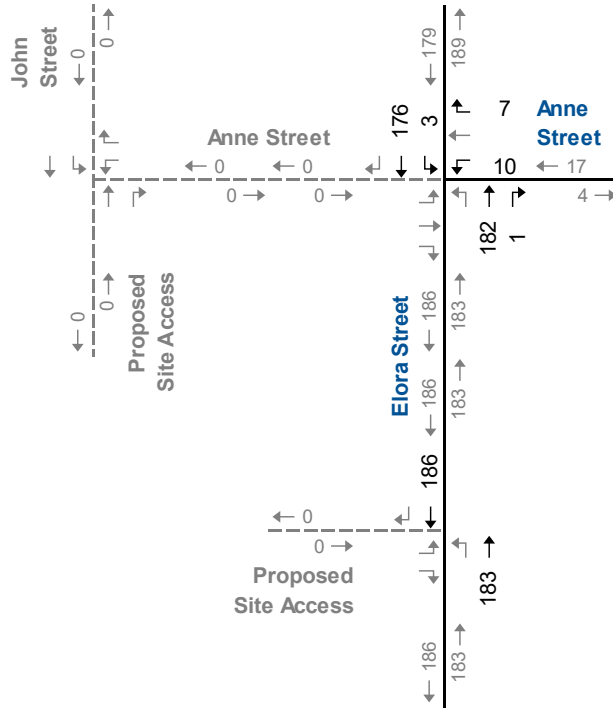


Appendix A contains the detailed traffic counts for study area intersections.

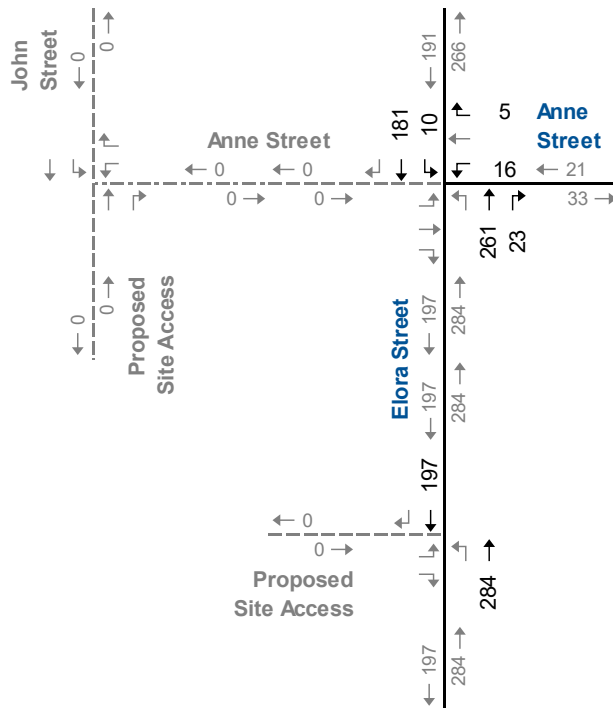




AM Peak Hour



PM Peak Hour



2019 Existing Peak Hour Traffic Volumes

2.4 Traffic Operations

The operations of the intersections in the study area were evaluated with the 2019 base year volumes using Synchro 9. The intersection analysis considered the following measures of effectiveness:

- ▶ The volume-to-capacity ratio for each movement and intersection;
- ▶ The LOS, based on the average control delay for each vehicle, for each turning movement; and
- ▶ The estimated 95th percentile queue length(s).

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

Table 2.1 summarizes the existing intersection operations. The entries in the table indicating the AM and PM peak hour level of service (LOS), volume to capacity ratios (V/C), and 95th percentile queues experienced.

All intersections are forecast to operate within acceptable levels, with no specific problem movements under existing traffic conditions.

Appendix B contains the detailed Synchro 9 reports.



TABLE 2.1: 2019 EXISTING PEAK HOUR TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																OVERALL
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Elora Street & Anne Street	TWSC	LOS Delay V/C 95th Storage Avail.					B 10 0.03 1 - -	> > > > > >	B 10		A 0 0.12 0 - -	> > > > > >	A 0	A 8 0.00 0 45 45	A 0 0.11 0 - -		A 0		
PM Peak Hour	Elora Street & Anne Street	TWSC	LOS Delay V/C 95th Storage Avail.					B 12 0.04 1 - -	> > > > > >	B 12		A 0 0.18 0 - -	> > > > > >	A 0	A 8 0.01 0 45 45	A 0 0.12 0 - -		A 0		

TWSC - Two-Way Stop Control
 TCS - Traffic Control Signal
 MOE - Measure of Effectiveness
 LOS - Level of Service

V/C - Volume to Capacity Ratio
 95th - 95th Percentile Queue Length
 Storage - Existing Storage (m)

Avail. - Available Storage (m)
 > - Shared Right-Turn Lane
 < - Shared Left-Turn Lane



3 Development Concept

3.1 Development Description

The subject site is located on the west side of Elora Street at the southern terminus of John Street in the community of Harriston, Town of Minto, County of Wellington. The site is bounded by single-family dwellings to the north, a creek to the west, agricultural land to the south, and Elora Street to the east.

The proposed development consists of approximately:

- ▶ 77 single family dwellings;
- ▶ 22 semi-detached dwellings; and
- ▶ 30 townhouses.

The proposed development is anticipated to be developed with the following phasing:

- ▶ **Phase 1** includes the John Street and Anne Street extensions, as well the construction of Street C to the storm pond. The expected timing for build-out is 5-7 years;
- ▶ **Phase 2** includes the construction of Street B and Street D, and the East Site Access connection to Elora Street. The expected timing of build-out is 10-12 years; and
- ▶ **Phase 3** includes the remainder of the development. The expected build-out is 10-15 years.

Vehicular access is proposed by two new municipal roadway connections. Anne Street will be extended westerly to form a T-intersection with John Street, which will be extended southerly into the subject site. A second site access is proposed on Elora Street south of the Jessie Street intersection.

For forecasting purposes, the development is expected to be completed at the end of the 15 year period.

Figure 3.1 shows the development concept.

3.2 Development Trip Generation

The Institute of Transportation Engineers (ITE) Trip Generation Manual¹ provides rates and equations used to estimate the peak hour

¹ *Trip Generation Tenth Edition*, Institute of Transportation Engineers, 2017



traffic volumes generated by the Land Use Codes (LUC) of this development:

- ▶ LUC 210 (Single Family Housing); and
- ▶ LUC 220 (Multifamily Housing, Low Rise).

Due to lack of public transit options and as the development only consists of residential dwellings, no trip reductions were applied.

Table 3.1 summarizes the forecast number of net new trips generated by the proposed development.

TABLE 3.1: SITE GENERATED TRIP ESTIMATES

Land Use Code	Number of Units	Formula or Rate	AM Peak Hour			PM Peak Hour				
			Rate per Unit	In	Out	Total	Rate per Unit	In	Out	Total
210: Single Family Housing	99 Units	Formula	0.76	19	56	75	1.02	63	37	100
220: Multifamily Housing (Low Rise)	30 Units	Formula	0.51	3	12	15	0.67	13	7	20
Total Net Trips				22	68	90		76	44	120

3.3 Development Trip Distribution and Assignment

Given that the proposed development and the nearby area primarily consists of residential dwellings, the trip assignment and distribution was based on existing travel patterns of the study area. **Table 3.2** displays the breakdown of trip distributions used in this study.

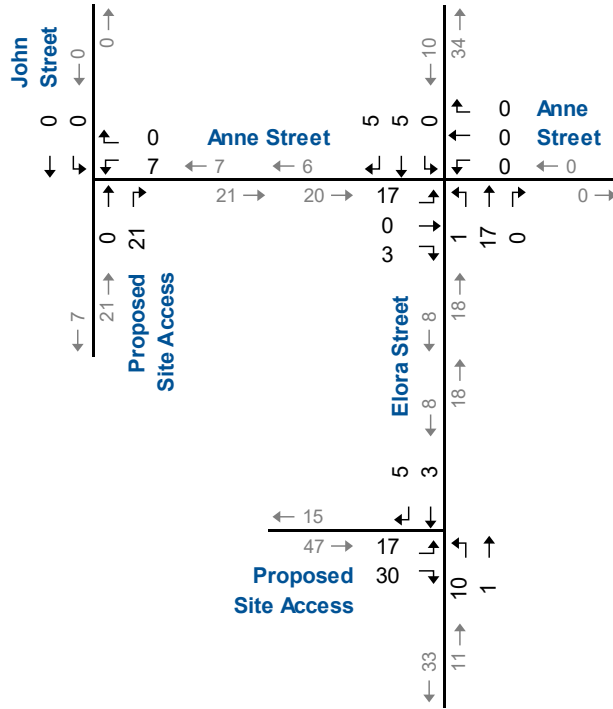
TABLE 3.2: ESTIMATED PEAK HOUR TRIP DISTRIBUTION

Direction of Travel on Elora Street	AM Peak Hour	PM Peak Hour
Northbound	51%	60%
Southbound	49%	40%

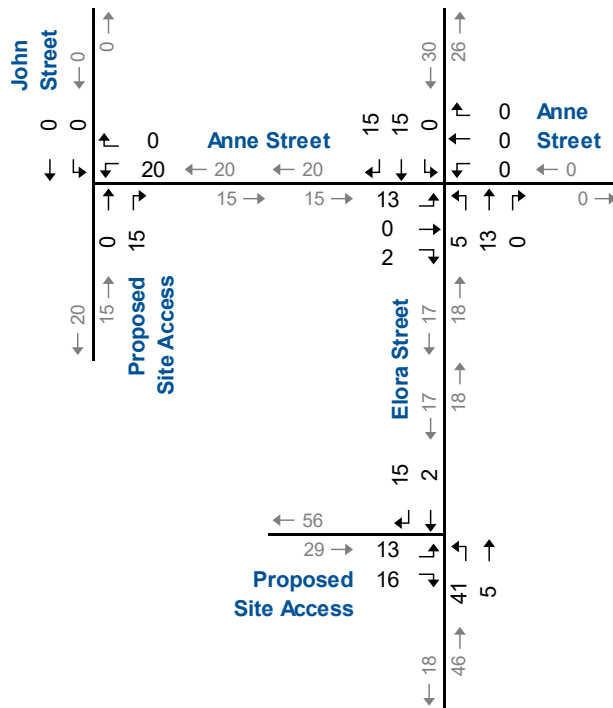
Figure 3.2 illustrates the site generated traffic volumes for the AM and PM peak hours.



AM Peak Hour



PM Peak Hour



Site Generated Peak Hour Traffic Volumes

4 Evaluation of Future Traffic Conditions

The assessment of future traffic conditions contained in this section includes estimates of future background and total traffic volumes, and the analyses for the 2034 horizon, the year of expected. The future traffic volumes in the vicinity of the development will likely consist of increased non-site traffic volumes (background traffic), traffic generated by other developments, and the traffic forecast to be generated by the proposed development.

4.1 Forecast Traffic Volumes

4.1.1 General Background Growth

The non-site traffic increase is the generalized traffic growth in the County of Wellington. The generalized growth is anticipated to follow the average increase in population within the area. The County of Wellington confirmed a growth rate of 1.5% per annum to forecast the background traffic.

4.1.2 Other Developments

During pre-study consultations, Paradigm requested information from known development applications within the community of Harriston. No other developments were identified by the Town of Minto.

4.2 2034 Background Traffic Operations

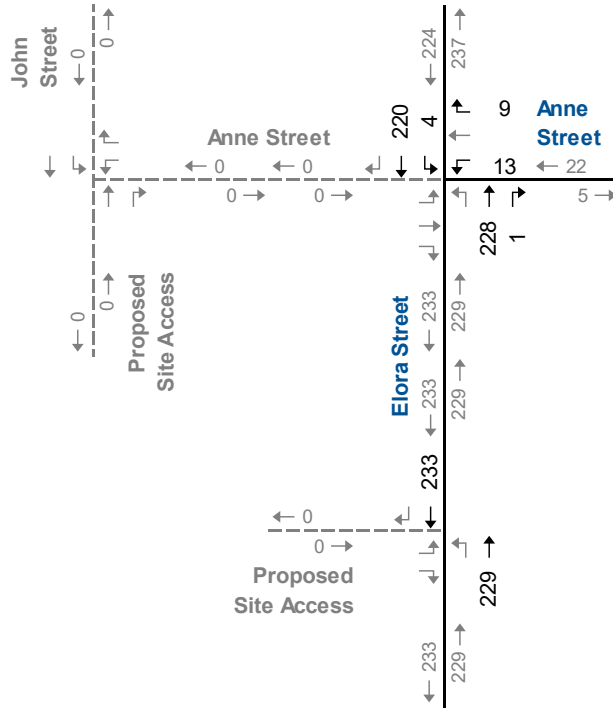
Figure 4.1 details the complete 2034 background traffic volumes.

The study area intersection operations analyses for the background traffic scenario followed the same methodology used for existing traffic conditions. **Table 4.1** details the level of service conditions. All intersections are forecast to operate within acceptable levels, with no specific problem movements under 2034 background traffic conditions.

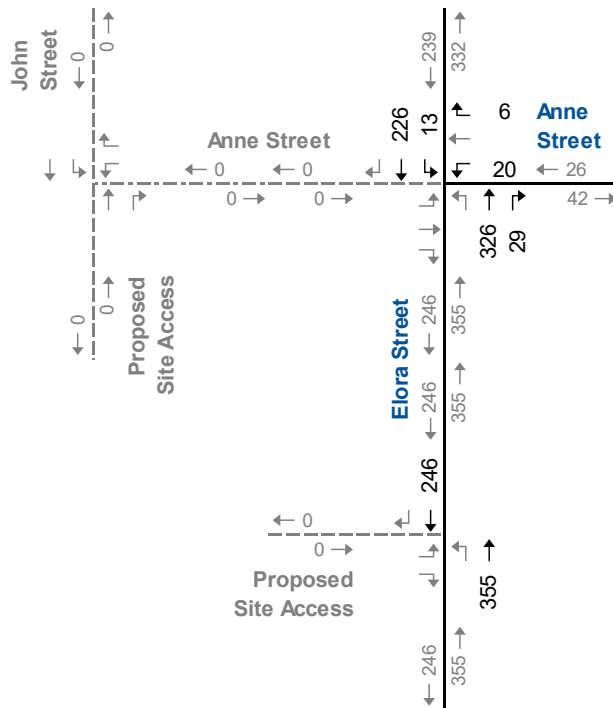
Appendix C contains the detailed Synchro 9 reports.



AM Peak Hour



PM Peak Hour



2034 Background Peak Hour Traffic Volumes

TABLE 4.1: 2034 BACKGROUND TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				OVERALL
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Elora Street & Anne Street	TWSC	LOS Delay V/C 95th Storage Avail.					B 11 0.04 1 - -		> > > > >	B 11		A 0 0.15 0 - -	> > > > >	A 0	A 8 0.00 0 45 45	A 0 0.14 0 - -		A 0	
PM Peak Hour	Elora Street & Anne Street	TWSC	LOS Delay V/C 95th Storage Avail.					B 13 0.06 2 - -		> > > > >	B 13		A 0 0.23 0 - -	> > > > >	A 0	A 8 0.01 0 45 45	A 0 0.14 0 - -		A 0	

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 MOE - Measure of Effectiveness
 LOS - Level of Service

V/C - Volume to Capacity Ratio
 95th - 95th Percentile Queue Length
 Storage - Existing Storage (m)

Avail. - Available Storage (m)
 > - Shared Right-Turn Lane
 < - Shared Left-Turn Lane



4.3 2034 Total Horizon

4.3.1 Rerouted Existing Traffic Volumes Resulting from the John Street and Anne Street Extensions

Under existing conditions, residents living on John Street, Margaret Street, and Lorne Street south of Pellister Street must use Pellister Street to access Elora Street. However, upon completion of the John Street and Anne Street extensions, residents will be able to access Elora Street via Anne Street.

Based on existing conditions, it is estimated that 46 nearby residential dwellings will use the proposed extensions of John Street and Anne Street. The trips forecast to be rerouted by the proposed road extensions are shown in **Table 4.2**.

TABLE 4.2: REROUTED TRAFFIC TRIP GENERATION ESTIMATES

Land Use Code	Number of Units	Formula or Rate	AM Peak Hour			PM Peak Hour				
			Rate per Unit	In	Out	Total	Rate per Unit	In	Out	Total
210: Single Family Housing	46 Units	Formula	0.81	9	28	37	1.05	30	18	48
Total Net Trips				9	28	37		30	18	48

It is forecast that all 46 dwellings will use Anne Street when travelling to / from the south on Elora Street. However, only 11 dwellings (the houses along Lorne Street) are forecast to use Anne Street when travelling to / from the north on Elora Street. **Figure 4.2** illustrates the trips rerouted by the John Street and Anne Street extensions while applying the same trip distributions used for the site generated trips.

4.3.2 2034 Total Traffic Operations

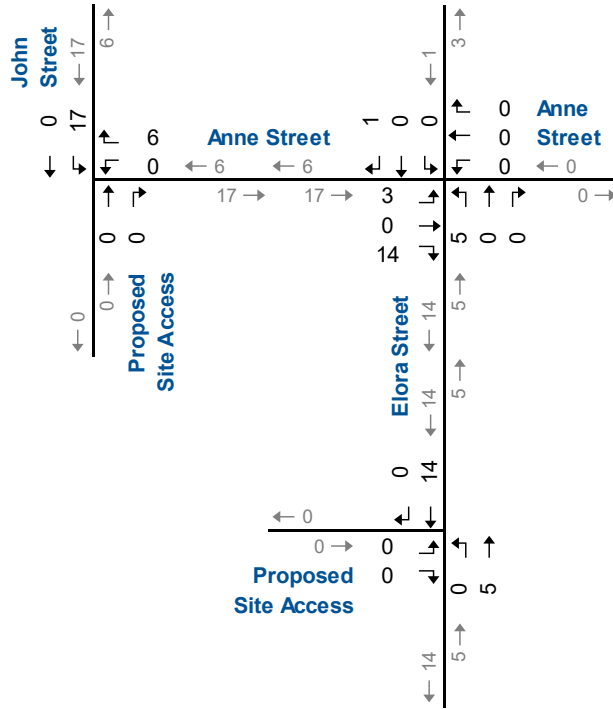
Figure 4.3 displays the forecast 2034 total traffic volumes, which includes the development traffic, general background traffic, and the additional traffic rerouted from the John Street and Anne Street extension.

The study area intersection operations analyses for the total traffic scenario followed the same methodology used for existing traffic conditions. **Table 4.3** details the level of service conditions. All intersections are forecast to operate within acceptable levels, with no specific problem movements under 2034 total traffic conditions.

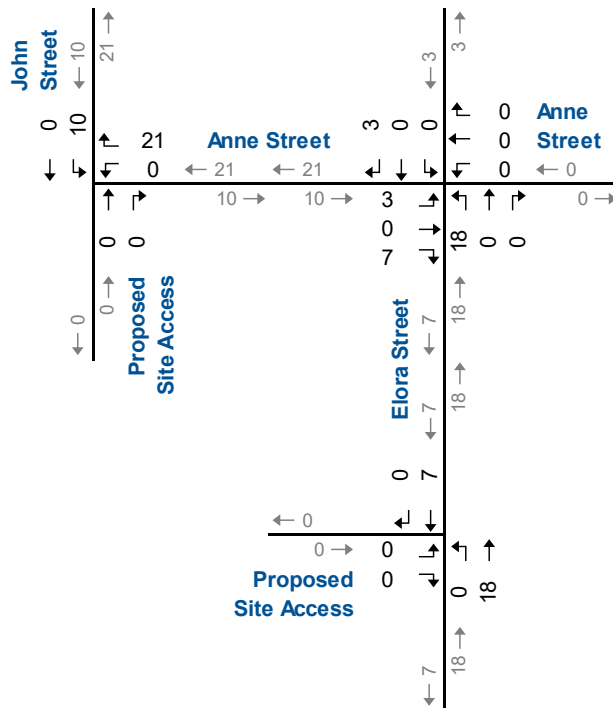
Appendix D contains the detailed Synchro 9 reports.



AM Peak Hour

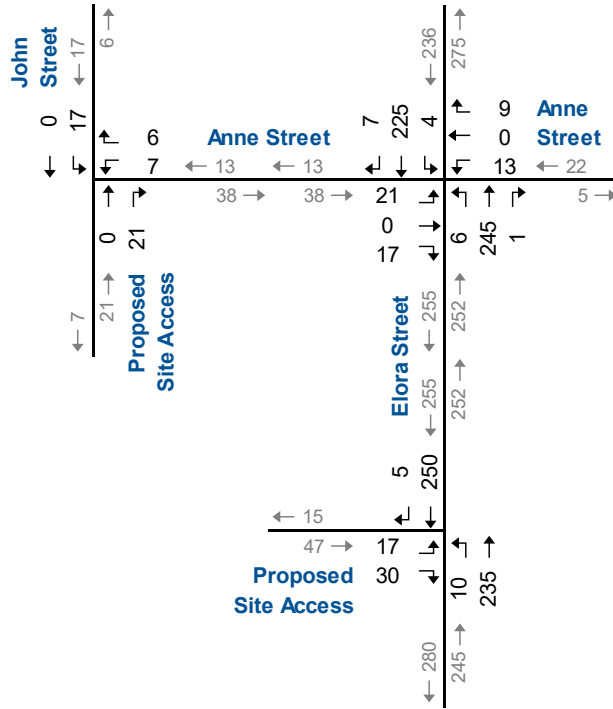


PM Peak Hour

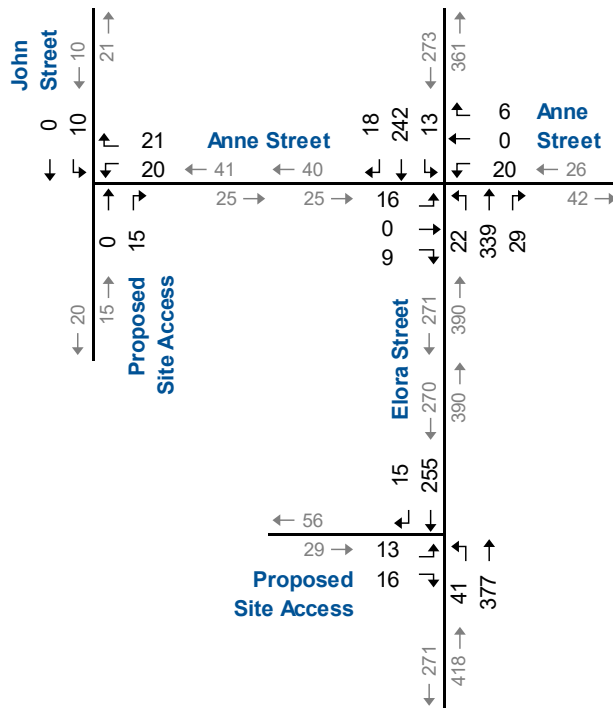


Rerouted Peak Hour Volumes from John Street and Anne Street Extensions

AM Peak Hour



PM Peak Hour



2034 Total Peak Hour Traffic Volumes

TABLE 4.3: 2034 TOTAL TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																OVERALL
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Elora Street & Anne Street	TWSC	LOS	<	B	>	B	<	B	>	B	<	A	>	A	A	>	A		
			Delay	<	12	>	12	<	12	>	12	<	0	>	0	8	0	>	0	
			V/C	<	0.07	>	0.04	<	0.00	>	0.00	<	0.00	>	0.00	0.15	>	0		
John Street / North Site Access & Anne Street	TWSC	LOS					A		>	A		A		>	A	<	A			
		Delay					9		>	9		0		>	0	<	7			
		V/C					0.01		>	0.01		0.01		>	<	0.01	<	0		
Elora Street & East Site Access	TWSC	LOS	B		>	B						<	A		A	>	A			
		Delay	11		>	11					<	0		0	>	0	>	0		
		V/C	0.08		>						<	0.01			0.16	>				
PM Peak Hour	Elora Street & Anne Street	TWSC	LOS	<	B	>	B	<	C	>	C	<	A	>	A	A	>	A		
			Delay	<	14	>	14	<	16	>	16	<	1	>	1	8	0	>	0	
			V/C	<	0.06	>	0.08	<	0.02	>	0.02	<	0.01	>	0.01	0.17	>			
John Street / North Site Access & Anne Street	TWSC	LOS					A		>	A		A		>	A	<	A			
		Delay					9		>	9		0		>	0	<	7			
		V/C					0.04		>	0.01		0.01		>	<	0.01	<	0		
Elora Street & East Site Access	TWSC	LOS	B		>	B						<	A		A	>	A			
		Delay	13		>	13					<	1		0	>	0	>	0		
		V/C	0.06		>						<	0.03			0.17	>				
Elora Street & East Site Access	TWSC	LOS	B		>	B						<	A		A	>	A			
		Delay	13		>	13					<	1		0	>	0	>	0		
		V/C	0.06		>						<	0.03			0.17	>				
Elora Street & East Site Access	TWSC	LOS	B		>	B						<	A		A	>	A			
		Delay	13		>	13					<	1		0	>	0	>	0		
		V/C	0.06		>						<	0.03			0.17	>				
Elora Street & East Site Access	TWSC	LOS	B		>	B						<	A		A	>	A			
		Delay	13		>	13					<	1		0	>	0	>	0		
		V/C	0.06		>						<	0.03			0.17	>				
Elora Street & East Site Access	TWSC	LOS	B		>	B						<	A		A	>	A			
		Delay	13		>	13					<	1		0	>	0	>	0		
		V/C	0.06		>						<	0.03			0.17	>				

TWSC - Two-Way Stop Control

TCS - Traffic Control Signal

MOE - Measure of Effectiveness

LOS - Level of Service

V/C - Volume to Capacity Ratio

95th - 95th Percentile Queue Length

Storage - Existing Storage (m)

Avail. - Available Storage (m)

> - Shared Right-Turn Lane

< - Shared Left-Turn Lane



5 Remedial Measures

5.1 Left-turn Lanes

The Ministry of Transportation's Design Supplement to the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads² provides guidance on the assessment of and/or need for auxiliary left-turn lanes at intersections. The warrant nomograph is used to determine if a left-turn lane is needed based on the following criteria:

- ▶ Design speed of the road (posted speed + 10 km/h);
- ▶ Advancing Volume;
- ▶ Opposing Volume; and
- ▶ Percent of advancing vehicles performing a left-turn maneuver.

The following minimum thresholds must be met for a left-turn lane to be assessed:

- ▶ Greater than 100 vehicles per hour (vph) opposing vehicles; and
- ▶ Greater than 2.5% of advancing vehicles making a left-turn maneuver, as the left-turning vehicle percentage is rounded to the nearest 5.0%.

The following movements exceeded the above thresholds and were analyzed using the nomographs for left-turn lanes on two-lane undivided highways at unsignalized intersections:

- ▶ Southbound left-turns on Elora Street at Anne Street;
- ▶ Northbound left-turns on Elora Street at Anne Street; and
- ▶ Northbound left-turns on Elora Street at the East Site Access.

The results indicate that left-turn lanes are not warranted on study area intersections based on 2034 total volumes. The warrant nomographs used in the analyses are included in **Appendix E**.

However, it is noted that a southbound left-turn lane already exists on Elora Street South at Anne Street, which includes a widened section of Elora Street South on the south leg. While it is not painted as such, it is essentially a shadow lane opposite of the southbound left-turn lane. The County of Wellington should consider using this shadow lane

² Transportation Association of Canada, *MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads – Appendix 9A*, Ministry of Transportation of Ontario, 2017.



width to formalize a short northbound left-turn lane on Elora Street South at Anne Street.

5.2 Sensitivity Analysis – Phase 1 Impact on Study Area

Until the construction of the East Site Access in Phase 2, all the Phase 1 site generated volumes are forecast to use the Elora Street and Anne Street intersection.

The Phase 1 traffic operations were assessed following the same methodology used in the rest of this study. The Phase 1 site generated traffic volumes were added to the 2034 background volumes to assess the impacts of this scenario. Additionally, the need for a northbound left-turn lane on Elora Street at Anne Street was assessed using MTO left-turn lane nomographs.

The results indicate that the study area intersections are forecast to operate within acceptable levels with no specific problem movements, and a left-turn lane is not warranted under 2034 total traffic conditions.

Appendix F contains the detailed Synchro 9 reports and the warrant nomographs.



6 Conclusions and Recommendations

6.1 Conclusions

Based on the investigations carried out, it is concluded that:

- ▶ Under existing 2019 traffic conditions, all turning movements at all study area intersections operate within acceptable levels;
- ▶ The development is forecast to generate 90 and 120 new trips during the AM and PM peak hours, respectively;
- ▶ Under 2034 background traffic conditions, all turning movements at all study area intersections are forecast to operate within acceptable levels;
- ▶ Under 2034 total traffic conditions, all turning movements at all study area intersections are forecast to operate within acceptable levels;
- ▶ Left-turn lanes are not forecast to be warranted on study area roads under 2034 total volumes during the AM or PM peak hours;
- ▶ Under the scenario with all Phase 1 traffic using the Elora Street and Anne Street intersection to access the development a second access is constructed in Phase 2, all turning movements at all study area intersections are forecast to operate within acceptable levels and left-turn lanes are not warranted; and
- ▶ The County of Wellington should consider implementing a northbound left-turn lane on Elora Street South at Anne Street, to occupy the space created by the shadow lane opposite of the existing southbound left-turn lane at this intersection. Since a left-turn lane is not forecast to be warranted, this is not a requirement, but a suggestion to be considered. As the left-turn is not forecast to be warranted, any left-turn lane implemented should therefore not be the responsibility of the developer.

6.2 Recommendations

Based on the findings of this study, it is recommended that the site be approved as planned with no conditions related to off-site transportation improvements.



Appendix A

Existing Traffic Counts





Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@pts.com

Count Name: Elora Street South & Anne Street
Site Code:
Start Date: 06/19/2019
Page No: 1

Turning Movement Data

Start Time	Anne Street Westbound					Elora Street South Northbound					Elora Street South Southbound					Int. Total
	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	
7:00 AM	3	0	0	2	3	26	2	0	0	28	1	37	0	0	38	69
7:15 AM	8	1	0	1	9	29	1	0	0	30	1	45	0	0	46	85
7:30 AM	1	2	0	1	3	34	0	0	0	34	0	50	0	0	50	87
7:45 AM	1	3	0	0	4	44	1	0	0	45	0	50	0	0	50	99
Hourly Total	13	6	0	4	19	133	4	0	0	137	2	182	0	0	184	340
8:00 AM	5	3	0	0	8	36	5	0	0	41	1	38	0	0	39	88
8:15 AM	1	1	0	0	2	35	0	0	0	35	0	40	0	0	40	77
8:30 AM	0	1	0	0	1	45	1	0	0	46	1	46	0	0	47	94
8:45 AM	4	2	0	1	6	54	0	0	0	54	0	48	0	0	48	108
Hourly Total	10	7	0	1	17	170	6	0	0	176	2	172	0	0	174	367
9:00 AM	2	4	0	1	6	37	0	0	0	37	0	45	0	0	45	88
9:15 AM	4	0	0	0	4	46	0	0	0	46	2	37	0	0	39	89
9:30 AM	1	2	0	0	3	41	2	0	0	43	2	39	0	0	41	87
9:45 AM	3	0	0	0	3	42	0	0	0	42	2	46	0	0	48	93
Hourly Total	10	6	0	1	16	166	2	0	0	168	6	167	0	0	173	357
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30 AM	1	2	0	0	3	47	4	0	0	51	1	43	0	0	44	98
11:45 AM	2	1	0	1	3	44	4	0	0	48	0	35	0	0	35	86
Hourly Total	3	3	0	1	6	91	8	0	0	99	1	78	0	0	79	184
12:00 PM	3	1	0	0	4	57	1	0	0	58	2	46	0	0	48	110
12:15 PM	5	1	0	0	6	40	6	0	0	46	1	30	0	0	31	83
12:30 PM	4	2	0	0	6	48	1	0	0	49	1	37	0	0	38	93
12:45 PM	7	2	0	0	9	35	3	0	0	38	1	63	0	0	64	111
Hourly Total	19	6	0	0	25	180	11	0	0	191	5	176	0	0	181	397
1:00 PM	4	2	0	0	6	50	2	0	0	52	1	51	0	0	52	110
1:15 PM	2	1	0	1	3	55	2	0	0	57	3	40	0	0	43	103
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	6	3	0	1	9	105	4	0	0	109	4	91	0	0	95	213
3:00 PM	1	2	0	0	3	34	1	0	0	35	2	43	0	0	45	83
3:15 PM	2	2	0	1	4	56	3	0	0	59	2	29	0	0	31	94
3:30 PM	2	2	0	0	4	51	4	0	0	55	2	43	0	0	45	104
3:45 PM	4	2	0	0	6	69	5	0	0	74	1	51	0	0	52	132
Hourly Total	9	8	0	1	17	210	13	0	0	223	7	166	0	0	173	413
4:00 PM	4	2	0	0	6	68	6	0	0	74	2	50	0	0	52	132
4:15 PM	4	2	0	2	6	69	3	0	0	72	1	47	0	0	48	126
4:30 PM	6	2	0	1	8	59	4	0	0	63	4	30	0	0	34	105
4:45 PM	3	2	0	0	5	59	5	0	0	64	2	45	0	0	47	116
Hourly Total	17	8	0	3	25	255	18	0	0	273	9	172	0	0	181	479



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

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Count Name: Elora Street South & Anne Street
Site Code:
Start Date: 06/19/2019
Page No: 10

Appendix B

Synchro 2019 Existing Traffic Operations Reports



HCM Unsignalized Intersection Capacity Analysis
1: Elora Street & Anne Street

Existing AM Peak Hour
Elora Street, Harriston TIS

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	R	T	R	T	R
Traffic Volume (veh/h)	10	7	182	1	3	176
Future Volume (Veh/h)	10	7	182	1	3	176
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	8	198	1	3	191
Pedestrians	2					
Lane Width (m)	3.6					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None		None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	398	200			201	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	398	200			201	
IC, single (s)	6.4	6.2			4.4	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.5	
p0 queue free %	98	99			100	
cM capacity (veh/h)	609	844			1204	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	19	199	3	191		
Volume Left	11	0	3	0		
Volume Right	8	1	0	0		
cSH	690	1700	1204	1700		
Volume to Capacity	0.03	0.12	0.00	0.11		
Queue Length 95th (m)	0.7	0.0	0.1	0.0		
Control Delay (s)	10.4	0.0	8.0	0.0		
Lane LOS	B		A			
Approach Delay (s)	10.4	0.0	0.1			
Approach LOS	B					
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization		19.9%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
1: Elora Street & Anne Street

Existing PM Peak Hour
Elora Street, Harriston TIS

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	R	T	R	T	R
Traffic Volume (veh/h)	16	5	261	23	10	181
Future Volume (Veh/h)	16	5	261	23	10	181
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	5	284	25	11	197
Pedestrians	4					
Lane Width (m)	3.6					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None		None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	520	300			313	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	520	300			313	
IC, single (s)	6.4	6.2			4.1	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.2	
p0 queue free %	97	99			99	
cM capacity (veh/h)	514	741			1255	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	22	309	11	197		
Volume Left	17	0	11	0		
Volume Right	5	25	0	0		
cSH	552	1700	1255	1700		
Volume to Capacity	0.04	0.18	0.01	0.12		
Queue Length 95th (m)	1.0	0.0	0.2	0.0		
Control Delay (s)	11.8	0.0	7.9	0.0		
Lane LOS	B		A			
Approach Delay (s)	11.8	0.0	0.4			
Approach LOS	B					
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization		25.2%		ICU Level of Service	A	
Analysis Period (min)		15				

Appendix C

Synchro 2034 Background Traffic Operations Reports



HCM Unsignalized Intersection Capacity Analysis
1: Elora Street & Anne Street

2034 Background AM Peak Hour
Elora Street, Harrison TIS

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	R	T	R	T	T
Traffic Volume (veh/h)	12	8	227	1	3	220
Future Volume (Veh/h)	12	8	227	1	3	220
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	9	247	1	3	239
Pedestrians	2					
Lane Width (m)	3.6					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None		None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	494	250			250	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	494	250			250	
IC, single (s)	6.4	6.2			4.4	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.5	
p0 queue free %	98	99			100	
cM capacity (veh/h)	536	793			1153	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	22	248	3	239		
Volume Left	13	0	3	0		
Volume Right	9	1	0	0		
cSH	618	1700	1153	1700		
Volume to Capacity	0.04	0.15	0.00	0.14		
Queue Length 95th (m)	0.9	0.0	0.1	0.0		
Control Delay (s)	11.0	0.0	8.1	0.0		
Lane LOS	B		A			
Approach Delay (s)	11.0	0.0	0.1			
Approach LOS	B					
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			22.1%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
1: Elora Street & Anne Street

2034 Background PM Peak Hour
Elora Street, Harrison TIS

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	R	T	R	T	T
Traffic Volume (veh/h)	20	6	326	28	12	226
Future Volume (Veh/h)	20	6	326	28	12	226
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	7	354	30	13	246
Pedestrians	4					
Lane Width (m)	3.6					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None		None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	645	373			388	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	645	373			388	
IC, single (s)	6.4	6.2			4.1	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.2	
p0 queue free %	95	99			99	
cM capacity (veh/h)	434	675			1178	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	29	384	13	246		
Volume Left	22	0	13	0		
Volume Right	7	30	0	0		
cSH	475	1700	1178	1700		
Volume to Capacity	0.06	0.23	0.01	0.14		
Queue Length 95th (m)	1.6	0.0	0.3	0.0		
Control Delay (s)	13.1	0.0	8.1	0.0		
Lane LOS	B		A			
Approach Delay (s)	13.1	0.0	0.4			
Approach LOS	B					
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			28.9%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix D

Synchro 2034 Total Traffic Operations Reports



HCM Unsignalized Intersection Capacity Analysis
1: Elora Street & Anne Street

2034 Total AM Peak Hour
Elora Street, Harrison TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↔			↔			↔		↔			
Traffic Volume (veh/h)	20	0	17	12	0	8	5	244	1	3	225	6	
Future Volume (Veh/h)	20	0	17	12	0	8	5	244	1	3	225	6	
Sign Control	Stop			Stop			Free			Free			
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)	22	0	18	13	0	9	5	265	1	3	245	7	
Pedestrians	2												
Lane Width (m)	3.6												
Walking Speed (m/s)	1.2												
Percent Blockage	0												
Right turn flare (veh)													
Median type	None						None						
Median storage (veh)													
Upstream signal (m)													
pX, platoon unblocked													
vC, conflicting volume	539	532	248	546	536	268	252						268
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	539	532	248	546	536	268	252						268
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1						4.4
IC, 2 stage (s)													
IF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2						2.5
p0 queue free %	95	100	98	97	100	99	100						100
cM capacity (veh/h)	445	449	790	438	448	775	1313						1134
Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2								
Volume Total	40	22	271	3	252								
Volume Left	22	13	5	3	0								
Volume Right	18	9	1	0	7								
cSH	554	532	1313	1134	1700								
Volume to Capacity	0.07	0.04	0.00	0.00	0.15								
Queue Length 95th (m)	1.9	1.0	0.1	0.1	0.0								
Control Delay (s)	12.0	12.1	0.2	8.2	0.0								
Lane LOS	B	B	A	A									
Approach Delay (s)	12.0	12.1	0.2	0.1									
Approach LOS	B	B											
Intersection Summary													
Average Delay				1.4									
Intersection Capacity Utilization	26.9%			ICU Level of Service		A							
Analysis Period (min)	15												

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (North)/John Street & Anne Street

2034 Total AM Peak Hour
Elora Street, Harrison TIS

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Traffic Volume (veh/h)	6	5	0	20	17	0
Future Volume (Veh/h)	6	5	0	20	17	0
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	5	0	22	18	0
Pedestrians	2					
Lane Width (m)	3.6					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	47	11			22	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	47	11			22	
IC, single (s)	6.4	6.2			4.1	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			99	
cM capacity (veh/h)	952	1070			1593	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	12	22	18			
Volume Left	7	0	18			
Volume Right	5	22	0			
cSH	998	1700	1593			
Volume to Capacity	0.01	0.01	0.01			
Queue Length 95th (m)	0.3	0.0	0.3			
Control Delay (s)	8.7	0.0	7.3			
Lane LOS	A		A			
Approach Delay (s)	8.7	0.0	7.3			
Approach LOS	A					
Intersection Summary						
Average Delay			4.5			
Intersection Capacity Utilization	17.6%		ICU Level of Service		A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
3: Elora Street & Site Access (East)

2034 Total AM Peak Hour
Elora Street, Harriston TIS

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔	↔		↕	↕	
Traffic Volume (veh/h)	17	30	10	234	249	5
Future Volume (Veh/h)	17	30	10	234	249	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	33	11	254	271	5
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	550	274	276			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	550	274	276			
IC, single (s)	6.4	6.2	4.1			
IC, 2 stage (s)						
IF (s)	3.5	3.3	2.2			
p0 queue free %	96	96	99			
cM capacity (veh/h)	492	765	1287			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	51	265	276			
Volume Left	18	11	0			
Volume Right	33	0	5			
cSH	640	1287	1700			
Volume to Capacity	0.08	0.01	0.16			
Queue Length 95th (m)	2.1	0.2	0.0			
Control Delay (s)	11.1	0.4	0.0			
Lane LOS	B	A				
Approach Delay (s)	11.1	0.4	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		1.1				
Intersection Capacity Utilization		30.4%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
1: Elora Street & Anne Street

2034 Total PM Peak Hour
Elora Street, Harriston TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔		↔	↔	
Traffic Volume (veh/h)	15	0	9	20	0	6	22	339	28	12	241	18
Future Volume (Veh/h)	15	0	9	20	0	6	22	339	28	12	241	18
Sign Control		Stop			Stop			Free			Free	
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)	16	0	10	22	0	7	24	368	30	13	262	20
Pedestrians					4							
Lane Width (m)					3.6							
Walking Speed (m/s)					1.2							
Percent Blockage					0							
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	736	748	272	733	743	387	282			402		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	736	748	272	733	743	387	282			402		
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
IC, 2 stage (s)												
IF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	100	99	93	100	99	98			99		
cM capacity (veh/h)	323	330	767	325	332	663	1280			1164		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2							
Volume Total	26	29	422	13	282							
Volume Left	16	22	24	13	0							
Volume Right	10	7	30	0	20							
cSH	415	371	1280	1164	1700							
Volume to Capacity	0.06	0.08	0.02	0.01	0.17							
Queue Length 95th (m)	1.6	2.0	0.5	0.3	0.0							
Control Delay (s)	14.2	15.5	0.6	8.1	0.0							
Lane LOS	B	C	A	A								
Approach Delay (s)	14.2	15.5	0.6	0.4								
Approach LOS	B	C										
Intersection Summary												
Average Delay				1.5								
Intersection Capacity Utilization				47.8%		ICU Level of Service	A					
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (North)/John Street & Anne Street

2034 Total PM Peak Hour
Elora Street, Harrison TIS

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Traffic Volume (veh/h)	19	20	0	14	9	0
Future Volume (Veh/h)	19	20	0	14	9	0
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	22	0	15	10	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	28	8			15	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	28	8			15	
IC, single (s)	6.4	6.2			4.1	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.2	
p0 queue free %	98	98			99	
cM capacity (veh/h)	981	1075			1603	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	43	15	10			
Volume Left	21	0	10			
Volume Right	22	15	0			
cSH	1027	1700	1603			
Volume to Capacity	0.04	0.01	0.01			
Queue Length 95th (m)	1.0	0.0	0.2			
Control Delay (s)	8.7	0.0	7.3			
Lane LOS	A		A			
Approach Delay (s)	8.7	0.0	7.3			
Approach LOS	A					
Intersection Summary						
Average Delay			6.5			
Intersection Capacity Utilization		17.2%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
3: Elora Street & Site Access (East)

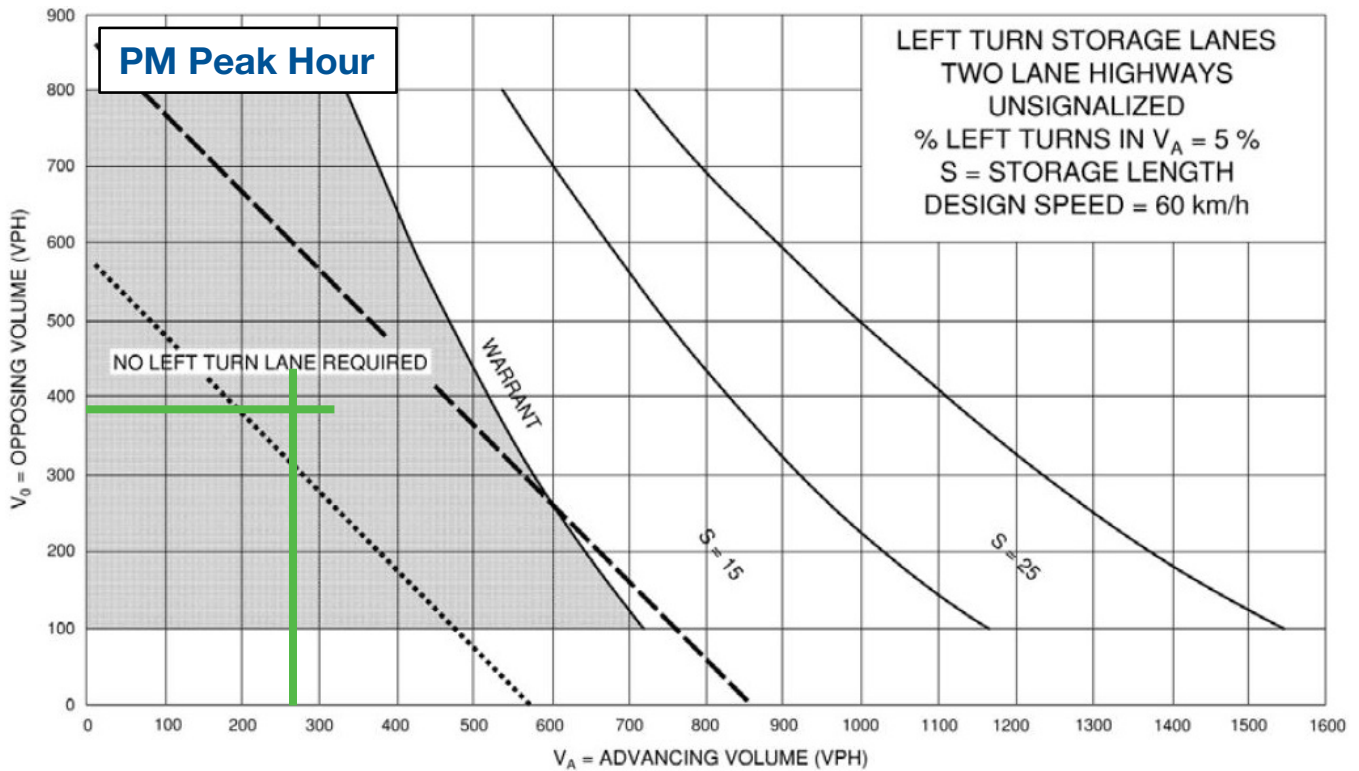
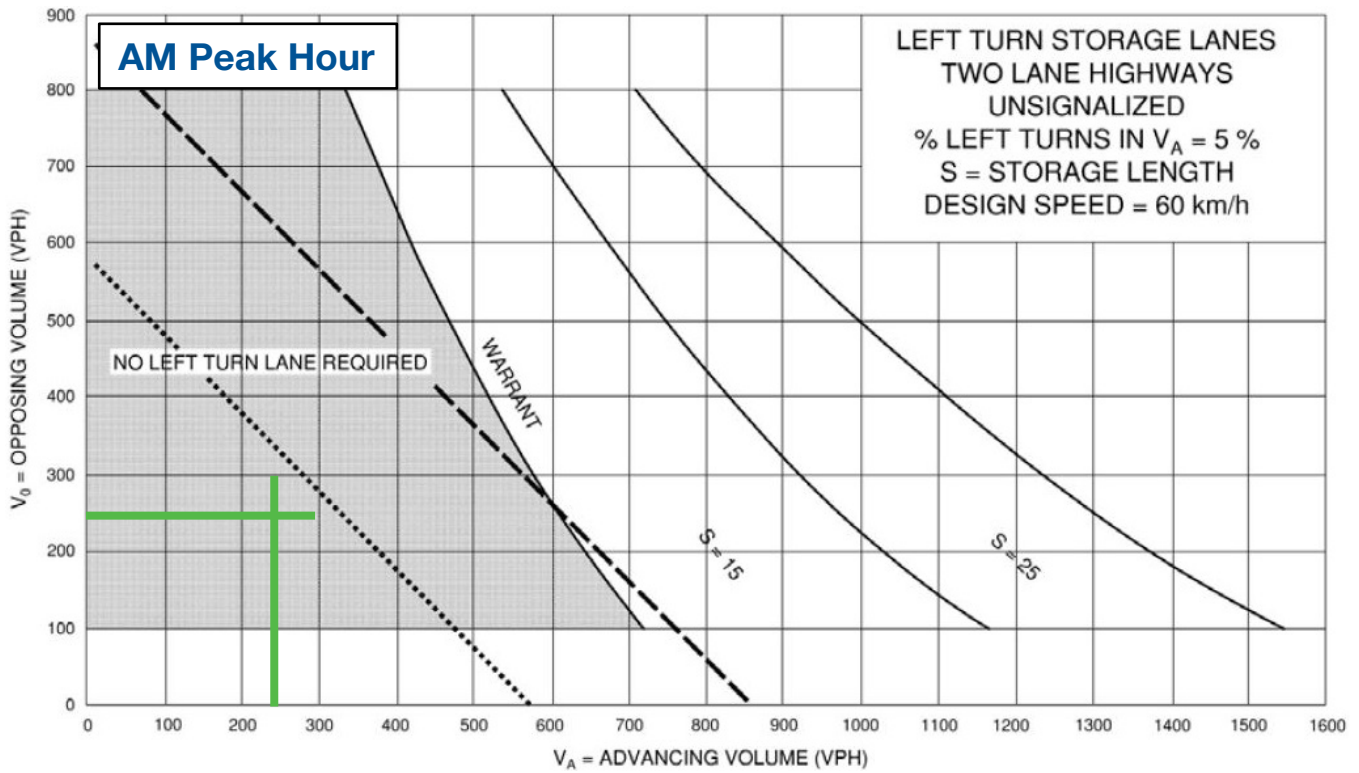
2034 Total PM Peak Hour
Elora Street, Harrison TIS

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	13	15	40	377	255	15
Future Volume (Veh/h)	13	15	40	377	255	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	16	43	410	277	16
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	781	285	293			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	781	285	293			
IC, single (s)	6.4	6.2	4.1			
IC, 2 stage (s)						
IF (s)	3.5	3.3	2.2			
p0 queue free %	96	98	97			
cM capacity (veh/h)	351	754	1269			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	30	453	293			
Volume Left	14	43	0			
Volume Right	16	0	16			
cSH	491	1269	1700			
Volume to Capacity	0.06	0.03	0.17			
Queue Length 95th (m)	1.6	0.8	0.0			
Control Delay (s)	12.8	1.1	0.0			
Lane LOS	B	A				
Approach Delay (s)	12.8	1.1	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization		49.7%		ICU Level of Service		A
Analysis Period (min)			15			

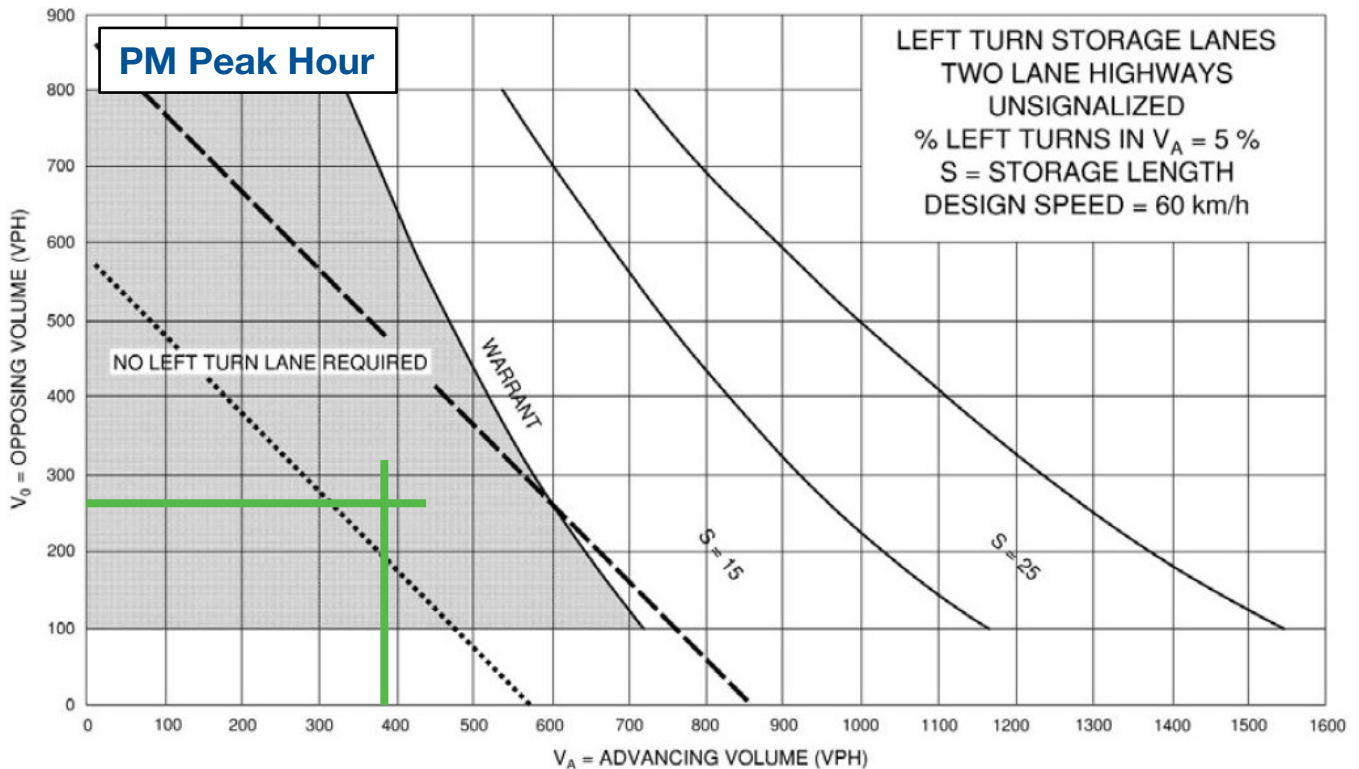
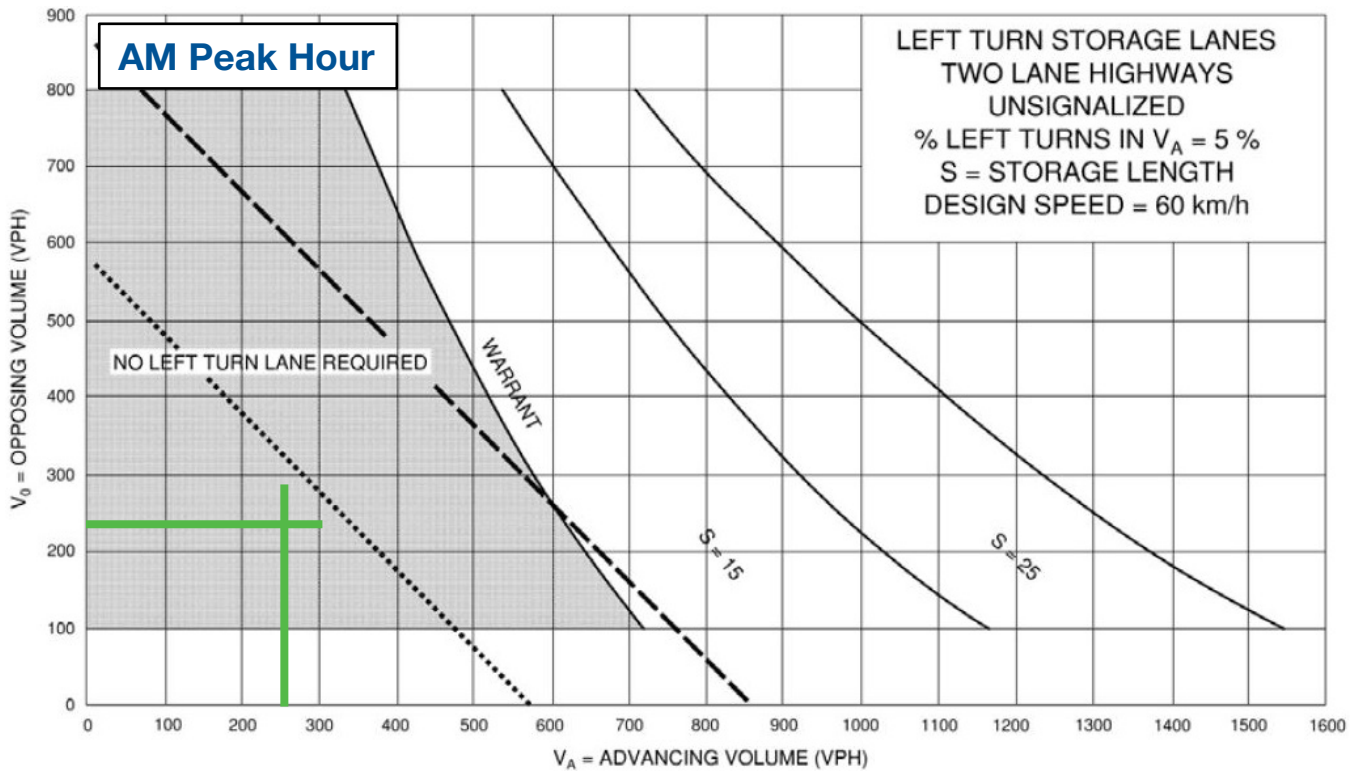
Appendix E

Left-Turn Lane Warrant Nomographs

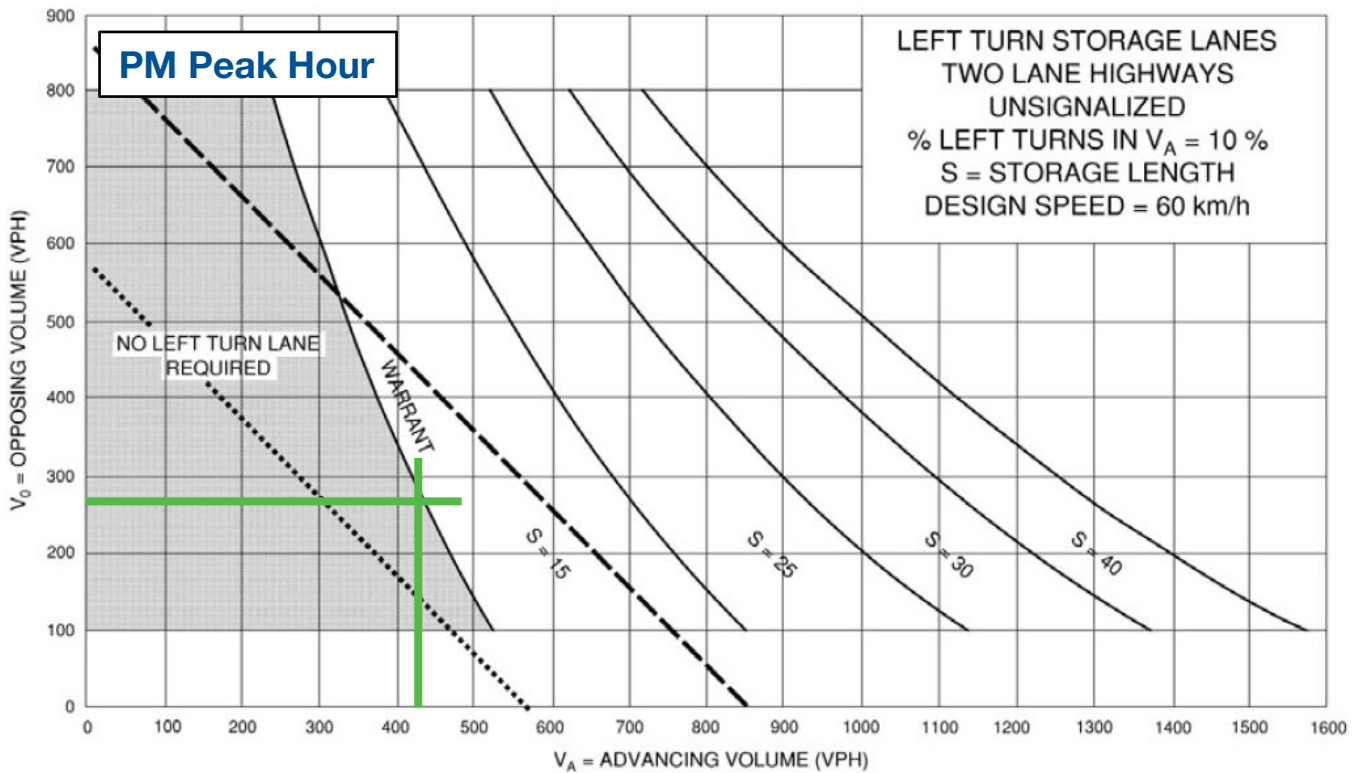
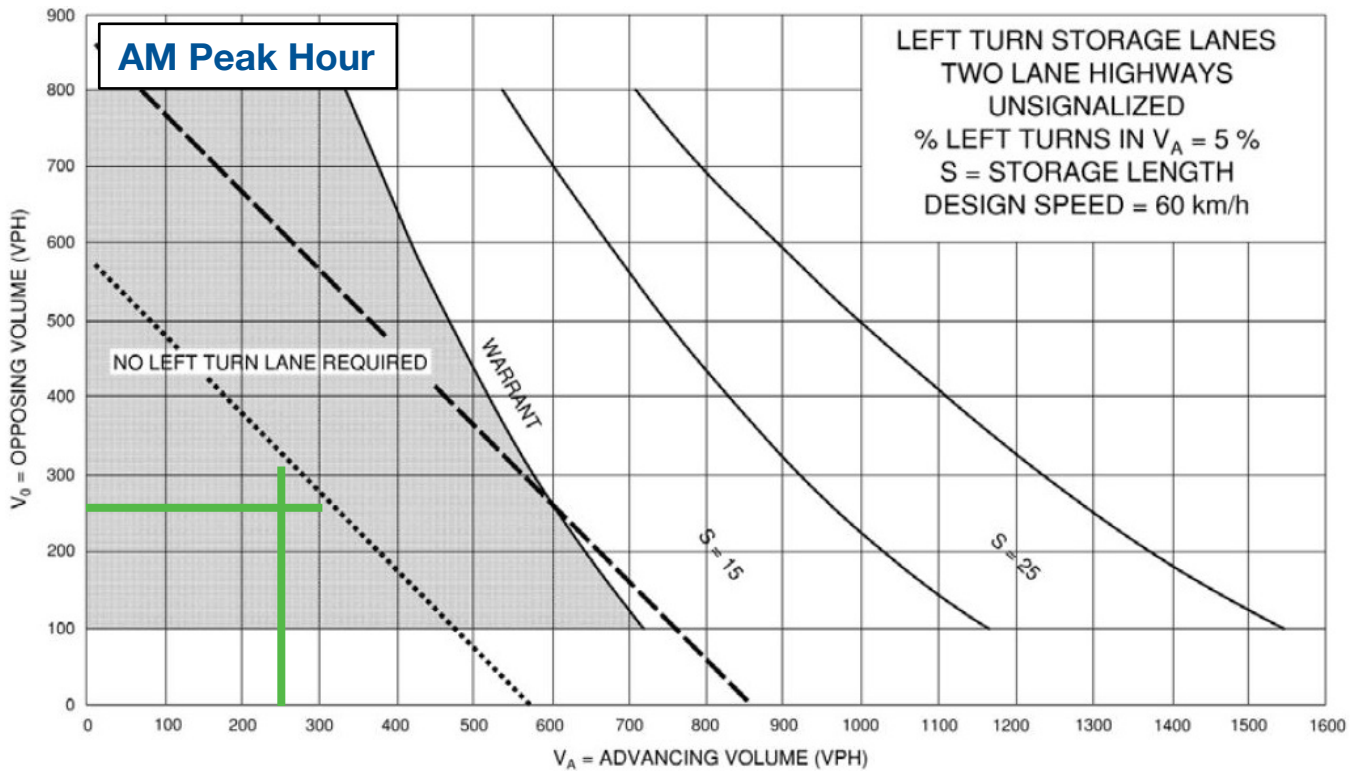




Left-Turn Lane Warrant Southbound Elora Street at Anne Street 2034 Total Horizon



Left-Turn Lane Warrant Northbound Elora Street at Anne Street 2034 Total Horizon



Left-Turn Lane Warrant
Northbound Elora Street at East Proposed Access
2034 Total Horizon (Phase 1)

Appendix F

Phase 1 Traffic Operations and Left-Turn Lane Warrant Nomographs



HCM Unsignalized Intersection Capacity Analysis
1: Elora Street & Anne Street

2034 Phase 1 Total AM Peak Hour
Elora Street, Harrison TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔		↔		
Traffic Volume (veh/h)	15	0	25	12	0	8	8	227	1	3	220	5
Future Volume (Veh/h)	15	0	25	12	0	8	8	227	1	3	220	5
Sign Control	Stop			Stop			Free			Free		
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)	16	0	27	13	0	9	9	247	1	3	239	5
Pedestrians	2											
Lane Width (m)	3.6											
Walking Speed (m/s)	1.2											
Percent Blockage	0											
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	522	516	242	540	518	250	244			250		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	522	516	242	540	518	250	244			250		
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.4		
IC, 2 stage (s)												
IF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.5		
p0 queue free %	96	100	97	97	100	99	99			100		
cM capacity (veh/h)	456	458	797	436	457	793	1322			1153		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2							
Volume Total	43	22	257	3	244							
Volume Left	16	13	9	3	0							
Volume Right	27	9	1	0	5							
cSH	624	535	1322	1153	1700							
Volume to Capacity	0.07	0.04	0.01	0.00	0.14							
Queue Length 95th (m)	1.8	1.0	0.2	0.1	0.0							
Control Delay (s)	11.2	12.0	0.3	8.1	0.0							
Lane LOS	B	B	A	A								
Approach Delay (s)	11.2	12.0	0.3	0.1								
Approach LOS	B	B										
Intersection Summary												
Average Delay				1.5								
Intersection Capacity Utilization	28.5%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (North)/John Street & Anne Street

2034 Phase 1 Total AM Peak Hour
Elora Street, Harrison TIS

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔		↔	↔
Traffic Volume (veh/h)	6	5	0	17	17	0
Future Volume (Veh/h)	6	5	0	17	17	0
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	5	0	18	18	0
Pedestrians	2					
Lane Width (m)	3.6					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	45	9			18	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	45	9			18	
IC, single (s)	6.4	6.2			4.1	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			99	
cM capacity (veh/h)	954	1073			1599	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	12	18	18			
Volume Left	7	0	18			
Volume Right	5	18	0			
cSH	1000	1700	1599			
Volume to Capacity	0.01	0.01	0.01			
Queue Length 95th (m)	0.3	0.0	0.3			
Control Delay (s)	8.6	0.0	7.3			
Lane LOS	A		A			
Approach Delay (s)	8.6	0.0	7.3			
Approach LOS	A					
Intersection Summary						
Average Delay				4.9		
Intersection Capacity Utilization	17.6%			ICU Level of Service		
Analysis Period (min)	15			A		

HCM Unsignalized Intersection Capacity Analysis
1: Elora Street & Anne Street

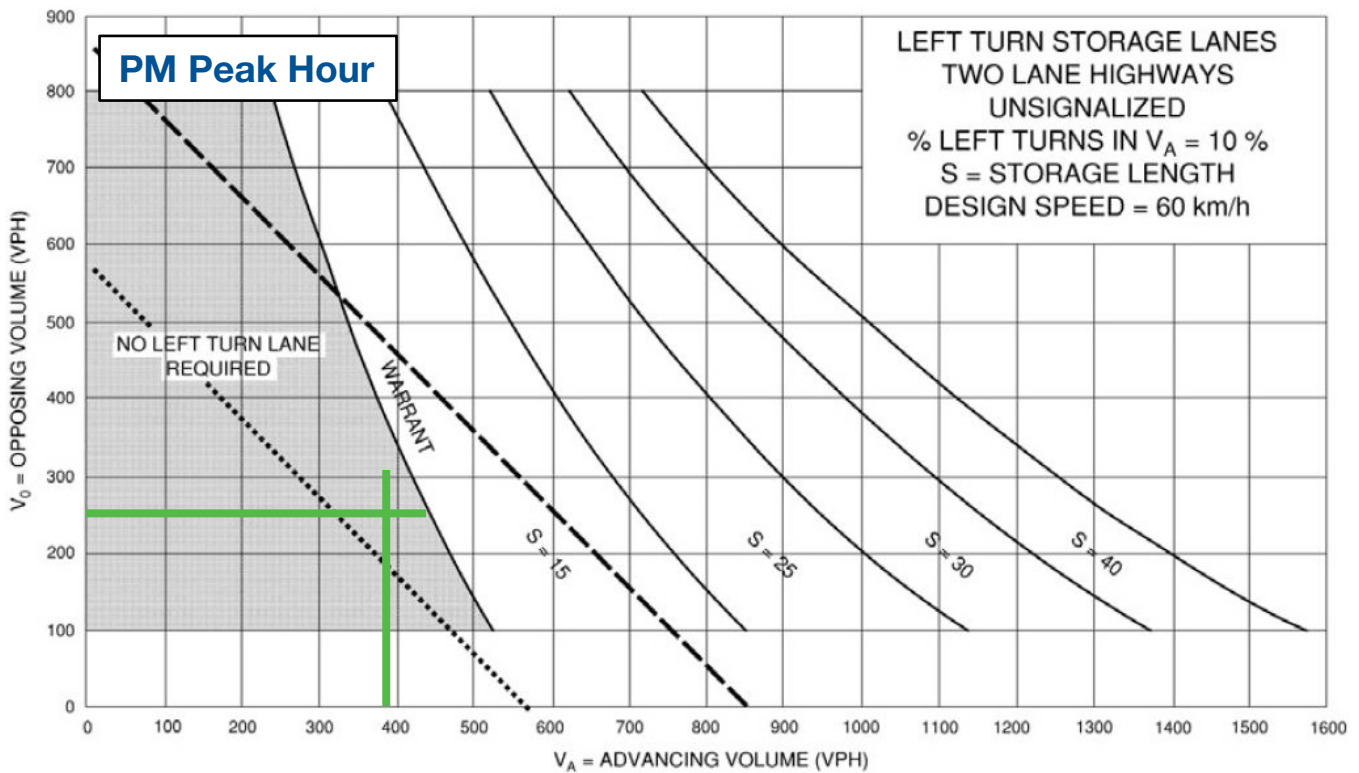
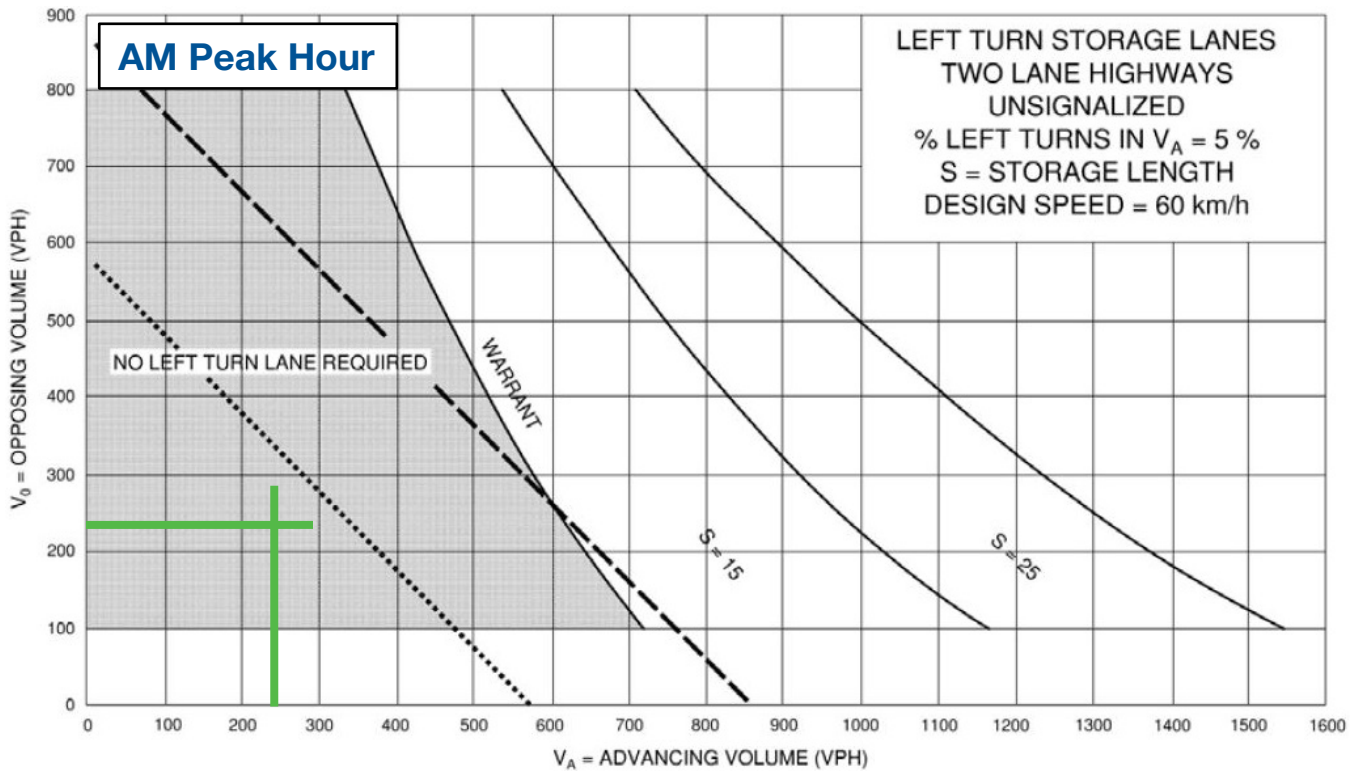
2034 Phase 1 Total PM Peak Hour
Elora Street, Harrison TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↔			↔			↔		↔			
Traffic Volume (veh/h)	12	0	14	20	0	6	35	326	28	12	226	14	
Future Volume (Veh/h)	12	0	14	20	0	6	35	326	28	12	226	14	
Sign Control	Stop			Stop			Free			Free			
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)	13	0	15	22	0	7	38	354	30	13	246	15	
Pedestrians	4												
Lane Width (m)	3.6												
Walking Speed (m/s)	1.2												
Percent Blockage	0												
Right turn flare (veh)													
Median type	None						None						
Median storage (veh)													
Upstream signal (m)													
pX, platoon unblocked													
vC, conflicting volume	732	744	254	736	736	373	261						388
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	732	744	254	736	736	373	261						388
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1						4.1
IC, 2 stage (s)													
IF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2						2.2
p0 queue free %	96	100	98	93	100	99	97						99
cM capacity (veh/h)	323	328	785	319	332	675	1303						1178
Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2								
Volume Total	28	29	422	13	261								
Volume Left	13	22	38	13	0								
Volume Right	15	7	30	0	15								
cSH	471	365	1303	1178	1700								
Volume to Capacity	0.06	0.08	0.03	0.01	0.15								
Queue Length 95th (m)	1.5	2.1	0.7	0.3	0.0								
Control Delay (s)	13.1	15.7	1.0	8.1	0.0								
Lane LOS	B	C	A	A									
Approach Delay (s)	13.1	15.7	1.0	0.4									
Approach LOS	B	C											
Intersection Summary													
Average Delay				1.8									
Intersection Capacity Utilization	46.9%			ICU Level of Service			A						
Analysis Period (min)	15												

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (North)/John Street & Anne Street

2034 Phase 1 Total PM Peak Hour
Elora Street, Harrison TIS

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Traffic Volume (veh/h)	20	20	0	11	9	0
Future Volume (Veh/h)	20	20	0	11	9	0
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	22	0	12	10	0
Pedestrians	0					
Lane Width (m)	3.6					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	26	6			12	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	26	6			12	
IC, single (s)	6.4	6.2			4.1	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.2	
p0 queue free %	98	98			99	
cM capacity (veh/h)	983	1077			1607	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	44	12	10			
Volume Left	22	0	10			
Volume Right	22	12	0			
cSH	1028	1700	1607			
Volume to Capacity	0.04	0.01	0.01			
Queue Length 95th (m)	1.1	0.0	0.2			
Control Delay (s)	8.7	0.0	7.3			
Lane LOS	A		A			
Approach Delay (s)	8.7	0.0	7.3			
Approach LOS	A					
Intersection Summary						
Average Delay				6.9		
Intersection Capacity Utilization	17.2%			ICU Level of Service		
Analysis Period (min)	15			A		



Left-Turn Lane Warrant
Northbound Elora Street at Anne Street
2034 Total Horizon (Phase 1 Single Access)