



613 Helena Street Town of Fort Erie Transportation Impact Study Update

Paradigm Transportation Solutions Limited
November 2022



Project Number
210371

Date: November 2022
Version 1.0.3

Client
SS Fort Erie Inc.
4080 Confederation Parkway Unit
605
Mississauga, ON

Client Contact
Hunain Siddiqui
President

Consultant Project Team
Stew Elkins, B.E.S.
Erica Bayley, P.Eng.
Scott Catton, C.E.T.
Andrew Orr, EIT

**Paradigm Transportation
Solutions Limited**
5A-150 Pinebush Road
Cambridge ON N1R 8J8
p: 519.896.3163
905.381.2229
416.479.9684
www.ptsl.com

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Executive Summary

Content

SS Fort Erie Inc. retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study (TIS), for a proposed townhouse development located at 613 Helena Street in the Town of Fort Erie.

This study determines the impacts of the development traffic on the surrounding road network and identifies the recommended improvements to accommodate the site generated traffic.

Development Concept

The subject site is located at 613 Helena Street in the Town of Fort Erie. The development concept includes 135 townhouse units.

Development and occupancy of the site is estimated to occur by Year 2024.

Vehicle access to the site is proposed via two new accesses to Helena Street.

Conclusions

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

- ▶ **Base Year Traffic Conditions:** The study area intersections are operating at acceptable levels of service and all movements are well within capacity during the weekday AM and PM peak hours. No critical movements are noted.
- ▶ **Site Trip Generation:** The proposed development is estimated to generate approximately 65 AM peak hour vehicle trips and 79 PM peak hour vehicle trips.
- ▶ **Background Traffic Conditions:** The study area intersections are forecast to operate at acceptable levels of service and all movements are well within capacity during the weekday AM and PM peak hours. No critical movements are noted.
- ▶ **Total Traffic Conditions:** The study area intersections are forecast to operate at acceptable levels of service and all movements are well within capacity during the weekday AM and PM peak hours. No critical movements are noted.



The site driveways are forecast to operate in the LOS A-B range with a v/c of less than 0.05 and 95th percentile queue lengths of less than 15 m.

- ▶ **Remedial Measures:** No improvements to the existing and proposed form of traffic control are required at the study area intersections.

Northbound left-turn lanes on Helena Street at the site driveways are not warranted based on forecast traffic volumes.

Recommendation

Based on the findings of this study, it is recommended that the municipal roadway approaches to Helena Street operate as unsignalized intersections. Stop control be placed on side street approaches to Helena Street in accordance with the Ontario Traffic Manual Book 5.



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1 Introduction

SS Fort Erie Inc. retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study (TIS), for a proposed townhouse development located at 613 Helena Street in the Town of Fort Erie.

Figure 1.1 illustrates the location of the subject site.

The scope of the study includes:

- ▶ An assessment of the current traffic and site conditions within the study area;
- ▶ Estimates of background traffic growth;
- ▶ Estimates of additional traffic generated by the subject site;
- ▶ Analyses of the impact of the future traffic on the surrounding road network; and
- ▶ Recommend remedial measures to mitigate the additional traffic on the study area road network, if required.

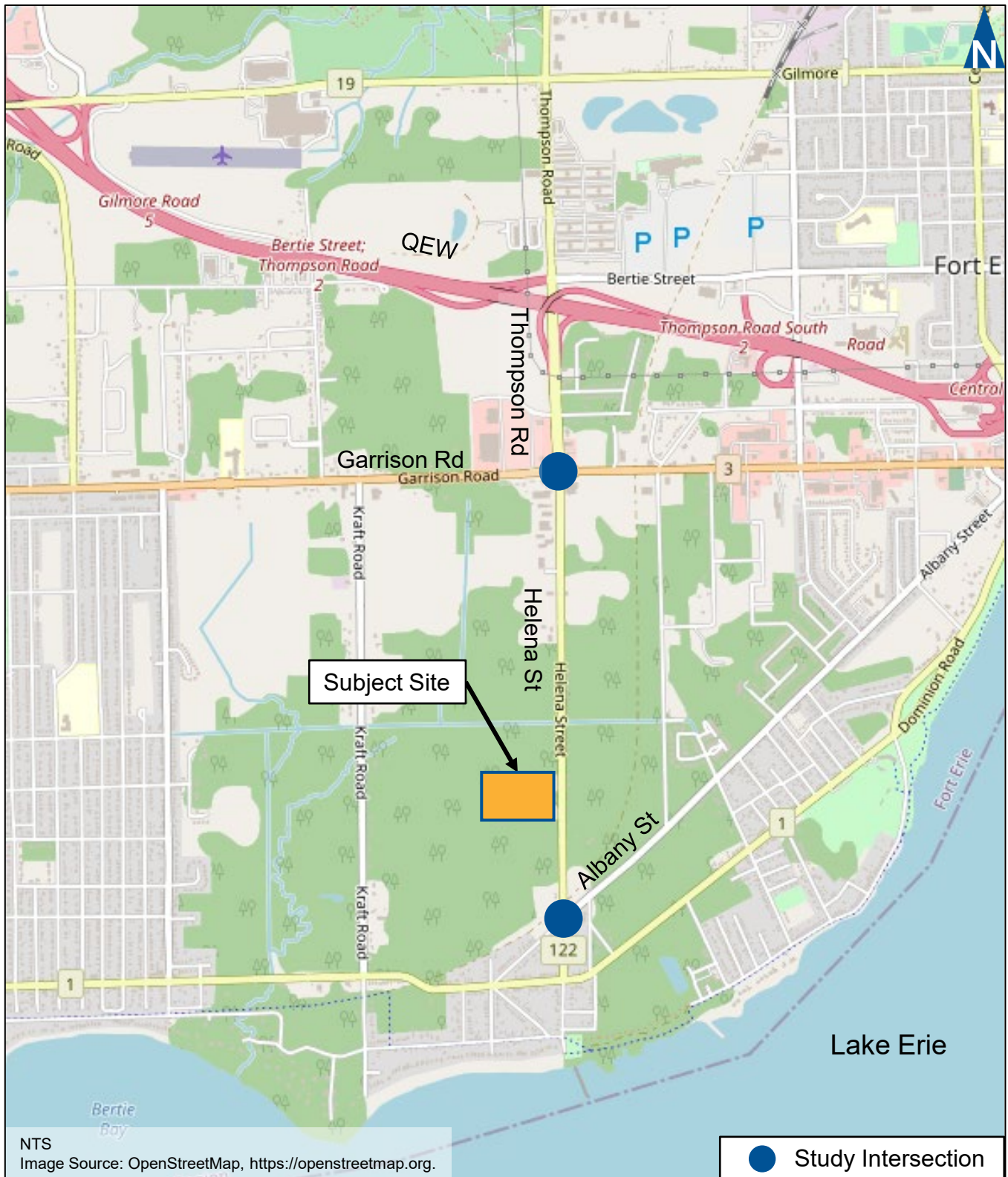
Appendix A contains the pre-study consultation correspondence with the Town of Fort Erie and Niagara Region. The study has been conducted in general accordance with the Niagara Region Traffic Impact Study Guidelines¹.

The study area intersections assessed include:

- ▶ Helena Street / Thompson Road at Garrison Road (signalized);
- ▶ Helena Street at Washington Road / Albany Street (unsignalized); and
- ▶ Two proposed site driveways to Helena Street.

¹ Niagara Region, *Guidelines for Transportation Impact Studies*, (Niagara Region, 2012).





NTS
Image Source: OpenStreetMap, <https://openstreetmap.org>.



Site Location

Figure 1.1

2 Existing Conditions

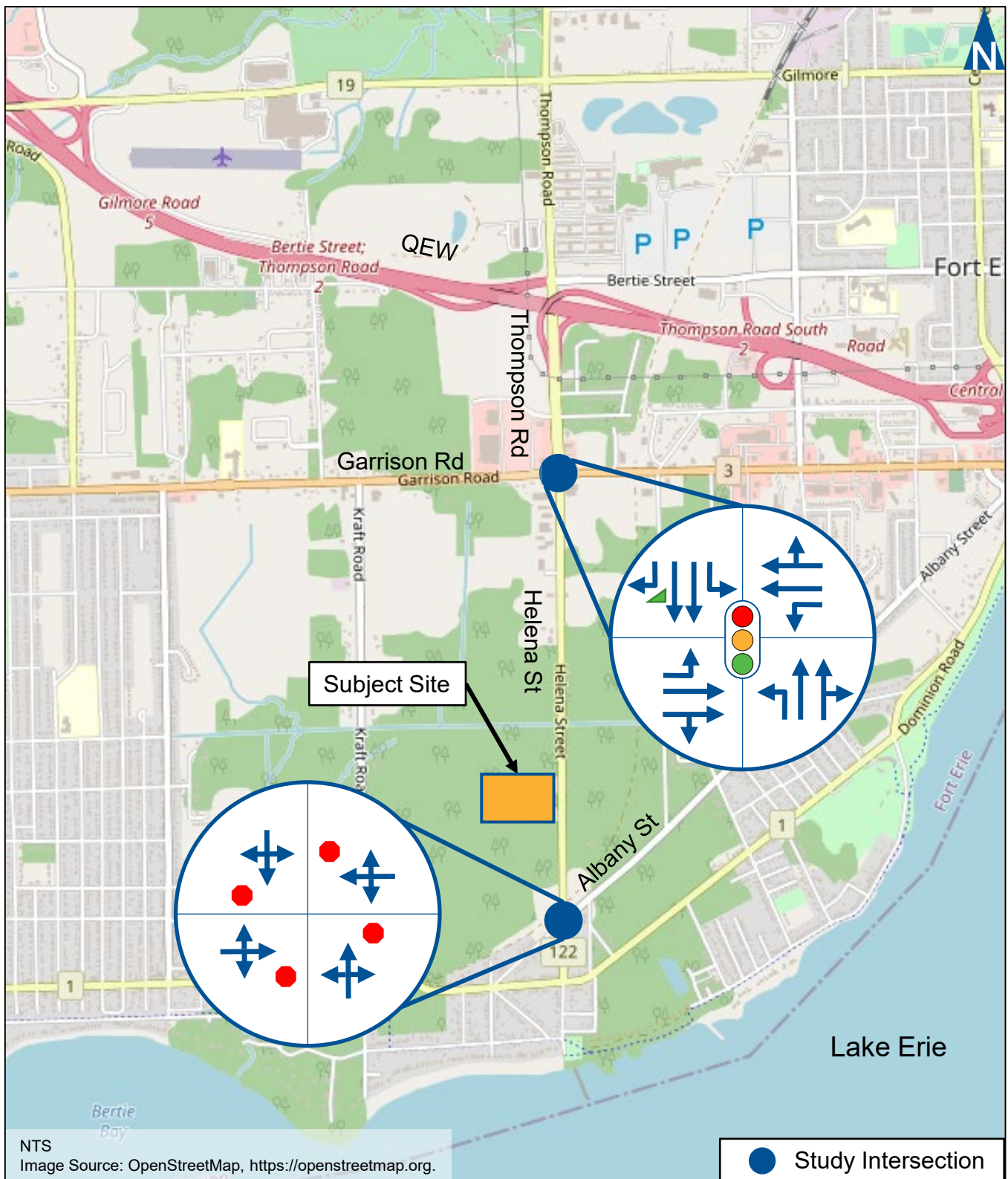
2.1 Road Network

The characteristics of the roadways within the study area are described as follows:

- ▶ **Garrison Road** (Regional Road 3) is an east / west roadway with 4-lanes and a posted speed limit of 60 km/h. Sidewalks are provided on both sides of the roadway within the study area. The intersection with Thompson Road / Helena Street is signalized.
- ▶ **Helena Street** (Regional Road 122) is a north / south roadway. The roadway has 2-lanes and widens to 4-lanes near the Garrison Road intersection. There is a posted speed limit of 70 km/h north of the subject site, a transition to 50 km/h south of the subject site. No sidewalks are provided within the study area. The intersection with Washington Road / Albany Street is all-way stop controlled.
- ▶ **Thompson Road** (Regional Road 122) is a north / south roadway with 4-lanes and a posted speed limit of 70 km/h. There are sidewalks on both sides of the roadway.
- ▶ **Washington Road / Albany Street** is an east / west roadway with 2-lanes and a posted speed limit of 50 km/h. No sidewalks are present within the study area.

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





Existing Lane Configuration & Traffic Control

2.2 Active Transportation

Sidewalks are provided on both sides of Garrison Road and Thompson Road. No sidewalks are present anywhere else in the study area. Marked crosswalks and pedestrian push buttons are provided on all approaches at the Helena Street / Thompson Road and Garrison Road intersection. No crosswalks are present at the Helena Street and Washington Road / Albany Street intersection.

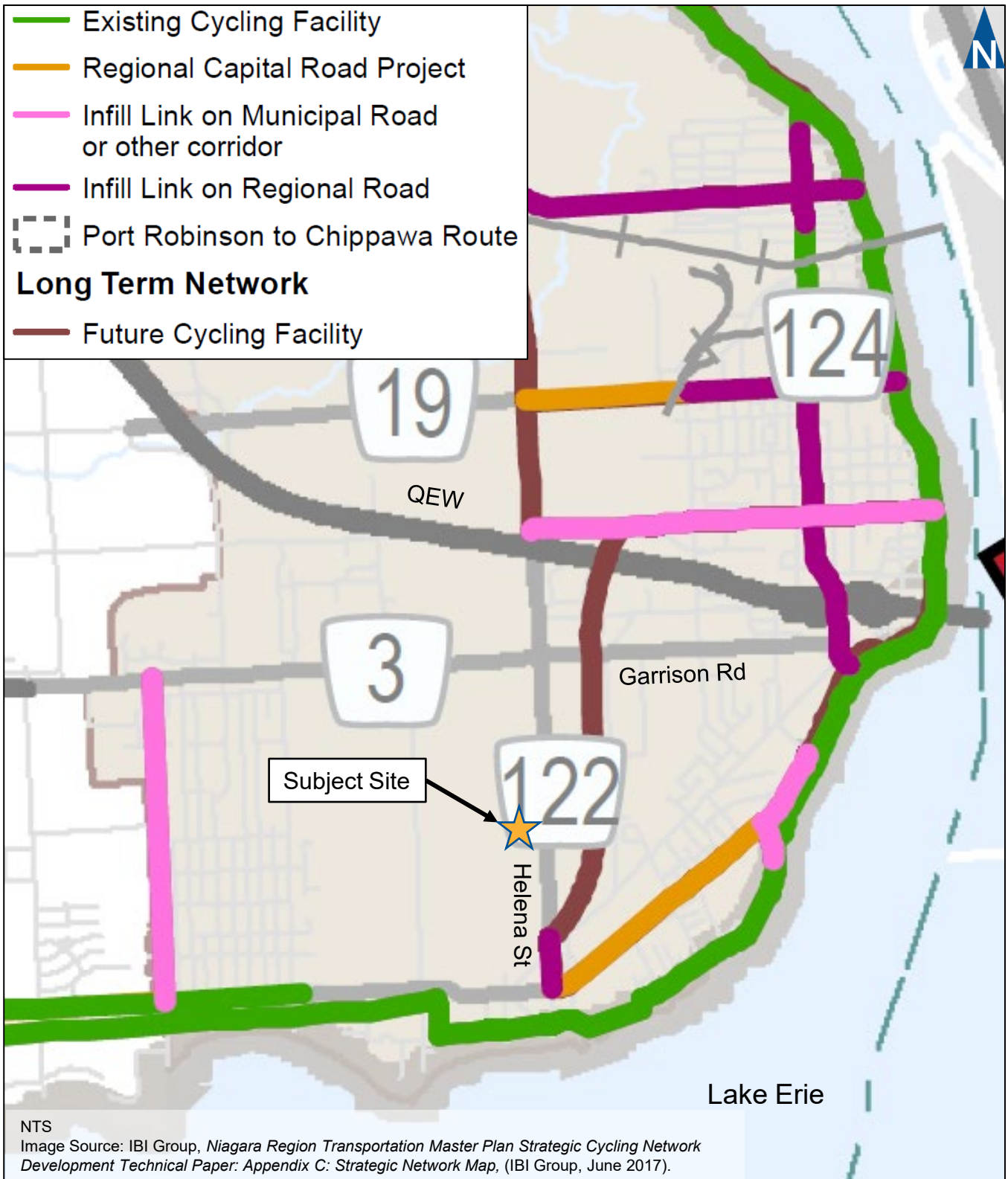
No existing cycling infrastructure is identified within the study area.

A future cycling facility² is proposed to formalize an existing trail that crosses Helena Street approximately 70 metres north of Washington Road / Albany Street, runs between Helena Street and Alfred Street, then crosses Garrison Road.

Figure 2.2 illustrates the future cycling network.

² IBI Group, *Niagara Region Transportation Master Plan Strategic Cycling Network Development Technical Paper*, (IBI Group, June 2017).





Future Cycling Network

2.3 Transit Network

Fort Erie On-Demand Transit (FET)³ operates an on-demand public transit system in the Town of Fort Erie. On-Demand Transit is a service that responds to ride requests rather than following a fixed route. Service is available Monday to Saturday from 6:00 AM to 9:00 PM but is unavailable Sunday or statutory holidays.

2.4 Traffic Volumes

2.4.1 Turning Movement Count Data

Table 2.1 summarizes the location and date of the existing available Turning Movement Count (TMC) data used in the analysis. Paradigm collected TMC data at the Helena Street and Washington Road / Albany Street intersection and Niagara Region provided the data for the Helena Street / Thompson Road and Garrison Road intersection.

Appendix B contains the detailed existing count data and signal timing data for the study area intersection.

TABLE 2.1: EXISTING TURNING MOVEMENT COUNT DATA

Intersection	TMC Year
Helena St at Washington Rd / Albany St	January 2018
Helena St / Thompson Rd at Garrison Rd	May 2019

The TMC data was factored to a Year 2022 base year condition by applying a growth rate of 2.0% per annum. The methodology used to develop the base year forecasts was confirmed with the Town and Region during pre-study consultations.

Figure 2.3 illustrates the base year weekday AM and PM peak hour volumes.

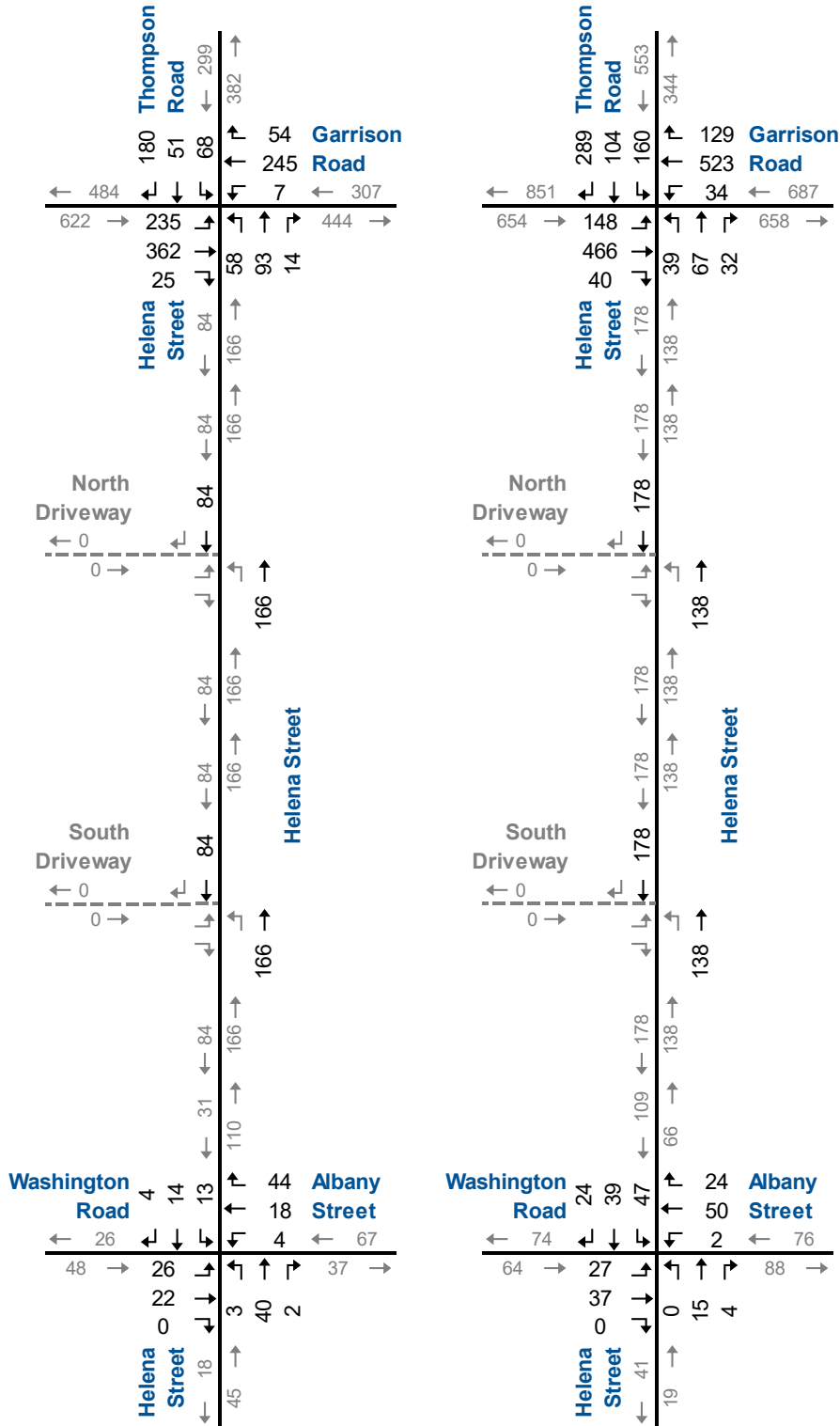
³ "Fort Erie Transit", Town of Fort Erie, 2022, <https://www.fetransit.ca/>.





AM Peak Hour

PM Peak Hour



Base Year Traffic Volumes

2.4.2 ATR Count

Pyramid Traffic Inc. undertook a 24-hour Automatic Traffic Recorder (ATR) count on Helena Street across the site's frontage. The count data provides the volume of vehicles, the speed, and the classification.

Traffic data was recorded on 28 July 2021 from midnight to 11:59 PM. The traffic count data was collected in 15-minute increments over a 24-hour period.

Appendix B contains the 24-Hour Speed / Volume / Classification Count data.

Table 2.2 summarizes the 2021 ATR count data and compares it to the 2018 ATR count data previously collected in the 2018 TIS⁴. The following is noted:

- ▶ The average 2021 speed is approximately 5 km/h higher than in 2018.
- ▶ The 2021 85th percentile speed is approximately 10 km/h higher than in 2018.
- ▶ The overall number of vehicles increased in 2021, however there was a significant decrease in the number of heavy vehicles.

TABLE 2.2: ATR SUMMARY

Attribute	Metric	2021 Data			Change from 2018		
		NB	SB	2-Way	NB	SB	2-Way
Speed (km/h)	Average	73	74	-	4	6	-
	85th Percentile	87	86	-	10	9	-
Volume	Recorded Vehicles	1136	1283	2419	112	312	424
Classification	Passenger Vehicles	1094	1235	2329	295	430	725
	Heavy Vehicles	7	14	21	-200	-145	-345
	Trucks / Buses	27	26	53	15	23	38
	Tractor Trailers	8	8	16	2	4	6

⁴ Paradigm Transportation Solutions Limited, *613 Helena Street Transportation Impact Study*, (Cambridge: PTSL, 2018).



2.5 Traffic Operations

Intersection level of service (LOS) is a recognized method of quantifying the efficiency of traffic flow at intersections. It is based on the delay experienced by individual vehicles executing the various movements. The delay is related to the number of vehicles wanting to make a movement, compared to the estimated capacity for that movement. The capacity is based on several criteria related to the opposing traffic flows. 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 at signalized intersections (50 seconds at unsignalized), the movement is considered to have a LOS F and remedial measures are usually implemented if they are feasible.

The operations of the intersections in the study area were evaluated under existing conditions using Synchro 11. The intersection analysis considered three separate measures of performance:

- ▶ The LOS for each turning movement. LOS is based on the average control delay per vehicle and was evaluated using HCM 2000 procedures;
- ▶ The volume to capacity ratio for each intersection was evaluated using HCM 2000 procedures; and
- ▶ 95th percentile queue length (m) was evaluated using SimTraffic.

Under the Region's TIS Guidelines, the following criteria indicate critical conditions and signify that mitigation measures may need to be considered:

- ▶ Volume to Capacity ratios (v/c) for through or shared through/turning movements that exceed 0.85 at a signalized intersection;
- ▶ v/c ratios for exclusive turning movements that exceed 0.90 at a signalized intersection;
- ▶ The 95th percentile queues for an individual movement are projected to exceed available turning lane storage; and
- ▶ LOS, based on average delay per vehicle on individual movements, operate at LOS D or worse for an unsignalized intersection.



Table 2.3 summarizes the level of service conditions. No critical movements are noted.

Appendix C contains the detailed Synchro 11 and SimTraffic reports.



TABLE 2.3: BASE YEAR 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	Helena St/Thompson Rd & Garrison Rd	TCS	LOS	A	A	>	A	B	B	>	B	B	B	>	B	B	B	B	B	B	B	B	B	B	
			Delay	7	7	>	7	15	14	>	14	17	16	>	17	17	16	>	17	16	16	17	17	16	16
			V/C	0.46	0.24	>		0.04	0.30	>		0.24	0.15	>		0.28	0.09	0.14							0.39
			Q	38	22	>		7	24	>		26	19	>		27	13	0							
			Stor.	120	-	>		110	-	>		35	-	>		70	-	-							
			Avail.	82	-	>		103	-	>		9	-	>		43	-	-							
AM Peak Hour	Helena St & Washington Rd/Albany St	AWSC	LOS	<	A	>	A	<	A	>	A	<	A	>	A	<	A	>	A	<	A	>	A	A	
			Delay	<	8	>	8	<	7	>	7	<	8	>	8	<	8	>	8	<	8	>	8	<	8
			D. Util	<	0.06	>		<	0.08	>		<	0.06	>		<	0.04	>							
			Q	<	11	>		<	13	>		<	5	>		<	6	>							
PM Peak Hour	Helena St/Thompson Rd & Garrison Rd	TCS	LOS	A	A	>	A	B	B	>	B	B	B	>	B	C	B	B	B	B	B	B	B	B	B
			Delay	9	10	>	10	13	16	>	16	19	19	>	19	23	19	20	20	20	20	20	20	20	20
			V/C	0.42	0.33	>		0.11	0.53	>		0.13	0.10	>		0.54	0.13	0.23							0.52
			Q	30	32	>		14	43	>		17	16	>		44	14	0							
			Stor.	120	-	>		110	-	>		35	-	>		70	-	-							
			Avail.	90	-	>		96	-	>		18	-	>		26	-	-							
PM Peak Hour	Helena St & Washington Rd/Albany St	AWSC	LOS	<	A	>	A	<	A	>	A	<	A	>	A	<	A	>	A	<	A	>	A	A	
			Delay	<	8	>	8	<	8	>	8	<	8	>	8	<	8	>	8	<	8	>	8	<	8
			D. Util	<	0.08	>		<	0.09	>		<	0.02	>		<	0.14	>							
			Q	<	11	>		<	12	>		<	6	>		<	10	>							

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

D.Util - Degree of Utilization

Q - 95th Percentile Queue Length

Ex. - Existing Available Storage

Avail. - Available Storage

< - Shared Left-turn

> - Shared Right-turn

TCS - Traffic Control Signal

AWSC - All-Way Stop Control

TWSC - Two-Way Stop Control



3 Development Concept

3.1 Description

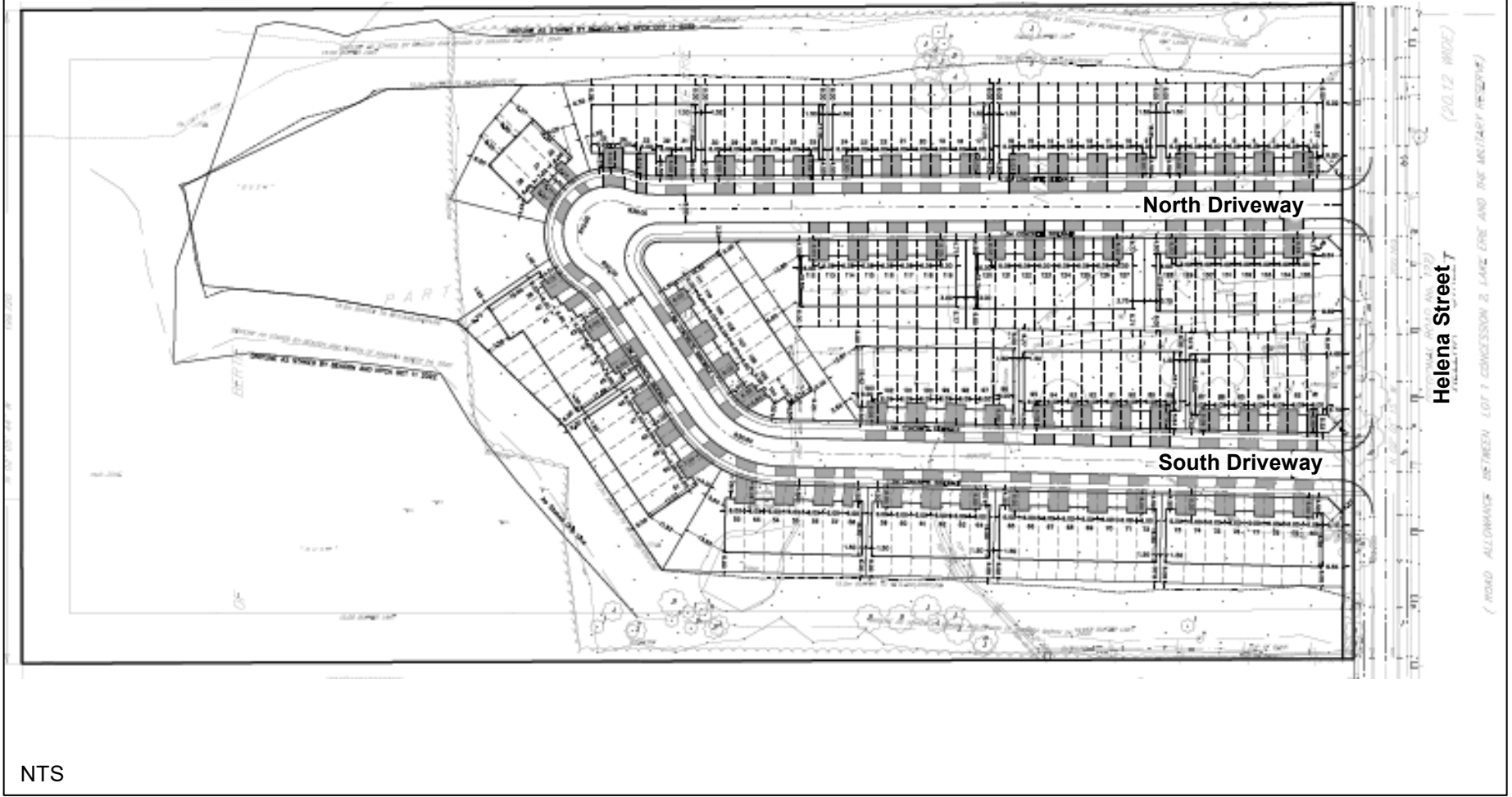
The subject site is located at 613 Helena Street in the Town of Fort Erie. The development concept includes 135 townhouse units.

Development and occupancy of the site is estimated to occur by Year 2024.

Vehicle access to the site is proposed via two new municipal roadways to Helena Street located approximately 460 and 580 metres north of Washington Road / Albany Street.

Figure 3.1 illustrates the site concept plan.





Site Concept Plan

3.2 Site Trip Generation

ITE Trip Generation⁵ data was used to estimate the vehicular trip generation. LUC 220 - Multifamily Housing (Low-Rise) was used to estimate the site's trip generation using regression equations. **Table 3.1** summarizes the estimated trip generation. To remain conservative, no modal split adjustments have been applied to the trip generation estimate to account for active transportation or transit-oriented trips.

The subject site is forecast to generate approximately 65 and 79 new vehicle trips during the AM and PM peak hours, respectively.

TABLE 3.1: SITE GENERATED TRAFFIC

Land Use	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
LUC 220 – 135 Units	16	49	65	50	29	79
Total Generation	16	49	65	50	29	79

AM | T = 0.31(X) + 22.55, PM | T = 0.43(X) + 20.55

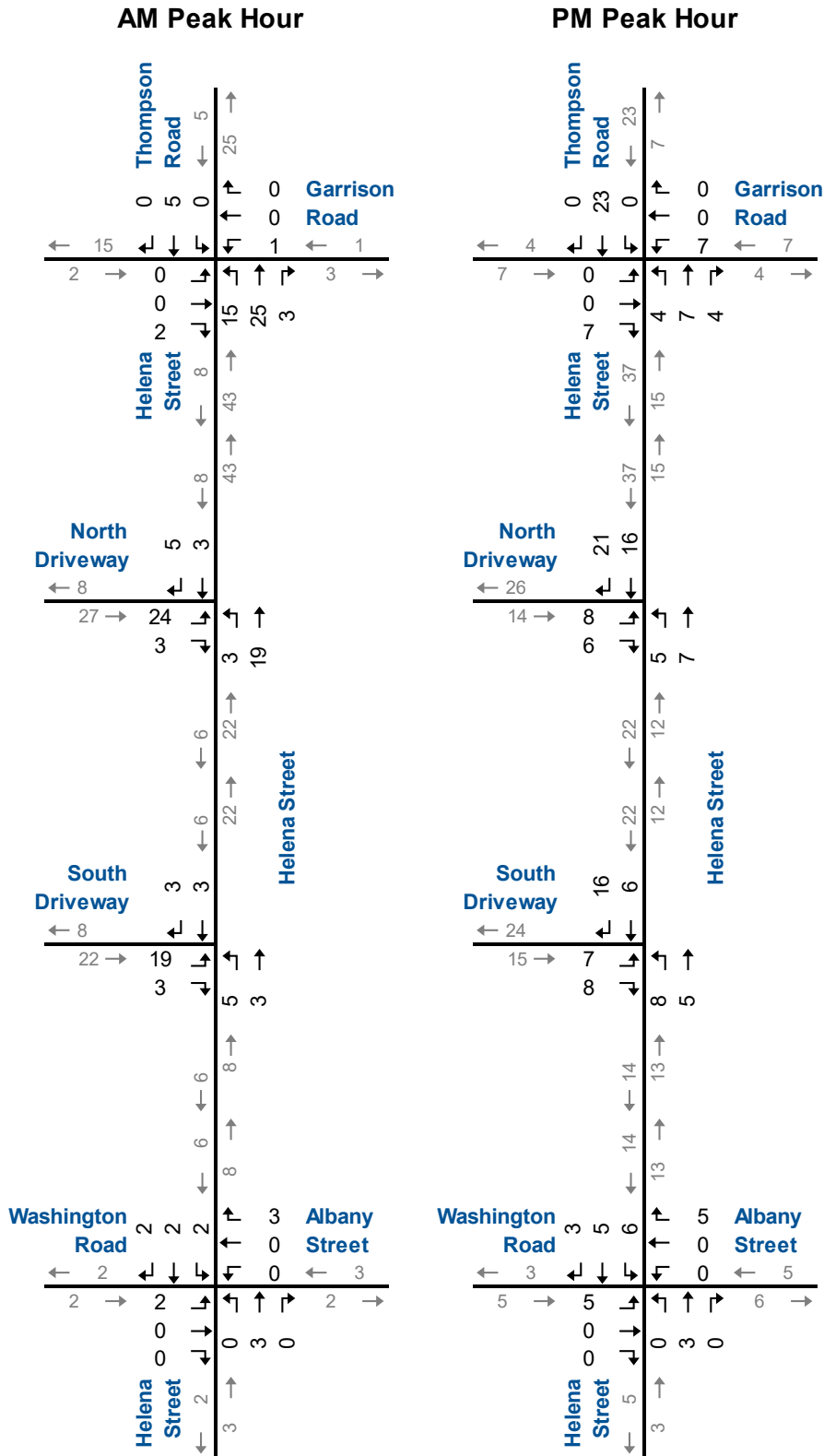
Table 3.2 summarizes the estimated trip distribution. The estimated distribution is based on existing conditions as the nearby area is primarily residential. **Figure 3.2** illustrates the site generated traffic.

TABLE 3.2: ESTIMATED TRIP DISTRIBUTION

Origin/Destination	AM Peak Hour		PM Peak Hour	
	In	Out	In	Out
North via Thompson Road	30%	50%	45%	25%
East via Garrison Road	5%	5%	15%	15%
West via Garrison Road	15%	30%	15%	15%
South via Helena Street	20%	5%	5%	15%
East via Albany Street	20%	5%	10%	20%
West via Washington Road	10%	5%	10%	10%
Total	100%	100%	100%	100%

⁵ Institute of Transportation Engineers, *Trip Generation Manual*, 11th ed., (Washington DC: ITE, 2021).





Site Generated Traffic Volumes

3.3 Sight Distance

The available sight distance at the proposed driveway locations have been assessed based on the methodology outlined in the Transportation Association of Canada (TAC) *Geometric Design Guide for Canadian Roads*⁶ (“TAC Guide”). The following parameters have been referenced in the assessment:

- ▶ Object Height (vehicle tail or brake light) – 0.60 metres;
- ▶ Driver Eye Height – 1.08 metres; and
- ▶ Top of Car – 1.30 metres.

The sight distance requirements for the proposed driveway locations were determined based on a design speed of 90 km/h, which is 20 km/h above the posted speed limit Helena Street. **Table 3.3** summarizes the sight distance measurements set out in the TAC Guide for level (flat) roadways applicable to this analysis.

TABLE 3.3: TAC GUIDE SIGHT DISTANCES

Sight Distance	Distance (m) (90 km/h Design Speed)
Minimum Stopping Sight Distance ⁷ <i>Driver approaching the site driveway.</i>	160 m
Intersection Sight Distance (Left Turn from Stop) ⁸ <i>Driver looks to the right before turning left to exit the site.</i>	190 m
Intersection Sight Distance (Right Turn from Stop) ⁹ <i>Driver looks to the left before turning right to exit the site.</i>	165 m

⁶ Transportation Association of Canada, *Geometric Design Guide for Canadian Roads*, (Ottawa: TAC, 2017).

⁷ Ibid. *Table 2.5.2: Stopping Sight Distance on Level Roadways for Automobiles.*

⁸ Ibid. *Table 9.9.4: Design Intersection Sight Distance – Case B1, Left Turn from Stop.*

⁹ Ibid. *Table 9.9.6: Design Intersection Sight Distance – Case B2, Right Turn from Stop.*



Paradigm staff completed a site visit on 05 August 2021 to review the existing sight distances at the proposed driveway locations. The sight distances at the proposed driveway locations are greater than 300 m and exceed the sight distances identified in the TAC Guide for a design speed of 90 km/h.



4 Future Traffic Conditions

The assessment of future conditions in this section includes the following components:

- ▶ Future background traffic estimates;
- ▶ Level of service analysis for background traffic (pre-development);
- ▶ Future total traffic estimates; and
- ▶ Level of service analysis for total traffic (post-development).

4.1 Forecast Traffic

A five-year horizon (Year 2027) from TIS commission has been assessed. The likely future traffic volumes near the subject site are estimated to consist of:

- ▶ Increased non-site traffic (generalized background traffic growth). A growth rate of 2% per annum was confirmed by the Region during pre-study consultations; and
- ▶ Traffic generated by the proposed development.

It is noted no other area background developments were identified by Region staff for inclusion within the traffic forecasts.

Figure 4.1 illustrates the forecast background traffic volumes.

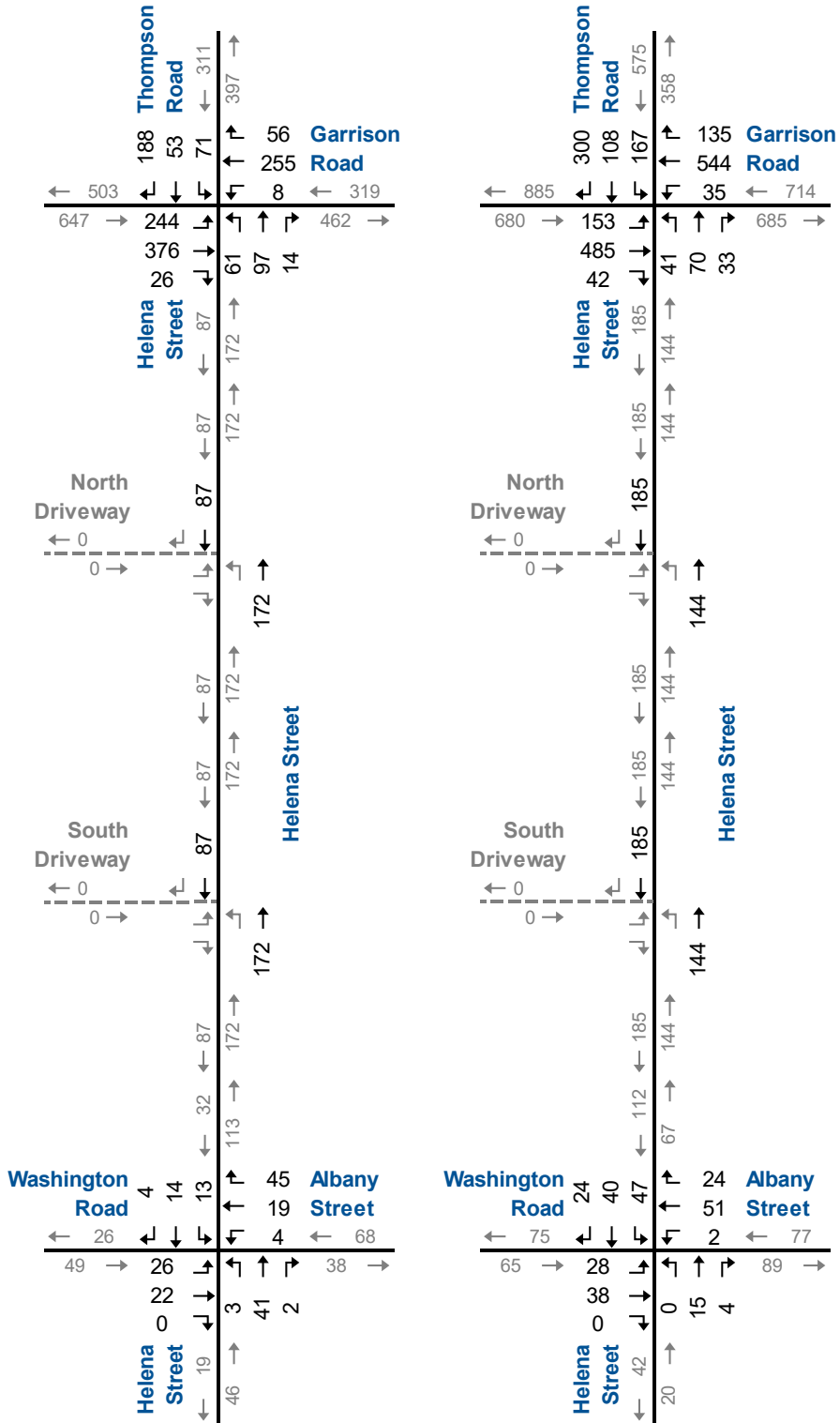
Figure 4.2 illustrates the forecast total traffic volumes.



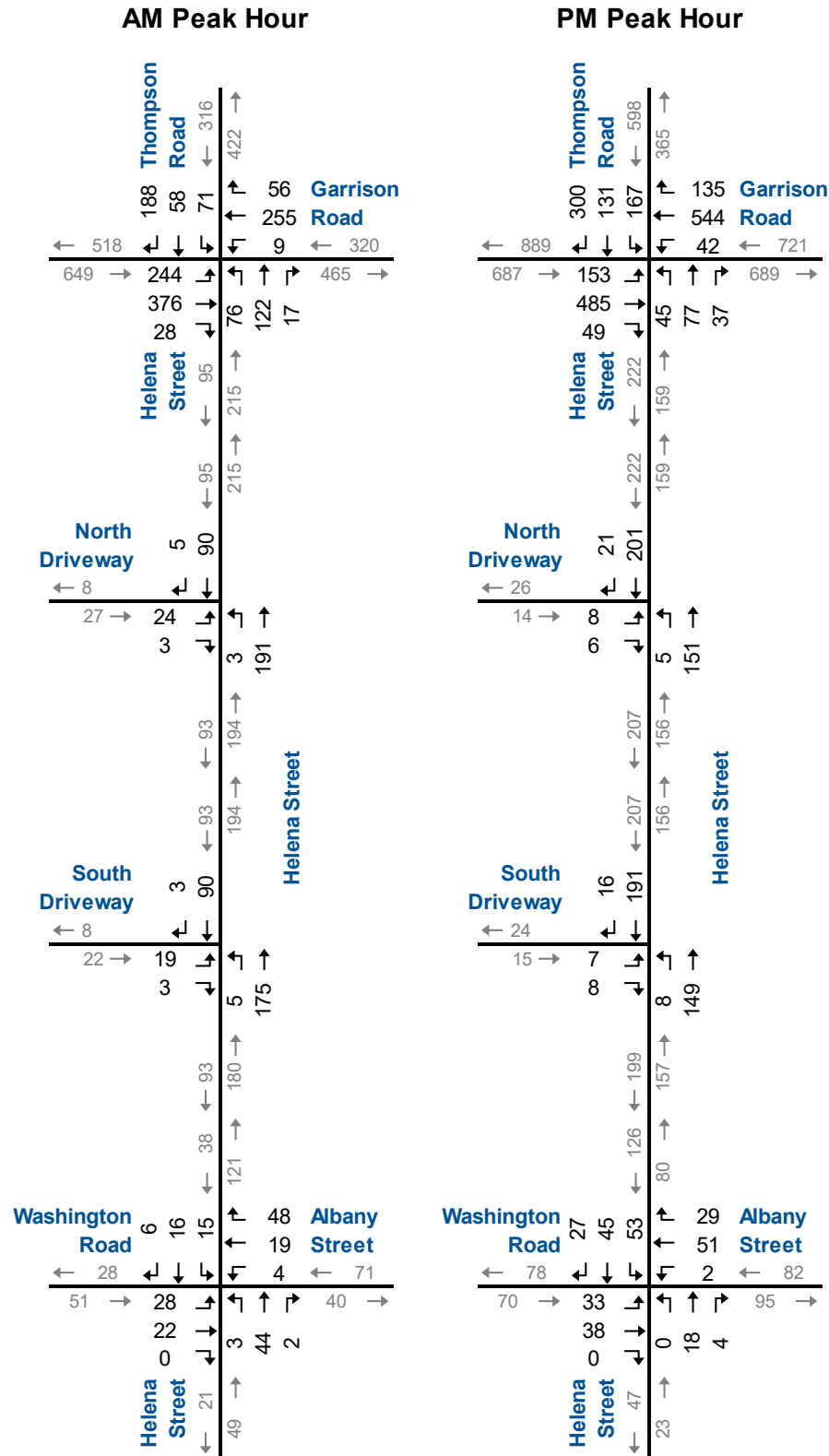


AM Peak Hour

PM Peak Hour



Forecast Background Traffic Volumes



Forecast Total Traffic Volumes

4.2 Background Traffic

The study area intersection operational analysis followed the same methodology used for existing conditions. No changes to the existing lane configurations or signal timings are assumed.

Table 4.1 summarizes the level of service conditions. No critical movements are noted.

Appendix D contains the detailed Synchro 11 and SimTraffic reports.



TABLE 4.1: 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	Helena St/Thompson Rd & Garrison Rd	TCS	LOS	A	A	>	A	B	B	>	B	B	B	>	B	B	B	B	B	B	B	B	B	B	
			Delay	8	7	>	7	15	14	>	14	18	17	>	17	18	16	17	17	17	17	17	17	17	17
			V/C	0.47	0.25	>		0.04	0.31	>		0.26	0.15	>		0.29	0.09	0.15							0.41
			Q	38	22	>		7	29	>		23	20	>		25	23	0							
			Stor.	120	-	>		110	-	>		35	-	>		70	-	-							
			Avail.	82	-	>		103	-	>		12	-	>		45	-	-							
AM Peak Hour	Helena St & Washington Rd/Albany St	AWSC	LOS	<	A	>	A	<	A	>	A	<	A	>	A	<	A	>	A	<	A	>	A		
			Delay	<	8	>	8	<	7	>	7	<	8	>	8	<	8	>	8	<	8	>	8	<	8
			D. Util	<	0.06	>		<	0.08	>		<	0.06	>		<	0.04	>							
			Q	<	11	>		<	14	>		<	6	>		<	6	>							
PM Peak Hour	Helena St/Thompson Rd & Garrison Rd	TCS	LOS	A	A	>	A	B	B	>	B	B	B	>	B	C	B	B	B	B	B	B	B	B	B
			Delay	10	10	>	10	14	16	>	16	19	19	>	19	24	19	20	20	20	20	20	20	20	20
			V/C	0.44	0.34	>		0.12	0.55	>		0.14	0.10	>		0.56	0.14	0.24							0.54
			Q	32	33	>		14	47	>		17	16	>		40	15	0							
			Stor.	120	-	>		110	-	>		35	-	>		70	-	-							
			Avail.	88	-	>		96	-	>		18	-	>		30	-	-							
PM Peak Hour	Helena St & Washington Rd/Albany St	AWSC	LOS	<	A	>	A	<	A	>	A	<	A	>	A	<	A	>	A	<	A	>	A		
			Delay	<	8	>	8	<	8	>	8	<	8	>	8	<	8	>	8	<	8	>	8	<	8
			D. Util	<	0.09	>		<	0.10	>		<	0.02	>		<	0.14	>							
			Q	<	12	>		<	13	>		<	5	>		<	10	>							

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Ex. - Existing Available Storage

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< - Shared Left-turn

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TCS - Traffic Control Signal

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TWSC - Two-Way Stop Control



4.3 Total Traffic

The study area intersection operational analysis followed the same methodology used for existing conditions. No changes to the existing lane configurations or signal timings are assumed.

Table 4.2 summarizes the level of service conditions. No critical movements are noted.

The site driveways are forecast to operate in the LOS A-B range with a v/c of less than 0.05 and 95th percentile queue lengths of less than 15 m.

Appendix E contains the detailed Synchro 11 and SimTraffic reports.

It is recommended that the municipal roadway approaches to Helena Street operate as unsignalized intersections. Stop control be placed on side street approaches to Helena Street in accordance with the Ontario Traffic Manual Book 5¹⁰.

¹⁰ Ontario Ministry of Transportation, Ontario Traffic Manual Book 5: Regulatory Signs, (Toronto: Queen's Printer for Ontario, 2021).



TABLE 4.2: 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	Helena St/Thompson Rd & Garrison Rd	TCS	LOS	A	A	>	A	B	B	>	B	B	B	>	B	B	B	B	B	B	B	B	B	B				
			Delay	8	7	>	7	16	14	>	14	18	17	>	17	18	16	17	17	17	17	17	17	17	17	17		
			V/C	0.47	0.25	>		0.05	0.31	>		0.32	0.20	>		0.30	0.10	0.15										
			Q	42	23	>		7	29	>		27	22	>		26	12	0										
AM Peak Hour	Helena St & Washington Rd/Albany St	AWSC	LOS	<	A	>	A	<	A	>	A	<	A	>	A	<	A	>	A	<	A	>	A	<	A			
			Delay	<	8	>	8	<	7	>	7	<	8	>	8	<	8	>	8	<	8	>	8	<	8	>	8	
			D. Util	<	0.06	>		<	0.08	>		<	0.06	>		<	0.05	>										
			Q	<	11	>		<	14	>		<	6	>		<	6	>										
AM Peak Hour	Helena St & North Driveway	TWSC	LOS	B		>	B							<	A					A				A				
			Delay	10		>	10									<	0				0			0				
			V/C	0.04		>										<	0.00					0.06			0			
			Q	13		>										<	0					0			0			
AM Peak Hour	Helena St & South Driveway	TWSC	LOS	B		>	B							<	A					A				A				
			Delay	10		>	10									<	0				0			0				
			V/C	0.03		>										<	0.00					0.06			0			
			Q	12		>										<	2					0			0			
PM Peak Hour	Helena St/Thompson Rd & Garrison Rd	TCS	LOS	A	B	>	A	B	B	>	B	B	B	>	B	C	B	B	C	C	C	C	C	C	C	C		
			Delay	10	10	>	10	14	17	>	16	19	19	>	19	24	19	20	21	21	21	21	21	21	21	21	21	
			V/C	0.44	0.34	>		0.14	0.55	>		0.15	0.11	>		0.57	0.16	0.24										
			Q	36	36	>		16	47	>		19	18	>		41	19	0										
PM Peak Hour	Helena St & Washington Rd/Albany St	AWSC	LOS	<	A	>	A	<	A	>	A	<	A	>	A	<	A	>	A	<	A	>	A	<	A			
			Delay	<	8	>	8	<	8	>	8	<	8	>	8	<	8	>	8	<	8	>	8	<	8	>	8	
			D. Util	<	0.10	>		<	0.10	>		<	0.03	>		<	0.16	>										
			Q	<	12	>		<	13	>		<	7	>		<	12	>										
PM Peak Hour	Helena St & North Driveway	TWSC	LOS	B		>	B							<	A					A				A				
			Delay	10		>	10									<	0				0			0				
			V/C	0.02		>										<	0.00					0.14			0			
			Q	10		>										<	4					0			0			
PM Peak Hour	Helena St & South Driveway	TWSC	LOS	B		>	B							<	A					A				A				
			Delay	10		>	10									<	0				0			0				
			V/C	0.02		>										<	0.01					0.13			0			
			Q	11		>										<	3					0			0			

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

D.Util - Degree of Utilization

Q - 95th Percentile Queue Length

Ex. - Existing Available Storage

Avail. - Available Storage

< - Shared Left-turn

> - Shared Right-turn

TCS - Traffic Control Signal

AWSC - All-Way Stop Control

TWSC - Two-Way Stop Control



5 Remedial Measures

5.1 Auxiliary Left-Turn Lanes

The need for left-turn lanes on Helena Street at the site driveways were evaluated using the Ministry of Transportation's (MTO) Design Supplement for the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads¹¹. The warrant nomographs determine if a left-turn lane is warranted based on the following criteria:

- ▶ Design speed of the road (20 km/h over the posted speed limit);
- ▶ Advancing volume;
- ▶ Opposing volume; and
- ▶ Percentage of advancing vehicles performing a left-turn movement.

Appendix F contains the left-turn lane warrant nomographs. The nomographs indicate that left-turn lanes are not warranted on Helena Street at the site driveways.

¹¹ Ontario Ministry of Transportation, *MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads*, (Toronto: Queen's Printer for Ontario, 2020).



6 Conclusions and Recommendations

6.1 Conclusions

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

- ▶ **Base Year Traffic Conditions:** The study area intersections are operating at acceptable levels of service and all movements are well within capacity during the weekday AM and PM peak hours. No critical movements are noted.
- ▶ **Site Trip Generation:** The proposed development is estimated to generate approximately 65 AM peak hour vehicle trips and 79 PM peak hour vehicle trips.
- ▶ **Background Traffic Conditions:** The study area intersections are forecast to operate at acceptable levels of service and all movements are well within capacity during the weekday AM and PM peak hours. No critical movements are noted.
- ▶ **Total Traffic Conditions:** The study area intersections are forecast to operate at acceptable levels of service and all movements are well within capacity during the weekday AM and PM peak hours. No critical movements are noted.

The site driveways are forecast to operate in the LOS A-B range with a v/c of less than 0.05 and 95th percentile queue lengths of less than 15 m.

- ▶ **Remedial Measures:** No improvements to the existing and proposed form of traffic control are required at the study area intersections.

Northbound left-turn lanes on Helena Street at the site driveways are not warranted based on forecast traffic volumes.

6.2 Recommendations

Based on the findings of this study, it is recommended that the municipal roadway approaches to Helena Street operate as unsignalized intersections. Stop control be placed on side street approaches to Helena Street in accordance with the Ontario Traffic Manual Book 5.



Appendix A

Pre-Study Consultation



Stefan Hajgato

From: Jeremy Korevaar <JKorevaar@forterie.ca>
Sent: July 27, 2021 9:47 AM
To: Stefan Hajgato
Cc: Scott Catton
Subject: RE: (210371: 613 Helena St) TIS Terms of Reference

Good Morning Stefan,

If the Region is accepting of factored traffic counts, that is fine with me.

Regards,

Jeremy Korevaar, C.E.T.
Coordinator, Development Approvals

Town of Fort Erie
1 Municipal Centre Drive
Fort Erie, Ontario
Canada
L2A 2S6

TEL: 1-905-871-1600 ext.2505
FAX: 1-905-871-6411

From: "Stefan Hajgato" <shajgato@ptsl.com>
To: "Jeremy Korevaar (JKorevaar@forterie.ca)" <JKorevaar@forterie.ca>
Cc: "Scott Catton" <scatton@ptsl.com>
Date: 2021-07-26 10:33 AM
Subject: RE: (210371: 613 Helena St) TIS Terms of Reference

Hi Jeremy,

As mentioned in Susan's email, the Region does not require additional turning movement counts to be collected. Do you have any concerns with using historical data factored to 2021?

Thanks,

Stefan Hajgato, P.Eng.
Transportation Engineer
(He/Him)



Paradigm Transportation Solutions Limited
p: 519.896.3163 x209

From:Dunsmore, Susan <Susan.Dunsmore@niagararegion.ca>
Sent: July 26, 2021 8:55 AM
To: Stefan Hajgato <shajgato@ptsl.com>
Cc: Jeremy Korevaar (JKorevaar@forterie.ca) <JKorevaar@forterie.ca>; Ramundo, Matteo <Matteo.Ramundo@niagararegion.ca>; Scott Catton <scatton@ptsl.com>
Subject: RE: (210371: 613 Helena St) TIS Terms of Reference

Hello Stefan,

Regional transportation staff have reviewed your TIS terms of reference and our comments are noted below in green.

If there are any improvements required a functional design should be included in the TIS.

If you require any additional information please contact me at your convenience.

Thank you

Susan M. Dunsmore, P. Eng.
Manager, Development Engineering
Planning and Development Services

Phone:(905) 980-6000 or 1-800-263-7215 ext 3661
Address: 1815 Sir Isaac Brock Way, Thorold ON, L2V4T7



From:Stefan Hajgato <shajgato@ptsl.com>
Sent: Monday, July 12, 2021 3:33 PM
To: Dunsmore, Susan <Susan.Dunsmore@niagararegion.ca>; JKorevaar@forterie.ca
Cc: Scott Catton <scatton@ptsl.com>
Subject: (210371: 613 Helena St) TIS Terms of Reference

CAUTION:This email originated from outside of the Niagara Region email system. Use caution when clicking links or opening attachments unless you recognize the sender and know the content is safe.

Hi Susan and Jeremy,

Paradigm has been retained to prepare a Transportation Impact Study (TIS) for a proposed 116-unit townhouse development at 613 Helena Street in the Town of Fort Erie. Two driveways are proposed to Helena Street approximately 475 and 560 metres north of Washington Road / Albany Street.

We are proposing the following scope:

Study Area Intersections:

- Helena Street / Thompson Road at Garrison Road (signalized); **Accepted**
- Helena Street at Washington Road / Albany Street (unsignalized); and **Accepted**

- Proposed site driveways (up to 2) to Helena Street. **Accepted**

Development (site plan attached):

- 116 townhouse units (bungalow and standard units).
- Build-out - Year 2024.

Horizon Year:

- Existing (Year 2021)
- Year 2026 (5-years from TIS commission).**Accepted.**

Growth Rate: 2.0% per annum.**Accepted.**

Existing Traffic Volumes: Please see discussion below.

Background Developments: Please identify.

Analysis Periods: Weekday AM & PM peak hours.**Accepted.**

Trip Generation: ITE Trip Generation Manual 10e.**Accepted.**

Trip Distribution: Local travel patterns. **Accepted.**

Planned Roadway Improvements: Please identify.

Capacity Analysis Software: Synchro. Paradigm to confirm the version of Synchro they are using.

Additional Studies: Paradigm to update their classification/speed study on Helena Street adjacent to the site that was requested and prepared for the 2018 TIS for the same previous reason. The purpose of this study is to address concerns that vehicles may be speeding on this road which could cause unsafe conditions for vehicles entering and exiting the subject site.

Existing Traffic Volumes

We can factor historical turning movements counts to 2021 conditions. Paradigm currently has 2016 counts at the Helena Street / Thompson Road and Garrison Road intersection and 2018 counts at the Helena Street and Washington Road / Albany Street intersection. Please advise if the Town or Region is able to provide more recent data.

As per the Region current TIS guidelines, traffic counts must be within at least 3 years of the study (ideally undertaken prior to the start of the pandemic in March 2020). 2018 counts for Helena Street and Washington Road/Albany Street intersection are accepted. The Region has 2019 counts for Helena Street/Thompson Road and Garrison Road intersection that can be purchased by Paradigm. In order to reflect today's counts we would ask that the older counts be increased by 2% each year to reach the anticipated 2021 counts. Regional counts can be obtained through our online system at the following link:

<https://www.niagararegion.ca/living/roads/permits/traffic-data-requests.aspx>

Alternatively, we can collect current turning movement counts at the study intersections. However, traffic patterns may be altered due to potential / recently lifted travel restrictions at the time of data collection. Please advise if you would like us to go this route and if we should apply a factor to the counts to normalize volumes.

New traffic counts are not required as per above.

Feel free to reach out if you have any questions or comments.

Thanks,

Stefan Hajgato, P.Eng.

Transportation Engineer

(He/Him)



Paradigm Transportation Solutions Limited

150 Pinebush Road, Unit 5A, Cambridge ON N1R 8J8

p: 519.896.3163 x209

e: shajgato@ptsl.com

w: www.ptsl.com

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Thanks for connecting.

For up-to-date information about the Town of Fort Erie's response to the COVID-19 virus, please visit <https://www.forterie.ca/pages/Covid19News>

We also strongly encourage you to stay-up-to-date with the latest advice from Niagara Region Public Health at <https://www.niagararegion.ca/health/covid-19/default.aspx>

All critical services, including water and wastewater and road operations as well as fire services will continue to operate to support our community. For after-hours services, including road or wastewater operations, please call 905-871-1600.

For emergency assistance from fire services please call 911.

As many Town staff are focusing on emergency management at this time, we thank you in advance for your patience.

Appendix B

Existing Data



Helena St @ Albany St

Morning Peak Diagram

Specified Period

From: 6:00:00

To: 9:00:00

One Hour Peak

From: 8:00:00

To: 9:00:00

Municipality: Fort Erie
Site #: 000000001
Intersection: Helena St & Albany St
TFR File #: 1
Count date: 16-Jan-2018

Weather conditions:

Clear/Wet

Person(s) who counted:

Cam

** Non-Signalized Intersection **

Major Road: Helena St runs N/S

North Leg Total: 131

North Entering: 29

North Peds: 0

Peds Cross: \times

Heavys	0	0	1	1
Trucks	1	0	0	1
Cars	3	13	11	27
Totals	4	13	12	



Heavys 2

Trucks 0

Cars 100

Totals 102

East Leg Total: 96

East Entering: 62

East Peds: 0

Peds Cross: \times

Heavys	Trucks	Cars	Totals
3	1	20	24

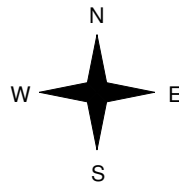


Helena St

Cars	Trucks	Heavys	Totals
39	0	2	41
16	0	1	17
3	0	1	4
58	0	4	



Heavys	Trucks	Cars	Totals
0	0	24	24
1	0	19	20
0	0	0	0
1	0	43	



Albany St



Peds Cross: \times

West Peds: 0

West Entering: 44

West Leg Total: 68

Cars	16
Trucks	0
Heavys	1
Totals	17



Cars	1	37	2	40
Trucks	0	0	0	0
Heavys	2	0	0	2
Totals	3	37	2	

Peds Cross: \times

South Peds: 0

South Entering: 42

South Leg Total: 59

Comments

Helena St @ Albany St

Mid-day Peak Diagram

Specified Period

From: 11:00:00

To: 13:00:00

One Hour Peak

From: 12:00:00

To: 13:00:00

Municipality: Fort Erie
Site #: 000000001
Intersection: Helena St & Albany St
TFR File #: 1
Count date: 16-Jan-2018

Weather conditions:

Clear/Wet

Person(s) who counted:

Cam

** Non-Signalized Intersection **

Major Road: Helena St runs N/S

North Leg Total: 140
 North Entering: 57
 North Peds: 0
 Peds Cross: \times

Heavys	0	0	0	0
Trucks	1	1	1	3
Cars	16	28	10	54
Totals	17	29	11	



Heavys	1
Trucks	3
Cars	79
Totals	83

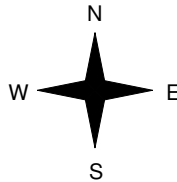
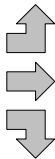
East Leg Total: 89
 East Entering: 54
 East Peds: 0
 Peds Cross: \times

Heavys	Trucks	Cars	Totals
1	1	42	44



Washington Rd

Heavys	Trucks	Cars	Totals
1	1	28	30
0	0	24	24
0	0	0	0
1	1	52	



Helena St



Cars	Trucks	Heavys	Totals
22	1	0	23
25	0	1	26
4	0	1	5
51	1	2	



Albany St



Cars	Trucks	Heavys	Totals
34	1	0	35

Peds Cross: \times
 West Peds: 0
 West Entering: 54
 West Leg Total: 98

Cars	32	Cars	1	29	0	30
Trucks	1	Trucks	0	1	0	1
Heavys	1	Heavys	0	0	0	0
Totals	34	Totals	1	30	0	



Peds Cross: \times
 South Peds: 3
 South Entering: 31
 South Leg Total: 65

Comments

Helena St @ Albany St

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 18:00:00

One Hour Peak

From: 16:30:00

To: 17:30:00

Municipality: Fort Erie
Site #: 000000001
Intersection: Helena St & Albany St
TFR File #: 1
Count date: 16-Jan-2018

Weather conditions:

Clear/Wet

Person(s) who counted:

Cam

** Non-Signalized Intersection **

Major Road: Helena St runs N/S

North Leg Total: 162

North Entering: 101

North Peds: 0

Peds Cross: \times

Heavys	0	1	0	1
Trucks	0	0	0	0
Cars	22	35	43	100
Totals	22	36	43	



Heavys 1

Trucks 0

Cars 60

Totals 61

East Leg Total: 151

East Entering: 70

East Peds: 0

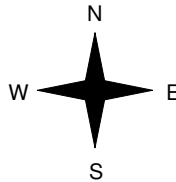
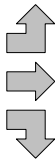
Peds Cross: \times

Heavys	Trucks	Cars	Totals
1	0	67	68



Washington Rd

Heavys	Trucks	Cars	Totals
0	0	25	25
0	1	33	34
0	0	0	0
0	1	58	



Helena St



Cars	Trucks	Heavys	Totals
22	0	0	22
45	0	1	46
1	0	1	2
68	0	2	

Albany St



Cars	Trucks	Heavys	Totals
79	1	1	81

Peds Cross: \times

West Peds: 0

West Entering: 59

West Leg Total: 127

Cars	36
Trucks	0
Heavys	2
Totals	38



Cars	0	13	3	16
Trucks	0	0	0	0
Heavys	0	1	1	2
Totals	0	14	4	

Peds Cross: \times

South Peds: 0

South Entering: 18

South Leg Total: 56

Comments

Helena St @ Albany St

Total Count Diagram

Municipality: Fort Erie
Site #: 000000001
Intersection: Helena St & Albany St
TFR File #: 1
Count date: 16-Jan-2018

Weather conditions:
 Clear/Wet
Person(s) who counted:
 Cam

**** Non-Signalized Intersection ****

Major Road: Helena St runs N/S

North Leg Total: 995
 North Entering: 452
 North Peds: 0
 Peds Cross: ∇

Heavys	0	1	2	3
Trucks	4	1	1	6
Cars	119	194	130	443
Totals	123	196	133	



Heavys 15
 Trucks 4
 Cars 524
Totals 543

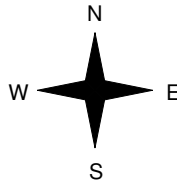
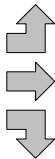
East Leg Total: 697
 East Entering: 390
 East Peds: 0
 Peds Cross: ∇

Heavys	Trucks	Cars	Totals
8	7	300	315



Washington Rd

Heavys	Trucks	Cars	Totals
3	1	163	167
3	2	152	157
0	0	1	1
6	3	316	



Helena St



Cars	Trucks	Heavys	Totals
171	1	8	180
178	3	6	187
18	0	5	23
367	4	19	



Albany St



Cars	Trucks	Heavys	Totals
295	3	9	307

Peds Cross: ∇
 West Peds: 2
 West Entering: 325
 West Leg Total: 640

Cars	213	Cars	3	190	13	206
Trucks	1	Trucks	0	2	0	2
Heavys	6	Heavys	2	4	4	10
Totals	220	Totals	5	196	17	



Peds Cross: ∇
 South Peds: 6
 South Entering: 218
 South Leg Total: 438

Comments

Location..... Garrison Road @ Helena Street/Thompson Road

GeoID..... 01725

Municipality. FORT ERIE

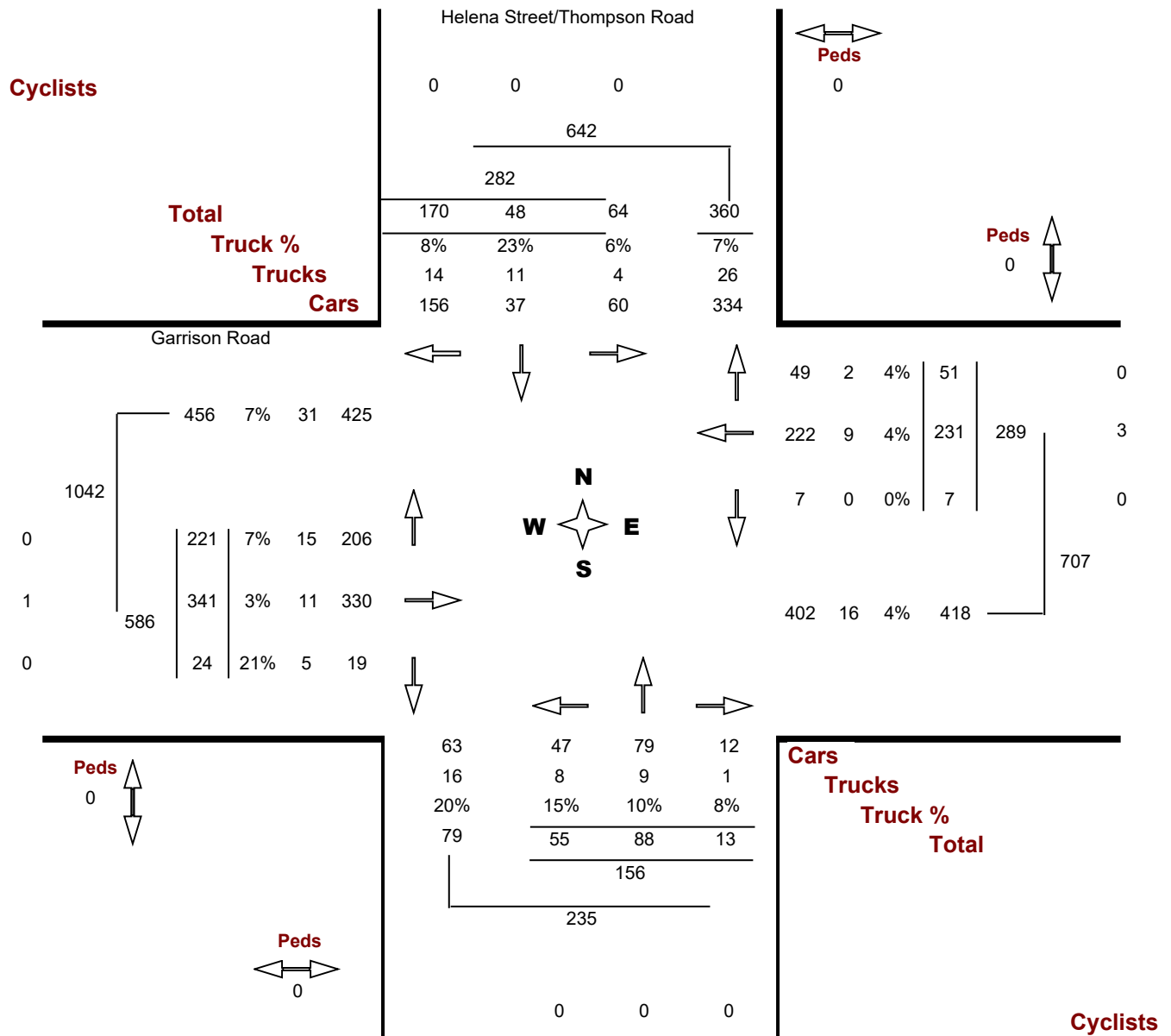
Count Date. Thursday, 23 May, 2019

Traffic Cont.

Count Time. 07:00 AM — 09:00 AM

Major Dir..... East west

Peak Hour.. 08:00 AM — 09:00 AM



Location..... Garrison Road @ Helena Street/Thompson Road

GeoID..... 01725

Municipality. FORT ERIE

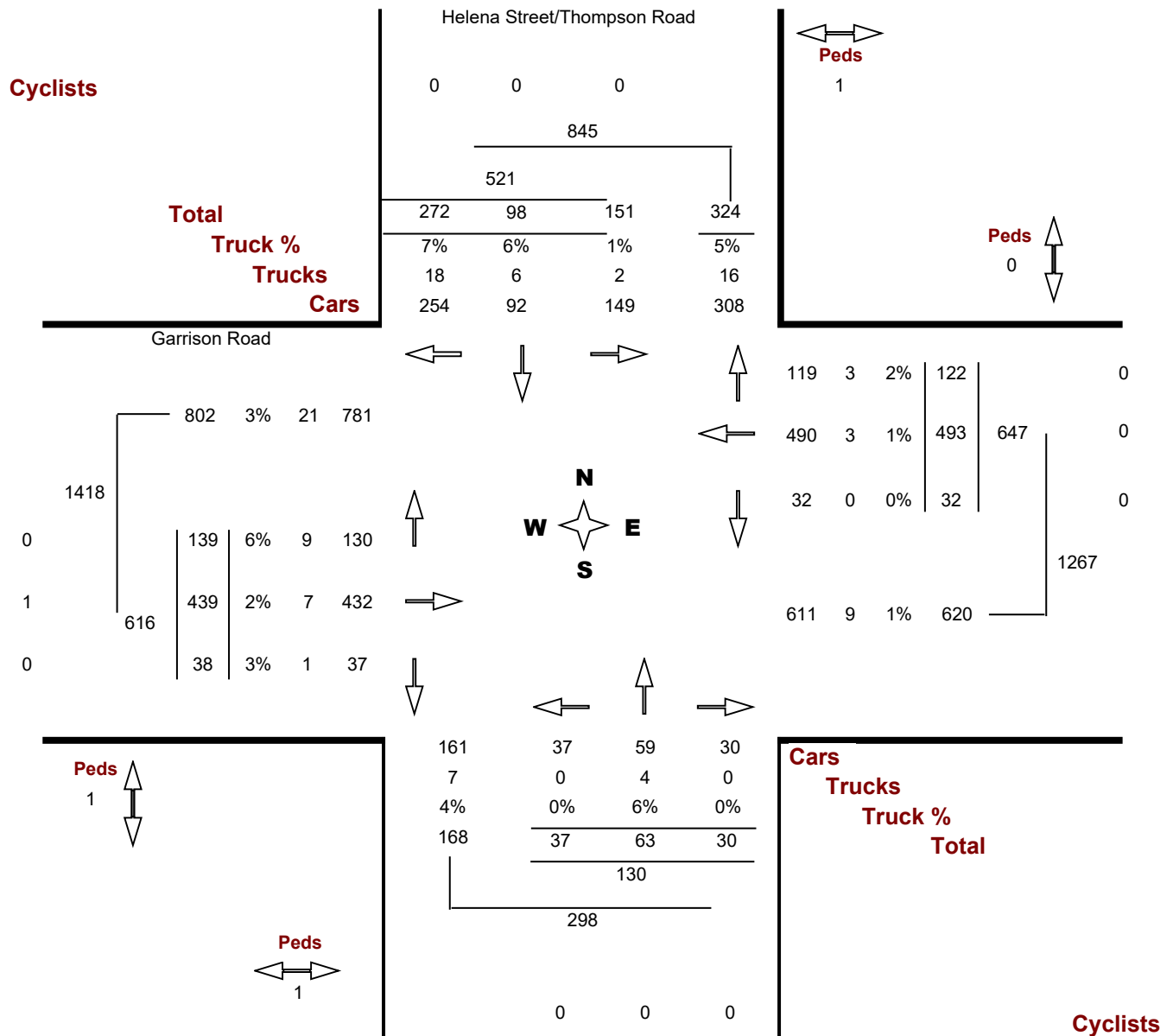
Count Date. Thursday, 23 May, 2019

Traffic Cont.

Count Time. 03:00 PM — 06:00 PM

Major Dir..... East west

Peak Hour.. 03:30 PM — 04:30 PM



Location..... Garrison Road @ Helena Street/Thompson Road

GeoID..... 01725

Municipality. FORT ERIE

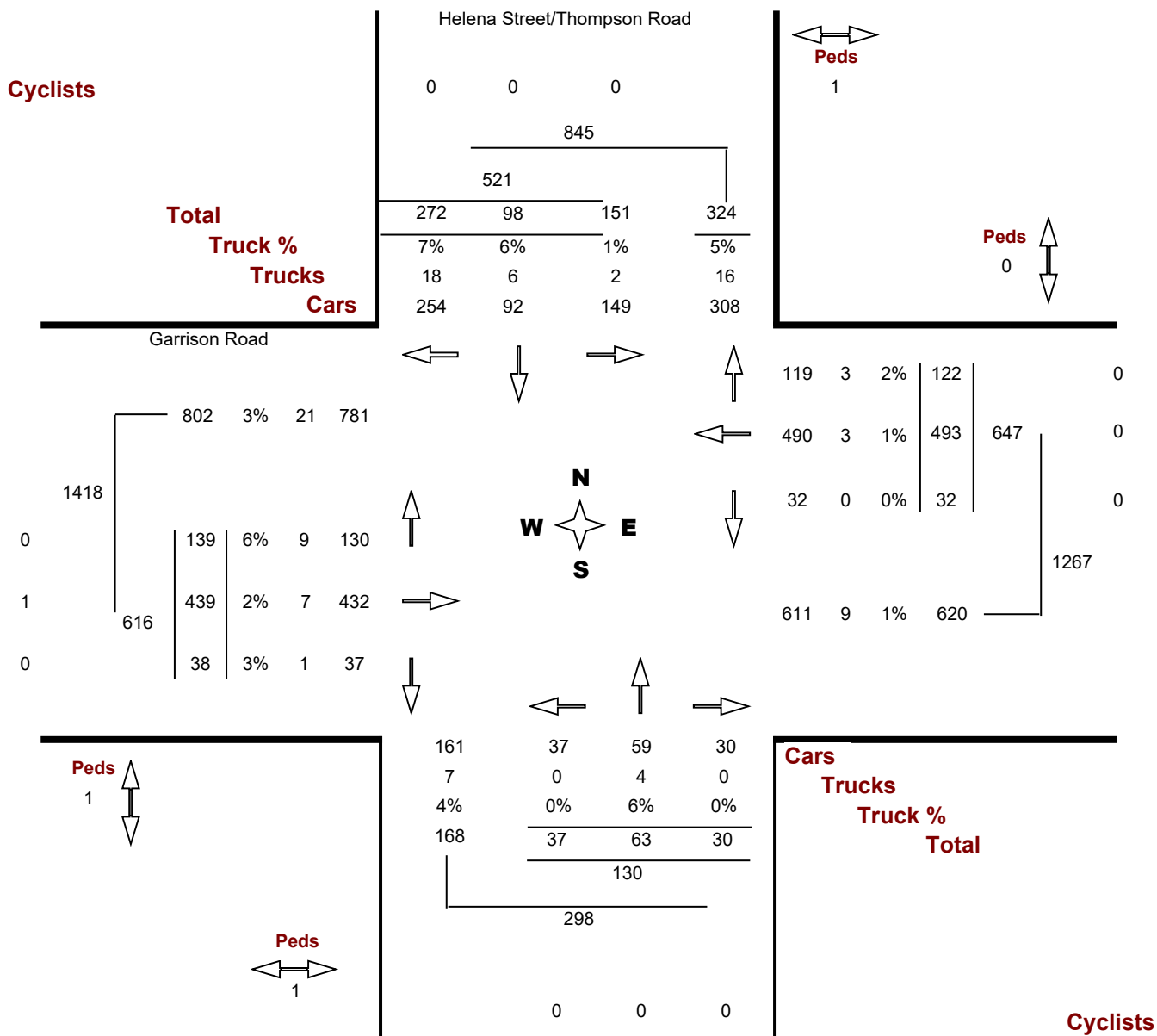
Count Date. Thursday, 23 May, 2019

Traffic Cont.

Count Time. 07:00 AM — 06:00 PM

Major Dir..... East west

Peak Hour.. 03:30 PM — 04:30 PM



Turning Movement Count - Details Report (15 min)

Location..... Garrison Road @ Helena Street/Thompson Road

Municipality..... FORT ERIE

Count Date..... Thursday, May 23, 2019

Helena Street/Thompson Road

Garrison Road

North Approach

South Approach

East Approach

West Approach

Time Period	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT
07:00 07:15	12	10	22	0	44	3	15	2	0	20	2	16	5	0	23	21	44	2	0	67
07:15 07:30	5	10	21	0	36	4	12	2	0	18	1	27	8	0	36	42	43	5	0	90
07:30 07:45	5	5	27	0	37	6	24	3	0	33	2	36	8	0	46	36	53	4	0	93
07:45 08:00	13	9	46	0	68	12	20	4	0	36	2	62	7	0	71	44	80	3	0	127
Hourly Total	35	34	116	0	185	25	71	11	0	107	7	141	28	0	176	143	220	14	0	377
08:00 08:15	12	11	41	0	64	13	16	1	0	30	2	64	9	0	75	42	67	3	0	112
08:15 08:30	8	10	43	0	61	12	22	4	0	38	3	61	13	0	77	52	85	3	0	140
08:30 08:45	23	17	46	0	86	18	26	3	0	47	1	48	14	0	63	55	80	7	0	142
08:45 09:00	21	10	40	0	71	12	24	5	0	41	1	58	15	0	74	72	109	11	0	192
Hourly Total	64	48	170	0	282	55	88	13	0	156	7	231	51	0	289	221	341	24	0	586
11:00 11:15	27	18	30	0	75	4	15	5	0	24	3	105	14	0	122	28	94	3	0	125
11:15 11:30	32	15	37	0	84	6	11	4	0	21	5	93	31	0	129	35	86	4	0	125
11:30 11:45	32	13	39	0	84	7	17	3	0	27	4	80	24	0	108	36	78	6	0	120
11:45 12:00	32	22	39	0	93	12	15	6	0	33	3	97	30	0	130	26	125	2	0	153
Hourly Total	123	68	145	0	336	29	58	18	0	105	15	375	99	0	489	125	383	15	0	523
12:00 12:15	38	14	49	0	101	9	13	5	0	27	3	128	27	0	158	33	102	13	0	148
12:15 12:30	39	18	25	0	82	12	18	3	0	33	3	112	19	0	134	35	112	13	0	160
12:30 12:45	33	16	41	0	90	4	16	8	0	28	2	104	35	0	141	30	106	5	0	141
12:45 13:00	44	16	35	0	95	5	13	4	0	22	7	90	22	0	119	47	110	8	0	165
Hourly Total	154	64	150	0	368	30	60	20	0	110	15	434	103	0	552	145	430	39	0	614
13:00 13:15	42	6	35	0	83	5	16	9	0	30	4	94	23	0	121	33	110	5	0	148
13:15 13:30	36	9	41	0	86	7	19	6	0	32	7	81	32	0	120	36	101	2	0	139
13:30 13:45	37	15	28	0	80	8	7	9	0	24	5	98	19	0	122	37	82	11	0	130
13:45 14:00	35	15	44	0	94	3	12	8	0	23	2	98	27	0	127	47	95	8	0	150
Hourly Total	150	45	148	0	343	23	54	32	0	109	18	371	101	0	490	153	388	26	0	567
15:00 15:15	31	18	65	0	114	10	16	3	0	29	3	98	25	0	126	41	105	3	0	149
15:15 15:30	47	22	35	0	104	9	28	7	0	44	9	120	40	0	169	40	100	14	0	154
15:30 15:45	36	19	69	0	124	11	20	9	0	40	10	109	34	0	153	34	96	15	0	145
15:45 16:00	47	34	73	0	154	10	9	6	0	25	5	102	30	0	137	39	133	8	0	180
Hourly Total	161	93	242	0	496	40	73	25	0	138	27	429	129	0	585	154	434	40	0	628
16:00 16:15	41	19	63	0	123	8	21	8	0	37	3	135	30	0	168	28	89	8	0	125

Helena Street/Thompson Road

Garrison Road

Time Period	North Approach					South Approach					East Approach					West Approach				
	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT	LT	TH	RT	U-Turn	TOT
16:15 16:30	27	26	67	0	120	8	13	7	0	28	14	147	28	0	189	38	121	7	0	166
16:30 16:45	33	35	63	0	131	10	16	8	0	34	5	106	26	0	137	29	96	8	0	133
16:45 17:00	21	23	56	0	100	4	13	7	0	24	6	117	20	0	143	39	103	6	0	148
Hourly Total	122	103	249	0	474	30	63	30	0	123	28	505	104	0	637	134	409	29	0	572
17:00 17:15	43	28	71	0	142	8	19	3	0	30	5	109	27	0	141	38	110	9	0	157
17:15 17:30	23	21	50	0	94	3	13	8	0	24	4	118	26	0	148	38	97	5	0	140
17:30 17:45	34	20	74	0	128	3	8	4	0	15	7	98	13	0	118	33	87	5	0	125
17:45 18:00	30	22	50	0	102	7	12	4	0	23	4	95	21	0	120	34	92	6	0	132
Hourly Total	130	91	245	0	466	21	52	19	0	92	20	420	87	0	527	143	386	25	0	554
Grand Total	939	546	1465	0	2950	253	519	168	0	940	137	2906	702	0	3745	1218	2991	212	0	4421
Truck %	2%	9%	6%	0%	5%	8%	8%	5%	0%	7%	1%	2%	4%	0%	2%	6%	2%	8%	0%	4%

Signal Code: 003122						
Intersection: RR3(Garrison) & RR122(Thompson Rd.)						
Municipality: forterie						
Owner: Region						
Last Modified: 1/11/2018 8:51:15 AM						
Timing Parameters	EBD & WBD ADVANCE GARRISON RD.	EBD & WBD THRU GARRISON RD.	NBD & SBD THRU THOMPSON RD./HELENA ST.	n/a	n/a	n/a
Min Green	6	10	10	0	0	0
Walk	0	12	12	0	0	0
Ped Clearance	0	20	20	0	0	0
Vehicle Ext.	2.5	5	3	0	0	0
Max Green	25	35	20	0	0	0
Yellow	3	5	4.1	0	0	0
All Red	0	2	2	0	0	0

		Offset
Minimum Cycle	33.1	0
Pedestrian Cycle	77.1	
Maximum Cycle	96.1	0
Operation	FA	

Installed On:

3/6/2004

Count Date:

10/13/2016

FA = Fully Actuated

SA = Semi Actuated

FT = Fixed Time

Close Window

Print Entry*

Refresh Entry

***Note: you need to change the paper orientation from Portrait to Landscape**

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**MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Fort Erie
Street: 613 Helena St - NB
Location: 1**

A study of vehicle traffic was conducted with the device having serial number 405258. The study was done in the NB lane at 613 Helena St - NB in Fort Erie, ON in county. The study began on 2021-07-28 at 12:00 AM and concluded on 2021-07-29 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 1,140 vehicles passed through the location with a peak volume of 31 on 2021-07-28 at [02:30 PM-02:45 PM] and a minimum volume of 0 on 2021-07-28 at [10:30 PM-10:45 PM]. The AADT count for this study was 1,140.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 70 - 80 KM/H range or lower. The average speed for all classified vehicles was 73 KM/H with 59.07% vehicles exceeding the posted speed of 70 KM/H. 26.23% percent of the total vehicles were traveling in excess of 89 KM/H. The mode speed for this traffic study was 70KM/H and the 85th percentile was 86.65 KM/H.

< to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	100 to 109	110 to 119	120 to 129	130 to 139	140 to >
0	3	2	3	18	118	321	373	191	76	15	9	7	0	0

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin. Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 1094 which represents 96 percent of the total classified vehicles. The number of Small Trucks in the study was 7 which represents 1 percent of the total classified vehicles. The number of Trucks/Buses in the study was 27 which represents 2 percent of the total classified vehicles. The number of Tractor Trailers in the study was 8 which represents 1 percent of the total classified vehicles.

< to 4.9	5.0 to 8.4	8.5 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 22.4	22.5 to >							
485	609	7	27	7	1	0	0							

CHART 2

HEADWAY

During the peak traffic period, on 2021-07-28 at [02:30 PM-02:45 PM] the average headway between vehicles was 28.125 seconds. During the slowest traffic period, on 2021-07-28 at [10:30 PM-10:45 PM] the average headway between vehicles was 900 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 22.00 and 44.00 degrees C.

**MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Fort Erie
Street: 613 Helena St - SB
Location: 1**

A study of vehicle traffic was conducted with the device having serial number 400181. The study was done in the SB lane at 613 Helena St - SB in Fort Erie, ON in county. The study began on 2021-07-28 at 12:00 AM and concluded on 2021-07-29 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 1,284 vehicles passed through the location with a peak volume of 46 on 2021-07-28 at [05:00 PM-05:15 PM] and a minimum volume of 0 on 2021-07-28 at [01:30 AM-01:45 AM]. The AADT count for this study was 1,284.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 70 - 80 KM/H range or lower. The average speed for all classified vehicles was 74 KM/H with 62.67% vehicles exceeding the posted speed of 70 KM/H. 24.16% percent of the total vehicles were traveling in excess of 89 KM/H. The mode speed for this traffic study was 70KM/H and the 85th percentile was 86.00 KM/H.

< to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	100 to 109	110 to 119	120 to 129	130 to 139	140 to >
0	2	3	2	12	105	355	494	195	82	27	3	3	0	0

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin. Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 1235 which represents 96 percent of the total classified vehicles. The number of Small Trucks in the study was 14 which represents 1 percent of the total classified vehicles. The number of Trucks/Buses in the study was 26 which represents 2 percent of the total classified vehicles. The number of Tractor Trailers in the study was 8 which represents 1 percent of the total classified vehicles.

< to 4.9	5.0 to 8.4	8.5 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 22.4	22.5 to >							
713	522	14	26	5	1	2	0							

CHART 2

HEADWAY

During the peak traffic period, on 2021-07-28 at [05:00 PM-05:15 PM] the average headway between vehicles was 19.149 seconds. During the slowest traffic period, on 2021-07-28 at [01:30 AM-01:45 AM] the average headway between vehicles was 900 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 22.00 and 45.00 degrees C.

Class/Volume Report Graph

HI-Star ID: 62F0A
 Street: 613 Helena St - NB
 State: ON
 City: Fort Erie
 Area:

Begin: 2021-07-28 12:00 AM
 Lane: NB
 Oper: MD
 Posted: 70
 AADT Factor: 1

End: 2021-07-29 12:00 AM
 Hours: 24:00
 Period: 15
 Raw Count: 1140
 AADT Count: 1140

NC300 - Metres	0.0 to 4.9	5.0 to 8.4	8.5 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 22.4	22.5 >	Total
2021-07-28 [12:00 AM-12:15 AM]	1	1	0	0	0	0	0	0	1
2021-07-28 [12:15 AM-12:30 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [12:30 AM-12:45 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [12:45 AM-01:00 AM]	0	0	0	0	0	0	0	0	0
	1	1	0	0	0	0	0	0	1
2021-07-28 [01:00 AM-01:15 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [01:15 AM-01:30 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [01:30 AM-01:45 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [01:45 AM-02:00 AM]	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
2021-07-28 [02:00 AM-02:15 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [02:15 AM-02:30 AM]	1	0	1	0	0	0	0	0	1
2021-07-28 [02:30 AM-02:45 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [02:45 AM-03:00 AM]	0	0	0	0	0	0	0	0	0
	1	0	1	0	0	0	0	0	1
2021-07-28 [03:00 AM-03:15 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [03:15 AM-03:30 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [03:30 AM-03:45 AM]	1	1	0	0	0	0	0	0	1
2021-07-28 [03:45 AM-04:00 AM]	0	0	0	0	0	0	0	0	0
	1	1	0	0	0	0	0	0	1
2021-07-28 [04:00 AM-04:15 AM]	1	1	0	0	0	0	0	0	1
2021-07-28 [04:15 AM-04:30 AM]	2	2	0	0	0	0	0	0	2
2021-07-28 [04:30 AM-04:45 AM]	1	1	0	0	0	0	0	0	1
2021-07-28 [04:45 AM-05:00 AM]	2	1	1	0	0	0	0	0	2
	6	5	1	0	0	0	0	0	6
2021-07-28 [05:00 AM-05:15 AM]	7	4	2	0	0	0	0	0	6
2021-07-28 [05:15 AM-05:30 AM]	3	0	3	0	0	0	0	0	3
2021-07-28 [05:30 AM-05:45 AM]	7	4	3	0	0	0	0	0	7
2021-07-28 [05:45 AM-06:00 AM]	7	4	3	0	0	0	0	0	7
	24	12	11	0	0	0	0	0	23
2021-07-28 [06:00 AM-06:15 AM]	10	5	5	0	0	0	0	0	10
2021-07-28 [06:15 AM-06:30 AM]	13	6	7	0	0	0	0	0	13
2021-07-28 [06:30 AM-06:45 AM]	15	5	10	0	0	0	0	0	15
2021-07-28 [06:45 AM-07:00 AM]	12	2	9	0	0	0	0	0	11
	50	18	31	0	0	0	0	0	49
2021-07-28 [07:00 AM-07:15 AM]	12	3	9	0	0	0	0	0	12
2021-07-28 [07:15 AM-07:30 AM]	17	7	9	0	1	0	0	0	17
2021-07-28 [07:30 AM-07:45 AM]	26	11	12	1	2	0	0	0	26
2021-07-28 [07:45 AM-08:00 AM]	25	11	12	0	0	1	0	0	24
	80	32	42	1	3	1	0	0	79
2021-07-28 [08:00 AM-08:15 AM]	22	15	6	0	0	0	1	0	22
2021-07-28 [08:15 AM-08:30 AM]	18	9	5	2	2	0	0	0	18
2021-07-28 [08:30 AM-08:45 AM]	16	7	7	0	1	1	0	0	16
2021-07-28 [08:45 AM-09:00 AM]	23	8	14	0	0	1	0	0	23
	79	39	32	2	3	2	1	0	79
2021-07-28 [09:00 AM-09:15 AM]	21	6	14	0	1	0	0	0	21
2021-07-28 [09:15 AM-09:30 AM]	26	8	16	0	2	0	0	0	26
2021-07-28 [09:30 AM-09:45 AM]	23	14	9	0	0	0	0	0	23
2021-07-28 [09:45 AM-10:00 AM]	19	6	12	0	1	0	0	0	19

	89	34	51	0	4	0	0	0	0	89
2021-07-28 [10:00 AM-10:15 AM]	27	14	13	0	0	0	0	0	0	27
2021-07-28 [10:15 AM-10:30 AM]	16	9	6	0	0	1	0	0	0	16
2021-07-28 [10:30 AM-10:45 AM]	26	13	13	0	0	0	0	0	0	26
2021-07-28 [10:45 AM-11:00 AM]	25	15	9	0	0	1	0	0	0	25
	94	51	41	0	0	2	0	0	0	94
2021-07-28 [11:00 AM-11:15 AM]	18	7	11	0	0	0	0	0	0	18
2021-07-28 [11:15 AM-11:30 AM]	11	4	7	0	0	0	0	0	0	11
2021-07-28 [11:30 AM-11:45 AM]	0	0	0	0	0	0	0	0	0	0
2021-07-28 [11:45 AM-12:00 PM]	0	0	0	0	0	0	0	0	0	0
	29	11	18	0	0	0	0	0	0	29
2021-07-28 [12:00 PM-12:15 PM]	22	13	8	1	0	0	0	0	0	22
2021-07-28 [12:15 PM-12:30 PM]	17	10	7	0	0	0	0	0	0	17
2021-07-28 [12:30 PM-12:45 PM]	22	7	15	0	0	0	0	0	0	22
2021-07-28 [12:45 PM-01:00 PM]	19	10	7	0	2	0	0	0	0	19
	80	40	37	1	2	0	0	0	0	80
2021-07-28 [01:00 PM-01:15 PM]	23	11	12	0	0	0	0	0	0	23
2021-07-28 [01:15 PM-01:30 PM]	24	6	17	0	1	0	0	0	0	24
2021-07-28 [01:30 PM-01:45 PM]	19	5	12	1	1	0	0	0	0	19
2021-07-28 [01:45 PM-02:00 PM]	22	12	9	0	1	0	0	0	0	22
	88	34	50	1	3	0	0	0	0	88
2021-07-28 [02:00 PM-02:15 PM]	27	4	22	0	1	0	0	0	0	27
2021-07-28 [02:15 PM-02:30 PM]	17	4	12	0	0	1	0	0	0	17
2021-07-28 [02:30 PM-02:45 PM]	31	12	18	0	1	0	0	0	0	31
2021-07-28 [02:45 PM-03:00 PM]	26	9	14	1	2	0	0	0	0	26
	101	29	66	1	4	1	0	0	0	101
2021-07-28 [03:00 PM-03:15 PM]	15	5	9	0	0	1	0	0	0	15
2021-07-28 [03:15 PM-03:30 PM]	23	13	10	0	0	0	0	0	0	23
2021-07-28 [03:30 PM-03:45 PM]	27	10	15	1	0	0	0	0	0	26
2021-07-28 [03:45 PM-04:00 PM]	21	8	13	0	0	0	0	0	0	21
	86	36	47	1	0	1	0	0	0	85
2021-07-28 [04:00 PM-04:15 PM]	24	13	9	0	2	0	0	0	0	24
2021-07-28 [04:15 PM-04:30 PM]	19	10	8	0	1	0	0	0	0	19
2021-07-28 [04:30 PM-04:45 PM]	14	7	7	0	0	0	0	0	0	14
2021-07-28 [04:45 PM-05:00 PM]	20	8	12	0	0	0	0	0	0	20
	77	38	36	0	3	0	0	0	0	77
2021-07-28 [05:00 PM-05:15 PM]	22	5	16	0	1	0	0	0	0	22
2021-07-28 [05:15 PM-05:30 PM]	16	7	9	0	0	0	0	0	0	16
2021-07-28 [05:30 PM-05:45 PM]	13	7	6	0	0	0	0	0	0	13
2021-07-28 [05:45 PM-06:00 PM]	26	10	15	0	1	0	0	0	0	26
	77	29	46	0	2	0	0	0	0	77
2021-07-28 [06:00 PM-06:15 PM]	14	5	9	0	0	0	0	0	0	14
2021-07-28 [06:15 PM-06:30 PM]	16	8	8	0	0	0	0	0	0	16
2021-07-28 [06:30 PM-06:45 PM]	12	5	7	0	0	0	0	0	0	12
2021-07-28 [06:45 PM-07:00 PM]	15	7	8	0	0	0	0	0	0	15
	57	25	32	0	0	0	0	0	0	57
2021-07-28 [07:00 PM-07:15 PM]	13	6	6	0	1	0	0	0	0	13
2021-07-28 [07:15 PM-07:30 PM]	15	7	8	0	0	0	0	0	0	15
2021-07-28 [07:30 PM-07:45 PM]	9	3	6	0	0	0	0	0	0	9
2021-07-28 [07:45 PM-08:00 PM]	16	7	9	0	0	0	0	0	0	16
	53	23	29	0	1	0	0	0	0	53
2021-07-28 [08:00 PM-08:15 PM]	10	3	7	0	0	0	0	0	0	10
2021-07-28 [08:15 PM-08:30 PM]	5	2	3	0	0	0	0	0	0	5
2021-07-28 [08:30 PM-08:45 PM]	12	7	5	0	0	0	0	0	0	12
2021-07-28 [08:45 PM-09:00 PM]	6	2	4	0	0	0	0	0	0	6
	33	14	19	0	0	0	0	0	0	33

2021-07-28 [09:00 PM-09:15 PM]	4	1	3	0	0	0	0	0	0	4
2021-07-28 [09:15 PM-09:30 PM]	3	1	2	0	0	0	0	0	0	3
2021-07-28 [09:30 PM-09:45 PM]	3	2	1	0	0	0	0	0	0	3
2021-07-28 [09:45 PM-10:00 PM]	4	3	1	0	0	0	0	0	0	4
	14	7	7	0	0	0	0	0	0	14
2021-07-28 [10:00 PM-10:15 PM]	8	3	3	0	2	0	0	0	0	8
2021-07-28 [10:15 PM-10:30 PM]	1	0	1	0	0	0	0	0	0	1
2021-07-28 [10:30 PM-10:45 PM]	0	0	0	0	0	0	0	0	0	0
2021-07-28 [10:45 PM-11:00 PM]	2	0	2	0	0	0	0	0	0	2
	11	3	6	0	2	0	0	0	0	11
2021-07-28 [11:00 PM-11:15 PM]	6	3	3	0	0	0	0	0	0	6
2021-07-28 [11:15 PM-11:30 PM]	1	0	1	0	0	0	0	0	0	1
2021-07-28 [11:30 PM-11:45 PM]	1	0	1	0	0	0	0	0	0	1
2021-07-28 [11:45 PM-12:00 AM]	1	0	1	0	0	0	0	0	0	1
	9	3	6	0	0	0	0	0	0	9
Daily Totals:	1140	485	609	7	27	7	1	0	0	1136
Total Counted:	1140									
Total Classified:	1136	1140	485	609	7	27	7	1	0	1136
Total Unclassified:	4									
Report Percentages:		42.69%	53.61%	0.62%	2.38%	0.62%	0.09%	0.00%	0.00%	
Peak Time: (AM):	2021-07-28 [10:00 AM-10:15 AM]			Peak Count:	27					
Peak Time: (PM):	2021-07-28 [02:30 PM-02:45 PM]			Peak Count:	31					

Class/Volume Report Graph

HI-Star ID: 61B35
 Street: 613 Helena St - SB
 State: ON
 City: Fort Erie
 Area:

Begin: 2021-07-28 12:00 AM
 Lane: SB
 Oper: MD
 Posted: 70
 AADT Factor: 1

End: 2021-07-29 12:00 AM
 Hours: 24:00
 Period: 15
 Raw Count: 1284
 AADT Count: 1284

NC300 - Metres	0.0 to 4.9	5.0 to 8.4	8.5 to 9.9	10.0 to 12.5	13.0 to 15.5	16.0 to 18.5	19.0 to 22.4	22.5 >	Total
2021-07-28 [12:00 AM-12:15 AM]	4	2	2	0	0	0	0	0	4
2021-07-28 [12:15 AM-12:30 AM]	2	2	0	0	0	0	0	0	2
2021-07-28 [12:30 AM-12:45 AM]	1	1	0	0	0	0	0	0	1
2021-07-28 [12:45 AM-01:00 AM]	4	3	1	0	0	0	0	0	4
	11	8	3	0	0	0	0	0	11
2021-07-28 [01:00 AM-01:15 AM]	1	0	1	0	0	0	0	0	1
2021-07-28 [01:15 AM-01:30 AM]	1	1	0	0	0	0	0	0	1
2021-07-28 [01:30 AM-01:45 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [01:45 AM-02:00 AM]	0	0	0	0	0	0	0	0	0
	2	1	1	0	0	0	0	0	2
2021-07-28 [02:00 AM-02:15 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [02:15 AM-02:30 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [02:30 AM-02:45 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [02:45 AM-03:00 AM]	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
2021-07-28 [03:00 AM-03:15 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [03:15 AM-03:30 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [03:30 AM-03:45 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [03:45 AM-04:00 AM]	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
2021-07-28 [04:00 AM-04:15 AM]	1	1	0	0	0	0	0	0	1
2021-07-28 [04:15 AM-04:30 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [04:30 AM-04:45 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [04:45 AM-05:00 AM]	0	0	0	0	0	0	0	0	0
	1	1	0	0	0	0	0	0	1
2021-07-28 [05:00 AM-05:15 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [05:15 AM-05:30 AM]	1	0	1	0	0	0	0	0	1
2021-07-28 [05:30 AM-05:45 AM]	2	2	0	0	0	0	0	0	2
2021-07-28 [05:45 AM-06:00 AM]	2	2	0	0	0	0	0	0	2
	5	4	1	0	0	0	0	0	5
2021-07-28 [06:00 AM-06:15 AM]	3	1	2	0	0	0	0	0	3
2021-07-28 [06:15 AM-06:30 AM]	3	1	0	1	1	0	0	0	3
2021-07-28 [06:30 AM-06:45 AM]	0	0	0	0	0	0	0	0	0
2021-07-28 [06:45 AM-07:00 AM]	2	2	0	0	0	0	0	0	2
	8	4	2	1	1	0	0	0	8
2021-07-28 [07:00 AM-07:15 AM]	10	4	4	1	1	0	0	0	10
2021-07-28 [07:15 AM-07:30 AM]	8	4	4	0	0	0	0	0	8
2021-07-28 [07:30 AM-07:45 AM]	11	6	4	0	1	0	0	0	11
2021-07-28 [07:45 AM-08:00 AM]	10	5	4	0	0	1	0	0	10
	39	19	16	1	2	1	0	0	39
2021-07-28 [08:00 AM-08:15 AM]	10	7	2	0	1	0	0	0	10
2021-07-28 [08:15 AM-08:30 AM]	11	4	6	1	0	0	0	0	11
2021-07-28 [08:30 AM-08:45 AM]	10	6	3	0	0	1	0	0	10
2021-07-28 [08:45 AM-09:00 AM]	10	6	4	0	0	0	0	0	10
	41	23	15	1	1	1	0	0	41
2021-07-28 [09:00 AM-09:15 AM]	12	7	5	0	0	0	0	0	12
2021-07-28 [09:15 AM-09:30 AM]	16	7	9	0	0	0	0	0	16
2021-07-28 [09:30 AM-09:45 AM]	15	9	6	0	0	0	0	0	15
2021-07-28 [09:45 AM-10:00 AM]	21	10	8	1	2	0	0	0	21
	64	33	28	1	2	0	0	0	64

2021-07-28 [10:00 AM-10:15 AM]	11	5	5	0	1	0	0	0	0	11
2021-07-28 [10:15 AM-10:30 AM]	15	11	3	1	0	0	0	0	0	15
2021-07-28 [10:30 AM-10:45 AM]	26	14	11	0	1	0	0	0	0	26
2021-07-28 [10:45 AM-11:00 AM]	15	10	4	0	1	0	0	0	0	15
	67	40	23	1	3	0	0	0	0	67
2021-07-28 [11:00 AM-11:15 AM]	19	9	9	0	1	0	0	0	0	19
2021-07-28 [11:15 AM-11:30 AM]	34	21	10	1	1	0	1	0	0	34
2021-07-28 [11:30 AM-11:45 AM]	45	22	21	1	0	1	0	0	0	45
2021-07-28 [11:45 AM-12:00 PM]	37	15	18	1	3	0	0	0	0	37
	135	67	58	3	5	1	1	0	0	135
2021-07-28 [12:00 PM-12:15 PM]	28	11	13	2	1	0	0	1	0	28
2021-07-28 [12:15 PM-12:30 PM]	23	11	12	0	0	0	0	0	0	23
2021-07-28 [12:30 PM-12:45 PM]	22	8	10	1	2	1	0	0	0	22
2021-07-28 [12:45 PM-01:00 PM]	17	10	7	0	0	0	0	0	0	17
	90	40	42	3	3	1	0	1	0	90
2021-07-28 [01:00 PM-01:15 PM]	19	11	8	0	0	0	0	0	0	19
2021-07-28 [01:15 PM-01:30 PM]	24	15	7	1	1	0	0	0	0	24
2021-07-28 [01:30 PM-01:45 PM]	26	15	9	0	1	1	0	0	0	26
2021-07-28 [01:45 PM-02:00 PM]	29	19	9	0	1	0	0	0	0	29
	98	60	33	1	3	1	0	0	0	98
2021-07-28 [02:00 PM-02:15 PM]	17	11	6	0	0	0	0	0	0	17
2021-07-28 [02:15 PM-02:30 PM]	29	12	15	0	1	0	0	0	0	28
2021-07-28 [02:30 PM-02:45 PM]	25	7	18	0	0	0	0	0	0	25
2021-07-28 [02:45 PM-03:00 PM]	32	19	12	0	0	0	0	1	0	32
	103	49	51	0	1	0	0	1	0	102
2021-07-28 [03:00 PM-03:15 PM]	19	12	7	0	0	0	0	0	0	19
2021-07-28 [03:15 PM-03:30 PM]	27	15	12	0	0	0	0	0	0	27
2021-07-28 [03:30 PM-03:45 PM]	21	11	8	1	1	0	0	0	0	21
2021-07-28 [03:45 PM-04:00 PM]	41	27	14	0	0	0	0	0	0	41
	108	65	41	1	1	0	0	0	0	108
2021-07-28 [04:00 PM-04:15 PM]	34	22	11	0	1	0	0	0	0	34
2021-07-28 [04:15 PM-04:30 PM]	37	19	18	0	0	0	0	0	0	37
2021-07-28 [04:30 PM-04:45 PM]	24	11	13	0	0	0	0	0	0	24
2021-07-28 [04:45 PM-05:00 PM]	27	16	10	0	1	0	0	0	0	27
	122	68	52	0	2	0	0	0	0	122
2021-07-28 [05:00 PM-05:15 PM]	46	28	17	1	0	0	0	0	0	46
2021-07-28 [05:15 PM-05:30 PM]	32	23	9	0	0	0	0	0	0	32
2021-07-28 [05:30 PM-05:45 PM]	31	19	12	0	0	0	0	0	0	31
2021-07-28 [05:45 PM-06:00 PM]	28	15	13	0	0	0	0	0	0	28
	137	85	51	1	0	0	0	0	0	137
2021-07-28 [06:00 PM-06:15 PM]	17	8	9	0	0	0	0	0	0	17
2021-07-28 [06:15 PM-06:30 PM]	15	11	4	0	0	0	0	0	0	15
2021-07-28 [06:30 PM-06:45 PM]	17	11	6	0	0	0	0	0	0	17
2021-07-28 [06:45 PM-07:00 PM]	11	5	6	0	0	0	0	0	0	11
	60	35	25	0	0	0	0	0	0	60
2021-07-28 [07:00 PM-07:15 PM]	4	0	3	0	1	0	0	0	0	4
2021-07-28 [07:15 PM-07:30 PM]	19	9	10	0	0	0	0	0	0	19
2021-07-28 [07:30 PM-07:45 PM]	24	14	10	0	0	0	0	0	0	24
2021-07-28 [07:45 PM-08:00 PM]	15	8	6	0	1	0	0	0	0	15
	62	31	29	0	2	0	0	0	0	62
2021-07-28 [08:00 PM-08:15 PM]	12	9	3	0	0	0	0	0	0	12
2021-07-28 [08:15 PM-08:30 PM]	15	11	4	0	0	0	0	0	0	15
2021-07-28 [08:30 PM-08:45 PM]	17	8	9	0	0	0	0	0	0	17
2021-07-28 [08:45 PM-09:00 PM]	18	10	8	0	0	0	0	0	0	18
	62	38	24	0	0	0	0	0	0	62
2021-07-28 [09:00 PM-09:15 PM]	15	9	6	0	0	0	0	0	0	15
2021-07-28 [09:15 PM-09:30 PM]	8	6	2	0	0	0	0	0	0	8

2021-07-28 [09:30 PM-09:45 PM]	4	4	0	0	0	0	0	0	0	4
2021-07-28 [09:45 PM-10:00 PM]	3	1	2	0	0	0	0	0	0	3
	30	20	10	0	0	0	0	0	0	30
2021-07-28 [10:00 PM-10:15 PM]	9	5	4	0	0	0	0	0	0	9
2021-07-28 [10:15 PM-10:30 PM]	9	4	5	0	0	0	0	0	0	9
2021-07-28 [10:30 PM-10:45 PM]	6	4	2	0	0	0	0	0	0	6
2021-07-28 [10:45 PM-11:00 PM]	4	1	3	0	0	0	0	0	0	4
	28	14	14	0	0	0	0	0	0	28
2021-07-28 [11:00 PM-11:15 PM]	4	2	2	0	0	0	0	0	0	4
2021-07-28 [11:15 PM-11:30 PM]	2	2	0	0	0	0	0	0	0	2
2021-07-28 [11:30 PM-11:45 PM]	2	2	0	0	0	0	0	0	0	2
2021-07-28 [11:45 PM-12:00 AM]	3	2	1	0	0	0	0	0	0	3
	11	8	3	0	0	0	0	0	0	11
Daily Totals:	1284	713	522	14	26	5	1	2	0	1283
Total Counted:	1284									
Total Classified:	1283	1284	713	522	14	26	5	1	2	0
Total Unclassified:	1									
Report Percentages:		55.57%	40.69%	1.09%	2.03%	0.39%	0.08%	0.16%	0.00%	
Peak Time: (AM):	2021-07-28 [11:30 AM-11:45 AM]	Peak Count:	45							
Peak Time: (PM):	2021-07-28 [05:00 PM-05:15 PM]	Peak Count:	46							

Time/Speed Report

HI-Star ID: 62FOA
 Street: 613 Helena St - NB
 State: ON
 City: Fort Erie
 Area:

Begin: 2021-07-28 12:00 AM
 Lane: NB
 Oper: MD
 Posted: 70
 AADT Factor: 1

End: 2021-07-29 12:00 AM
 Hours: 24:00
 Period: 15
 Raw Count: 1140
 AADT Count: 1140

NC300 - km/h	0 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	100 to 109	110 to 119	120 to 129	130 to 139	140 >	Total
2021-07-28 [12:00 AM-12:15 AM]	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
2021-07-28 [12:15 AM-12:30 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [12:30 AM-12:45 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [12:45 AM-01:00 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
2021-07-28 [01:00 AM-01:15 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [01:15 AM-01:30 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [01:30 AM-01:45 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [01:45 AM-02:00 AM]	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	0	0	0	0	0	0	0
2021-07-28 [02:00 AM-02:15 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [02:15 AM-02:30 AM]	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
2021-07-28 [02:30 AM-02:45 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [02:45 AM-03:00 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
2021-07-28 [03:00 AM-03:15 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [03:15 AM-03:30 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [03:30 AM-03:45 AM]	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
2021-07-28 [03:45 AM-04:00 AM]	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	0	1	0	0	0	0	1
2021-07-28 [04:00 AM-04:15 AM]	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
2021-07-28 [04:15 AM-04:30 AM]	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	2
2021-07-28 [04:30 AM-04:45 AM]	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
2021-07-28 [04:45 AM-05:00 AM]	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
	0	0	0	0	1	1	2	1	1	0	0	0	0	0	0	6
2021-07-28 [05:00 AM-05:15 AM]	0	0	0	0	0	0	2	2	1	1	0	0	0	0	0	6
2021-07-28 [05:15 AM-05:30 AM]	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	3
2021-07-28 [05:30 AM-05:45 AM]	0	0	0	0	1	1	2	1	0	1	0	0	1	0	0	7
2021-07-28 [05:45 AM-06:00 AM]	0	0	0	0	2	1	1	1	1	0	1	0	0	0	0	7
	0	0	0	0	3	2	6	5	2	2	2	0	1	0	0	23
2021-07-28 [06:00 AM-06:15 AM]	0	0	0	0	0	1	2	2	3	1	0	1	0	0	0	10
2021-07-28 [06:15 AM-06:30 AM]	0	0	0	0	0	0	7	3	3	0	0	0	0	0	0	13
2021-07-28 [06:30 AM-06:45 AM]	0	0	0	0	0	0	1	6	2	5	0	0	1	0	0	15
2021-07-28 [06:45 AM-07:00 AM]	0	0	0	0	0	1	2	1	5	2	0	0	0	0	0	11
	0	0	0	0	0	2	12	12	13	8	0	1	1	0	0	49
2021-07-28 [07:00 AM-07:15 AM]	0	0	0	0	0	2	2	5	3	0	0	0	0	0	0	12
2021-07-28 [07:15 AM-07:30 AM]	0	0	1	0	0	0	5	8	3	0	0	0	0	0	0	17
2021-07-28 [07:30 AM-07:45 AM]	0	0	0	0	0	3	8	8	4	1	1	1	0	0	0	26
2021-07-28 [07:45 AM-08:00 AM]	0	0	0	0	0	1	10	10	3	0	0	0	0	0	0	24
	0	0	1	0	0	6	25	31	13	1	1	1	0	0	0	79
2021-07-28 [08:00 AM-08:15 AM]	0	0	0	0	0	0	7	8	4	3	0	0	0	0	0	22
2021-07-28 [08:15 AM-08:30 AM]	0	0	0	0	0	4	3	3	4	3	0	0	1	0	0	18
2021-07-28 [08:30 AM-08:45 AM]	0	0	0	0	0	2	2	6	3	3	0	0	0	0	0	16
2021-07-28 [08:45 AM-09:00 AM]	0	0	0	0	0	1	6	7	3	5	0	1	0	0	0	23
	0	0	0	0	0	7	18	24	14	14	0	1	1	0	0	79
2021-07-28 [09:00 AM-09:15 AM]	0	0	0	0	1	4	8	5	3	0	0	0	0	0	0	21
2021-07-28 [09:15 AM-09:30 AM]	0	0	0	0	0	3	6	8	8	0	0	1	0	0	0	26
2021-07-28 [09:30 AM-09:45 AM]	0	0	0	0	0	2	7	9	5	0	0	0	0	0	0	23
2021-07-28 [09:45 AM-10:00 AM]	0	0	0	0	1	3	11	2	1	0	1	0	0	0	0	19
	0	0	0	0	2	12	32	24	17	0	1	1	0	0	0	89
2021-07-28 [10:00 AM-10:15 AM]	0	0	0	0	0	4	11	5	5	1	1	0	0	0	0	27
2021-07-28 [10:15 AM-10:30 AM]	0	0	0	0	2	4	4	4	1	1	0	0	0	0	0	16
2021-07-28 [10:30 AM-10:45 AM]	0	0	0	0	2	4	11	7	1	1	0	0	0	0	0	26
2021-07-28 [10:45 AM-11:00 AM]	0	0	0	1	0	7	8	5	1	3	0	0	0	0	0	25
	0	0	0	1	4	19	34	21	8	6	1	0	0	0	0	94
2021-07-28 [11:00 AM-11:15 AM]	0	0	0	0	0	3	11	1	2	1	0	0	0	0	0	18
2021-07-28 [11:15 AM-11:30 AM]	0	0	0	0	0	2	4	3	0	2	0	0	0	0	0	11
2021-07-28 [11:30 AM-11:45 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [11:45 AM-12:00 PM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	5	15	4	2	3	0	0	0	0	0	29
2021-07-28 [12:00 PM-12:15 PM]	0	3	0	0	1	5	4	4	3	1	0	1	0	0	0	22
2021-07-28 [12:15 PM-12:30 PM]	0	0	0	0	0	4	5	6	1	0	1	0	0	0	0	17
2021-07-28 [12:30 PM-12:45 PM]	0	0	0	0	1	1	5	9	3	2	1	0	0	0	0	22
2021-07-28 [12:45 PM-01:00 PM]	0	0	0	0	0	2	3	9	2	1	0	1	1	0	0	19
	0	3	0	0	2	12	17	28	9	4	2	2	1	0	0	80
2021-07-28 [01:00 PM-01:15 PM]	0	0	0	1	0	1	9	7	4	1	0	0	0	0	0	23
2021-07-28 [01:15 PM-01:30 PM]	0	0	0	0	0	0	6	8	7	1	1	0	1	0	0	24
2021-07-28 [01:30 PM-01:45 PM]	0	0	0	0	3	4	5	3	1	3	0	0	0	0	0	19
2021-07-28 [01:45 PM-02:00 PM]	0	0	0	0	0	2	5	10	5	0	0	0	0	0	0	22
	0	0	0	1	3	7	25	28	17	5	1	0	1	0	0	88
2021-07-28 [02:00 PM-02:15 PM]	0	0	0	0	0	2	7	12	2	3	1	0	0	0	0	27
2021-07-28 [02:15 PM-02:30 PM]	0	0	0	0	0	0	5	4	5	3	0	0	0	0	0	17
2021-07-28 [02:30 PM-02:45 PM]	0	0	0	0	1	1	9	14	3	1	1	1	0	0	0	31
2021-07-28 [02:45 PM-03:00 PM]	0	0	0	0	0	2	7	12	4	1	0	0	0	0	0	26
	0	0	0	0	1	5	28	42	14	8	2	1	0	0	0	101

2021-07-28 [03:00 PM-03:15 PM]	0	0	0	1	0	1	4	6	3	0	0	0	0	0	0	15
2021-07-28 [03:15 PM-03:30 PM]	0	0	0	0	0	3	2	9	9	0	0	0	0	0	0	23
2021-07-28 [03:30 PM-03:45 PM]	0	0	1	0	0	3	9	7	5	1	0	0	0	0	0	26
2021-07-28 [03:45 PM-04:00 PM]	0	0	0	0	0	2	7	10	2	0	0	0	0	0	0	21
	0	0	1	1	0	9	22	32	19	1	0	0	0	0	0	85
2021-07-28 [04:00 PM-04:15 PM]	0	0	0	0	0	8	5	8	2	0	1	0	0	0	0	24
2021-07-28 [04:15 PM-04:30 PM]	0	0	0	0	0	1	5	6	5	1	0	0	1	0	0	19
2021-07-28 [04:30 PM-04:45 PM]	0	0	0	0	0	0	5	4	4	1	0	0	0	0	0	14
2021-07-28 [04:45 PM-05:00 PM]	0	0	0	0	1	1	5	8	4	1	0	0	0	0	0	20
	0	0	0	0	1	10	20	26	15	3	1	0	1	0	0	77
2021-07-28 [05:00 PM-05:15 PM]	0	0	0	0	0	1	7	8	5	1	0	0	0	0	0	22
2021-07-28 [05:15 PM-05:30 PM]	0	0	0	0	0	4	6	1	3	2	0	0	0	0	0	16
2021-07-28 [05:30 PM-05:45 PM]	0	0	0	0	0	0	2	8	1	2	0	0	0	0	0	13
2021-07-28 [05:45 PM-06:00 PM]	0	0	0	0	0	4	4	10	5	3	0	0	0	0	0	26
	0	0	0	0	0	9	19	27	14	8	0	0	0	0	0	77
2021-07-28 [06:00 PM-06:15 PM]	0	0	0	0	0	3	3	3	5	0	0	0	0	0	0	14
2021-07-28 [06:15 PM-06:30 PM]	0	0	0	0	0	1	5	7	3	0	0	0	0	0	0	16
2021-07-28 [06:30 PM-06:45 PM]	0	0	0	0	1	0	4	3	2	1	1	0	0	0	0	12
2021-07-28 [06:45 PM-07:00 PM]	0	0	0	0	0	1	4	6	3	1	0	0	0	0	0	15
	0	0	0	0	1	5	16	19	13	2	1	0	0	0	0	57
2021-07-28 [07:00 PM-07:15 PM]	0	0	0	0	0	0	3	4	3	2	0	0	1	0	0	13
2021-07-28 [07:15 PM-07:30 PM]	0	0	0	0	0	1	2	6	5	1	0	0	0	0	0	15
2021-07-28 [07:30 PM-07:45 PM]	0	0	0	0	0	0	1	2	3	2	1	0	0	0	0	9
2021-07-28 [07:45 PM-08:00 PM]	0	0	0	0	0	1	3	9	0	2	0	1	0	0	0	16
	0	0	0	0	0	2	9	21	11	7	1	1	1	0	0	53
2021-07-28 [08:00 PM-08:15 PM]	0	0	0	0	0	0	3	2	2	1	1	1	0	0	0	10
2021-07-28 [08:15 PM-08:30 PM]	0	0	0	0	0	0	1	3	0	1	0	0	0	0	0	5
2021-07-28 [08:30 PM-08:45 PM]	0	0	0	0	0	2	2	7	1	0	0	0	0	0	0	12
2021-07-28 [08:45 PM-09:00 PM]	0	0	0	0	0	0	2	4	0	0	0	0	0	0	0	6
	0	0	0	0	0	2	8	16	3	2	1	1	0	0	0	33
2021-07-28 [09:00 PM-09:15 PM]	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	4
2021-07-28 [09:15 PM-09:30 PM]	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	3
2021-07-28 [09:30 PM-09:45 PM]	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	3
2021-07-28 [09:45 PM-10:00 PM]	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	4
	0	0	0	0	0	2	6	3	2	1	0	0	0	0	0	14
2021-07-28 [10:00 PM-10:15 PM]	0	0	0	0	0	0	4	1	2	1	0	0	0	0	0	8
2021-07-28 [10:15 PM-10:30 PM]	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
2021-07-28 [10:30 PM-10:45 PM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [10:45 PM-11:00 PM]	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
	0	0	0	0	0	0	5	3	2	1	0	0	0	0	0	11
2021-07-28 [11:00 PM-11:15 PM]	0	0	0	0	0	1	0	3	2	0	0	0	0	0	0	6
2021-07-28 [11:15 PM-11:30 PM]	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
2021-07-28 [11:30 PM-11:45 PM]	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
2021-07-28 [11:45 PM-12:00 AM]	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	1	2	4	2	0	0	0	0	0	0	9
Daily Totals:	0	3	2	3	18	118	321	373	191	76	15	9	7	0	0	1136
Report Totals:	0	3	2	3	18	118	321	373	191	76	15	9	7	0	0	1136
Report Percentages:	0.00%	0.26%	0.18%	0.26%	1.58%	10.39%	28.26%	32.83%	16.81%	6.69%	1.32%	0.79%	0.62%	0.00%	0.00%	

Time/Speed Report

HI-Star ID: 61B35
 Street: 613 Helena St - SB
 State: ON
 City: Fort Erie
 Area:

Begin: 2021-07-28 12:00 AM
 Lane: SB
 Oper: MD
 Posted: 70
 AADT Factor: 1

End: 2021-07-29 12:00 AM
 Hours: 24:00
 Period: 15
 Raw Count: 1284
 AADT Count: 1284

NC300 - km/h	0 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	100 to 109	110 to 119	120 to 129	130 to 139	140 >	Total
2021-07-28 [12:00 AM-12:15 AM]	0	0	0	0	0	1	0	0	2	1	0	0	0	0	0	4
2021-07-28 [12:15 AM-12:30 AM]	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
2021-07-28 [12:30 AM-12:45 AM]	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
2021-07-28 [12:45 AM-01:00 AM]	0	0	0	0	0	0	2	1	1	0	0	0	0	0	0	4
	0	0	0	0	0	1	4	2	3	1	0	0	0	0	0	11
2021-07-28 [01:00 AM-01:15 AM]	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
2021-07-28 [01:15 AM-01:30 AM]	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
2021-07-28 [01:30 AM-01:45 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [01:45 AM-02:00 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
2021-07-28 [02:00 AM-02:15 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [02:15 AM-02:30 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [02:30 AM-02:45 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [02:45 AM-03:00 AM]	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	0	0	0	0	0	0	0
2021-07-28 [03:00 AM-03:15 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [03:15 AM-03:30 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [03:30 AM-03:45 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [03:45 AM-04:00 AM]	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	0	0	0	0	0	0	0
2021-07-28 [04:00 AM-04:15 AM]	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
2021-07-28 [04:15 AM-04:30 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [04:30 AM-04:45 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [04:45 AM-05:00 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
2021-07-28 [05:00 AM-05:15 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [05:15 AM-05:30 AM]	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
2021-07-28 [05:30 AM-05:45 AM]	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2
2021-07-28 [05:45 AM-06:00 AM]	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2
	0	0	0	0	0	1	0	2	2	0	0	0	0	0	0	5
2021-07-28 [06:00 AM-06:15 AM]	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	3
2021-07-28 [06:15 AM-06:30 AM]	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
2021-07-28 [06:30 AM-06:45 AM]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021-07-28 [06:45 AM-07:00 AM]	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2
	0	0	0	0	0	0	0	5	3	0	0	0	0	0	0	8
2021-07-28 [07:00 AM-07:15 AM]	0	0	0	0	0	0	2	2	5	1	0	0	0	0	0	10
2021-07-28 [07:15 AM-07:30 AM]	0	0	0	0	0	0	1	3	2	1	1	0	0	0	0	8
2021-07-28 [07:30 AM-07:45 AM]	0	0	0	0	0	0	3	6	1	1	0	0	0	0	0	11
2021-07-28 [07:45 AM-08:00 AM]	0	0	0	0	0	1	0	3	5	1	0	0	0	0	0	10
	0	0	0	0	0	1	6	14	13	4	1	0	0	0	0	39
2021-07-28 [08:00 AM-08:15 AM]	0	0	0	0	0	0	2	3	4	0	1	0	0	0	0	10
2021-07-28 [08:15 AM-08:30 AM]	0	0	0	0	0	1	4	5	1	0	0	0	0	0	0	11
2021-07-28 [08:30 AM-08:45 AM]	0	0	0	0	0	1	2	7	0	0	0	0	0	0	0	10
2021-07-28 [08:45 AM-09:00 AM]	0	0	0	0	0	0	4	3	2	0	1	0	0	0	0	10
	0	0	0	0	0	2	12	18	7	0	2	0	0	0	0	41
2021-07-28 [09:00 AM-09:15 AM]	0	0	0	0	0	3	4	4	1	0	0	0	0	0	0	12
2021-07-28 [09:15 AM-09:30 AM]	0	0	0	0	0	6	4	5	0	1	0	0	0	0	0	16
2021-07-28 [09:30 AM-09:45 AM]	0	0	0	0	0	1	6	5	3	0	0	0	0	0	0	15
2021-07-28 [09:45 AM-10:00 AM]	0	0	0	0	0	1	2	13	3	2	0	0	0	0	0	21
	0	0	0	0	0	11	16	27	7	3	0	0	0	0	0	64
2021-07-28 [10:00 AM-10:15 AM]	0	0	0	0	0	1	3	6	1	0	0	0	0	0	0	11
2021-07-28 [10:15 AM-10:30 AM]	0	0	0	0	0	5	4	4	1	1	0	0	0	0	0	15
2021-07-28 [10:30 AM-10:45 AM]	0	0	0	0	1	4	5	8	5	1	2	0	0	0	0	26
2021-07-28 [10:45 AM-11:00 AM]	0	0	0	0	0	3	5	5	2	0	0	0	0	0	0	15
	0	0	0	0	1	13	17	23	9	2	2	0	0	0	0	67
2021-07-28 [11:00 AM-11:15 AM]	0	1	0	1	1	3	7	5	1	0	0	0	0	0	0	19
2021-07-28 [11:15 AM-11:30 AM]	0	0	0	0	0	4	15	8	6	1	0	0	0	0	0	34
2021-07-28 [11:30 AM-11:45 AM]	0	0	0	0	2	9	17	14	1	1	0	0	1	0	0	45
2021-07-28 [11:45 AM-12:00 PM]	0	0	0	0	1	4	13	16	3	0	0	0	0	0	0	37
	0	1	0	1	4	20	52	43	11	2	0	0	1	0	0	135
2021-07-28 [12:00 PM-12:15 PM]	0	0	0	0	0	0	6	12	6	3	1	0	0	0	0	28
2021-07-28 [12:15 PM-12:30 PM]	0	0	0	0	0	1	2	10	7	2	0	1	0	0	0	23
2021-07-28 [12:30 PM-12:45 PM]	0	0	1	0	4	7	4	4	1	0	0	1	0	0	0	22
2021-07-28 [12:45 PM-01:00 PM]	0	0	0	0	0	1	4	7	4	0	1	0	0	0	0	17
	0	0	1	0	4	9	16	33	18	5	2	2	0	0	0	90
2021-07-28 [01:00 PM-01:15 PM]	0	0	0	0	0	1	2	8	4	4	0	0	0	0	0	19
2021-07-28 [01:15 PM-01:30 PM]	0	0	0	0	0	0	12	8	1	1	2	0	0	0	0	24
2021-07-28 [01:30 PM-01:45 PM]	0	0	0	0	0	0	7	13	2	3	1	0	0	0	0	26
2021-07-28 [01:45 PM-02:00 PM]	0	0	0	0	0	5	7	10	4	2	1	0	0	0	0	29
	0	0	0	0	0	6	28	39	11	10	4	0	0	0	0	98
2021-07-28 [02:00 PM-02:15 PM]	0	0	0	0	0	0	6	8	1	1	1	0	0	0	0	17
2021-07-28 [02:15 PM-02:30 PM]	0	0	0	0	0	1	10	11	3	3	0	0	0	0	0	28
2021-07-28 [02:30 PM-02:45 PM]	0	0	0	0	0	1	6	8	6	3	1	0	0	0	0	25
2021-07-28 [02:45 PM-03:00 PM]	0	0	0	0	0	4	12	12	2	1	1	0	0	0	0	32
	0	0	0	0	0	6	34	39	12	8	3	0	0	0	0	102

2021-07-28 [03:00 PM-03:15 PM]	0	0	0	0	0	0	3	8	7	1	0	0	0	0	0	19
2021-07-28 [03:15 PM-03:30 PM]	0	0	0	0	0	3	5	14	3	0	1	0	1	0	0	27
2021-07-28 [03:30 PM-03:45 PM]	0	0	0	0	0	2	8	7	3	1	0	0	0	0	0	21
2021-07-28 [03:45 PM-04:00 PM]	0	0	0	0	1	2	7	23	5	0	2	1	0	0	0	41
	0	0	0	0	1	7	23	52	18	2	3	1	1	0	0	108
2021-07-28 [04:00 PM-04:15 PM]	0	1	2	0	0	4	14	12	0	1	0	0	0	0	0	34
2021-07-28 [04:15 PM-04:30 PM]	0	0	0	0	0	1	10	15	9	2	0	0	0	0	0	37
2021-07-28 [04:30 PM-04:45 PM]	0	0	0	0	0	0	7	7	7	1	2	0	0	0	0	24
2021-07-28 [04:45 PM-05:00 PM]	0	0	0	0	0	0	8	11	5	1	2	0	0	0	0	27
	0	1	2	0	0	5	39	45	21	5	4	0	0	0	0	122
2021-07-28 [05:00 PM-05:15 PM]	0	0	0	0	0	1	13	21	9	2	0	0	0	0	0	46
2021-07-28 [05:15 PM-05:30 PM]	0	0	0	0	0	2	11	16	1	2	0	0	0	0	0	32
2021-07-28 [05:30 PM-05:45 PM]	0	0	0	0	0	1	8	11	3	8	0	0	0	0	0	31
2021-07-28 [05:45 PM-06:00 PM]	0	0	0	0	1	3	8	9	4	3	0	0	0	0	0	28
	0	0	0	0	1	7	40	57	17	15	0	0	0	0	0	137
2021-07-28 [06:00 PM-06:15 PM]	0	0	0	0	0	1	3	8	4	1	0	0	0	0	0	17
2021-07-28 [06:15 PM-06:30 PM]	0	0	0	0	0	2	4	6	2	1	0	0	0	0	0	15
2021-07-28 [06:30 PM-06:45 PM]	0	0	0	0	0	1	3	9	1	2	1	0	0	0	0	17
2021-07-28 [06:45 PM-07:00 PM]	0	0	0	1	0	0	2	4	3	0	1	0	0	0	0	11
	0	0	0	1	0	4	12	27	10	4	2	0	0	0	0	60
2021-07-28 [07:00 PM-07:15 PM]	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	4
2021-07-28 [07:15 PM-07:30 PM]	0	0	0	0	0	2	5	7	3	1	1	0	0	0	0	19
2021-07-28 [07:30 PM-07:45 PM]	0	0	0	0	0	1	10	7	2	4	0	0	0	0	0	24
2021-07-28 [07:45 PM-08:00 PM]	0	0	0	0	0	0	5	7	2	1	0	0	0	0	0	15
	0	0	0	0	0	3	20	23	9	6	1	0	0	0	0	62
2021-07-28 [08:00 PM-08:15 PM]	0	0	0	0	1	0	9	0	2	0	0	0	0	0	0	12
2021-07-28 [08:15 PM-08:30 PM]	0	0	0	0	0	3	6	3	0	2	1	0	0	0	0	15
2021-07-28 [08:30 PM-08:45 PM]	0	0	0	0	0	1	4	9	2	1	0	0	0	0	0	17
2021-07-28 [08:45 PM-09:00 PM]	0	0	0	0	0	1	3	6	5	3	0	0	0	0	0	18
	0	0	0	0	1	5	22	18	9	6	1	0	0	0	0	62
2021-07-28 [09:00 PM-09:15 PM]	0	0	0	0	0	0	5	4	2	4	0	0	0	0	0	15
2021-07-28 [09:15 PM-09:30 PM]	0	0	0	0	0	1	1	4	1	1	0	0	0	0	0	8
2021-07-28 [09:30 PM-09:45 PM]	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	4
2021-07-28 [09:45 PM-10:00 PM]	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	3
	0	0	0	0	0	1	7	13	3	5	1	0	0	0	0	30
2021-07-28 [10:00 PM-10:15 PM]	0	0	0	0	0	1	0	6	2	0	0	0	0	0	0	9
2021-07-28 [10:15 PM-10:30 PM]	0	0	0	0	0	0	3	2	2	2	0	0	0	0	0	9
2021-07-28 [10:30 PM-10:45 PM]	0	0	0	0	0	2	0	3	1	0	0	0	0	0	0	6
2021-07-28 [10:45 PM-11:00 PM]	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	4
	0	0	0	0	0	3	4	11	6	3	1	0	0	0	0	28
2021-07-28 [11:00 PM-11:15 PM]	0	0	0	0	0	0	1	0	2	0	0	0	1	0	0	4
2021-07-28 [11:15 PM-11:30 PM]	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
2021-07-28 [11:30 PM-11:45 PM]	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2
2021-07-28 [11:45 PM-12:00 AM]	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	3
	0	0	0	0	0	0	2	2	5	1	0	0	1	0	0	11
Daily Totals:	0	2	3	2	12	105	355	494	195	82	27	3	3	0	0	1283
Report Totals:	0	2	3	2	12	105	355	494	195	82	27	3	3	0	0	1283
Report Percentages:	0.00%	0.16%	0.23%	0.16%	0.94%	8.18%	27.67%	38.50%	15.20%	6.39%	2.10%	0.23%	0.23%	0.00%	0.00%	

Appendix C

Base Year Traffic Operations



Lanes, Volumes, Timings

210371

1: Helena St/Thompson Rd & Garrison Rd

Base Year AM Peak Hour

	↖	→	↗	↖	←	↖	↖	↖	↖	↖	↖	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗	↖	↖	↖↗	↖	↖	↖↗	↖	↖	↖↗	↖
Traffic Volume (vph)	235	362	25	7	245	54	58	93	14	68	51	180
Future Volume (vph)	235	362	25	7	245	54	58	93	14	68	51	180
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	120.0		0.0	110.0		0.0	35.0		0.0	70.0		0.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	1.00
Frt		0.990			0.973			0.981				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1554	3160	0	1662	3111	0	1446	2972	0	1568	2703	1377
Flt Permitted	0.430			0.506			0.719			0.679		
Satd. Flow (perm)	703	3160	0	886	3111	0	1094	2972	0	1121	2703	1377
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			27			15				196
Link Speed (k/h)	60			60			70			70		
Link Distance (m)	228.1			304.7			100.2			351.7		
Travel Time (s)	13.7			18.3			5.2			18.1		
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
Heavy Vehicles (%)	7%	3%	21%	0%	4%	4%	15%	10%	8%	6%	23%	8%
Adj. Flow (vph)	255	393	27	8	266	59	63	101	15	74	55	196
Shared Lane Traffic (%)												
Lane Group Flow (vph)	255	420	0	8	325	0	63	116	0	74	55	196
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8		2	2		6	6	6
Permitted Phases	4			8			2			6		6
Detector Phase	7	4		3	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	6.0	10.0		6.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	9.0	39.0		9.0	39.0		38.1	38.1		38.1	38.1	38.1
Total Split (s)	28.0	42.0		28.0	42.0		38.1	38.1		38.1	38.1	38.1
Total Split (%)	25.9%	38.9%		25.9%	38.9%		35.2%	35.2%		35.2%	35.2%	35.2%
Maximum Green (s)	25.0	35.0		25.0	35.0		32.0	32.0		32.0	32.0	32.0
Yellow Time (s)	3.0	5.0		3.0	5.0		4.1	4.1		4.1	4.1	4.1
All-Red Time (s)	0.0	2.0		0.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	1.0	-3.0		1.0	-3.0		-2.1	-2.1		-2.1	-2.1	-2.1
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	5.0		2.5	5.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Min		None	Min		None	None		None	None	None
Walk Time (s)		12.0			12.0		12.0	12.0		12.0	12.0	12.0
Flash Dont Walk (s)		20.0			20.0		20.0	20.0		20.0	20.0	20.0
Pedestrian Calls (#/hr)		0			0		0	0		0	0	0
Act Effct Green (s)	30.5	29.0		20.3	15.2		12.7	12.7		12.7	12.7	12.7
Actuated g/C Ratio	0.59	0.57		0.40	0.30		0.25	0.25		0.25	0.25	0.25
v/c Ratio	0.42	0.23		0.02	0.35		0.23	0.16		0.27	0.08	0.40
Control Delay	7.3	6.5		5.9	14.7		20.1	15.7		20.5	17.2	6.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0

Lanes, Volumes, Timings

210371

1: Helena St/Thompson Rd & Garrison Rd

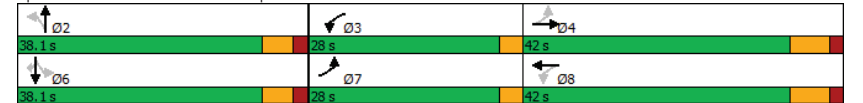
Base Year AM Peak Hour

	↖	→	↗	↖	←	↖	↖	↖	↖	↖	↖	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	7.3	6.5		5.9	14.7		20.1	15.7		20.5	17.2	6.4
LOS	A	A		A	B		C	B		C	B	A
Approach Delay		6.8			14.5			17.2			11.5	
Approach LOS		A			B			B			B	
Queue Length 50th (m)	9.1	7.4		0.3	10.7		4.5	3.7		5.4	2.0	0.0
Queue Length 95th (m)	20.0	21.4		1.4	22.5		14.7	10.3		16.7	6.3	13.4
Internal Link Dist (m)		204.1			280.7			76.2			327.7	
Turn Bay Length (m)	120.0				110.0			35.0			70.0	
Base Capacity (vph)	820	2373		894	2341		736	2006		754	1820	991
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.31	0.18		0.01	0.14		0.09	0.06		0.10	0.03	0.20

Intersection Summary

Area Type:	Other
Cycle Length:	108.1
Actuated Cycle Length:	51.3
Natural Cycle:	90
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.42
Intersection Signal Delay:	10.7
Intersection LOS:	B
Intersection Capacity Utilization:	44.1%
ICU Level of Service:	A
Analysis Period (min):	15

Splits and Phases: 1: Helena St/Thompson Rd & Garrison Rd



HCM Signalized Intersection Capacity Analysis
1: Helena St/Thompson Rd & Garrison Rd

210371
Base Year AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↔	↔	↕	↔	↔	↕	↔	↔	↕	↔
Traffic Volume (vph)	235	362	25	7	245	54	58	93	14	68	51	180
Future Volume (vph)	235	362	25	7	245	54	58	93	14	68	51	180
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Fr	1.00	0.99		1.00	0.97		1.00	0.98		1.00	1.00	0.85
Fit Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1554	3162		1662	3110		1446	2971		1568	2703	1377
Fit Permitted	0.43	1.00		0.51	1.00		0.72	1.00		0.68	1.00	1.00
Satd. Flow (perm)	704	3162		886	3110		1095	2971		1120	2703	1377
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	255	393	27	8	266	59	63	101	15	74	55	196
RTOR Reduction (vph)	0	3	0	0	18	0	0	11	0	0	0	150
Lane Group Flow (vph)	255	417	0	8	307	0	63	105	0	74	55	46
Heavy Vehicles (%)	7%	3%	21%	0%	4%	4%	15%	10%	8%	6%	23%	8%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2				6
Permitted Phases	4			8				2				6
Actuated Green, G (s)	30.0	26.0		15.8	14.8		10.6	10.6		10.6	10.6	10.6
Effective Green, g (s)	29.0	29.0		13.8	17.8		12.7	12.7		12.7	12.7	12.7
Actuated g/C Ratio	0.54	0.54		0.26	0.33		0.24	0.24		0.24	0.24	0.24
Clearance Time (s)	3.0	7.0		3.0	7.0		6.1	6.1		6.1	6.1	6.1
Vehicle Extension (s)	2.5	5.0		2.5	5.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	557	1707		227	1030		258	702		264	639	325
v/s Ratio Prot	c0.10	0.13			0.10			0.04				0.02
v/s Ratio Perm	c0.15			0.01			0.06			c0.07		0.03
v/c Ratio	0.46	0.24		0.04	0.30		0.24	0.15		0.28	0.09	0.14
Uniform Delay, d1	7.0	6.5		15.0	13.3		16.6	16.2		16.8	16.0	16.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.4	0.2		0.0	0.3		0.5	0.1		0.6	0.1	0.2
Delay (s)	7.4	6.7		15.0	13.7		17.1	16.3		17.3	16.0	16.4
Level of Service	A	A		B	B		B	B		B	B	B
Approach Delay (s)		7.0			13.7			16.6				16.6
Approach LOS		A			B			B				B

Intersection Summary	
HCM 2000 Control Delay	11.7 HCM 2000 Level of Service B
HCM 2000 Volume to Capacity ratio	0.39
Actuated Cycle Length (s)	53.7 Sum of lost time (s) 12.0
Intersection Capacity Utilization	44.1% ICU Level of Service A
Analysis Period (min)	15
c Critical Lane Group	

Lanes, Volumes, Timings
2: Helena St & Washington Rd/Albany St

210371
Base Year AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	26	22	0	4	18	44	3	40	2	13	14	4
Future Volume (vph)	26	22	0	4	18	44	3	40	2	13	14	4
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Fr					0.910			0.994				0.984
Fit Protected		0.974						0.997				0.979
Satd. Flow (prot)	0	1666	0	0	1492	0	0	1665	0	0	1584	0
Fit Permitted		0.974			0.997			0.997				0.979
Satd. Flow (perm)	0	1666	0	0	1492	0	0	1665	0	0	1584	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		238.9			355.9			223.0			459.6	
Travel Time (s)		17.2			25.6			16.1			33.1	
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
Heavy Vehicles (%)	0%	5%	0%	25%	6%	5%	67%	0%	0%	8%	0%	25%
Adj. Flow (vph)	28	24	0	4	20	48	3	43	2	14	15	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	52	0	0	72	0	0	48	0	0	33	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	22.5% ICU Level of Service A
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
 2: Helena St & Washington Rd/Albany St

210371
 Base Year AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔			↔			↔			↔		
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	26	22	0	4	18	44	3	40	2	13	14	4
Future Volume (vph)	26	22	0	4	18	44	3	40	2	13	14	4
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)	28	24	0	4	20	48	3	43	2	14	15	4
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	52	72	48	33								
Volume Left (vph)	28	4	3	14								
Volume Right (vph)	0	48	2	4								
Hadj (s)	0.15	-0.28	0.06	0.12								
Departure Headway (s)	4.3	3.9	4.3	4.3								
Degree Utilization, x	0.06	0.08	0.06	0.04								
Capacity (veh/h)	815	909	812	802								
Control Delay (s)	7.6	7.2	7.5	7.5								
Approach Delay (s)	7.6	7.2	7.5	7.5								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay	7.4											
Level of Service	A											
Intersection Capacity Utilization	22.5%		ICU Level of Service		A							
Analysis Period (min)	15											

Lanes, Volumes, Timings
 1: Helena St/Thompson Rd & Garrison Rd

210371
 Base Year PM Peak Hour


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	↔
Traffic Volume (vph)	148	466	40	34	523	129	39	67	32	160	104	289
Future Volume (vph)	148	466	40	34	523	129	39	67	32	160	104	289
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	120.0	0.0	110.0	0.0	35.0	0.0	70.0	0.0	70.0	0.0	70.0	0.0
Storage Lanes	1	0	1	0	1	0	1	0	1	0	1	1
Taper Length (m)	7.5		7.5		7.5		7.5		7.5		7.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.988		0.970		0.951		0.850					
Fit Protected	0.950		0.950		0.950		0.950					
Satd. Flow (prot)	1568	3217	0	1662	3179	0	1662	3039	0	1646	3137	1390
Fit Permitted	0.238		0.446		0.681		0.684					
Satd. Flow (perm)	393	3217	0	780	3179	0	1191	3039	0	1185	3137	1372
Right Turn on Red	Yes		Yes		Yes		Yes					
Satd. Flow (RTOR)	9		31		35		314					
Link Speed (k/h)	60		60		70		70					
Link Distance (m)	228.1		304.7		100.2		351.7					
Travel Time (s)	13.7		18.3		5.2		18.1					
Confl. Peds. (#/hr)	1	1	1	1	1	1	1	1	1	1	1	1
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
Heavy Vehicles (%)	6%	2%	2%	0%	1%	2%	0%	6%	0%	1%	6%	7%
Adj. Flow (vph)	161	507	43	37	568	140	42	73	35	174	113	314
Shared Lane Traffic (%)												
Lane Group Flow (vph)	161	550	0	37	708	0	42	108	0	174	113	314
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA	Perm	Perm
Protected Phases	7	4	3	8	2	2	6	6	6	6	6	6
Permitted Phases	4	8	2	6	6	6	6	6	6	6	6	6
Detector Phase	7	4	3	8	2	2	6	6	6	6	6	6
Switch Phase												
Minimum Initial (s)	6.0	10.0	6.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	9.0	39.0	9.0	39.0	38.1	38.1	38.1	38.1	38.1	38.1	38.1	38.1
Total Split (s)	28.0	42.0	28.0	42.0	38.1	38.1	38.1	38.1	38.1	38.1	38.1	38.1
Total Split (%)	25.9%	38.9%	25.9%	38.9%	35.2%	35.2%	35.2%	35.2%	35.2%	35.2%	35.2%	35.2%
Maximum Green (s)	25.0	35.0	25.0	35.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0
Yellow Time (s)	3.0	5.0	3.0	5.0	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	1.0	-3.0	1.0	-3.0	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lag								
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	5.0	2.5	5.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	None	Min	None	None	None	None	None	None	None	None
Walk Time (s)	12.0		12.0		12.0		12.0		12.0		12.0	
Flash Dont Walk (s)	20.0		20.0		20.0		20.0		20.0		20.0	
Pedestrian Calls (#/hr)	0		0		0		0		0		0	
Act Effct Green (s)	40.3	35.3	31.8	26.4	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6
Actuated g/C Ratio	0.60	0.52	0.47	0.39	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
v/c Ratio	0.40	0.32	0.08	0.56	0.13	0.12	0.53	0.13	0.52	0.13	0.52	0.52

Lanes, Volumes, Timings

210371

1: Helena St/Thompson Rd & Garrison Rd

Base Year PM Peak Hour



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	9.8	11.1		7.7	17.9		21.9	15.2		29.5	20.7	6.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	9.8	11.1		7.7	17.9		21.9	15.2		29.5	20.7	6.4
LOS	A	B		A	B		C	B		C	C	A
Approach Delay	10.8				17.4		17.1				15.8	
Approach LOS	B				B		B				B	
Queue Length 50th (m)	7.4	20.5		1.6	31.1		3.7	3.3		17.3	5.2	0.0
Queue Length 95th (m)	20.1	40.1		6.0	63.8		13.1	10.8		45.1	13.9	18.5
Internal Link Dist (m)	204.1		280.7		76.2		327.7					
Turn Bay Length (m)	120.0		110.0		35.0		70.0					
Base Capacity (vph)	677	1981		798	1906		636	1640		633	1677	879
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.24	0.28		0.05	0.37		0.07	0.07		0.27	0.07	0.36

Intersection Summary

Area Type:	Other
Cycle Length:	108.1
Actuated Cycle Length:	67.3
Natural Cycle:	90
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.56
Intersection Signal Delay:	14.8
Intersection Capacity Utilization:	58.5%
ICU Level of Service:	B
Analysis Period (min):	15

Spits and Phases: 1: Helena St/Thompson Rd & Garrison Rd




HCM Signalized Intersection Capacity Analysis

210371

1: Helena St/Thompson Rd & Garrison Rd

Base Year PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↔	↔	↕	↔	↔	↕	↔	↔	↕	↔
Traffic Volume (vph)	148	466	40	34	523	129	39	67	32	160	104	289
Future Volume (vph)	148	466	40	34	523	129	39	67	32	160	104	289
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.97		1.00	0.95		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1568	3218		1662	3180		1662	3040		1646	3137	1373
Flt Permitted	0.24	1.00		0.45	1.00		0.68	1.00		0.68	1.00	1.00
Satd. Flow (perm)	393	3218		781	3180		1190	3040		1185	3137	1373
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	161	507	43	37	568	140	42	73	35	174	113	314
RTOR Reduction (vph)	0	4	0	0	18	0	0	25	0	0	0	229
Lane Group Flow (vph)	161	546	0	37	690	0	42	83	0	174	113	85
Confl. Peds. (#/hr)	1		1	1		1	1			1	1	1
Heavy Vehicles (%)	6%	2%	2%	0%	1%	2%	0%	6%	0%	1%	6%	7%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2				6
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	38.5	32.2		28.1	24.8		16.4	16.4		16.4	16.4	16.4
Effective Green, g (s)	37.5	35.2		26.1	27.8		18.5	18.5		18.5	18.5	18.5
Actuated g/C Ratio	0.55	0.52		0.38	0.41		0.27	0.27		0.27	0.27	0.27
Clearance Time (s)	3.0	7.0		3.0	7.0		6.1	6.1		6.1	6.1	6.1
Vehicle Extension (s)	2.5	5.0		2.5	5.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	384	1665		329	1300		323	827		322	853	373
v/s Ratio Prot	c0.06	0.17		0.00	c0.22			0.03				0.04
v/s Ratio Perm	0.17			0.04			0.04			c0.15		0.06
v/c Ratio	0.42	0.33		0.11	0.53		0.13	0.10		0.54	0.13	0.23
Uniform Delay, d1	8.7	9.5		13.2	15.2		18.7	18.5		21.1	18.7	19.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2		0.1	0.8		0.2	0.1		1.8	0.1	0.3
Delay (s)	9.2	9.8		13.3	15.9		18.9	18.6		23.0	18.8	19.5
Level of Service	A	A		B	B		B	B		C	B	B
Approach Delay (s)	9.7				15.8		18.7				20.4	
Approach LOS	A				B		B				C	

Intersection Summary

HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	68.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
2: Helena St & Washington Rd/Albany St

210371
Base Year PM Peak Hour

	↖	→	↘	↙	←	↖	↙	↘	↙	↘	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	27	37	0	2	50	24	0	15	4	47	39	24
Future Volume (vph)	27	37	0	2	50	24	0	15	4	47	39	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fit					0.957			0.973			0.971	
Fit Protected		0.979			0.999			0.979			0.979	
Satd. Flow (prot)	0	1684	0	0	1632	0	0	1540	0	0	1646	0
Fit Permitted		0.979			0.999			0.979			0.979	
Satd. Flow (perm)	0	1684	0	0	1632	0	0	1540	0	0	1646	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		238.9			355.9			223.0			459.6	
Travel Time (s)		17.2			25.6			16.1			33.1	
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
Heavy Vehicles (%)	0%	3%	0%	50%	2%	0%	0%	7%	25%	0%	3%	0%
Adj. Flow (vph)	29	40	0	2	54	26	0	16	4	51	42	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	69	0	0	82	0	0	20	0	0	119	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	30.4%
ICU Level of Service	A
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
2: Helena St & Washington Rd/Albany St

210371
Base Year PM Peak Hour

	↖	→	↘	↙	←	↖	↙	↘	↙	↘	↙	↘
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	27	37	0	2	50	24	0	15	4	47	39	24
Future Volume (vph)	27	37	0	2	50	24	0	15	4	47	39	24
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)	29	40	0	2	54	26	0	16	4	51	42	26
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	69	82	20	119								
Volume Left (vph)	29	2	0	51								
Volume Right (vph)	0	26	4	26								
Hadj (s)	0.11	-0.14	0.06	-0.03								
Departure Headway (s)	4.4	4.1	4.4	4.2								
Degree Utilization, x	0.08	0.09	0.02	0.14								
Capacity (veh/h)	784	834	771	821								
Control Delay (s)	7.8	7.6	7.5	7.9								
Approach Delay (s)	7.8	7.6	7.5	7.9								
Approach LOS	A	A	A	A								

Intersection Summary	
Delay	7.8
Level of Service	A
Intersection Capacity Utilization	30.4%
ICU Level of Service	A
Analysis Period (min)	15

Queuing and Blocking Report
Base Year AM Peak Hour

210371
Base Year AM Peak Hour

Intersection: 1: Helena St/Thompson Rd & Garrison Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	TR	L	T	T
Maximum Queue (m)	51.0	29.6	24.0	8.9	35.2	20.6	30.6	24.4	19.5	32.1	24.4	8.3
Average Queue (m)	21.5	13.4	10.9	1.5	18.1	9.4	12.3	9.6	8.4	12.7	9.3	0.3
95th Queue (m)	38.3	24.3	20.1	6.8	29.8	19.1	25.5	20.5	17.3	26.7	21.8	3.8
Link Distance (m)		212.3	212.3		289.8	289.8		77.0	77.0		335.9	335.9
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	120.0			110.0			35.0			70.0		
Storage Blk Time (%)							0	0				
Queuing Penalty (veh)							0	0				

Intersection: 2: Helena St & Washington Rd/Albany St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	13.4	17.7	9.4	10.4
Average Queue (m)	5.6	7.0	2.0	2.0
95th Queue (m)	11.2	13.2	4.9	5.9
Link Distance (m)	220.5	337.5	204.6	434.3
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 0

Queuing and Blocking Report
Base Year PM Peak Hour

210371
Base Year PM Peak Hour

Intersection: 1: Helena St/Thompson Rd & Garrison Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	TR	L	T	T
Maximum Queue (m)	35.8	40.0	39.5	13.9	53.8	50.2	21.9	16.4	19.9	54.1	34.4	3.5
Average Queue (m)	17.1	20.6	14.3	6.2	28.7	21.6	6.5	6.7	8.0	25.0	14.1	0.1
95th Queue (m)	30.4	35.1	28.5	13.8	45.4	39.7	17.2	14.9	17.4	43.6	26.7	2.2
Link Distance (m)		212.3	212.3		289.8	289.8		77.0	77.0		335.9	335.9
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	120.0			110.0			35.0			70.0		
Storage Blk Time (%)							0	0				
Queuing Penalty (veh)							0	0				

Intersection: 2: Helena St & Washington Rd/Albany St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	12.4	16.4	13.3	13.4
Average Queue (m)	6.2	7.2	1.4	4.3
95th Queue (m)	10.7	12.0	5.9	10.3
Link Distance (m)	220.5	337.5	204.6	434.3
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 0

Appendix D

Background Traffic Operations



Lanes, Volumes, Timings

210371

1: Helena St/Thompson Rd & Garrison Rd

2027 Background AM Peak Hour

	↖	→	↗	↙	←	↖	↙	↗	↘	↖	↙	↗
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗	↗	↖	↖↗	↗	↖	↖↗	↗	↖	↖↗	↗
Traffic Volume (vph)	244	376	26	8	255	56	61	97	14	71	53	188
Future Volume (vph)	244	376	26	8	255	56	61	97	14	71	53	188
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	120.0		0.0	110.0		0.0	35.0		0.0	70.0		0.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	1.00
Frt		0.990			0.973			0.981				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1554	3160	0	1662	3111	0	1446	2972	0	1568	2703	1377
Flt Permitted	0.426			0.498			0.717			0.676		
Satd. Flow (perm)	697	3160	0	872	3111	0	1091	2972	0	1116	2703	1377
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			27			15				204
Link Speed (k/h)	60			60			70			70		
Link Distance (m)	228.1			304.7			100.2			351.7		
Travel Time (s)	13.7			18.3			5.2			18.1		
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
Heavy Vehicles (%)	7%	3%	21%	0%	4%	4%	15%	10%	8%	6%	23%	8%
Adj. Flow (vph)	265	409	28	9	277	61	66	105	15	77	58	204
Shared Lane Traffic (%)												
Lane Group Flow (vph)	265	437	0	9	338	0	66	120	0	77	58	204
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8		2	2		6	6	6
Permitted Phases	4			8			2			6		6
Detector Phase	7	4		3	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	6.0	10.0		6.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	9.0	39.0		9.0	39.0		38.1	38.1		38.1	38.1	38.1
Total Split (s)	28.0	42.0		28.0	42.0		38.1	38.1		38.1	38.1	38.1
Total Split (%)	25.9%	38.9%		25.9%	38.9%		35.2%	35.2%		35.2%	35.2%	35.2%
Maximum Green (s)	25.0	35.0		25.0	35.0		32.0	32.0		32.0	32.0	32.0
Yellow Time (s)	3.0	5.0		3.0	5.0		4.1	4.1		4.1	4.1	4.1
All-Red Time (s)	0.0	2.0		0.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	1.0	-3.0		1.0	-3.0		-2.1	-2.1		-2.1	-2.1	-2.1
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	5.0		2.5	5.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Min		None	Min		None	None		None	None	None
Walk Time (s)		12.0			12.0		12.0	12.0		12.0	12.0	12.0
Flash Dont Walk (s)		20.0			20.0		20.0	20.0		20.0	20.0	20.0
Pedestrian Calls (#/hr)		0			0		0	0		0	0	0
Act Effct Green (s)	31.3	29.8		20.6	15.5		12.9	12.9		12.9	12.9	12.9
Actuated g/C Ratio	0.60	0.57		0.39	0.30		0.25	0.25		0.25	0.25	0.25
v/c Ratio	0.44	0.24		0.02	0.36		0.25	0.16		0.28	0.09	0.41
Control Delay	7.4	6.5		6.0	15.2		20.7	16.1		21.2	17.6	6.5
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0

Lanes, Volumes, Timings

210371

1: Helena St/Thompson Rd & Garrison Rd

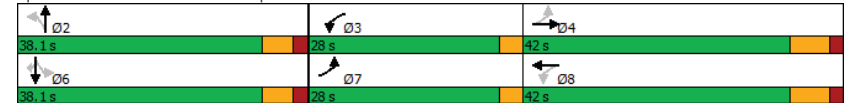
2027 Background AM Peak Hour

	↖	→	↗	↙	←	↖	↙	↗	↘	↖	↙	↗
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	7.4	6.5		6.0	15.2		20.7	16.1		21.2	17.6	6.5
LOS	A	A		A	B		C	B		C	B	A
Approach Delay		6.9			14.9			17.8			11.8	
Approach LOS		A			B			B			B	
Queue Length 50th (m)	9.5	7.8		0.3	11.4		4.8	3.9		5.7	2.1	0.0
Queue Length 95th (m)	21.1	22.5		1.6	24.0		15.4	10.8		17.5	6.7	13.8
Internal Link Dist (m)		204.1			280.7			76.2			327.7	
Turn Bay Length (m)	120.0			110.0			35.0			70.0		
Base Capacity (vph)	816	2335		890	2304		723	1974		739	1791	981
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.32	0.19		0.01	0.15		0.09	0.06		0.10	0.03	0.21

Intersection Summary

Area Type:	Other
Cycle Length:	108.1
Actuated Cycle Length:	52.3
Natural Cycle:	90
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.44
Intersection Signal Delay:	11.0
Intersection LOS:	B
Intersection Capacity Utilization:	45.2%
ICU Level of Service:	A
Analysis Period (min):	15

Splits and Phases: 1: Helena St/Thompson Rd & Garrison Rd



HCM Signalized Intersection Capacity Analysis
1: Helena St/Thompson Rd & Garrison Rd

210371
2027 Background AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↔	↔	↕	↔	↔	↕	↔	↔	↕	↔
Traffic Volume (vph)	244	376	26	8	255	56	61	97	14	71	53	188
Future Volume (vph)	244	376	26	8	255	56	61	97	14	71	53	188
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Fr	1.00	0.99		1.00	0.97		1.00	0.98		1.00	1.00	0.85
Fit Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1554	3162		1662	3111		1446	2973		1568	2703	1377
Fit Permitted	0.43	1.00		0.50	1.00		0.72	1.00		0.68	1.00	1.00
Satd. Flow (perm)	697	3162		872	3111		1091	2973		1116	2703	1377
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	265	409	28	9	277	61	66	105	15	77	58	204
RTOR Reduction (vph)	0	3	0	0	18	0	0	11	0	0	0	156
Lane Group Flow (vph)	265	434	0	9	320	0	66	109	0	77	58	48
Heavy Vehicles (%)	7%	3%	21%	0%	4%	4%	15%	10%	8%	6%	23%	8%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8		2			6		6
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	30.7	26.7		16.0	15.0		10.8	10.8		10.8	10.8	10.8
Effective Green, g (s)	29.7	29.7		14.0	18.0		12.9	12.9		12.9	12.9	12.9
Actuated g/C Ratio	0.54	0.54		0.26	0.33		0.24	0.24		0.24	0.24	0.24
Clearance Time (s)	3.0	7.0		3.0	7.0		6.1	6.1		6.1	6.1	6.1
Vehicle Extension (s)	2.5	5.0		2.5	5.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	562	1719		223	1025		257	702		263	638	325
v/s Ratio Prot	c0.10	0.14			0.10			0.04				0.02
v/s Ratio Perm	c0.16			0.01			0.06			c0.07		0.03
v/c Ratio	0.47	0.25		0.04	0.31		0.26	0.15		0.29	0.09	0.15
Uniform Delay, d1	7.1	6.6		15.3	13.7		17.0	16.5		17.1	16.3	16.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2		0.1	0.4		0.5	0.1		0.6	0.1	0.2
Delay (s)	7.5	6.7		15.3	14.0		17.5	16.6		17.7	16.3	16.7
Level of Service	A	A		B	B		B	B		B	B	B
Approach Delay (s)		7.0			14.1			16.9				16.9
Approach LOS		A			B			B				B
Intersection Summary												
HCM 2000 Control Delay	11.9		HCM 2000 Level of Service				B					
HCM 2000 Volume to Capacity ratio	0.41											
Actuated Cycle Length (s)	54.6		Sum of lost time (s)				12.0					
Intersection Capacity Utilization	45.2%		ICU Level of Service				A					
Analysis Period (min)	15											
c Critical Lane Group												

Lanes, Volumes, Timings
2: Helena St & Washington Rd/Albany St

210371
2027 Background AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	26	22	0	4	19	45	3	41	2	13	14	4
Future Volume (vph)	26	22	0	4	19	45	3	41	2	13	14	4
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Fr					0.911			0.995				0.984
Fit Protected		0.974			0.997			0.997				0.979
Satd. Flow (prot)	0	1666	0	0	1494	0	0	1669	0	0	1584	0
Fit Permitted		0.974			0.997			0.997				0.979
Satd. Flow (perm)	0	1666	0	0	1494	0	0	1669	0	0	1584	0
Link Speed (k/h)		50			50			50				50
Link Distance (m)		238.9			355.9			223.0				459.6
Travel Time (s)		17.2			25.6			16.1				33.1
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
Heavy Vehicles (%)	0%	5%	0%	25%	6%	5%	67%	0%	0%	8%	0%	25%
Adj. Flow (vph)	28	24	0	4	21	49	3	45	2	14	15	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	52	0	0	74	0	0	50	0	0	33	0
Sign Control		Stop			Stop			Stop				Stop
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	22.6%		ICU Level of Service A									
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
2: Helena St & Washington Rd/Albany St

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2027 Background AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔			↔			↔			↔		
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	26	22	0	4	19	45	3	41	2	13	14	4
Future Volume (vph)	26	22	0	4	19	45	3	41	2	13	14	4
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)	28	24	0	4	21	49	3	45	2	14	15	4
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	52	74	50	33								
Volume Left (vph)	28	4	3	14								
Volume Right (vph)	0	49	2	4								
Hadj (s)	0.15	-0.28	0.06	0.12								
Departure Headway (s)	4.3	3.9	4.3	4.3								
Degree Utilization, x	0.06	0.08	0.06	0.04								
Capacity (veh/h)	813	907	811	800								
Control Delay (s)	7.6	7.2	7.5	7.5								
Approach Delay (s)	7.6	7.2	7.5	7.5								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay	7.4											
Level of Service	A											
Intersection Capacity Utilization	22.6%		ICU Level of Service		A							
Analysis Period (min)	15											

Lanes, Volumes, Timings
1: Helena St/Thompson Rd & Garrison Rd

210371
2027 Background PM Peak Hour


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔			↔			↔			↔		
Traffic Volume (vph)	153	485	42	35	544	135	41	70	33	167	108	300
Future Volume (vph)	153	485	42	35	544	135	41	70	33	167	108	300
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	120.0	0.0	110.0	0.0	35.0	0.0	70.0	0.0	70.0	0.0	70.0	0.0
Storage Lanes	1	0	1	0	1	0	1	0	1	0	1	1
Taper Length (m)	7.5		7.5		7.5		7.5		7.5		7.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.988		0.970		0.952		0.850					
Fit Protected	0.950		0.950		0.950		0.950					
Satd. Flow (prot)	1568	3217	0	1662	3179	0	1662	3042	0	1646	3137	1390
Fit Permitted	0.225		0.436		0.678		0.681					
Satd. Flow (perm)	371	3217	0	763	3179	0	1185	3042	0	1180	3137	1372
Right Turn on Red	Yes		Yes		Yes		Yes					
Satd. Flow (RTOR)	9		31		36		326					
Link Speed (k/h)	60		60		70		70					
Link Distance (m)	228.1		304.7		100.2		351.7					
Travel Time (s)	13.7		18.3		5.2		18.1					
Confl. Peds. (#/hr)	1	1	1	1	1	1	1	1	1	1	1	1
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
Heavy Vehicles (%)	6%	2%	2%	0%	1%	2%	0%	6%	0%	1%	6%	7%
Adj. Flow (vph)	166	527	46	38	591	147	45	76	36	182	117	326
Shared Lane Traffic (%)												
Lane Group Flow (vph)	166	573	0	38	738	0	45	112	0	182	117	326
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA	Perm	Perm
Protected Phases	7	4	3	8	2	2	6	6	6	6	6	6
Permitted Phases	4	8	2	6	6	6	6	6	6	6	6	6
Detector Phase	7	4	3	8	2	2	6	6	6	6	6	6
Switch Phase												
Minimum Initial (s)	6.0	10.0	6.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	9.0	39.0	9.0	39.0	38.1	38.1	38.1	38.1	38.1	38.1	38.1	38.1
Total Split (s)	28.0	42.0	28.0	42.0	38.1	38.1	38.1	38.1	38.1	38.1	38.1	38.1
Total Split (%)	25.9%	38.9%	25.9%	38.9%	35.2%	35.2%	35.2%	35.2%	35.2%	35.2%	35.2%	35.2%
Maximum Green (s)	25.0	35.0	25.0	35.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0
Yellow Time (s)	3.0	5.0	3.0	5.0	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	1.0	-3.0	1.0	-3.0	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lag								
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	5.0	2.5	5.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	None	Min	None	None	None	None	None	None	None	None
Walk Time (s)	12.0		12.0		12.0		12.0		12.0		12.0	
Flash Dont Walk (s)	20.0		20.0		20.0		20.0		20.0		20.0	
Pedestrian Calls (#/hr)	0		0		0		0		0		0	
Act Effct Green (s)	41.6	36.7	32.8	27.4	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3
Actuated g/C Ratio	0.60	0.53	0.47	0.40	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
v/c Ratio	0.42	0.34	0.09	0.58	0.14	0.13	0.55	0.13	0.53	0.13	0.53	0.53

Lanes, Volumes, Timings

210371

1: Helena St/Thompson Rd & Garrison Rd

2027 Background PM Peak Hour



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	10.4	11.5		8.0	18.7		22.3	15.4		30.6	21.0	6.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	10.4	11.5		8.0	18.7		22.3	15.4		30.6	21.0	6.4
LOS	B	B		A	B		C	B		C	C	A
Approach Delay	11.2		18.2			17.4			16.2			
Approach LOS	B		B			B			B			
Queue Length 50th (m)	8.0	22.3		1.7	34.4		4.2	3.6		19.3	5.7	0.0
Queue Length 95th (m)	21.4	43.1		6.4	69.0		13.9	11.2		47.2	14.3	18.5
Internal Link Dist (m)	204.1		280.7			76.2			327.7			
Turn Bay Length (m)	120.0		110.0			35.0			70.0			
Base Capacity (vph)	659	1926		786	1851		615	1596		612	1628	868
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.25	0.30		0.05	0.40		0.07	0.07		0.30	0.07	0.38

Intersection Summary

Area Type:	Other
Cycle Length:	108.1
Actuated Cycle Length:	69.3
Natural Cycle:	90
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.58
Intersection Signal Delay:	15.4
Intersection Capacity Utilization:	60.0%
ICU Level of Service:	B
Analysis Period (min):	15

Spits and Phases: 1: Helena St/Thompson Rd & Garrison Rd




HCM Signalized Intersection Capacity Analysis

210371

1: Helena St/Thompson Rd & Garrison Rd

2027 Background PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	153	485	42	35	544	135	41	70	33	167	108	300
Future Volume (vph)	153	485	42	35	544	135	41	70	33	167	108	300
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	0.99
Ftbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.97		1.00	0.95		1.00	1.00	0.85
Fit Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1568	3217		1662	3179		1662	3041		1646	3137	1373
Fit Permitted	0.23	1.00		0.44	1.00		0.68	1.00		0.68	1.00	1.00
Satd. Flow (perm)	372	3217		764	3179		1186	3041		1180	3137	1373
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	166	527	46	38	591	147	45	76	36	182	117	326
RTOR Reduction (vph)	0	4	0	0	18	0	0	26	0	0	0	237
Lane Group Flow (vph)	166	569	0	38	720	0	45	86	0	182	117	89
Confl. Peds. (#/hr)	1	1		1	1		1	1		1	1	1
Heavy Vehicles (%)	6%	2%	2%	0%	1%	2%	0%	6%	0%	1%	6%	7%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2				6
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	39.8	33.5		29.1	25.8		17.1	17.1		17.1	17.1	17.1
Effective Green, g (s)	38.8	36.5		27.1	28.8		19.2	19.2		19.2	19.2	19.2
Actuated g/C Ratio	0.55	0.52		0.39	0.41		0.27	0.27		0.27	0.27	0.27
Clearance Time (s)	3.0	7.0		3.0	7.0		6.1	6.1		6.1	6.1	6.1
Vehicle Extension (s)	2.5	5.0		2.5	5.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	377	1677		325	1307		325	834		323	860	376
v/s Ratio Prot	c0.06	0.18		0.00	c0.23			0.03				0.04
v/s Ratio Perm	0.18			0.04			0.04			c0.15		0.07
v/c Ratio	0.44	0.34		0.12	0.55		0.14	0.10		0.56	0.14	0.24
Uniform Delay, d1	9.0	9.7		13.5	15.7		19.2	19.0		21.8	19.1	19.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.6	0.3		0.1	0.9		0.2	0.1		2.2	0.1	0.3
Delay (s)	9.6	10.0		13.6	16.5		19.4	19.0		24.1	19.2	20.0
Level of Service	A	A		B	B		B	B		C	B	C
Approach Delay (s)	9.9		16.4			19.1			21.1			
Approach LOS	A		B			B			C			

Intersection Summary

HCM 2000 Control Delay	15.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings 210371
 2: Helena St & Washington Rd/Albany St 2027 Background PM Peak Hour

	↖	→	↘	↙	←	↖	↙	↘	↙	↘	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕		↕	↕		↕	↕	
Traffic Volume (vph)	28	38	0	2	51	24	0	15	4	47	40	24
Future Volume (vph)	28	38	0	2	51	24	0	15	4	47	40	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fit Protected		0.979			0.999			0.973			0.971	
Satd. Flow (prot)	0	1684	0	0	1633	0	0	1540	0	0	1646	0
Fit Permitted		0.979			0.999			0.979			0.979	
Satd. Flow (perm)	0	1684	0	0	1633	0	0	1540	0	0	1646	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		238.9			355.9			223.0			459.6	
Travel Time (s)		17.2			25.6			16.1			33.1	
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
Heavy Vehicles (%)	0%	3%	0%	50%	2%	0%	0%	7%	25%	0%	3%	0%
Adj. Flow (vph)	30	41	0	2	55	26	0	16	4	51	43	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	71	0	0	83	0	0	20	0	0	120	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	30.6%
ICU Level of Service	A
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis 210371
 2: Helena St & Washington Rd/Albany St 2027 Background PM Peak Hour

	↖	→	↘	↙	←	↖	↙	↘	↙	↘	↙	↘
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	28	38	0	2	51	24	0	15	4	47	40	24
Future Volume (vph)	28	38	0	2	51	24	0	15	4	47	40	24
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)	30	41	0	2	55	26	0	16	4	51	43	26
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	71	83	20	120								
Volume Left (vph)	30	2	0	51								
Volume Right (vph)	0	26	4	26								
Hadj (s)	0.11	-0.14	0.06	-0.03								
Departure Headway (s)	4.4	4.2	4.4	4.2								
Degree Utilization, x	0.09	0.10	0.02	0.14								
Capacity (veh/h)	783	833	769	819								
Control Delay (s)	7.8	7.6	7.5	7.9								
Approach Delay (s)	7.8	7.6	7.5	7.9								
Approach LOS	A	A	A	A								

Intersection Summary	
Delay	7.8
Level of Service	A
Intersection Capacity Utilization	30.6%
ICU Level of Service	A
Analysis Period (min)	15

Queuing and Blocking Report
2027 Background AM Peak Hour

210371
2027 Background AM Peak Hour

Intersection: 1: Helena St/Thompson Rd & Garrison Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	TR	L	T
Maximum Queue (m)	52.5	28.6	22.6	8.9	43.6	34.4	26.7	25.4	24.8	31.2	26.3
Average Queue (m)	22.7	12.5	10.6	1.6	20.3	11.2	10.1	9.7	8.3	12.1	9.6
95th Queue (m)	37.6	23.5	20.0	7.0	34.1	23.0	22.9	21.1	18.6	24.6	22.6
Link Distance (m)		212.3	212.3		289.8	289.8		77.0	77.0		335.9
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (m)	120.0			110.0			35.0			70.0	
Storage Blk Time (%)							0	0			
Queuing Penalty (veh)							0	0			

Intersection: 2: Helena St & Washington Rd/Albany St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	10.3	18.7	11.0	11.0
Average Queue (m)	5.8	7.7	2.3	1.9
95th Queue (m)	10.7	14.4	6.4	6.3
Link Distance (m)	220.5	337.5	204.6	434.3
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 0

Queuing and Blocking Report
2027 Background PM Peak Hour

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2027 Background PM Peak Hour

Intersection: 1: Helena St/Thompson Rd & Garrison Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	TR	L	T	T
Maximum Queue (m)	44.5	45.1	41.0	15.5	54.4	48.5	21.4	17.9	18.1	46.9	31.1	7.2
Average Queue (m)	17.4	20.7	14.1	6.5	32.3	25.4	7.3	5.6	8.8	24.8	14.4	0.2
95th Queue (m)	32.1	36.6	28.6	13.7	50.1	44.4	17.4	14.5	17.2	40.2	26.9	3.3
Link Distance (m)		212.3	212.3		289.8	289.8		77.0	77.0		335.9	335.9
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	120.0			110.0			35.0			70.0		
Storage Blk Time (%)							0	0				
Queuing Penalty (veh)							0	0				

Intersection: 2: Helena St & Washington Rd/Albany St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	16.1	16.4	8.8	13.1
Average Queue (m)	6.5	7.2	1.6	4.4
95th Queue (m)	12.2	12.9	4.8	10.3
Link Distance (m)	220.5	337.5	204.6	434.3
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 0

Appendix E

Total Traffic Operations



Lanes, Volumes, Timings

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1: Helena St/Thompson Rd & Garrison Rd

2027 Total AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↔	↔	↕	↔	↔	↕	↔	↔	↕	↔
Traffic Volume (vph)	244	376	28	9	255	56	76	122	17	71	58	188
Future Volume (vph)	244	376	28	9	255	56	76	122	17	71	58	188
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	120.0		0.0	110.0		0.0	35.0		0.0	70.0		0.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	1.00
Frt		0.990			0.973			0.982				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1554	3158	0	1662	3111	0	1446	2975	0	1568	2703	1377
Flt Permitted	0.425			0.497			0.714			0.656		
Satd. Flow (perm)	695	3158	0	870	3111	0	1087	2975	0	1083	2703	1377
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			27			14				204
Link Speed (k/h)	60			60			70			70		
Link Distance (m)	228.1			304.7			100.2			351.7		
Travel Time (s)	13.7			18.3			5.2			18.1		
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
Heavy Vehicles (%)	7%	3%	21%	0%	4%	4%	15%	10%	8%	6%	23%	8%
Adj. Flow (vph)	265	409	30	10	277	61	83	133	18	77	63	204
Shared Lane Traffic (%)												
Lane Group Flow (vph)	265	439	0	10	338	0	83	151	0	77	63	204
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8		2	2		6		6
Permitted Phases	4			8			2			6		6
Detector Phase	7	4		3	8		2	2		6		6
Switch Phase												
Minimum Initial (s)	6.0	10.0		6.0	10.0		10.0	10.0		10.0		10.0
Minimum Split (s)	9.0	39.0		9.0	39.0		38.1	38.1		38.1		38.1
Total Split (s)	28.0	42.0		28.0	42.0		38.1	38.1		38.1		38.1
Total Split (%)	25.9%	38.9%		25.9%	38.9%		35.2%	35.2%		35.2%		35.2%
Maximum Green (s)	25.0	35.0		25.0	35.0		32.0	32.0		32.0		32.0
Yellow Time (s)	3.0	5.0		3.0	5.0		4.1	4.1		4.1		4.1
All-Red Time (s)	0.0	2.0		0.0	2.0		2.0	2.0		2.0		2.0
Lost Time Adjust (s)	1.0	-3.0		1.0	-3.0		-2.1	-2.1		-2.1		-2.1
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0		4.0
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	5.0		2.5	5.0		3.0	3.0		3.0		3.0
Recall Mode	None	Min		None	Min		None	None		None		None
Walk Time (s)		12.0			12.0		12.0	12.0		12.0		12.0
Flash Dont Walk (s)		20.0			20.0		20.0	20.0		20.0		20.0
Pedestrian Calls (#/hr)		0			0		0	0		0		0
Act Effct Green (s)	31.5	30.1		20.7	15.6		13.1	13.1		13.1		13.1
Actuated g/C Ratio	0.60	0.57		0.39	0.30		0.25	0.25		0.25		0.25
v/c Ratio	0.44	0.24		0.02	0.36		0.31	0.20		0.29		0.41
Control Delay	7.6	6.7		6.2	15.5		21.8	16.7		21.5		6.5
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0		0.0

Lanes, Volumes, Timings

210371

1: Helena St/Thompson Rd & Garrison Rd

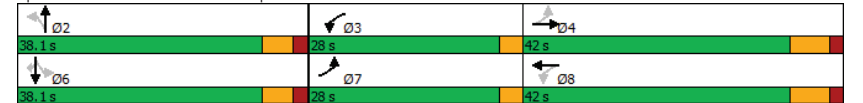
2027 Total AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	7.6	6.7		6.2	15.5		21.8	16.7		21.5	17.7	6.5
LOS	A	A		A	B		C	B		C	B	A
Approach Delay		7.0			15.2			18.5			11.9	
Approach LOS		A			B			B			B	
Queue Length 50th (m)	9.5	7.8		0.3	11.5		6.2	5.2		5.8	2.3	0.0
Queue Length 95th (m)	22.0	23.2		1.8	24.6		19.0	13.4		17.8	7.2	13.8
Internal Link Dist (m)		204.1			280.7			76.2			327.7	
Turn Bay Length (m)	120.0			110.0			35.0			70.0		
Base Capacity (vph)	812	2315		885	2286		714	1960		711	1776	975
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.33	0.19		0.01	0.15		0.12	0.08		0.11	0.04	0.21

Intersection Summary

Area Type:	Other
Cycle Length:	108.1
Actuated Cycle Length:	52.8
Natural Cycle:	90
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.44
Intersection Signal Delay:	11.4
Intersection LOS:	B
Intersection Capacity Utilization:	54.3%
ICU Level of Service:	A
Analysis Period (min):	15

Splits and Phases: 1: Helena St/Thompson Rd & Garrison Rd



HCM Signalized Intersection Capacity Analysis
1: Helena St/Thompson Rd & Garrison Rd

210371
2027 Total AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↔	↔	↕	↔	↔	↕	↔	↔	↕	↔
Traffic Volume (vph)	244	376	28	9	255	56	76	122	17	71	58	188
Future Volume (vph)	244	376	28	9	255	56	76	122	17	71	58	188
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Fr _t	1.00	0.99		1.00	0.97		1.00	0.98		1.00	1.00	0.85
Fit Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1554	3157		1662	3111		1446	2975		1568	2703	1377
Fit Permitted	0.43	1.00		0.50	1.00		0.71	1.00		0.66	1.00	1.00
Satd. Flow (perm)	696	3157		870	3111		1086	2975		1083	2703	1377
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	265	409	30	10	277	61	83	133	18	77	63	204
RTOR Reduction (vph)	0	4	0	0	18	0	0	11	0	0	0	155
Lane Group Flow (vph)	265	435	0	10	320	0	83	140	0	77	63	49
Heavy Vehicles (%)	7%	3%	21%	0%	4%	4%	15%	10%	8%	6%	23%	8%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8		2			6		6
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	31.0	27.0		16.1	15.1		11.0	11.0		11.0	11.0	11.0
Effective Green, g (s)	30.0	30.0		14.1	18.1		13.1	13.1		13.1	13.1	13.1
Actuated g/C Ratio	0.54	0.54		0.26	0.33		0.24	0.24		0.24	0.24	0.24
Clearance Time (s)	3.0	7.0		3.0	7.0		6.1	6.1		6.1	6.1	6.1
Vehicle Extension (s)	2.5	5.0		2.5	5.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	564	1718		222	1021		258	707		257	642	327
v/s Ratio Prot	c0.10	0.14			0.10			0.05				0.02
v/s Ratio Perm	c0.15			0.01			c0.08			0.07		0.04
v/c Ratio	0.47	0.25		0.05	0.31		0.32	0.20		0.30	0.10	0.15
Uniform Delay, d1	7.1	6.6		15.4	13.8		17.3	16.8		17.2	16.4	16.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2		0.1	0.4		0.7	0.1		0.7	0.1	0.2
Delay (s)	7.6	6.8		15.5	14.2		18.1	16.9		17.9	16.5	16.8
Level of Service	A	A		B	B		B	B		B	B	B
Approach Delay (s)		7.1			14.3			17.3				17.0
Approach LOS		A			B			B				B

Intersection Summary	
HCM 2000 Control Delay	12.2 HCM 2000 Level of Service B
HCM 2000 Volume to Capacity ratio	0.42
Actuated Cycle Length (s)	55.1 Sum of lost time (s) 12.0
Intersection Capacity Utilization	54.3% ICU Level of Service A
Analysis Period (min)	15
c Critical Lane Group	

Lanes, Volumes, Timings
2: Helena St & Washington Rd/Albany St

210371
2027 Total AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	28	22	0	4	19	48	3	44	2	15	16	6
Future Volume (vph)	28	22	0	4	19	48	3	44	2	15	16	6
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Fr _t					0.909			0.995			0.976	
Fit Protected		0.973			0.997			0.997			0.980	
Satd. Flow (prot)	0	1666	0	0	1492	0	0	1673	0	0	1556	0
Fit Permitted		0.973			0.997			0.997			0.980	
Satd. Flow (perm)	0	1666	0	0	1492	0	0	1673	0	0	1556	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		238.9			355.9			223.0			459.6	
Travel Time (s)		17.2			25.6			16.1			33.1	
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
Heavy Vehicles (%)	0%	5%	0%	25%	6%	5%	67%	0%	0%	8%	0%	25%
Adj. Flow (vph)	30	24	0	4	21	52	3	48	2	16	17	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	54	0	0	77	0	0	53	0	0	40	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	24.0% ICU Level of Service A
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
 2: Helena St & Washington Rd/Albany St

210371
 2027 Total AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↕			↕			↕			↕		
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	28	22	0	4	19	48	3	44	2	15	16	6
Future Volume (vph)	28	22	0	4	19	48	3	44	2	15	16	6
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)	30	24	0	4	21	52	3	48	2	16	17	7
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	54	77	53	40								
Volume Left (vph)	30	4	3	16								
Volume Right (vph)	0	52	2	7								
Hadj (s)	0.15	-0.29	0.05	0.10								
Departure Headway (s)	4.3	3.9	4.3	4.3								
Degree Utilization, x	0.06	0.08	0.06	0.05								
Capacity (veh/h)	806	901	807	800								
Control Delay (s)	7.6	7.2	7.6	7.6								
Approach Delay (s)	7.6	7.2	7.6	7.6								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay	7.5											
Level of Service	A											
Intersection Capacity Utilization	24.0%			ICU Level of Service	A							
Analysis Period (min)	15											

Lanes, Volumes, Timings
 3: Helena St & North Driveway

210371
 2027 Total AM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↕			↕	↕	
Traffic Volume (vph)	24	3	3	191	90	5
Future Volume (vph)	24	3	3	191	90	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t	0.986				0.993	
Fit Protected	0.957				0.999	
Satd. Flow (prot)	1619		0		1714	
Fit Permitted	0.957				0.999	
Satd. Flow (perm)	1619		0		1714	
Link Speed (k/h)	50				70	
Link Distance (m)	176.9				116.0	
Travel Time (s)	12.7				6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	3	3	208	98	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	29	0	0	211	103	0
Sign Control	Stop				Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	23.5%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
3: Helena St & North Driveway

210371
2027 Total AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	24	3	3	191	90	5
Future Volume (Veh/h)	24	3	3	191	90	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)	26	3	3	208	98	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	314	100	103			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	314	100	103			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	100	100			
cM capacity (veh/h)	677	955	1489			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	29	211	103			
Volume Left	26	3	0			
Volume Right	3	0	5			
cSH	698	1489	1700			
Volume to Capacity	0.04	0.00	0.06			
Queue Length 95th (m)	1.0	0.0	0.0			
Control Delay (s)	10.4	0.1	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.4	0.1	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization		23.5%		ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings
4: Helena St & South Driveway

210371
2027 Total AM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	19	3	5	175	90	3
Future Volume (vph)	19	3	5	175	90	3
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t	0.983				0.996	
Fit Protected	0.958			0.999		
Satd. Flow (prot)	1616	0	0	1714	1709	0
Fit Permitted	0.958			0.999		
Satd. Flow (perm)	1616	0	0	1714	1709	0
Link Speed (k/h)	50			70	70	
Link Distance (m)	172.7			459.6	116.0	
Travel Time (s)	12.4			23.6	6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	3	5	190	98	3
Shared Lane Traffic (%)						
Lane Group Flow (vph)	24	0	0	195	101	0
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	24.4%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
4: Helena St & South Driveway

210371
2027 Total AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔	↔	↔	↕	↕	↔
Traffic Volume (veh/h)	19	3	5	175	90	3
Future Volume (Veh/h)	19	3	5	175	90	3
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	3	5	190	98	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	300	100	101			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	300	100	101			
tC, single (s)	6.4	6.2	4.1			
tF (s)	3.5	3.3	2.2			
pD queue free %	97	100	100			
cM capacity (veh/h)	690	956	1491			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	24	195	101			
Volume Left	21	5	0			
Volume Right	3	0	3			
eSH	714	1491	1700			
Volume to Capacity	0.03	0.00	0.06			
Queue Length 95th (m)	0.8	0.1	0.0			
Control Delay (s)	10.2	0.2	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.2	0.2	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization		24.4%		ICU Level of Service	A	
Analysis Period (min)		15				

Lanes, Volumes, Timings
1: Helena St/Thompson Rd & Garrison Rd

210371
2027 Total PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↕	↔	↕	↕	↔	↕	↕	↔	↕	↕
Traffic Volume (vph)	153	485	49	42	544	135	45	77	37	167	131	300
Future Volume (vph)	153	485	49	42	544	135	45	77	37	167	131	300
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	120.0		0.0	110.0		0.0	35.0		0.0	70.0		0.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00					0.99
Frt		0.986			0.970			0.952				0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1568	3210	0	1662	3179	0	1662	3042	0	1646	3137	1390
Fit Permitted	0.225			0.434			0.662			0.673		
Satd. Flow (perm)	371	3210	0	759	3179	0	1158	3042	0	1166	3137	1372
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			31			40				326
Link Speed (k/h)		60			60			70				70
Link Distance (m)		228.1			304.7			100.2				351.7
Travel Time (s)		13.7			18.3			5.2				18.1
Confl. Peds. (#/hr)	1		1	1		1	1					1
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
Heavy Vehicles (%)	6%	2%	2%	0%	1%	2%	0%	6%	0%	1%	6%	7%
Adj. Flow (vph)	166	527	53	46	591	147	49	84	40	182	142	326
Shared Lane Traffic (%)												
Lane Group Flow (vph)	166	580	0	46	738	0	49	124	0	182	142	326
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2				6
Permitted Phases	4			8			2			6		6
Detector Phase	7	4		3	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	6.0	10.0		6.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	9.0	39.0		9.0	39.0		38.1	38.1		38.1	38.1	38.1
Total Split (s)	28.0	42.0		28.0	42.0		38.1	38.1		38.1	38.1	38.1
Total Split (%)	25.9%	38.9%		25.9%	38.9%		35.2%	35.2%		35.2%	35.2%	35.2%
Maximum Green (s)	25.0	35.0		25.0	35.0		32.0	32.0		32.0	32.0	32.0
Yellow Time (s)	3.0	5.0		3.0	5.0		4.1	4.1		4.1	4.1	4.1
All-Red Time (s)	0.0	2.0		0.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	1.0	-3.0		1.0	-3.0		-2.1	-2.1		-2.1	-2.1	-2.1
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	5.0		2.5	5.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Min		None	Min		None	None		None	None	None
Walk Time (s)		12.0			12.0		12.0	12.0		12.0	12.0	12.0
Flash Dont Walk (s)		20.0			20.0		20.0	20.0		20.0	20.0	20.0
Pedestrian Calls (#/hr)		0			0		0	0		0	0	0
Act Effct Green (s)	41.6	36.6		33.0	27.4		19.4	19.4		19.4	19.4	19.4
Actuated g/C Ratio	0.60	0.53		0.47	0.39		0.28	0.28		0.28	0.28	0.28
v/c Ratio	0.42	0.34		0.11	0.58		0.15	0.14		0.56	0.16	0.53

Lanes, Volumes, Timings

210371

1: Helena St/Thompson Rd & Garrison Rd

2027 Total PM Peak Hour

	↖	→	↘	↙	←	↖	↙	↘	↙	↘	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	10.5	11.7		8.1	18.8		22.4	15.3		30.7	21.0	6.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	10.5	11.7		8.1	18.8		22.4	15.3		30.7	21.0	6.4
LOS	B	B		A	B		C	B		C	C	A
Approach Delay	11.4		18.2			17.3			16.4			
Approach LOS	B		B			B			B			
Queue Length 50th (m)	8.0	22.6		2.0	34.5		4.6	4.1		19.4	7.0	0.0
Queue Length 95th (m)	21.7	44.4		7.5	69.4		14.8	12.0		47.4	16.7	18.5
Internal Link Dist (m)	204.1		280.7			76.2			327.7			
Turn Bay Length (m)	120.0		110.0			35.0			70.0			
Base Capacity (vph)	658	1915		783	1848		599	1595		604	1625	867
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.25	0.30		0.06	0.40		0.08	0.08		0.30	0.09	0.38

Intersection Summary

Area Type:	Other
Cycle Length:	108.1
Actuated Cycle Length:	69.5
Natural Cycle:	90
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.58
Intersection Signal Delay:	15.5
Intersection Capacity Utilization:	62.1%
ICU Level of Service:	B
Analysis Period (min):	15

Spits and Phases: 1: Helena St/Thompson Rd & Garrison Rd



HCM Signalized Intersection Capacity Analysis

210371

1: Helena St/Thompson Rd & Garrison Rd

2027 Total PM Peak Hour

	↖	→	↘	↙	←	↖	↙	↘	↙	↘	↙	↘
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗	↘	↖	↖↗	↘	↖	↖↗	↘	↖	↖↗	↘
Traffic Volume (vph)	153	485	49	42	544	135	45	77	37	167	131	300
Future Volume (vph)	153	485	49	42	544	135	45	77	37	167	131	300
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.97		1.00	0.95		1.00	1.00	0.85
Fit Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1568	3211		1662	3179		1662	3041		1646	3137	1373
Fit Permitted	0.22	1.00		0.43	1.00		0.66	1.00		0.67	1.00	1.00
Satd. Flow (perm)	371	3211		759	3179		1158	3041		1167	3137	1373
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	166	527	53	46	591	147	49	84	40	182	142	326
RTOR Reduction (vph)	0	5	0	0	18	0	0	29	0	0	0	236
Lane Group Flow (vph)	166	575	0	46	720	0	49	95	0	182	142	90
Confl. Peds. (#/hr)	1	1	1	1	1	1	1	1	1	1	1	1
Heavy Vehicles (%)	6%	2%	2%	0%	1%	2%	0%	6%	0%	1%	6%	7%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	39.8	33.4		29.2	25.8		17.2	17.2		17.2	17.2	17.2
Effective Green, g (s)	38.8	36.4		27.2	28.8		19.3	19.3		19.3	19.3	19.3
Actuated g/C Ratio	0.55	0.52		0.39	0.41		0.28	0.28		0.28	0.28	0.28
Clearance Time (s)	3.0	7.0		3.0	7.0		6.1	6.1		6.1	6.1	6.1
Vehicle Extension (s)	2.5	5.0		2.5	5.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	376	1667		325	1306		318	837		321	863	378
v/s Ratio Prot	c0.06	0.18		0.00	c0.23			0.03				0.05
v/s Ratio Perm	0.18			0.05			0.04			c0.16		0.07
v/c Ratio	0.44	0.34		0.14	0.55		0.15	0.11		0.57	0.16	0.24
Uniform Delay, d1	9.1	9.9		13.5	15.7		19.2	19.0		21.8	19.3	19.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.6	0.3		0.1	0.9		0.2	0.1		2.3	0.1	0.3
Delay (s)	9.7	10.1		13.6	16.6		19.4	19.1		24.1	19.4	20.0
Level of Service	A	B		B	B		B	B		C	B	C
Approach Delay (s)	10.0		16.4			19.2			21.0			
Approach LOS	B		B			B			C			

Intersection Summary

HCM 2000 Control Delay	15.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	70.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	62.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
2: Helena St & Washington Rd/Albany St

210371
2027 Total PM Peak Hour

	↖	→	↘	↙	←	↖	↙	↘	↙	↘	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕		↕	↕		↕	↕	
Traffic Volume (vph)	33	38	0	2	51	29	0	18	4	53	45	27
Future Volume (vph)	33	38	0	2	51	29	0	18	4	53	45	27
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fit					0.951			0.977			0.971	
Fit Protected		0.977			0.999			0.979			0.979	
Satd. Flow (prot)	0	1683	0	0	1624	0	0	1554	0	0	1646	0
Fit Permitted		0.977			0.999			0.979			0.979	
Satd. Flow (perm)	0	1683	0	0	1624	0	0	1554	0	0	1646	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		238.9			355.9			223.0			459.6	
Travel Time (s)		17.2			25.6			16.1			33.1	
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
Heavy Vehicles (%)	0%	3%	0%	50%	2%	0%	0%	7%	25%	0%	3%	0%
Adj. Flow (vph)	36	41	0	2	55	32	0	20	4	58	49	29
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	77	0	0	89	0	0	24	0	0	136	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	31.7%
ICU Level of Service	A
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
2: Helena St & Washington Rd/Albany St

210371
2027 Total PM Peak Hour

	↖	→	↘	↙	←	↖	↙	↘	↙	↘	↙	↘
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕		↕	↕		↕	↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	33	38	0	2	51	29	0	18	4	53	45	27
Future Volume (vph)	33	38	0	2	51	29	0	18	4	53	45	27
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)	36	41	0	2	55	32	0	20	4	58	49	29
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	77	89	24	136								
Volume Left (vph)	36	2	0	58								
Volume Right (vph)	0	32	4	29								
Hadj (s)	0.12	-0.17	0.07	-0.02								
Departure Headway (s)	4.5	4.2	4.5	4.3								
Degree Utilization, x	0.10	0.10	0.03	0.16								
Capacity (veh/h)	770	824	757	800								
Control Delay (s)	8.0	7.7	7.6	8.1								
Approach Delay (s)	8.0	7.7	7.6	8.1								
Approach LOS	A	A	A	A								

Intersection Summary	
Delay	7.9
Level of Service	A
Intersection Capacity Utilization	31.7%
ICU Level of Service	A
Analysis Period (min)	15

Lanes, Volumes, Timings
3: Helena St & North Driveway

210371
2027 Total PM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	8	6	5	151	201	21
Future Volume (vph)	8	6	5	151	201	21
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.941				0.987	
Fit Protected	0.973			0.999		
Satd. Flow (prot)	1571	0	0	1714	1693	0
Fit Permitted	0.973			0.999		
Satd. Flow (perm)	1571	0	0	1714	1693	0
Link Speed (k/h)	50			70	70	
Link Distance (m)	176.9			116.0	1195.0	
Travel Time (s)	12.7			6.0	61.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	7	5	164	218	23
Shared Lane Traffic (%)						
Lane Group Flow (vph)	16	0	0	169	241	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	23.0%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
3: Helena St & North Driveway

210371
2027 Total PM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	8	6	5	151	201	21
Future Volume (Veh/h)	8	6	5	151	201	21
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)	9	7	5	164	218	23
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	404	230	241			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	404	230	241			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	100			
cM capacity (veh/h)	601	810	1326			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	16	169	241			
Volume Left	9	5	0			
Volume Right	7	0	23			
sSH	677	1326	1700			
Volume to Capacity	0.02	0.00	0.14			
Queue Length 95th (m)	0.6	0.1	0.0			
Control Delay (s)	10.4	0.3	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.4	0.3	0.0			
Approach LOS	B					

Intersection Summary

Average Delay		0.5	
Intersection Capacity Utilization	23.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lanes, Volumes, Timings
4: Helena St & South Driveway

210371
2027 Total PM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	7	8	8	149	191	16
Future Volume (vph)	7	8	8	149	191	16
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.929			0.990		
Fit Protected	0.977			0.997		
Satd. Flow (prot)	1557	0	0	1711	1699	0
Fit Permitted	0.977			0.997		
Satd. Flow (perm)	1557	0	0	1711	1699	0
Link Speed (k/h)	50			70	70	
Link Distance (m)	172.7			459.6	116.0	
Travel Time (s)	12.4			23.6	6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	9	9	162	208	17
Shared Lane Traffic (%)						
Lane Group Flow (vph)	17	0	0	171	225	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	25.6%
ICU Level of Service A	
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
4: Helena St & South Driveway

210371
2027 Total PM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	8	8	149	191	16
Future Volume (Veh/h)	7	8	8	149	191	16
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)	8	9	9	162	208	17
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	396	216	225			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	396	216	225			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	99			
cM capacity (veh/h)	605	823	1344			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	17	171	225			
Volume Left	8	9	0			
Volume Right	9	0	17			
sSH	704	1344	1700			
Volume to Capacity	0.02	0.01	0.13			
Queue Length 95th (m)	0.6	0.2	0.0			
Control Delay (s)	10.2	0.5	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.2	0.5	0.0			
Approach LOS	B					

Intersection Summary			
Average Delay		0.6	
Intersection Capacity Utilization	25.6%	ICU Level of Service	A
Analysis Period (min)	15		

Queuing and Blocking Report
2027 Total AM Peak Hour

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2027 Total AM Peak Hour

Intersection: 1: Helena St/Thompson Rd & Garrison Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	TR	L	T	T
Maximum Queue (m)	57.8	30.2	26.9	9.0	42.8	30.9	28.4	27.2	25.1	28.8	26.6	3.6
Average Queue (m)	24.3	13.4	11.6	1.6	19.3	11.9	12.8	10.1	10.3	12.7	9.6	0.1
95th Queue (m)	42.3	25.1	21.3	7.0	33.4	24.6	26.5	22.3	21.2	25.7	22.1	2.3
Link Distance (m)		212.3	212.3		289.8	289.8		77.0	77.0		335.9	335.9
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	120.0			110.0			35.0			70.0		
Storage Blk Time (%)							0	0				
Queuing Penalty (veh)							0	0				

Intersection: 2: Helena St & Washington Rd/Albany St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	11.5	16.9	7.9	9.4
Average Queue (m)	6.3	7.3	2.3	2.2
95th Queue (m)	10.8	13.9	5.6	6.1
Link Distance (m)	220.5	337.5	204.6	434.3
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Helena St & North Driveway

Movement	EB
Directions Served	LR
Maximum Queue (m)	12.5
Average Queue (m)	5.3
95th Queue (m)	12.9
Link Distance (m)	168.4
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Queuing and Blocking Report
2027 Total AM Peak Hour

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2027 Total AM Peak Hour

Intersection: 4: Helena St & South Driveway

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	10.7	3.8
Average Queue (m)	4.5	0.1
95th Queue (m)	12.0	1.7
Link Distance (m)	164.0	434.3
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Queuing and Blocking Report
2027 Total PM Peak Hour

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2027 Total PM Peak Hour

Intersection: 1: Helena St/Thompson Rd & Garrison Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	TR	L	T	T
Maximum Queue (m)	47.8	44.4	44.3	17.2	55.4	53.3	21.8	23.0	25.2	45.7	33.7	11.0
Average Queue (m)	19.7	22.9	16.7	7.5	31.9	23.9	8.4	7.2	9.2	24.8	17.2	0.7
95th Queue (m)	36.1	39.1	32.5	16.3	50.8	43.6	18.6	17.6	18.8	41.0	31.9	6.8
Link Distance (m)		212.3	212.3		289.8	289.8		77.0	77.0		335.9	335.9
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	120.0			110.0			35.0			70.0		
Storage Blk Time (%)												
Queuing Penalty (veh)	0											

Intersection: 2: Helena St & Washington Rd/Albany St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	15.6	17.6	12.7	13.0
Average Queue (m)	6.6	7.5	1.9	5.3
95th Queue (m)	11.5	13.3	6.6	11.7
Link Distance (m)	220.5	337.5	204.6	434.3
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Helena St & North Driveway

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	9.2	12.1
Average Queue (m)	3.3	0.5
95th Queue (m)	10.4	4.4
Link Distance (m)	168.4	99.2
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Queuing and Blocking Report
2027 Total PM Peak Hour

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2027 Total PM Peak Hour

Intersection: 4: Helena St & South Driveway

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	9.1	5.9
Average Queue (m)	3.8	0.3
95th Queue (m)	10.8	2.9
Link Distance (m)	164.0	434.3
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

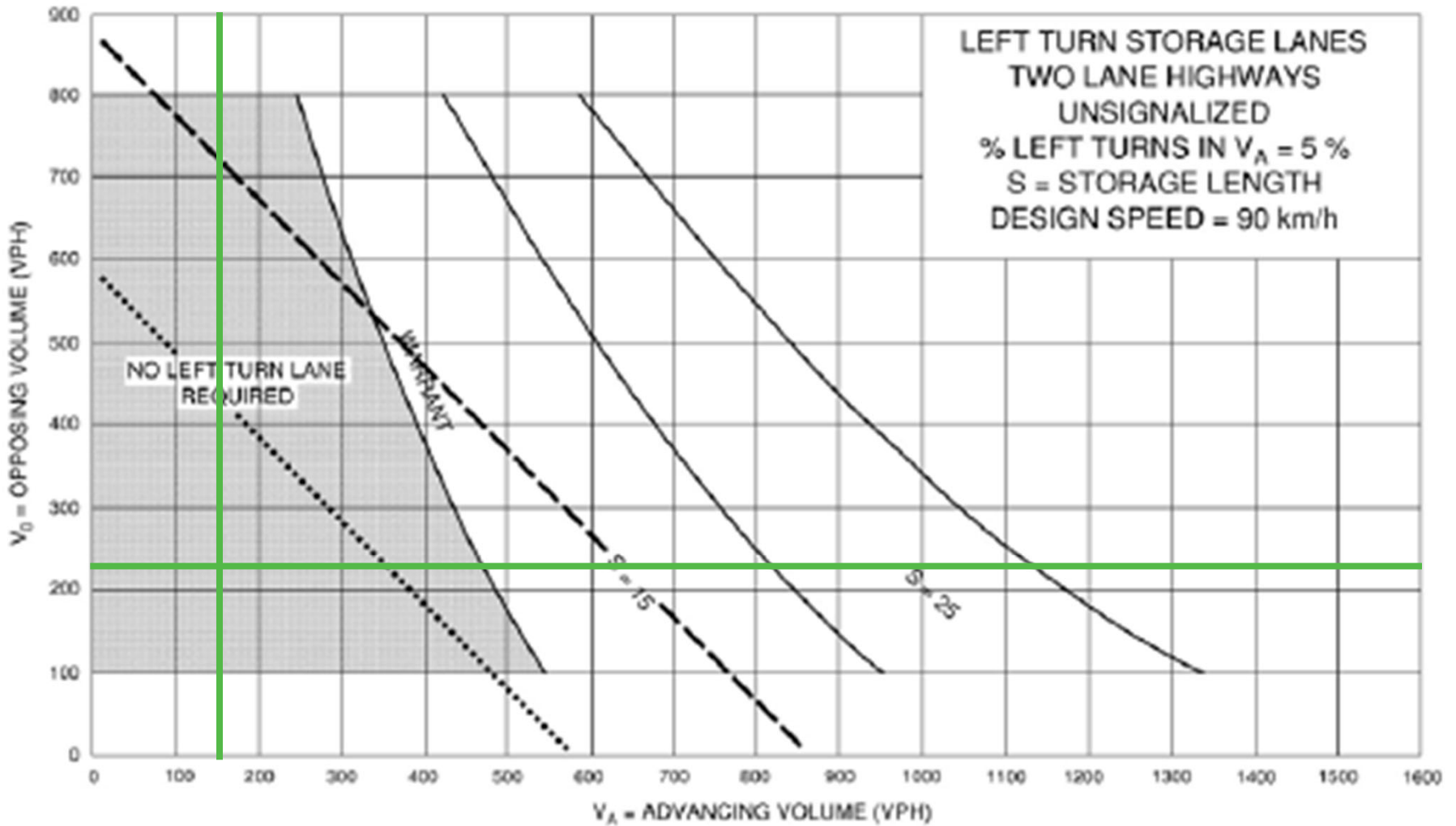
Appendix F

Left-Turn Lane Warrants

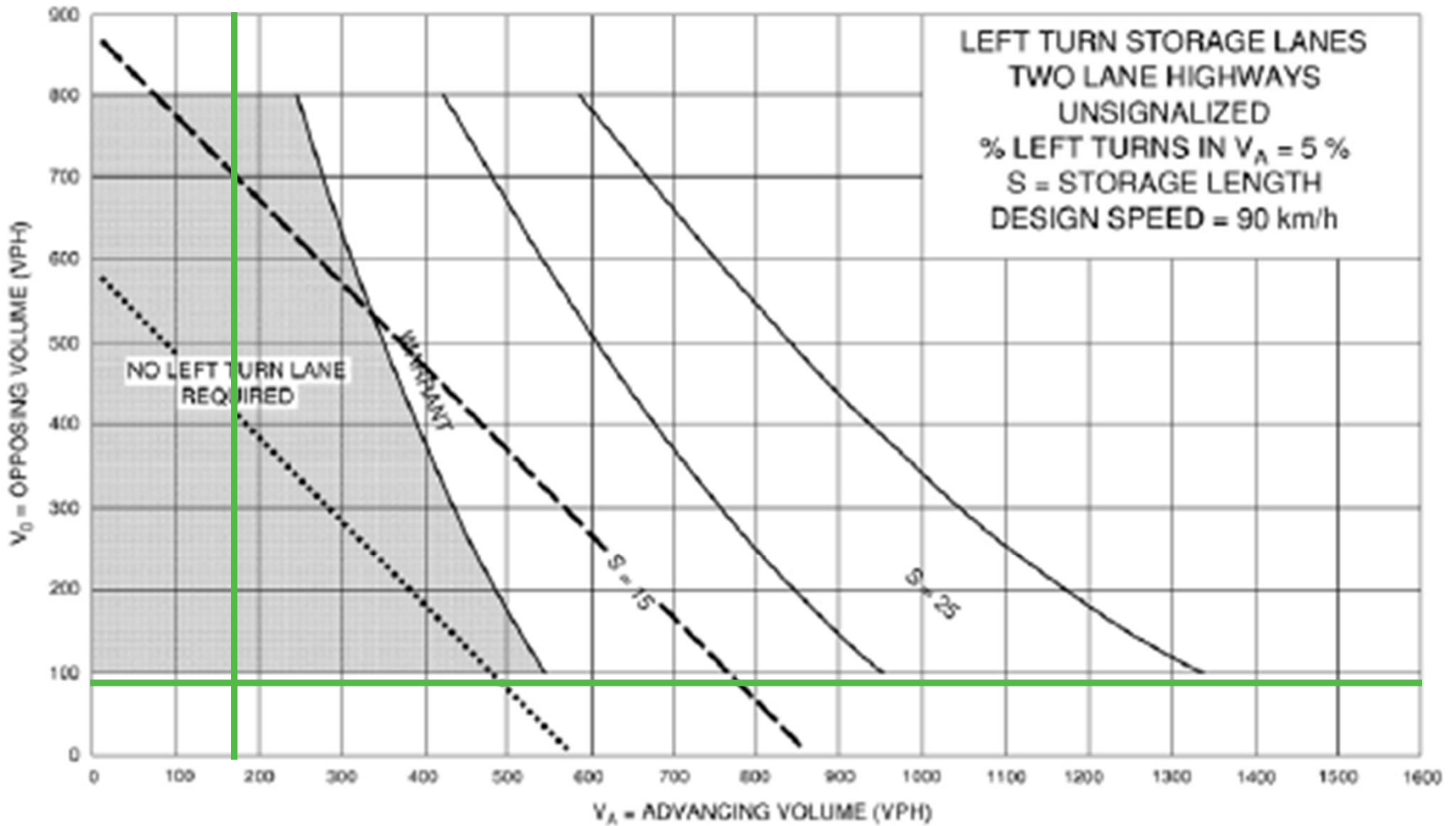


Roadway	Helena Street			
Intersection	North Driveway		South Driveway	
Approach Direction	Northbound		Northbound	
Design Speed	90 km/h		90 km/h	
Horizon	Total 2027		Total 2027	
Peak Hour	AM	PM	AM	PM
Advancing Volume	194	156	180	157
Opposing Volume	95	222	93	207
Left Turning Traffic	3	5	5	8
% of Left Turning Traffic	2%	3%	3%	5%
Figure Used*	NA	9A-19	9A-19	9A-19
Warranted	No	No	No	No
Storage Length Required	-	-	-	-

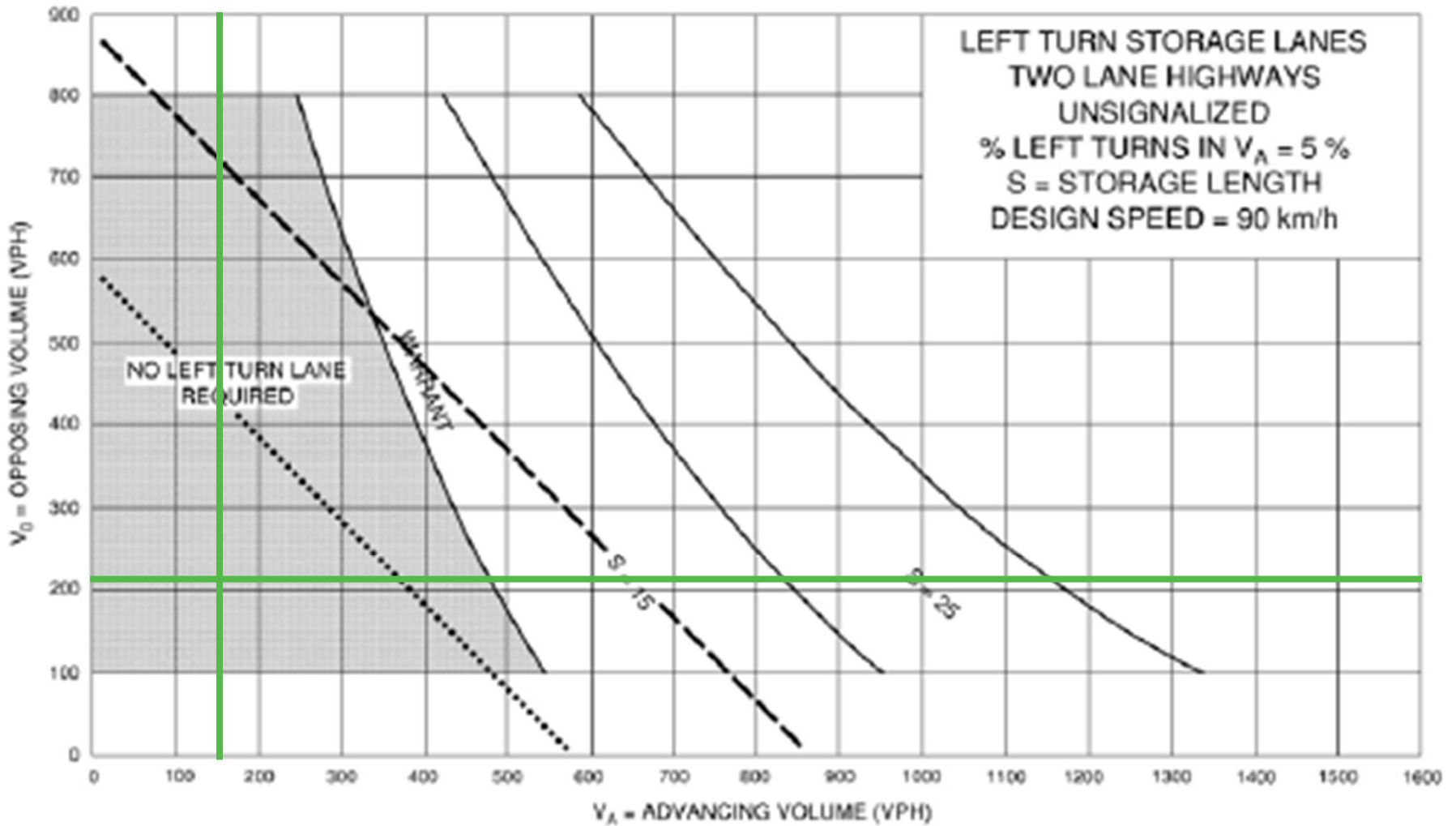
*Ontario Ministry of Transportation, *MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads*, (Toronto: Queens Printer for Ontario, 2020).



Helena Street and North Driveway Left-Turn Lane Warrant



Helena Street and South Driveway Left-Turn Lane Warrant



Helena Street and South Driveway Left-Turn Lane Warrant