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# ALMA Guelph Phase 2 601 Scottsdale Drive, Guelph Transportation Impact Study and Parking Study

Paradigm Transportation Solutions Limited

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## ALMA Guelph Phase 2, 601 Scottsdale Drive, Guelph Transportation Impact Study and Parking Study



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# Executive Summary

## Content

Forum 601 Scottsdale LP retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study (TIS) and Parking Study (PS) for the proposed Phase 2 of the ALMA student residential development located at 601 Scottsdale Drive in Guelph, Ontario.

The TIS includes an analysis of existing traffic conditions, describes the proposed development, forecasts traffic to opening year and five and ten years beyond the full build-out of the development, and recommends improvements to mitigate future traffic conditions.

The purpose of the PS is to determine if the proposed parking supply will accommodate the anticipated demand for the proposed development based on Zoning By-law requirements, auto ownership, proxy site parking studies, other assessment methods and transportation demand management (TDM) measures.

## Development Description

The subject site is proposed to have the existing off-campus student housing development expanded with an additional 489 units.

Vehicle access is proposed via an all-moves driveway connection to Scottsdale Drive.

The full build-out is assumed to be completed by 2025.

A total of 191 parking spaces will be provided on-site (0.29 spaces per unit for Phases 1 and 2).

The proposed parking supply does not meet City of Guelph zoning requirements as currently planned.

## Conclusions

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

### Transportation Impact Study:

- ▶ **Existing Traffic Operations:** The study area intersections are currently operating at acceptable levels of service with the following critical movements noted:

Highway 6 and Stone Road West:



- The eastbound through/right-turn movement is forecast to have a queue length that blocks the eastbound left-turn lane during the AM and PM peak hours;
- The westbound left-turn movement is forecast to have a v/c ratio surpassing 1.00 and a queue length that surpasses its storage length by 70 and 115 metres during the AM and PM peak hours;
- The westbound through/right-turn movement is forecast to have a queue length that blocks the westbound left-turn lane during the AM and PM peak hours;
- The northbound through movement is forecast to have a v/c ratio surpassing 0.85 during the PM peak hour and a queue length that is forecast to block the northbound left-turn and right-turn lanes during the AM and PM peak hours;
- The northbound right-turn movement is forecast to have a queue length that surpasses its storage length by 80 and 39 metres during the AM and PM peak hours;
- The southbound left-turn movement is forecast to have a v/c ratio equal to 0.85 during the PM peak hour; and
- The southbound through/right-turn is forecast to have a v/c ratio surpassing 0.85 and 1.00 during the AM and PM peak hours respectively and a queue length that blocks the southbound left-turn lane during the AM and PM peak hours.

#### Stone Road West and Scottsdale Drive:

- The westbound left-turn movement is forecast to have a queue length that surpasses its storage length by 2 metres during the PM peak hour.
- ▶ **Trip Generation:** The development is forecast to generate 32 and 96 new trips during the AM and PM peak hours, respectively;
- ▶ **Future Background Traffic Operations:** The study area intersections are forecast to operate at acceptable levels of service similar to existing traffic conditions. The southbound left-turn movement at the intersection of Stone Road West and Scottsdale Drive is forecast to have a queue length that surpasses its storage length;
- ▶ **Future Total Traffic Operations:** The study area intersections are forecast to operate at acceptable levels of service similar to future background traffic conditions;



- ▶ **Left-Turn Lanes:**
  - At the intersection of Stone Road and Scottsdale Drive, the westbound left-turn queue is forecast to exceed the existing storage length by 16 metres under future conditions regardless of whether the subject development is built. The southbound left-turn lane is forecast to exceed the existing storage length by 6 metres under future traffic conditions, of which 3 metres are attributable to the subject development.
  - A northbound left-turn lane is forecast to be warranted at the site entrance on Scottsdale Drive.

### **Parking Study:**

- ▶ **Zoning Bylaw:** The City of Guelph Zoning By-Law 1995 - 14864 indicates that lodging houses (most similar to off-campus student housing) require a total parking supply equal to a third of the total unit count and one parking spot for the building (219 spaces for Phases 1 and 2);
- ▶ **Northdale Neighbourhood Waterloo:** Zoning By-Law 2018-050 indicates that apartments in the Northdale Neighbourhood require a total of 0.25 parking spaces per bedroom including 0.20 resident spaces per bedroom and 0.05 visitor spaces per bedroom (191 spaces for Phases 1 and 2);
- ▶ **Parking Survey:** The Phase 1 survey results show a peak demand of 0.18 spaces per unit (118 parking spaces for Phases 1 and 2); and
- ▶ **Estimated Parking Demand:** Given the results of the Northdale Neighbourhood and Phase 1 survey rates, the forecast parking demand for this site is between 118 and 219 residential spaces for Phases 1 and 2.
- ▶ **Transportation Demand Management:** The site concept plan is able to support multiple TDM measures that can assist in mitigating the site's transportation and parking impacts on the adjacent road network, promote a strong and vibrant economy, and create a livable community that has a balanced transportation network.

## **Recommendations**

Based on the findings of this study, it is recommended that:

- ▶ The proposed development be approved with the proposed parking supply and consideration given to the discussed TDM measures; and



- ▶ A northbound left-turn lane with 15 metres of storage be considered by the City of Guelph on Scottsdale Drive at the Site Driveway.

The Phase II Development includes measures to accommodate traffic into and out of both developments on the Lands. In the event that the Phase II Development does not proceed, it is understood that the City requires a new median be constructed in the municipal right-of-way cross the south driveway access to manage traffic flow. Regardless of whether the subject development proceeds, it is recommended to:

- ▶ Proceed with the planned conversion of the intersection of Highway 6 and Stone Road West to an interchange as identified in the Hanlon Expressway Environmental Assessment;
- ▶ Extend the westbound and southbound left-turn lanes at the intersection of Stone Road West and Scottsdale Drive to meet the forecast queue lengths.



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# 1 Introduction

## 1.1 Overview

Forum 601 Scottsdale LP retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study (TIS) for a proposed student residence expansion located at 601 Scottsdale Drive in Guelph, Ontario.

**Figure 1.1** details the location of the subject development.

The scope of the study includes:

- ▶ Assessing current traffic and site conditions within the study area;
- ▶ Estimating background traffic growth for opening year and five and ten years from the full build-out of the development (2025, 2030, and 2035);
- ▶ Estimating additional traffic generated by the subject site;
- ▶ Analysing future traffic impacts on the surrounding road network;
- ▶ Recommending any necessary mitigation;
- ▶ Assessing current parking and alternative mode resources within the study area;
- ▶ Reviewing Zoning By-Law parking requirements in Guelph;
- ▶ Forecasting parking demand based on data collected at residential proxy sites in Kitchener;
- ▶ Evaluating proposed TDM measures; and
- ▶ Recommending preferred measures to support the reduction in parking supply.

The impact assessment will focus on the following intersections:

- ▶ Stone Road West and Scottsdale Drive (signalized);
- ▶ Highway 6 and Stone Road West (signalized); and
- ▶ Site Driveways connecting to Scottsdale Drive (unsignalized).

This study has been prepared in accordance with the requirements of the City of Guelph (the City) and the Ministry of Transportation Ontario (MTO) Traffic Impact Study Guidelines. A pre-study conference was held with City and MTO staff to confirm the study scope.





## Site Location

601 Scottsdale Drive, Guelph TIS and PS  
220563

**Figure 1.1**

## 2 Existing Conditions

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

### 2.1 Road Network

The study area roadways include<sup>1</sup>:

- ▶ **Highway 6 (Hanlon Parkway)** is a four-lane, 80 km/h provincial highway. Approximately 45 metres north of Stone Road West, the speed limit is 70 km/h;
- ▶ **Scottsdale Drive** is a two-lane, 40 km/h collector road. Between Janefield Avenue and Cole Road, the speed limit is 50 km/h; and
- ▶ **Stone Road West** is a four-lane, 60 km/h arterial road.

The study area is primarily bordered by residential and commercial uses.

**Figure 2.1** illustrates the study intersections, and their existing lane configurations and traffic controls.

### 2.2 Transit Network

The following routes are available within walking distance of the development<sup>2</sup>:

- ▶ **Route 1 (Edinburgh College)** operates in a one way-loop (clockwise) connecting Stone Road Mall and the University of Guelph. The route operates Monday - Sundays with 30-minute headways;
- ▶ **Route 2 (College Edinburgh)** operates in a one way-loop (counter-clockwise) connecting Stone Road Mall and the University of Guelph. The route operates Monday - Sundays with 30-minute headways;
- ▶ **Route 6 (Ironwood)** operates between the University of Guelph and Highway 6 generally along Harvard Road, Ironwood Road,

<sup>1</sup> City of Guelph, *Official Plan Schedule 5: Road & Rail Network*, (Guelph: City of Guelph, 2021).

<sup>2</sup> "Guelph Transit schedules and maps," City of Guelph, <https://guelph.ca/living/getting-around/bus/schedules/>.

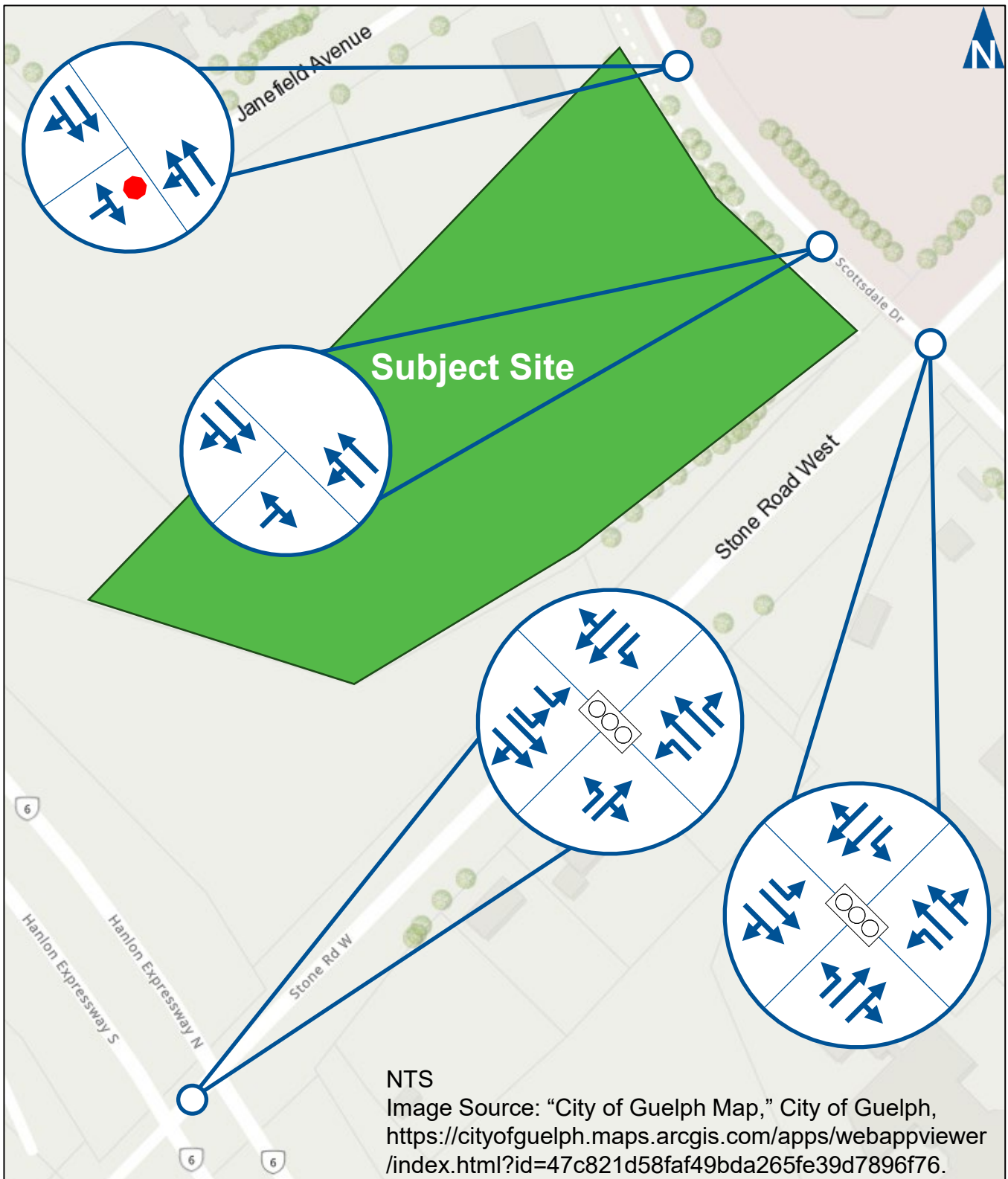


and Scottsdale Drive. The route operates Monday - Sundays with 30-minute headways;

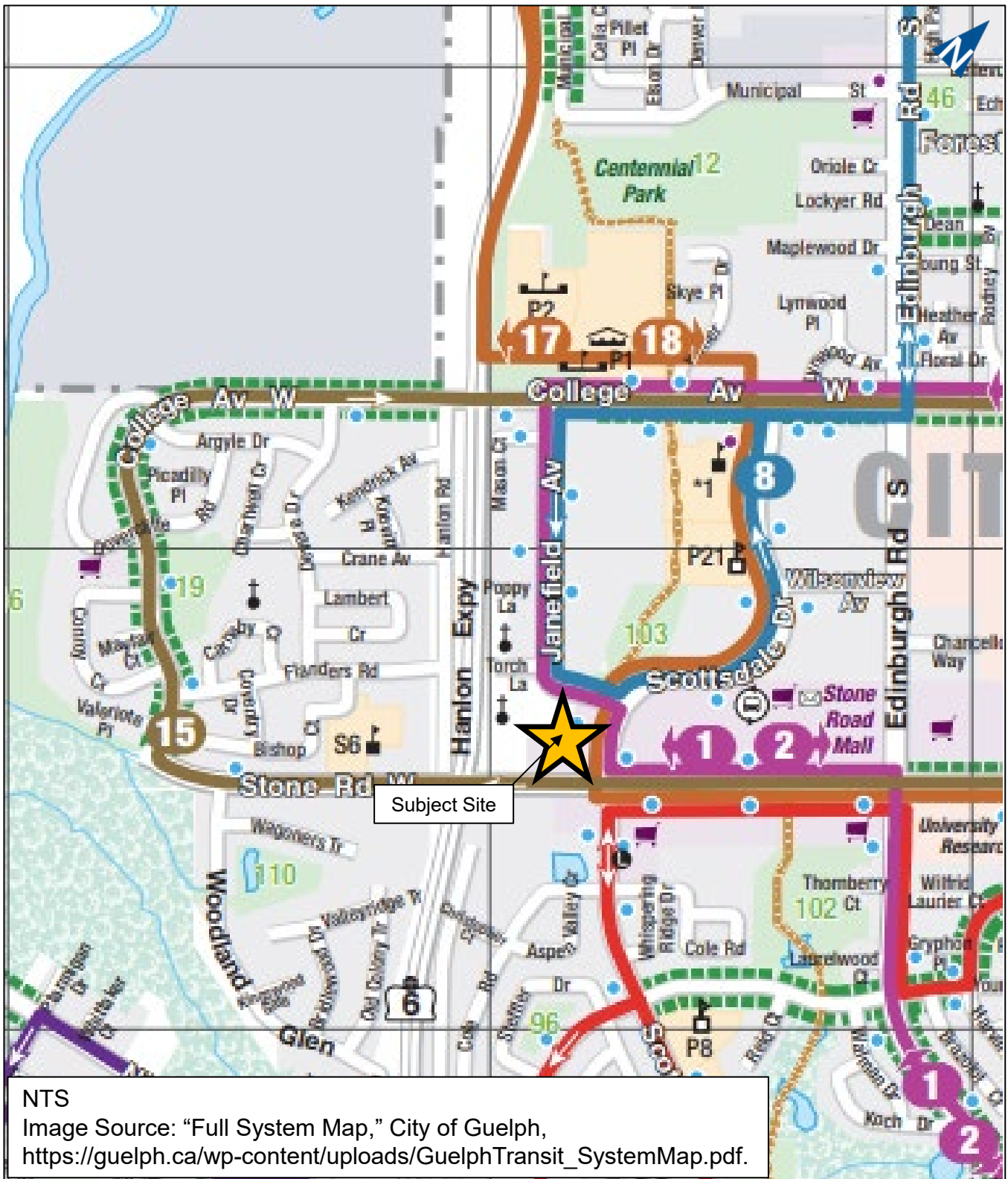
- ▶ **Route 8 (Stone Road Mall)** operates along Edinburgh Road and Wellington Street between Guelph Central Station and Stone Road Mall. The route operates Monday - Sundays with 30-minute headways;
- ▶ **Route 15 (College)** operates in a one way-loop (clockwise) along College Avenue and Stone Road between the University of Guelph and the west end of Stone Road. The route operates Monday - Sundays with 30-minute headways;
- ▶ **Route 17 (Woodlawn Watson)** operates in a one way-loop (clockwise) connecting Stone Road Mall and the west, north and east border of Guelph. The route operates Monday - Sundays with headways generally around 30 minutes;
- ▶ **Route 18 (Watson Woodlawn)** operates in a one way-loop (counter-clockwise) connecting Stone Road Mall and the west, north and east border of Guelph. The route operates Monday - Sundays with headways generally around 30 minutes;
- ▶ **Route 50U (Scottsdale)** operates in a one way-loop (clockwise) connecting Stone Road Mall and the University of Guelph. The route operates only Monday - Friday with 15-minute headways. Additionally, this route is unavailable from May – August.

**Figure 2.2** displays the map of the existing transit network around the subject site.





## Existing Lane Configuration and Traffic Control



NTS  
 Image Source: "Full System Map," City of Guelph,  
[https://guelph.ca/wp-content/uploads/GuelphTransit\\_SystemMap.pdf](https://guelph.ca/wp-content/uploads/GuelphTransit_SystemMap.pdf).



## Existing Transit Network



## 2.3 Cycling and Pedestrian Facilities

There are sidewalks in the following areas:

- ▶ **Scottsdale Drive:** both sides of the road; and
- ▶ **Stone Road West:** both sides of the road east of Scottsdale Drive, and only on the north side west of Scottsdale Drive.

Buffered bike lanes are provided on Stone Road West east of Edinburgh Road South (approximately 700 metres from the proposed development) providing cycling access to both the University and downtown area.

Additionally, access to Silvercreek Trail is available to the north of Janefield Avenue, also providing cycling access to both the University and downtown area.

**Figure 2.3** illustrates the Guelph cycling map.

It was noted during the pre-study conference, with City staff, that a multi-use pathway is planned for Scottsdale Drive between Janefield Avenue and Stone Road.

**Figure 2.4** illustrates the Guelph recommended active transportation network.

## 2.4 Traffic Volumes

Traffic counts were collected by Paradigm during the AM and PM peak hours of a weekday at the following intersections:

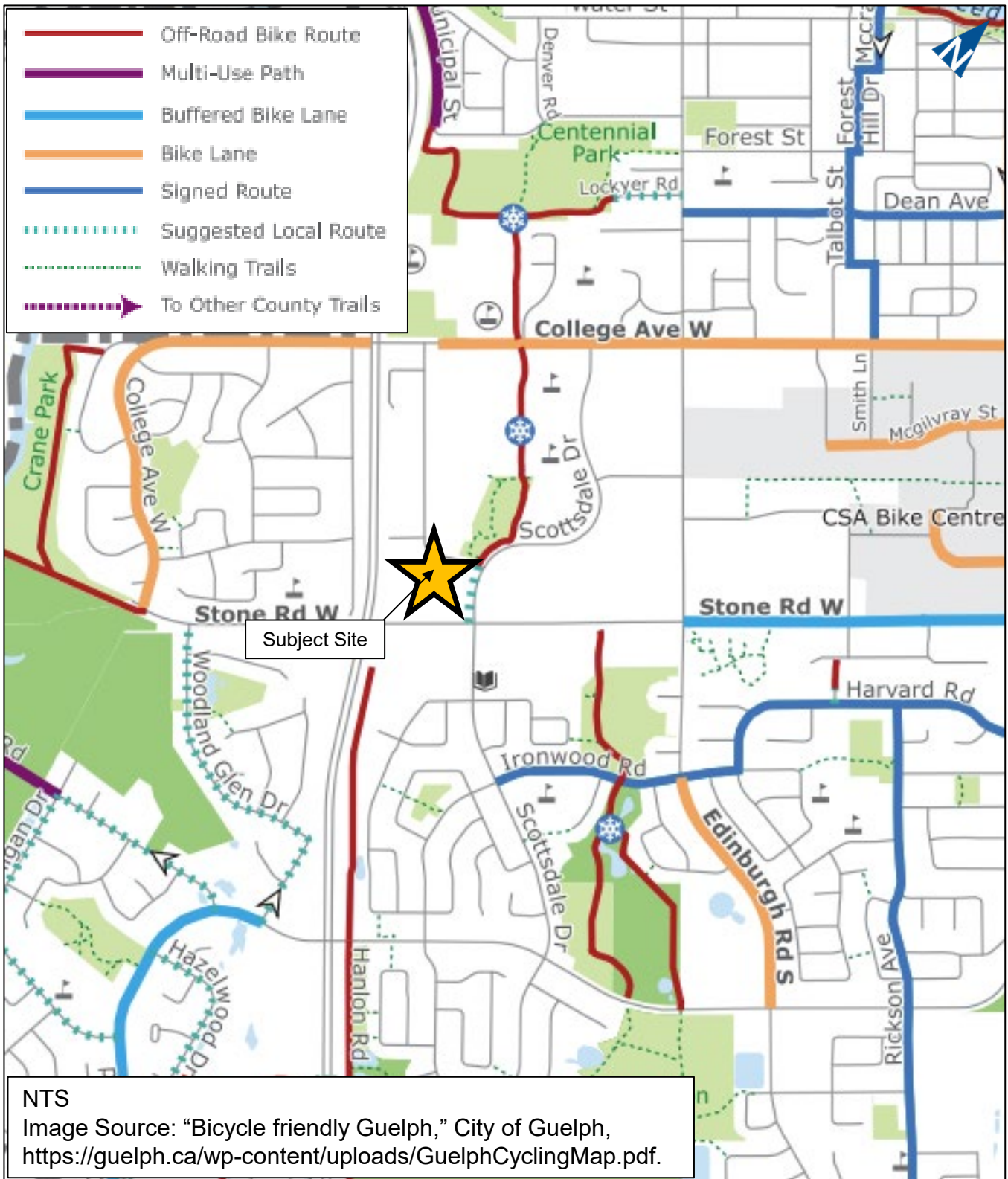
- ▶ Highway 6 and Stone Road West (March 2023); and
- ▶ Stone Road West and Scottsdale Drive (September 2021).

The September 2021 traffic counts were factored using a 1.5% growth rate to provide a 2023 base year condition. Volume balancing (by addition) was completed for the 2023 base year condition along Stone Road West between Highway 6 and Scottsdale Drive.

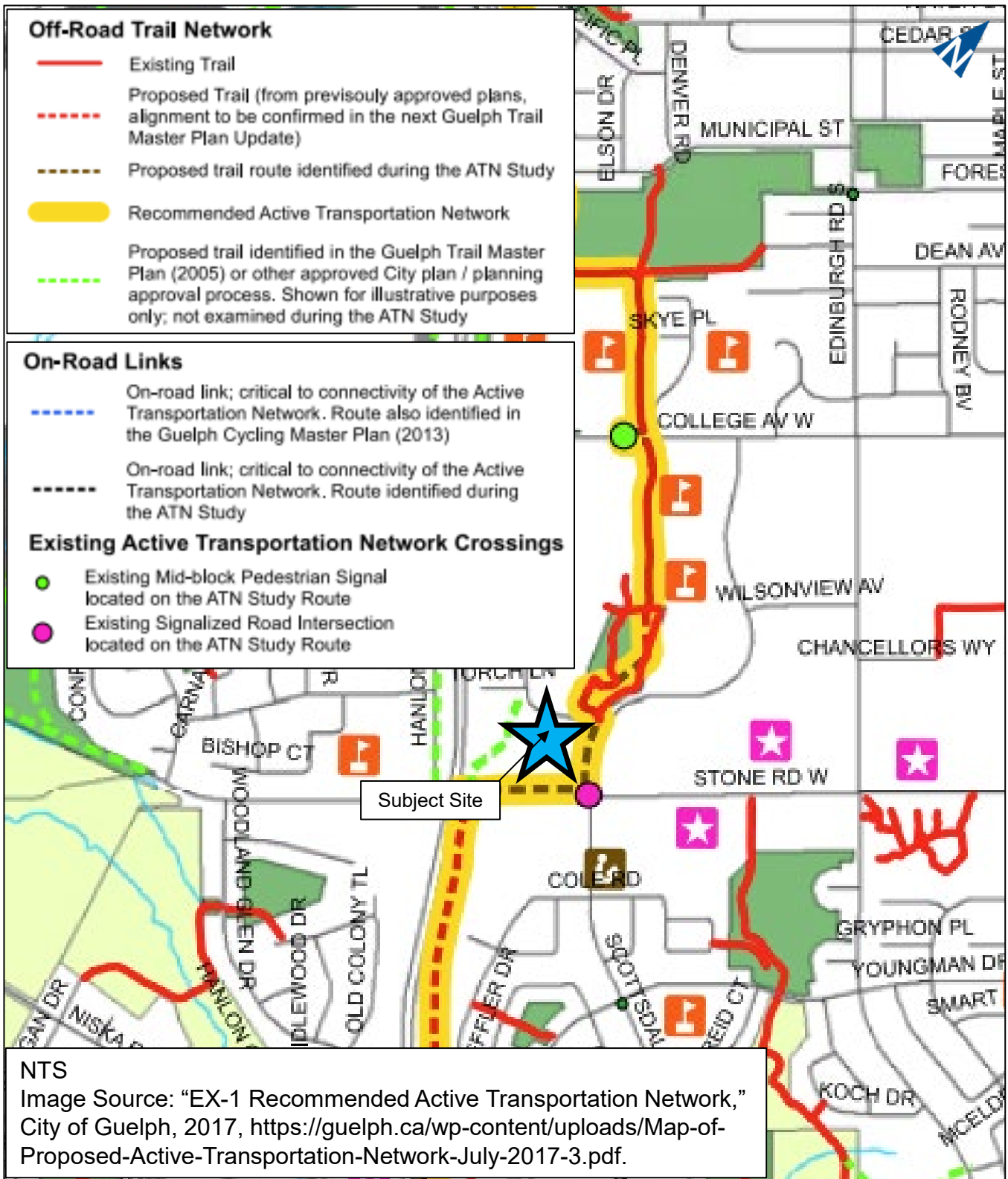
In/Out counts were also collected by Paradigm in March 2023 at the site driveways along Scottsdale Drive to capture the 601 Scottsdale Drive Phase 1 site traffic.

**Figure 2.5a** and **Figure 2.5b** illustrate the existing AM and PM peak hour traffic volumes respectively. **Appendix A** contains the existing count data.



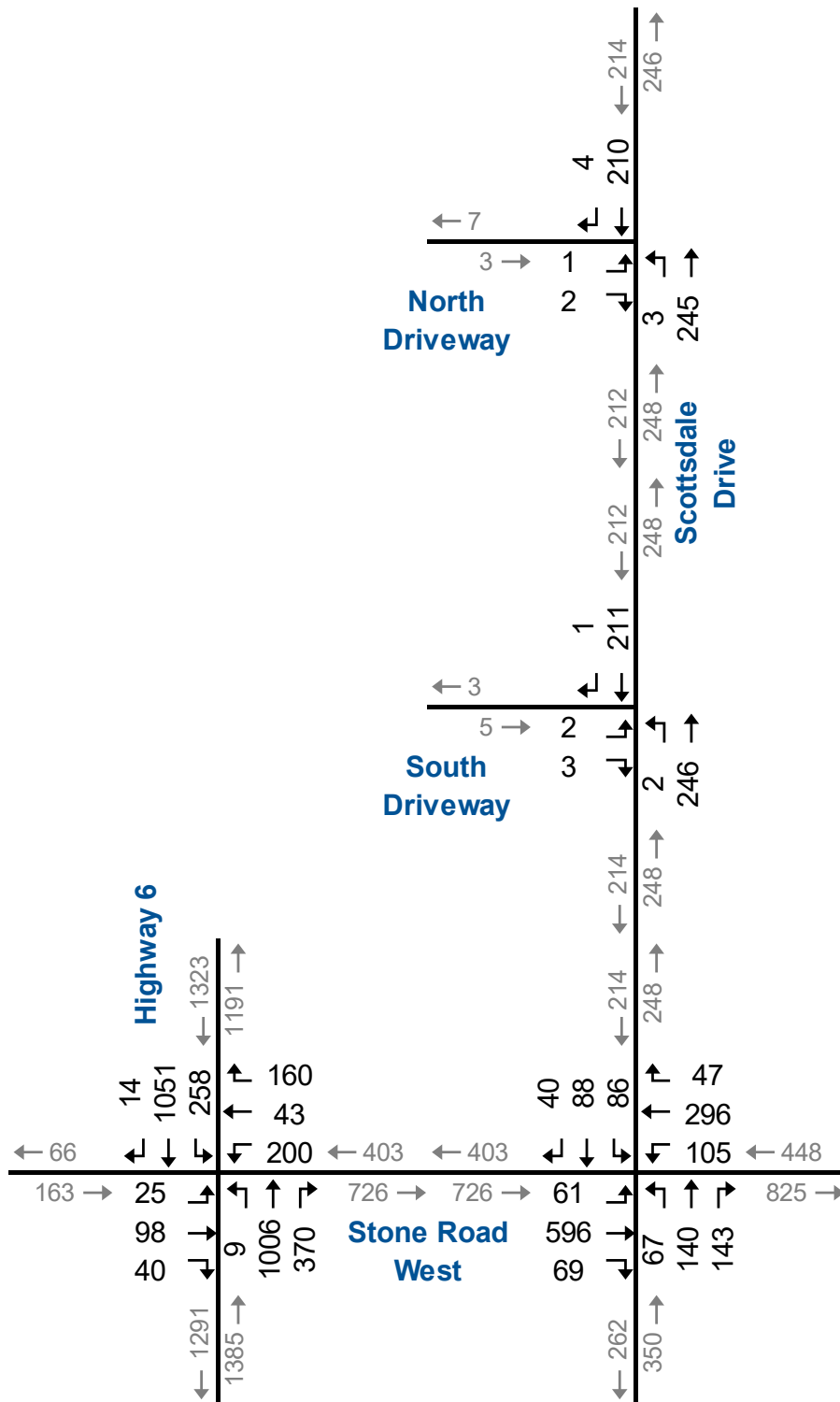


## Existing Cycling Network



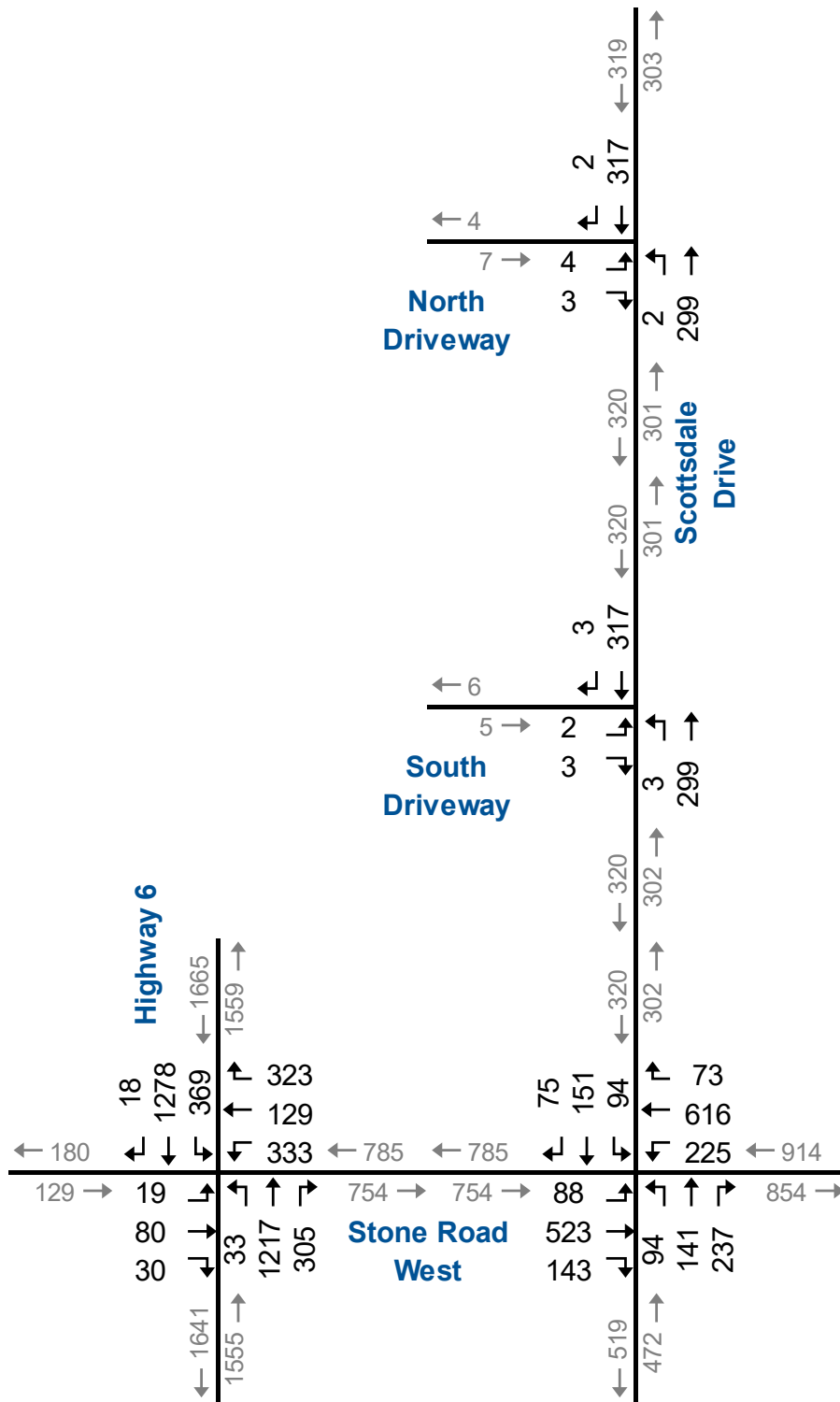
# Future Active Transportation Network

AM Peak Hour



Existing Traffic Volumes  
(AM Peak Hour)

PM Peak Hour



Existing Traffic Volumes (PM Peak Hour)

## 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 desiring to make a particular 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 intersections), 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 using the existing lane configurations, traffic controls and the existing traffic peak volumes.

The level of service conditions on the existing road network have been assessed using Synchro 11. The criteria, as defined by the City<sup>3</sup>, for identifying “critical” intersections are:

- ▶ For signalized intersections:
  - v/c ratios for overall intersection operation, through movements or shared/turning movements increased to 0.85 or above;
  - v/c ratios for exclusive movements increased to 0.90 or above; or
  - queues for an individual movement are projected to exceed available turning lane storage.
- ▶ For unsignalized intersections:
  - level of service (LOS) based on average delay per vehicle, on individual movements exceeds LOS “E”; or
  - the estimated 95th percentile queue length for an individual movement exceeds the available queue storage.

As noted in MTO TIS guidelines<sup>4</sup>, critical movements occur when:

- ▶ individual movements have v/c ratio greater than 0.85 at signalized intersections; or

<sup>3</sup> City of Guelph, *Traffic Impact Study Guidelines*, (Guelph: City of Guelph, 2016).

<sup>4</sup> Ontario Ministry of Transportation, *General Guidelines for the Preparation of Traffic Impact Studies*, (Toronto: King’s Printer for Ontario, 2023).



- ▶ individual movements have v/c ratio greater than 0.75 on ramp terminal approaches.

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

**Table 2.2a** summarizes the northbound right-turn storage lengths at the intersection of Highway 6 and Stone Road West using the Geometric Design Guide for Canadian Roads. The northbound right-turn storage lengths at the intersection of Highway 6 and Stone Road West were generated using the Geometric Design Guide for Canadian Roads<sup>5</sup>.

**Table 2.2b** summarizes the through, left-turn, and shared movement queue lengths at the intersection of Highway 6 and Stone Road West using MTO's Traffic Signal Operating & Timing Policy. The through, left-turn, and shared movement queue lengths at the intersection of Highway 6 and Stone Road West were generated using MTO's Traffic Signal Operating & Timing Policy<sup>6</sup>.

All study area intersections are forecast to operate at acceptable levels of service during the AM and PM peak hours with the following critical movements noted:

- ▶ Highway 6 and Stone Road West:
  - The eastbound through/right-turn movement is forecast to have a queue length that blocks the eastbound left-turn lane during the AM and PM peak hours;
  - The westbound left-turn movement is forecast to have a v/c ratio surpassing 1.00 and a queue length that surpasses its storage length by 70 and 115 metres during the AM and PM peak hours;
  - The westbound through/right-turn movement is forecast to have a queue length that blocks the westbound left-turn lane during the AM and PM peak hours;
  - The northbound through movement is forecast to have a v/c ratio surpassing 0.85 during the PM peak hour and a queue length that is forecast to block the northbound left-turn and right-turn lanes during the AM and PM peak hours;

<sup>5</sup> Transportation Association of Canada, *Geometric Design Guide for Canadian Roads: Section 9.14.4*, (Ottawa: TAC, 2017).

<sup>6</sup> Ontario Ministry of Transportation, *Implementation of the Traffic Signal Operating & Timing Policy # 2010-02*, (Toronto: Queen's Printer for Ontario, 2017).



- The northbound right-turn movement is forecast to have a queue length that surpasses its storage length by 80 and 39 metres during the AM and PM peak hours;
  - The southbound left-turn movement is forecast to have a v/c ratio equal to 0.85 during the PM peak hour; and
  - The southbound through/right-turn is forecast to have a v/c ratio surpassing 0.85 and 1.00 during the AM and PM peak hours respectively and a queue length that blocks the southbound left-turn lane during the AM and PM peak hours.
- ▶ Stone Road West and Scottsdale Drive:
- The westbound left-turn movement is forecast to have a queue length that surpasses its storage length by 2 metres during the PM peak hour.

**Appendix B** contains the detailed Synchro 11 reports.





**TABLE 2.1: EXISTING 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	Highway 6 & Stone Road West	TCS	LOS Delay	E 63	E 69	>	E 68	F 141	D 49	E 56	F 97	D 42	C 23	C 21	C 23	E 71	E 57	E 56	F 60	D 49
			V/C	0.17	0.74	>		1.06	0.14	0.57		0.02	0.60	0.46		0.80	0.87	0.87		
			Q	13	70	>		88	19	72		4	125	91		67	205	212		
			Stor.	65	-	>		35	-	-		160	-	150		195	-	-		
			Avail.	52	-	>		-53	-	-		156	-	59		128	-	-		
AM Peak Hour	Scottsdale Drive & Stone Road West	TCS	LOS Delay	B 12	C 20	C 20	B 19	B 14	B 16	B 16	B 16	C 24	C 30	C 32	C 30	C 25	C 28	C 28	C 27	C 21
			V/C	0.14	0.50	0.50		0.32	0.26	0.27		0.19	0.42	0.50		0.33	0.19	0.20		
			Q	8	64	64		14	28	29		15	38	40		20	16	16		
			Stor.	28	-	-		25	-	-		30	-	-		20	-	-		
			Avail.	20	-	-		11	-	-		15	-	-		0	-	-		
AM Peak Hour	Scottsdale Drive & South Driveway	TWSC	LOS Delay	A 10		>	A 10					A 8	A 0		A 0		A 0	A 0	A 0	
			V/C	0.01		>						0.00	0.00				0.00	0.00		
			Q	0		>						0	0				0	0		
			Stor.	0		>						0	0				0	0		
AM Peak Hour	North Driveway & Scottsdale Drive	TWSC	LOS Delay	A 10		>	A 10					A 8	A 0		A 0		A 0	A 0	A 0	
			V/C	0.00		>						0.00	0.00				0.00	0.00		
			Q	0		>						0	0				0	0		
			Stor.	0		>						0	0				0	0		
PM Peak Hour	Highway 6 & Stone Road West	TCS	LOS Delay	E 66	D 52	>	D 54	F 121	D 42	E 56	F 82	D 52	D 44	C 32	D 42	E 74	F 83	F 82	F 80	E 65
			V/C	0.18	0.34	>		1.06	0.28	0.79		0.12	0.86	0.47		0.85	1.01	1.01		
			Q	10	50	>		151	51	133		15	211	94		92	291	302		
			Stor.	65	-	>		35	-	-		160	-	150		195	-	-		
			Avail.	55	-	>		-116	-	-		145	-	56		103	-	-		
PM Peak Hour	Scottsdale Drive & Stone Road West	TCS	LOS Delay	B 14	C 22	C 22	C 21	B 15	B 20	B 20	B 18	C 24	C 30	D 36	C 32	C 26	C 29	C 29	C 28	C 23
			V/C	0.23	0.50	0.50		0.55	0.47	0.47		0.26	0.37	0.72		0.39	0.29	0.31		
			Q	11	64	63		27	60	61		20	34	64		20	27	27		
			Stor.	28	-	-		25	-	-		30	-	-		20	-	-		
			Avail.	17	-	-		-2	-	-		10	-	-		0	-	-		
PM Peak Hour	Scottsdale Drive & South Driveway	TWSC	LOS Delay	B 11		>	B 11					A 8	A 0		A 0		A 0	A 0	A 0	
			V/C	0.01		>						0.00	0.00				0.00	0.00		
			Q	0		>						0	0				0	0		
			Stor.	0		>						0	0				0	0		
PM Peak Hour	North Driveway & Scottsdale Drive	TWSC	LOS Delay	B 11		>	B 11					A 8	A 0		A 0		A 0	A 0	A 0	
			V/C	0.01		>						0.00	0.00				0.00	0.00		
			Q	0		>						0	0				0	0		
			Stor.	0		>						0	0				0	0		

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

Stor. - Existing Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

</> - Shared with through movement



**TABLE 2.2A: EXISTING RIGHT-TURN STORAGE LENGTHS**

Intersection	Parameter	Direction/Movement	
		AM Peak Hour	PM Peak Hour
		NBR	NBR
Highway 6 and Stone Road West	Volume (vph)	370	305
	Cycle Length (s)	148.7	148.7
	Design Speed (km/h)	100	100
	Queue (m)	230	189
	Storage (m)	150	150
	Available (m)	-80	-39

Transportation Association of Canada, *Geometric Design Guide for Canadian Roads: Section 9.14.4*, (Ottawa: TAC, 2017).

**TABLE 2.2B: EXISTING THROUGH, RIGHT-TURN, AND SHARED QUEUE LENGTHS**

Analysis Period	Intersection	Parameter	Direction/Movement										
			EBL	EBTR	WBL	WBTR1	WBTR2	NBL	NBT	SBL1	SBL2	SBTR1	SBTR2
AM Peak Hour	Highway 6 and Stone Road West	Volume (vph)	25	138	200	122	81	9	1006	155	103	639	426
		Heavy Vehicle %	4%	2%	5%	4%	4%	11%	12%	3%	3%	10%	10%
		Cycle Length (s)	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7
		Passenger Cars Per Hour	26	141	210	127	85	10	1127	160	107	703	469
		Number of Lanes	1	1	1	1	1	1	2	1	1	1	1
		Arrival Rate (veh/s/lane)	1.1	5.8	8.7	5.2	3.5	0.4	23.3	6.6	4.4	29.0	19.4
		Queue (vehicles)*	3	10	14	9	7	2	31	11	8	35	27
		Queue (m)	23	75	105	68	53	15	233	83	60	263	203
PM Peak Hour	Highway 6 and Stone Road West	Volume (vph)	19	110	333	271	181	33	1217	221	148	778	518
		Heavy Vehicle %	0%	2%	1%	1%	1%	0%	5%	1%	1%	4%	4%
		Cycle Length (s)	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7
		Passenger Cars Per Hour	19	113	337	274	183	33	1278	224	150	810	539
		Number of Lanes	1	1	1	1	1	1	2	1	1	1	1
		Arrival Rate (veh/s/lane)	0.8	4.7	13.9	11.3	7.6	1.4	26.4	9.3	6.2	33.5	22.3
		Queue (vehicles)*	2	9	20	17	12	3	35	15	11	35	30
		Queue (m)	15	68	150	128	90	23	263	113	83	263	225
Storage (m)	65	-	35	-	-	160	-	195	195	-	-		
Available (m)	50	-	-115	-	-	137	-	82	112	-	-		

\*Ontario Ministry of Transportation, *Implementation of the Traffic Signal Operating & Timing Policy # 2010-02*, (Toronto: Queen's Printer for Ontario, 2017).



## 3 Development Concept

### 3.1 Development Description

The subject site is proposed to have the existing off-campus student housing development expanded with an additional 489 units.

Vehicle access is proposed via an all-moves driveway connection to Scottsdale Drive.

The southern driveway for 601 Scottsdale Drive is removed and the northern driveway (Site Driveway) is the only site access.

The full build-out is assumed to be completed by 2025.

A total of 191 parking spaces is proposed to be provided on-site for both Phase 1 and Phase 2 (0.29 spaces per unit).

The proposed parking supply does not meet City of Guelph zoning requirements as currently planned.

**Figure 3.1** illustrates the conceptual site plan enclosed.





NTS



601 Scottsdale Drive, Guelph T1S and PS  
220563

# Site Plan

Figure 3.1

### 3.2 Trip Generation

The Institute of Transportation Engineers (ITE) Trip Generation manual<sup>7</sup> methods forecast site-generated trips. Land Use Code (LUC) 226 (Off-Campus Student Apartment, Mid-Rise) was used to estimate the site trip generation. This indicates 41 AM peak hour and 123 PM peak hour net external trips.

The site location and proposed use will be a significant factor contributing to a reduction of automobile trips to/from the site as the site location will be attractive for the residents to use transit or active transportation modes. The site location is near multiple bus routes (as outlined in **Section 2.2**) and the University of Guelph subsidises bus passes for all students. This will make public transit an attractive alternative for trips made in addition to reasonable walking or cycling distances.

With the convenient access to alternative mode facilities and the residents being university students and as consulted with the City in the pre-study consultation, the trip generation for this development was reduced by 22% (15% transit and 7% cycling reduction). This resulted in 32 and 96 new trips during the AM and PM peak hours, respectively.

**Table 3.1** summarizes the trip generation for the site.

**TABLE 3.1: TRIP GENERATION**

Land Use	No. of Bedrooms	AM Peak Hour				PM Peak Hour			
		Rate	In	Out	Total	Rate	In	Out	Total
LUC 226 - Off-Campus Student Apartment (Mid-Rise)	587	Eq	19	22	41	Eq	58	65	123
		<i>Mode Share</i>	4	5	9	22%	13	14	27
<b>Net Trip Generation</b>			<b>15</b>	<b>17</b>	<b>32</b>		<b>45</b>	<b>51</b>	<b>96</b>

LUC 226 - AM: Average Rate = 0.07 | PM: Average Rate = 0.21

### 3.3 Trip Distribution and Assignment

The distribution is based on the Transportation Tomorrow Survey (TTS) 2016 results. The TTS uses zones (Zone 8097) covering the residential lands surrounding and including the subject development lands. **Table 3.2** summarizes the estimated trip distribution.

<sup>7</sup> Institute of Transportation Engineers, *Trip Generation Manual*, 11th ed., (Washington DC: ITE, 2021).



**TABLE 3.2: TRIP DISTRIBUTION**

Origin/Destination	In/Out
North via Highway 6	10%
North via Scottsdale Drive	45%
South via Highway 6	20%
East via Stone Road West	20%
West via Stone Road West	5%
<b>Total</b>	<b>100%</b>

**Figure 3.2** shows the trip assignment for the site expansion during the AM and PM peak hours.

### 3.4 Site Circulation Review

The site circulation has been assessed using the following design vehicles:

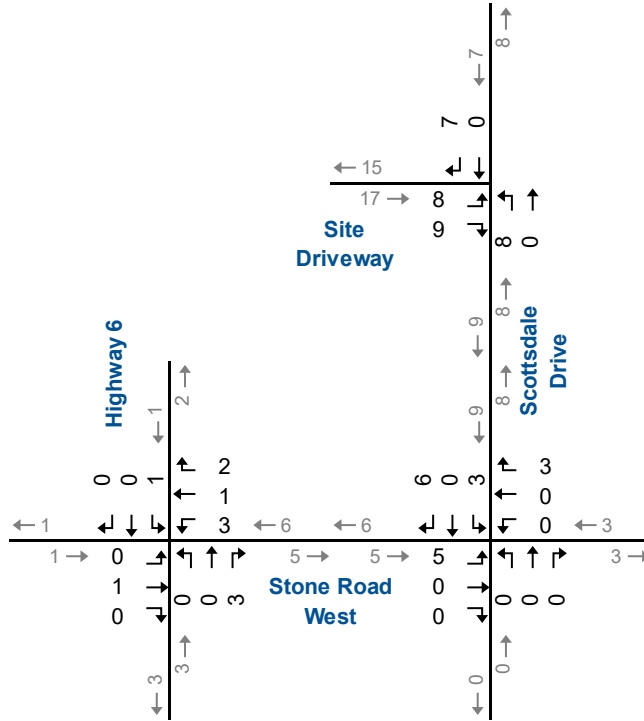
- ▶ Transportation Association of Canada<sup>8</sup> (TAC) Passenger Car (P);
- ▶ TAC Light Single Unit (LSU);
- ▶ TAC Medium Single Unit (MSU);
- ▶ TAC Heavy Single Unit (HSU); and
- ▶ Fire Truck.

**Appendix C** contains the vehicle maneuvering diagrams. There are no conflicts identified with the site's geometry.

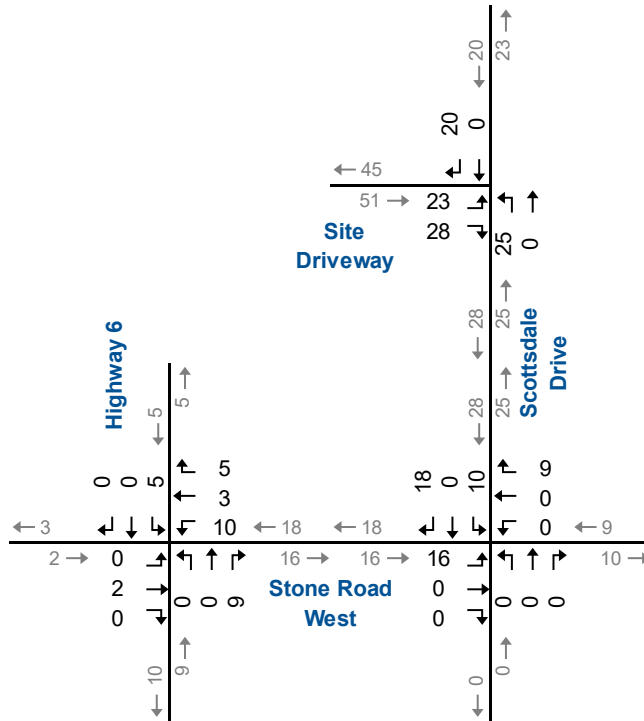
<sup>8</sup> Transportation Association of Canada, *Geometric Design Guide for Canadian Roads*, (Ottawa: TAC, 2017).



AM Peak Hour



PM Peak Hour



# Site Generated Traffic Volumes

## 4 Evaluation of Future Conditions

The assessment of future traffic conditions contained in this section includes estimates of future background and total traffic volumes, and the analyses for opening year (2025) and for five (2030) and ten (2035) years beyond the full build-out of the development.

### 4.1 Background Traffic Forecasts

The growth rate for generalized background growth on City of Guelph streets was assumed at 1.5% per annum, confirmed by City staff during the pre-study conference.

The growth rate for generalized background growth on Highway 6 was assumed at 1.0% per annum, confirmed by MTO staff during the pre-study conference.

Volume balancing (by addition) was also completed for all future conditions along Stone Road West between Highway 6 and Scottsdale Drive.

No other background developments were identified for inclusion in the background traffic volumes.

### 4.2 2025 Horizon

#### 4.2.1 Background Traffic Operations

The operations of the intersections in the study area were evaluated using the assumed lane configurations, traffic controls, the forecast 2025 background traffic peak volumes, and optimized signal timing splits.

**Figure 4.1** illustrates the 2025 background traffic volumes. **Table 4.1** summarizes the results of the 2025 background traffic operations.

**Table 4.2a** summarizes the northbound right-turn storage lengths at the intersection of Highway 6 and Stone Road West using the Geometric Design Guide for Canadian Roads.

**Table 4.2b** summarizes the through, left-turn, and shared movement queue lengths at the intersection of Highway 6 and Stone Road West using MTO's Traffic Signal Operating & Timing Policy.

All study area intersections are forecast to operate at acceptable levels of service during the AM and PM peak hours with the following critical movements noted:





- ▶ Highway 6 and Stone Road West:
  - The eastbound through/right-turn movement is forecast to have a queue length that blocks the eastbound left-turn lane during the AM and PM peak hours;
  - The westbound left-turn movement is forecast to have a v/c ratio surpassing 1.00 and a queue length that surpasses its storage length by 70 and 123 metres during the AM and PM peak hours;
  - The westbound through/right-turn movement is forecast to have a queue length that blocks the westbound left-turn lane during the AM and PM peak hours;
  - The northbound through movement is forecast to have a queue length that is forecast to block the northbound left-turn and right-turn lanes during the AM and PM peak hours;
  - The northbound right-turn movement is forecast to have a queue length that surpasses its storage length by 87 and 45 metres during the AM and PM peak hours;
  - The southbound left-turn movement is forecast to have a v/c ratio surpassing 0.85 and 1.00 during the AM and PM peak hours respectively; and
  - The southbound through/right-turn is forecast to have a queue length that blocks the southbound left-turn lane during the AM and PM peak hours.
  
- ▶ Stone Road West and Scottsdale Drive:
  - The westbound left-turn movement is forecast to have a queue length that surpasses its storage length by 3 metres during the PM peak hour; and
  - The southbound left-turn movement is forecast to have a queue length that surpasses its storage length by 1 metre during the AM peak hour.

**Appendix D** contains the supporting detailed Synchro 11 reports.



**TABLE 4.1: 2025 BACKGROUND 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	Highway 6 & Stone Road West	TCS	LOS	E	E	>	<b>E</b>	F	D	E	<b>F</b>	D	C	C	<b>C</b>	F	D	D	<b>D</b>	<b>D</b>
			Delay	63	69	>	<b>68</b>	152	49	55	<b>103</b>	52	23	21	<b>23</b>	84	38	38	<b>47</b>	<b>45</b>
			V/C	0.18	0.75	>		1.10	0.14	0.58		0.04	0.61	0.47		0.86	0.74	0.74		
Q	13	72	>		96	19	74		4	128	93		74	171	178					
Stor.	65	-	>		35	-	-		160	-	150		195	-	-					
Avail.	52	-	>		-61	-	-		156	-	57		121	-	-					
AM Peak Hour	Scottsdale Drive & Stone Road West	TCS	LOS	B	C	C	<b>B</b>	B	B	B	<b>B</b>	C	C	C	<b>C</b>	C	C	C	<b>C</b>	<b>C</b>
			Delay	12	21	21	<b>20</b>	14	16	16	<b>16</b>	24	30	32	<b>30</b>	25	28	28	<b>27</b>	<b>22</b>
			V/C	0.14	0.52	0.52		0.34	0.27	0.28		0.20	0.43	0.51		0.34	0.19	0.21		
Q	8	67	68		14	30	31		16	39	40		21	16	16					
Stor.	28	-	-		25	-	-		30	-	-		20	-	-					
Avail.	20	-	-		11	-	-		14	-	-		-1	-	-					
AM Peak Hour	Site Driveway & Scottsdale Drive	TWSC	LOS	A		>	<b>A</b>					A	A		<b>A</b>		A	A	<b>A</b>	
			Delay	10		>	<b>10</b>					8	0		<b>0</b>		0	0	<b>0</b>	
			V/C	0.01		>					0.00	0.00					0.00	0.00		
Q	0		>					0	0					0	0					
PM Peak Hour	Highway 6 & Stone Road West	TCS	LOS	E	D	>	<b>D</b>	F	D	E	<b>F</b>	E	D	C	<b>D</b>	F	D	D	<b>E</b>	<b>E</b>
			Delay	67	51	>	<b>54</b>	136	42	58	<b>88</b>	65	41	30	<b>39</b>	122	44	44	<b>61</b>	<b>58</b>
			V/C	0.19	0.34	>		1.10	0.29	0.81		0.25	0.84	0.46		1.04	0.84	0.84		
Q	10	51	>		168	53	138		17	206	94		117	220	230					
Stor.	65	-	>		35	-	-		160	-	150		195	-	-					
Avail.	55	-	>		-133	-	-		143	-	56		78	-	-					
PM Peak Hour	Scottsdale Drive & Stone Road West	TCS	LOS	B	C	C	<b>C</b>	B	C	C	<b>B</b>	C	C	D	<b>C</b>	C	C	C	<b>C</b>	<b>C</b>
			Delay	15	24	24	<b>23</b>	15	20	20	<b>19</b>	24	30	37	<b>32</b>	26	29	29	<b>28</b>	<b>24</b>
			V/C	0.25	0.53	0.53		0.57	0.49	0.49		0.27	0.38	0.73		0.40	0.30	0.32		
Q	12	68	67		28	63	64		20	34	67		20	28	27					
Stor.	28	-	-		25	-	-		30	-	-		20	-	-					
Avail.	16	-	-		-3	-	-		10	-	-		0	-	-					
PM Peak Hour	Site Driveway & Scottsdale Drive	TWSC	LOS	B		>	<b>B</b>					A	A		<b>A</b>		A	A	<b>A</b>	
			Delay	11		>	<b>11</b>					8	0		<b>0</b>		0	0	<b>0</b>	
			V/C	0.02		>					0.01	0.00					0.00	0.00		
Q	1		>					0	0					0	0					

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

Stor. - Existing Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

</> - Shared with through movement



**TABLE 4.2A: 2025 BACKGROUND RIGHT-TURN STORAGE LENGTHS**

Intersection	Parameter	Direction/Movement	
		AM Peak Hour	PM Peak Hour
		NBR	NBR
Highway 6 and Stone Road West	Volume (vph)	381	314
	Cycle Length (s)	148.7	148.7
	Design Speed (km/h)	100	100
	Queue (m)	237	195
	Storage (m)	150	150
	Available (m)	-87	-45

Transportation Association of Canada, *Geometric Design Guide for Canadian Roads: Section 9.14.4*, (Ottawa: TAC, 2017).

**TABLE 4.2B: 2025 BACKGROUND THROUGH, RIGHT-TURN, AND SHARED QUEUE LENGTHS**

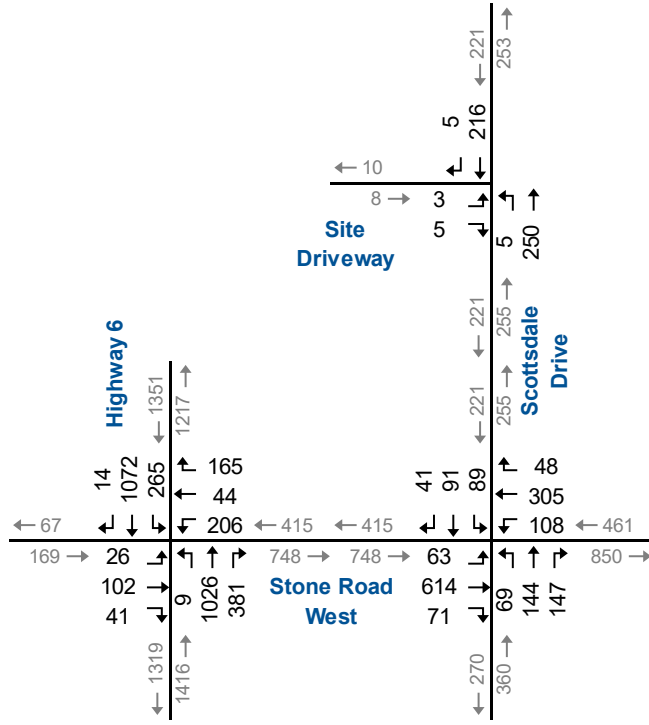
Analysis Period	Intersection	Parameter	Direction/Movement										
			EBL	EBTR	WBL	WBTR1	WBTR2	NBL	NBT	SBL1	SBL2	SBTR1	SBTR2
AM Peak Hour	Highway 6 and Stone Road West	Volume (vph)	26	143	206	125	84	9	1026	159	106	652	434
		Heavy Vehicle %	4%	2%	5%	4%	4%	11%	12%	3%	3%	10%	10%
		Cycle Length (s)	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7
		Passenger Cars Per Hour	28	146	217	130	88	10	1150	164	110	718	478
		Number of Lanes	1	1	1	1	1	1	2	1	1	1	1
		Arrival Rate (veh/s/lane)	1.2	6.0	9.0	5.4	3.6	0.4	23.8	6.8	4.5	29.7	19.7
		Queue (vehicles)*	3	10	14	9	7	2	32	11	8	35	27
		Queue (m)	23	75	105	68	53	15	240	83	60	263	203
		Storage (m)	65	-	35	-	-	160	-	195	195	-	-
Available (m)	42	-	-70	-	-	145	-	112	135	-	-		
PM Peak Hour	Highway 6 and Stone Road West	Volume (vph)	19	114	343	280	186	34	1241	228	152	793	529
		Heavy Vehicle %	0%	2%	1%	1%	1%	0%	5%	1%	1%	4%	4%
		Cycle Length (s)	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7
		Passenger Cars Per Hour	19	117	347	283	188	34	1304	231	154	825	551
		Number of Lanes	1	1	1	1	1	1	2	1	1	1	1
		Arrival Rate (veh/s/lane)	0.8	4.8	14.3	11.7	7.8	1.4	26.9	9.5	6.4	34.1	22.8
		Queue (vehicles)*	2	9	21	18	13	3	35	15	11	35	31
		Queue (m)	15	68	158	135	98	23	263	113	83	263	233
		Storage (m)	65	-	35	-	-	160	-	195	195	-	-
Available (m)	50	-	-123	-	-	137	-	82	112	-	-		

\*Ontario Ministry of Transportation, *Implementation of the Traffic Signal Operating & Timing Policy # 2010-02*, (Toronto: Queen's Printer for Ontario, 2017).

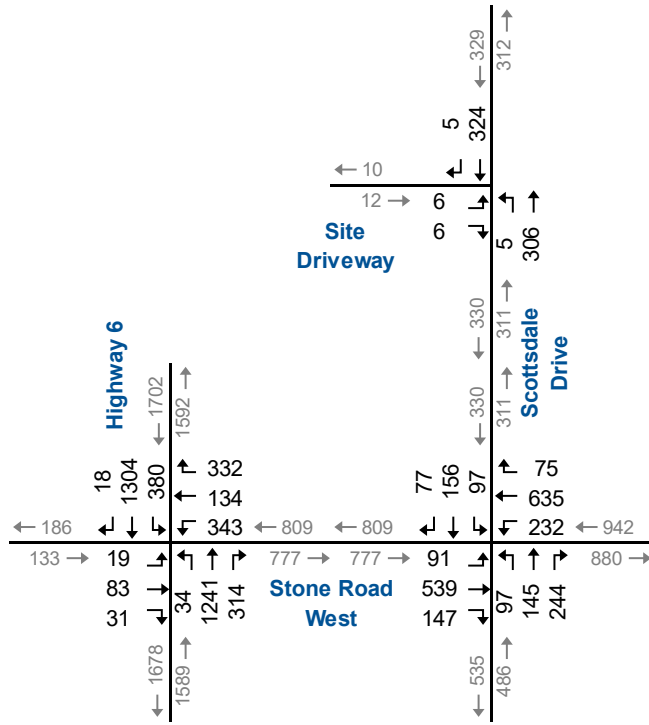




**AM Peak Hour**



**PM Peak Hour**



# 2025 Background Traffic Volumes

## 4.2.2 Total Traffic Operations

**Figure 4.2** illustrates the 2025 total traffic volumes, including trips generated by the subject development.

The 2025 total traffic volumes have been analyzed using the same methodology as under 2025 background traffic conditions. Although, the signal timing splits were optimized. **Table 4.3** summarizes the results of the 2025 total traffic operations.

**Table 4.4a** summarizes the northbound right-turn storage lengths at the intersection of Highway 6 and Stone Road West using the Geometric Design Guide for Canadian Roads.

**Table 4.4b** summarizes the through, left-turn, and shared movement queue lengths at the intersection of Highway 6 and Stone Road West using MTO's Traffic Signal Operating & Timing Policy.

All study area intersections are forecast to operate at acceptable levels of service during the AM and PM peak hours with the following critical movements noted:

- ▶ Highway 6 and Stone Road West:
  - The eastbound through/right-turn movement is forecast to have a queue length that blocks the eastbound left-turn lane during the AM and PM peak hours;
  - The westbound left-turn movement is forecast to have a v/c ratio surpassing 1.00 and a queue length that surpasses its storage length by 70 and 123 metres during the AM and PM peak hours;
  - The westbound through/right-turn movement is forecast to have a queue length that blocks the westbound left-turn lane during the AM and PM peak hours;
  - The northbound through movement is forecast to have a v/c ratio surpassing 0.85 during the PM peak hour and a queue length that is forecast to block the northbound left-turn and right-turn lanes during the AM and PM peak hours;
  - The northbound right-turn movement is forecast to have a queue length that surpasses its storage length by 88 and 51 metres during the AM and PM peak hours;
  - The southbound left-turn movement is forecast to have a v/c ratio surpassing 0.85 during the AM and PM peak hours; and



- The southbound through/right-turn is forecast to have a queue length that blocks the southbound left-turn lane during the AM and PM peak hours.
- ▶ Stone Road West and Scottsdale Drive:
  - The westbound left-turn movement is forecast to have a queue length that surpasses its storage length by 4 metres during the PM peak hour; and
  - The southbound left-turn movement is forecast to have a queue length that surpasses its storage length by 1 and 2 metres during the AM and PM peak hours, respectively.

**Appendix E** contains the supporting detailed Synchro 11 reports.



**TABLE 4.3: 2025 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	Highway 6 & Stone Road West	TCS	LOS	E	E	>	<b>E</b>	F	D	E	<b>F</b>	D	C	C	<b>C</b>	F	D	D	<b>D</b>	<b>D</b>
			Delay	63	69	>	<b>68</b>	157	49	55	<b>105</b>	52	24	22	<b>23</b>	84	38	38	<b>47</b>	<b>45</b>
			V/C	0.18	0.75	>		1.11	0.14	0.59		0.04	0.61	0.47		0.86	0.74	0.74		
Q	13	73	>		99	20	74		4	128	94		74	171	178					
Stor.	65	-	>		35	-	-		160	-	150		195	-	-					
Avail.	52	-	>		-64	-	-		156	-	56		121	-	-					
AM Peak Hour	Scottsdale Drive & Stone Road West	TCS	LOS	B	C	C	<b>B</b>	B	B	B	<b>B</b>	C	C	C	<b>C</b>	C	C	C	<b>C</b>	<b>C</b>
			Delay	12	21	21	<b>20</b>	14	17	17	<b>16</b>	24	30	32	<b>30</b>	25	28	28	<b>27</b>	<b>22</b>
			V/C	0.16	0.52	0.52		0.34	0.28	0.28		0.20	0.43	0.51		0.35	0.20	0.22		
Q	9	67	68		14	31	32		16	39	40		21	17	17					
Stor.	28	-	-		25	-	-		30	-	-		20	-	-					
Avail.	19	-	-		11	-	-		14	-	-		-1	-	-					
AM Peak Hour	Site Driveway & Scottsdale Drive	TWSC	LOS	B		>	<b>B</b>					A	A		<b>A</b>		A	A	<b>A</b>	
			Delay	10		>	<b>10</b>					8	0		<b>0</b>		0	0	<b>0</b>	
			V/C	0.04		>						0.01	0.00				0.00	0.00		
Q	1		>						0	0				0	0					
PM Peak Hour	Highway 6 & Stone Road West	TCS	LOS	E	D	>	<b>D</b>	F	D	E	<b>F</b>	E	D	C	<b>D</b>	F	D	D	<b>E</b>	<b>E</b>
			Delay	67	51	>	<b>53</b>	146	42	58	<b>93</b>	66	42	31	<b>41</b>	108	44	44	<b>58</b>	<b>58</b>
			V/C	0.19	0.34	>		1.13	0.29	0.82		0.26	0.86	0.49		0.99	0.84	0.84		
Q	10	52	>		179	54	140		17	212	98		113	220	230					
Stor.	65	-	>		35	-	-		160	-	150		195	-	-					
Avail.	55	-	>		-144	-	-		143	-	52		82	-	-					
PM Peak Hour	Scottsdale Drive & Stone Road West	TCS	LOS	B	C	C	<b>C</b>	B	C	C	<b>B</b>	C	C	D	<b>C</b>	C	C	C	<b>C</b>	<b>C</b>
			Delay	15	24	24	<b>23</b>	16	21	21	<b>20</b>	24	30	37	<b>32</b>	26	29	29	<b>28</b>	<b>24</b>
			V/C	0.30	0.54	0.54		0.57	0.51	0.51		0.27	0.38	0.73		0.44	0.32	0.34		
Q	15	69	68		29	65	65		20	34	67		22	30	29					
Stor.	28	-	-		25	-	-		30	-	-		20	-	-					
Avail.	13	-	-		-4	-	-		10	-	-		-2	-	-					
PM Peak Hour	Site Driveway & Scottsdale Drive	TWSC	LOS	B		>	<b>B</b>					A	A		<b>A</b>		A	A	<b>A</b>	
			Delay	12		>	<b>12</b>					8	0		<b>1</b>		0	0	<b>0</b>	
			V/C	0.12		>						0.03	0.00				0.00	0.00		
Q	3		>						1	0				0	0					

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

Stor. - Existing Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

</> - Shared with through movement



**TABLE 4.4A: 2025 TOTAL RIGHT-TURN STORAGE LENGTHS**

Intersection	Parameter	Direction/Movement	
		AM Peak Hour	PM Peak Hour
		NBR	NBR
Highway 6 and Stone Road West	Volume (vph)	384	323
	Cycle Length (s)	148.7	148.7
	Design Speed (km/h)	100	100
	Queue (m)	238	201
	Storage (m)	150	150
	Available (m)	-88	-51

Transportation Association of Canada, *Geometric Design Guide for Canadian Roads: Section 9.14.4*, (Ottawa: TAC, 2017).

**TABLE 4.4B: 2025 TOTAL THROUGH, RIGHT-TURN, AND SHARED QUEUE LENGTHS**

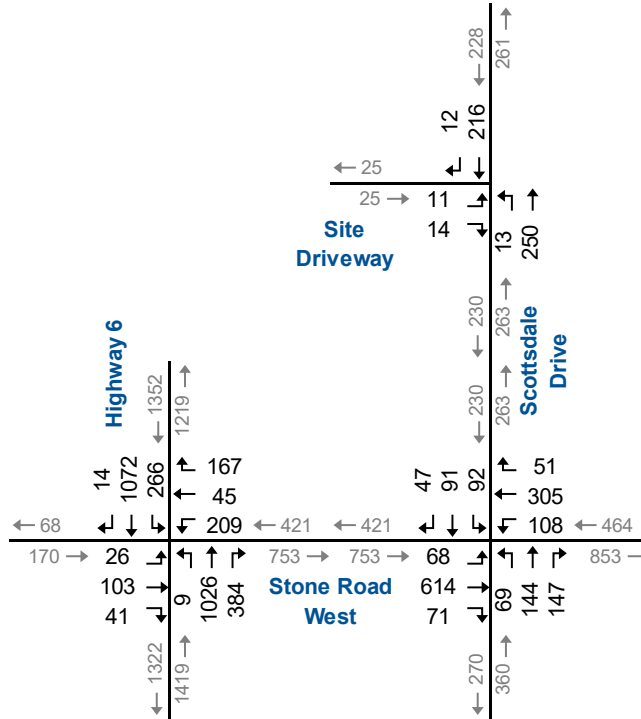
Analysis Period	Intersection	Parameter	Direction/Movement										
			EBL	EBTR	WBL	WBTR1	WBTR2	NBL	NBT	SBL1	SBL2	SBTR1	SBTR2
AM Peak Hour	Highway 6 and Stone Road West	Volume (vph)	26	144	209	127	85	9	1026	160	106	652	434
		Heavy Vehicle %	4%	2%	5%	4%	4%	11%	12%	3%	3%	10%	10%
		Cycle Length (s)	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7
		Passenger Cars Per Hour	28	147	220	133	89	10	1150	165	110	718	478
		Number of Lanes	1	1	1	1	1	1	2	1	1	1	1
		Arrival Rate (veh/s/lane)	1.2	6.1	9.1	5.5	3.7	0.4	23.8	6.8	4.5	29.7	19.7
		Queue (vehicles)*	3	10	14	10	7	2	32	11	8	35	27
		Queue (m)	23	75	105	75	53	15	240	83	60	263	203
PM Peak Hour	Highway 6 and Stone Road West	Volume (vph)	19	116	353	284	190	34	1241	231	154	793	529
		Heavy Vehicle %	0%	2%	1%	1%	1%	0%	5%	1%	1%	4%	4%
		Cycle Length (s)	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7
		Passenger Cars Per Hour	19	119	357	287	192	34	1304	234	156	825	551
		Number of Lanes	1	1	1	1	1	1	2	1	1	1	1
		Arrival Rate (veh/s/lane)	0.8	4.9	14.7	11.9	7.9	1.4	26.9	9.7	6.4	34.1	22.8
		Queue (vehicles)*	2	9	21	18	13	3	35	15	11	35	31
		Queue (m)	15	68	158	135	98	23	263	113	83	263	233
Storage (m)	65	-	35	-	-	160	-	195	195	-	-		
Available (m)	50	-	-123	-	-	137	-	82	112	-	-		

\*Ontario Ministry of Transportation, *Implementation of the Traffic Signal Operating & Timing Policy # 2010-02*, (Toronto: Queen's Printer for Ontario, 2017).

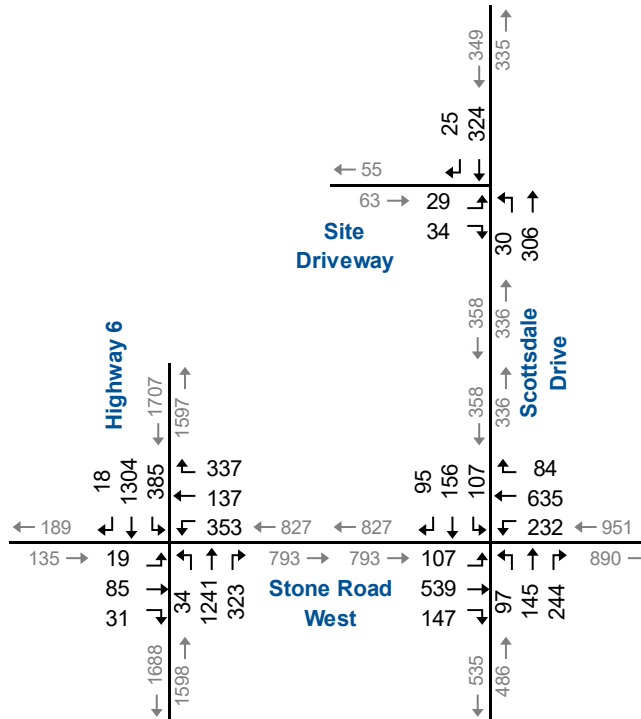




AM Peak Hour



PM Peak Hour



# 2025 Total Traffic Volumes

## 4.3 2030 Horizon

### 4.3.1 Background Traffic Operations

The operations of the intersections in the study area were evaluated using the assumed lane configurations, traffic controls, the forecast 2030 background traffic peak volumes, and optimized signal timing splits.

**Figure 4.3** illustrates the 2030 background traffic volumes. **Table 4.5** summarizes the results of the 2030 background traffic operations.

**Table 4.6a** summarizes the northbound right-turn storage lengths at the intersection of Highway 6 and Stone Road West using the Geometric Design Guide for Canadian Roads.

**Table 4.6b** summarizes the through, left-turn, and shared movement queue lengths at the intersection of Highway 6 and Stone Road West using MTO's Traffic Signal Operating & Timing Policy.

All study area intersections are forecast to operate at acceptable levels of service during the AM and PM peak hours with the following critical movements noted:

- ▶ Highway 6 and Stone Road West:
  - The eastbound through/right-turn movement is forecast to have a queue length that blocks the eastbound left-turn lane during the AM and PM peak hours;
  - The westbound left-turn movement is forecast to have a v/c ratio surpassing 1.00 and a queue length that surpasses its storage length by 78 and 130 metres during the AM and PM peak hours;
  - The westbound through/right-turn movement is forecast to have a queue length that blocks the westbound left-turn lane during the AM and PM peak hours;
  - The northbound through movement is forecast to have a v/c ratio surpassing 0.85 during the PM peak hour and a queue length that is forecast to block the northbound left-turn and right-turn lanes during the AM and PM peak hours;
  - The northbound right-turn movement is forecast to have a queue length that surpasses its storage length by 104 and 59 metres during the AM and PM peak hours;



- The southbound left-turn movement is forecast to have a v/c ratio equal to 0.85 and 1.00 during the AM and PM peak hours; and
  - The southbound through/right-turn is forecast to have a v/c ratio surpassing 0.85 during the PM peak hour and a queue length that blocks the southbound left-turn lane during the AM and PM peak hours.
- ▶ Stone Road West and Scottsdale Drive:
- The westbound left-turn movement is forecast to have a queue length that surpasses its storage length by 9 metres during the PM peak hour; and
  - The southbound left-turn movement is forecast to have a queue length that surpasses its storage length by 2 metres during both the AM and PM peak hours.

**Appendix F** contains the supporting detailed Synchro 11 reports.



**TABLE 4.5: 2030 BACKGROUND 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	Highway 6 & Stone Road West	TCS	LOS	E	E	>	<b>E</b>	F	D	E	<b>F</b>	D	C	C	<b>C</b>	F	D	D	<b>D</b>	<b>D</b>
			Delay	66	69	>	<b>68</b>	242	50	57	<b>148</b>	53	24	22	<b>23</b>	92	38	38	<b>48</b>	<b>51</b>
			V/C	0.21	0.76	>		1.33	0.16	0.64		0.04	0.64	0.50		0.90	0.75	0.75		
Q	14	76	>		141	22	79		4	136	100		82	178	185					
Stor.	65	-	>		35	-	-		160	-	150		195	-	-					
Avail.	51	-	>		-106	-	-		156	-	50		113	-	-					
AM Peak Hour	Scottsdale Drive & Stone Road West	TCS	LOS	B	C	C	<b>C</b>	B	B	B	<b>B</b>	C	C	C	<b>C</b>	C	C	C	<b>C</b>	<b>C</b>
			Delay	12	22	22	<b>21</b>	15	17	17	<b>17</b>	24	30	32	<b>30</b>	25	28	28	<b>27</b>	<b>22</b>
			V/C	0.16	0.57	0.57		0.39	0.30	0.30		0.21	0.45	0.55		0.37	0.20	0.22		
Q	9	74	74		16	34	34		16	42	44		22	17	18					
Stor.	28	-	-		25	-	-		30	-	-		20	-	-					
Avail.	19	-	-		9	-	-		14	-	-		-2	-	-					
AM Peak Hour	Site Driveway & Scottsdale Drive	TWSC	LOS	A		>	<b>A</b>					A	A		<b>A</b>		A	A	<b>A</b>	
			Delay	10		>	<b>10</b>					8	0		<b>0</b>		0	0	<b>0</b>	
			V/C	0.01		>					0.00	0.00					0.00	0.00		
Q	0		>					0	0					0	0					
PM Peak Hour	Highway 6 & Stone Road West	TCS	LOS	E	D	>	<b>D</b>	F	D	E	<b>F</b>	E	D	C	<b>D</b>	F	D	D	<b>E</b>	<b>E</b>
			Delay	68	50	>	<b>53</b>	155	41	60	<b>97</b>	68	49	32	<b>46</b>	124	48	48	<b>66</b>	<b>64</b>
			V/C	0.21	0.35	>		1.16	0.31	0.84		0.30	0.92	0.52		1.05	0.88	0.89		
Q	10	55	>		193	58	149		18	237	105		125	242	252					
Stor.	65	-	>		35	-	-		160	-	150		195	-	-					
Avail.	55	-	>		-158	-	-		142	-	45		70	-	-					
PM Peak Hour	Scottsdale Drive & Stone Road West	TCS	LOS	B	C	C	<b>C</b>	B	C	C	<b>C</b>	C	C	D	<b>C</b>	C	C	C	<b>C</b>	<b>C</b>
			Delay	16	26	27	<b>25</b>	18	22	22	<b>21</b>	24	29	39	<b>33</b>	26	28	28	<b>28</b>	<b>26</b>
			V/C	0.29	0.60	0.60		0.65	0.55	0.55		0.28	0.39	0.76		0.44	0.31	0.33		
Q	14	77	76		34	70	70		21	38	73		22	29	29					
Stor.	28	-	-		25	-	-		30	-	-		20	-	-					
Avail.	14	-	-		-9	-	-		9	-	-		-2	-	-					
PM Peak Hour	Site Driveway & Scottsdale Drive	TWSC	LOS	B		>	<b>B</b>					A	A		<b>A</b>		A	A	<b>A</b>	
			Delay	11		>	<b>11</b>					8	0		<b>0</b>		0	0	<b>0</b>	
			V/C	0.02		>					0.01	0.00					0.00	0.00		
Q	1		>					0	0					0	0					

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

Stor. - Existing Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

</> - Shared with through movement



**TABLE 4.6A: 2030 BACKGROUND RIGHT-TURN STORAGE LENGTHS**

Intersection	Parameter	Direction/Movement	
		AM Peak Hour	PM Peak Hour
		NBR	NBR
Highway 6 and Stone Road West	Volume (vph)	409	337
	Cycle Length (s)	148.7	148.7
	Design Speed (km/h)	100	100
	Queue (m)	254	209
	Storage (m)	150	150
	Available (m)	-104	-59

Transportation Association of Canada, *Geometric Design Guide for Canadian Roads: Section 9.14.4*, (Ottawa: TAC, 2017).

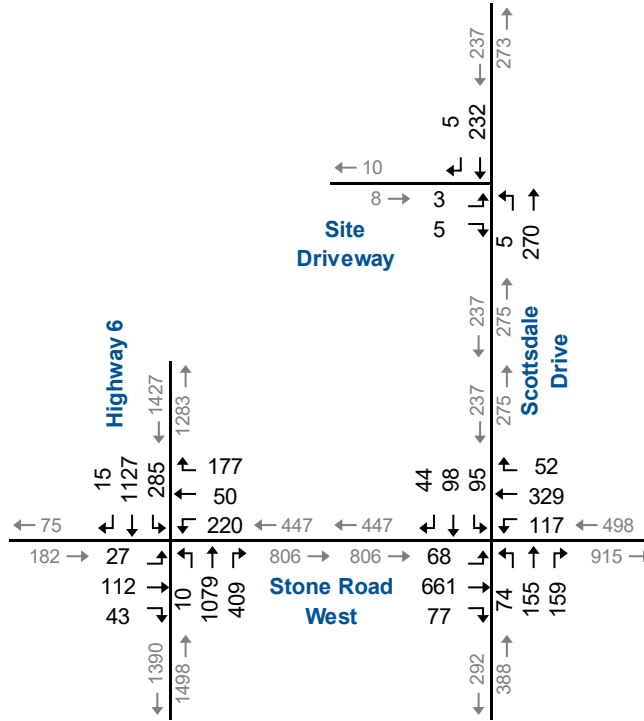
**TABLE 4.6B: 2030 BACKGROUND THROUGH, RIGHT-TURN, AND SHARED QUEUE LENGTHS**

Analysis Period	Intersection	Parameter	Direction/Movement										
			EBL	EBTR	WBL	WBTR1	WBTR2	NBL	NBT	SBL1	SBL2	SBTR1	SBTR2
AM Peak Hour	Highway 6 and Stone Road West	Volume (vph)	27	155	220	136	91	10	1079	171	114	685	457
		Heavy Vehicle %	4%	2%	5%	4%	4%	11%	12%	3%	3%	10%	10%
		Cycle Length (s)	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7
		Passenger Cars Per Hour	29	159	231	142	95	12	1209	177	118	754	503
		Number of Lanes	1	1	1	1	1	1	2	1	1	1	1
		Arrival Rate (veh/s/lane)	1.2	6.6	9.5	5.9	3.9	0.5	25.0	7.3	4.9	31.1	20.8
		Queue (vehicles)*	3	11	15	10	7	2	33	12	9	35	28
		Queue (m)	23	83	113	75	53	15	248	90	68	263	210
		Storage (m)	65	-	35	-	-	160	-	195	195	-	-
Available (m)	42	-	-78	-	-	145	-	105	127	-	-		
PM Peak Hour	Highway 6 and Stone Road West	Volume (vph)	20	124	368	302	201	35	1305	245	163	833	556
		Heavy Vehicle %	0%	2%	1%	1%	1%	0%	5%	1%	1%	4%	4%
		Cycle Length (s)	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7
		Passenger Cars Per Hour	20	127	372	306	204	35	1371	248	165	867	579
		Number of Lanes	1	1	1	1	1	1	2	1	1	1	1
		Arrival Rate (veh/s/lane)	0.8	5.2	15.4	12.6	8.4	1.4	28.3	10.2	6.8	35.8	23.9
		Queue (vehicles)*	2	9	22	19	13	3	35	16	11	35	32
		Queue (m)	15	68	165	143	98	23	263	120	83	263	240
		Storage (m)	65	-	35	-	-	160	-	195	195	-	-
Available (m)	50	-	-130	-	-	137	-	75	112	-	-		

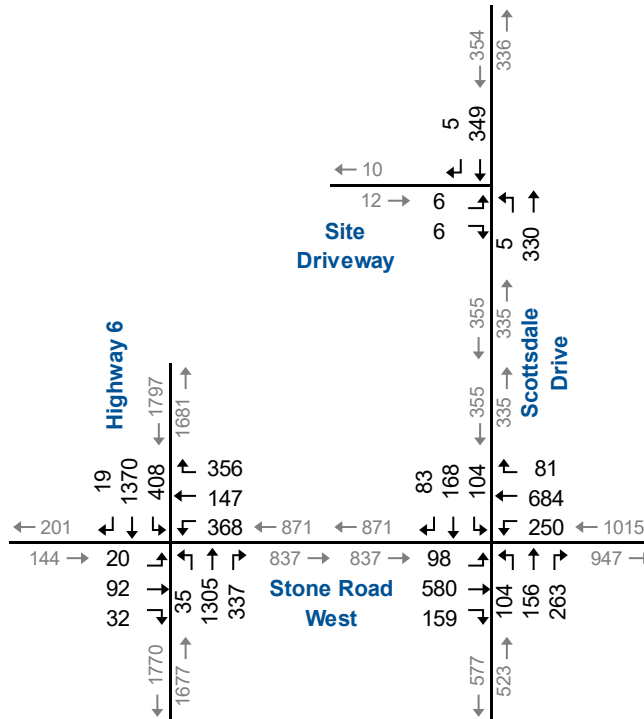
\*Ontario Ministry of Transportation, *Implementation of the Traffic Signal Operating & Timing Policy # 2010-02*, (Toronto: Queen's Printer for Ontario, 2017).



AM Peak Hour



PM Peak Hour



# 2030 Background Traffic Volumes

### 4.3.2 Total Traffic Operations

**Figure 4.4** illustrates the 2030 total traffic volumes, including trips generated by the subject development.

The 2030 total traffic volumes have been analyzed using the same methodology as under 2030 background traffic conditions. Although, the signal timing splits were optimized. **Table 4.7** summarizes the results of the 2030 total traffic operations.

**Table 4.8a** summarizes the northbound right-turn storage lengths at the intersection of Highway 6 and Stone Road West using the Geometric Design Guide for Canadian Roads.

**Table 4.8b** summarizes the through, left-turn, and shared movement queue lengths at the intersection of Highway 6 and Stone Road West using MTO's Traffic Signal Operating & Timing Policy.

All study area intersections are forecast to operate at acceptable levels of service during the AM and PM peak hours with the following critical movements noted:

- ▶ Highway 6 and Stone Road West:
  - The eastbound through/right-turn movement is forecast to have a queue length that blocks the eastbound left-turn lane during the AM and PM peak hours;
  - The westbound left-turn movement is forecast to have a v/c ratio surpassing 1.00 and a queue length that surpasses its storage length by 78 and 138 metres during the AM and PM peak hours;
  - The westbound through/right-turn movement is forecast to have a queue length that blocks the westbound left-turn lane during the AM and PM peak hours;
  - The northbound through movement is forecast to have a v/c ratio surpassing 0.85 during the PM peak hour and a queue length that is forecast to block the northbound left-turn and right-turn lanes during the AM and PM peak hours;
  - The northbound right-turn movement is forecast to have a queue length that surpasses its storage length by 106 and 65 metres during the AM and PM peak hours;
  - The southbound left-turn movement is forecast to have a v/c ratio equal to 0.85 and 1.00 during the AM and PM peak hours; and



- The southbound through/right-turn is forecast to have a v/c ratio surpassing 0.85 during the PM peak hour and a queue length that blocks the southbound left-turn lane during the AM and PM peak hours.
- ▶ Stone Road West and Scottsdale Drive:
  - The westbound left-turn movement is forecast to have a queue length that surpasses its storage length by 9 metres during the PM peak hour; and
  - The southbound left-turn movement is forecast to have a queue length that surpasses its storage length by 2 and 4 metres during the AM and PM peak hours, respectively.

**Appendix G** contains the supporting detailed Synchro 11 reports.





**TABLE 4.7: 2030 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	Highway 6 & Stone Road West	TCS	LOS	E	E	>	<b>E</b>	F	D	E	<b>F</b>	D	C	C	<b>C</b>	F	D	D	<b>D</b>	<b>D</b>
			Delay	66	69	>	<b>68</b>	249	50	58	<b>151</b>	53	24	22	<b>24</b>	86	38	38	<b>47</b>	<b>52</b>
			V/C	0.21	0.76	>		1.35	0.16	0.65		0.04	0.64	0.51		0.87	0.75	0.75		
AM Peak Hour	Scottsdale Drive & Stone Road West	TCS	LOS	B	C	C	<b>C</b>	B	B	B	<b>B</b>	C	C	C	<b>C</b>	C	C	C	<b>C</b>	<b>C</b>
			Delay	13	22	22	<b>21</b>	15	17	17	<b>17</b>	24	30	32	<b>30</b>	25	28	28	<b>27</b>	<b>22</b>
			V/C	0.18	0.57	0.57		0.39	0.30	0.31		0.21	0.45	0.55		0.38	0.21	0.23		
AM Peak Hour	Site Driveway & Scottsdale Drive	TWSC	LOS	B		>	<b>B</b>					A	A		<b>A</b>		A	A	<b>A</b>	
			Delay	10		>	<b>10</b>					8	0		<b>0</b>		0	0	<b>0</b>	
			V/C	0.04		>						0.01	0.00				0.00	0.00		
PM Peak Hour	Highway 6 & Stone Road West	TCS	LOS	E	D	>	<b>D</b>	F	D	E	<b>F</b>	E	D	C	<b>D</b>	F	D	D	<b>E</b>	<b>E</b>
			Delay	68	50	>	<b>53</b>	166	41	60	<b>102</b>	68	50	33	<b>47</b>	128	48	48	<b>67</b>	<b>66</b>
			V/C	0.22	0.35	>		1.19	0.31	0.84		0.31	0.92	0.54		1.07	0.88	0.89		
PM Peak Hour	Scottsdale Drive & Stone Road West	TCS	LOS	B	C	C	<b>C</b>	B	C	C	<b>C</b>	C	C	D	<b>C</b>	C	C	C	<b>C</b>	<b>C</b>
			Delay	17	27	27	<b>25</b>	18	22	22	<b>21</b>	24	29	39	<b>33</b>	26	28	29	<b>28</b>	<b>26</b>
			V/C	0.34	0.60	0.60		0.65	0.56	0.56		0.29	0.39	0.76		0.48	0.33	0.36		
PM Peak Hour	Site Driveway & Scottsdale Drive	TWSC	LOS	B		>	<b>B</b>					A	A		<b>A</b>		A	A	<b>A</b>	
			Delay	13		>	<b>13</b>					8	0		<b>1</b>		0	0	<b>0</b>	
			V/C	0.13		>						0.03	0.00				0.00	0.00		
PM Peak Hour	Site Driveway & Scottsdale Drive	TWSC	LOS	B		>	<b>B</b>					A	A		<b>A</b>		A	A	<b>A</b>	
			Delay	13		>	<b>13</b>					8	0		<b>1</b>		0	0	<b>0</b>	
			V/C	0.13		>						0.03	0.00				0.00	0.00		

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

Stor. - Existing Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

</> - Shared with through movement



**TABLE 4.8A: 2030 TOTAL RIGHT-TURN STORAGE LENGTHS**

Intersection	Parameter	Direction/Movement	
		AM Peak Hour	PM Peak Hour
		NBR	NBR
Highway 6 and Stone Road West	Volume (vph)	412	346
	Cycle Length (s)	148.7	148.7
	Design Speed (km/h)	100	100
	Queue (m)	256	215
	Storage (m)	150	150
	Available (m)	-106	-65

Transportation Association of Canada, *Geometric Design Guide for Canadian Roads: Section 9.14.4*, (Ottawa: TAC, 2017).

**TABLE 4.8B: 2030 TOTAL THROUGH, RIGHT-TURN, AND SHARED QUEUE LENGTHS**

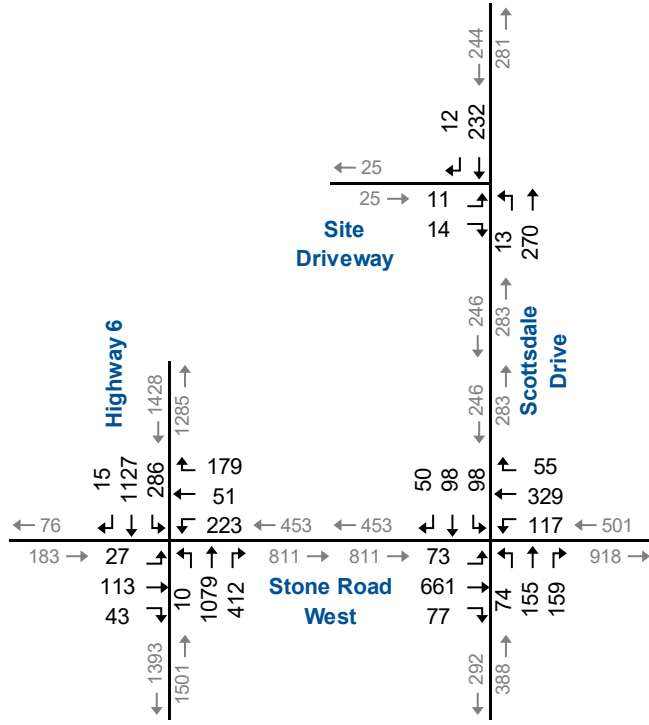
Analysis Period	Intersection	Parameter	Direction/Movement										
			EBL	EBTR	WBL	WBTR1	WBTR2	NBL	NBT	SBL1	SBL2	SBTR1	SBTR2
AM Peak Hour	Highway 6 and Stone Road West	Volume (vph)	27	156	223	138	92	10	1079	172	114	685	457
		Heavy Vehicle %	4%	2%	5%	4%	4%	11%	12%	3%	3%	10%	10%
		Cycle Length (s)	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7
		Passenger Cars Per Hour	29	160	235	144	96	12	1209	178	118	754	503
		Number of Lanes	1	1	1	1	1	1	2	1	1	1	1
		Arrival Rate (veh/s/lane)	1.2	6.6	9.7	5.9	4.0	0.5	25.0	7.4	4.9	31.1	20.8
		Queue (vehicles)*	3	11	15	10	7	2	33	12	9	35	28
		Queue (m)	23	83	113	75	53	15	248	90	68	263	210
PM Peak Hour	Highway 6 and Stone Road West	Volume (vph)	20	126	378	307	204	35	1305	248	165	833	556
		Heavy Vehicle %	0%	2%	1%	1%	1%	0%	5%	1%	1%	4%	4%
		Cycle Length (s)	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7
		Passenger Cars Per Hour	20	129	382	311	207	35	1371	251	167	867	579
		Number of Lanes	1	1	1	1	1	1	2	1	1	1	1
		Arrival Rate (veh/s/lane)	0.8	5.3	15.8	12.8	8.6	1.4	28.3	10.4	6.9	35.8	23.9
		Queue (vehicles)*	2	9	23	19	14	3	35	16	11	35	32
		Queue (m)	15	68	173	143	105	23	263	120	83	263	240
Storage (m)	65	-	35	-	-	160	-	195	195	-	-		
Available (m)	50	-	-138	-	-	137	-	75	112	-	-		

\*Ontario Ministry of Transportation, *Implementation of the Traffic Signal Operating & Timing Policy # 2010-02*, (Toronto: Queen's Printer for Ontario, 2017).

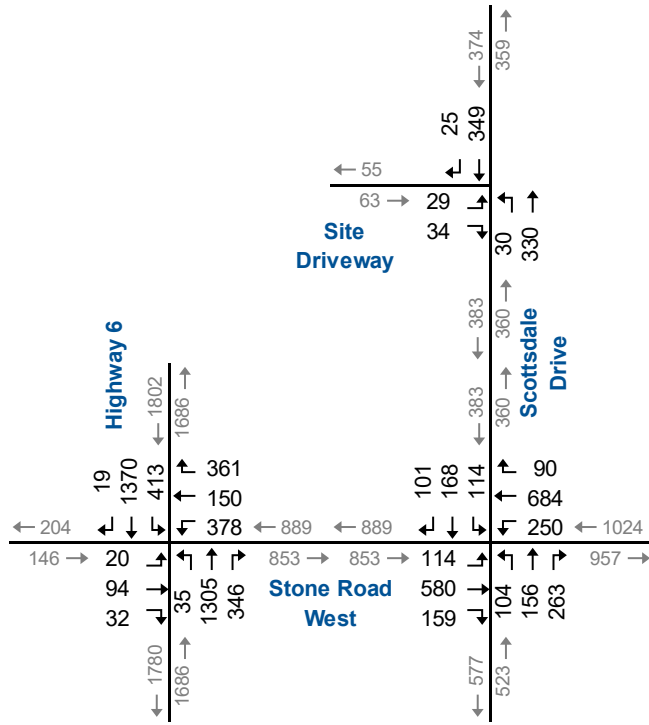




**AM Peak Hour**



**PM Peak Hour**



**2030 Total Traffic Volumes**

## 4.4 2035 Horizon

### 4.4.1 Background Traffic Operations

The operations of the intersections in the study area were evaluated using the assumed lane configurations, traffic controls, the forecast 2035 background traffic peak volumes, and optimized signal timing splits.

**Figure 4.5** illustrates the 2035 background traffic volumes. **Table 4.9** summarizes the results of the 2035 background traffic operations.

**Table 4.10a** summarizes the northbound right-turn storage lengths at the intersection of Highway 6 and Stone Road West using the Geometric Design Guide for Canadian Roads.

**Table 4.10b** summarizes the through, left turn, and shared movement queue lengths at the intersection of Highway 6 and Stone Road West using MTO's Traffic Signal Operating & Timing Policy.

All study area intersections are forecast to operate at acceptable levels of service during the AM and PM peak hours with the following critical movements noted:

- ▶ Highway 6 and Stone Road West:
  - The eastbound through/right-turn movement is forecast to have a queue length that blocks the eastbound left-turn lane during the AM and PM peak hours;
  - The westbound left-turn movement is forecast to have a v/c ratio surpassing 1.00 and a queue length that surpasses its storage length by 85 and 138 metres during the AM and PM peak hours;
  - The westbound through/right-turn movement is forecast to have a v/c ratio surpassing 0.85 during the PM peak hour and a queue length that blocks the westbound left-turn lane during the AM and PM peak hours;
  - The northbound through movement is forecast to have a v/c ratio surpassing 0.85 during the PM peak hour and a queue length that is forecast to block the northbound left-turn and right-turn lanes during the AM and PM peak hours;
  - The northbound right-turn movement is forecast to have a queue length that surpasses its storage length by 122 and 75 metres during the AM and PM peak hours;



- The southbound left-turn movement is forecast to have a v/c ratio equal to 0.85 and 1.00 during the AM and PM peak hours; and
  - The southbound through/right-turn is forecast to have a v/c ratio surpassing 0.85 during the PM peak hour and a queue length that blocks the southbound left-turn lane during the AM and PM peak hours.
- ▶ Stone Road West and Scottsdale Drive:
- The westbound left-turn movement is forecast to have a queue length that surpasses its storage length by 16 metres during the PM peak hour; and
  - The southbound left-turn movement is forecast to have a queue length that surpasses its storage length by 4 and 3 metres during the AM and PM peak hours, respectively.

**Appendix H** contains the supporting detailed Synchro 11 reports.



**TABLE 4.9: 2035 BACKGROUND 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	Highway 6 & Stone Road West	TCS	LOS	E	E	>	<b>E</b>	F	D	E	<b>F</b>	D	C	C	<b>C</b>	F	D	D	<b>D</b>	<b>E</b>
			Delay	67	68	>	<b>68</b>	334	50	58	<b>194</b>	54	26	24	<b>25</b>	91	39	38	<b>49</b>	<b>59</b>
			V/C	0.24	0.78	>		1.54	0.18	0.69		0.04	0.68	0.55		0.90	0.78	0.78		
Q	14	82	>		183	23	85		4	148	111		87	189	196					
Stor.	65	-	>		35	-	-		160	-	150		195	-	-					
Avail.	51	-	>		-148	-	-		156	-	39		108	-	-					
AM Peak Hour	Scottsdale Drive & Stone Road West	TCS	LOS	B	C	C	<b>C</b>	B	B	B	<b>B</b>	C	C	C	<b>C</b>	C	C	C	<b>C</b>	<b>C</b>
			Delay	13	24	24	<b>23</b>	16	18	18	<b>17</b>	24	31	32	<b>30</b>	25	28	28	<b>27</b>	<b>23</b>
			V/C	0.18	0.62	0.62		0.45	0.33	0.33		0.23	0.48	0.58		0.41	0.21	0.23		
Q	10	82	82		17	37	38		18	45	48		24	19	20					
Stor.	28	-	-		25	-	-		30	-	-		20	-	-					
Avail.	18	-	-		8	-	-		12	-	-		-4	-	-					
AM Peak Hour	Site Driveway & Scottsdale Drive	TWSC	LOS	B		>	<b>B</b>					A	A		<b>A</b>		A	A	<b>A</b>	
			Delay	10		>	<b>10</b>					8	0		<b>0</b>		0	0	<b>0</b>	
			V/C	0.01		>						0.00	0.00				0.00	0.00		
Q	0		>						0	0				0	0					
PM Peak Hour	Highway 6 & Stone Road West	TCS	LOS	E	D	>	<b>D</b>	F	D	E	<b>F</b>	E	E	D	<b>E</b>	F	D	D	<b>E</b>	<b>E</b>
			Delay	69	49	>	<b>52</b>	175	40	62	<b>106</b>	71	64	35	<b>58</b>	150	55	54	<b>77</b>	<b>75</b>
			V/C	0.24	0.36	>		1.21	0.32	0.86		0.38	0.99	0.57		1.13	0.93	0.93		
Q	11	58	>		220	61	162		20	280	116		144	268	280					
Stor.	65	-	>		35	-	-		160	-	150		195	-	-					
Avail.	54	-	>		-185	-	-		140	-	34		51	-	-					
PM Peak Hour	Scottsdale Drive & Stone Road West	TCS	LOS	B	C	C	<b>C</b>	C	C	C	<b>C</b>	C	C	D	<b>C</b>	C	C	C	<b>C</b>	<b>C</b>
			Delay	18	30	30	<b>29</b>	22	24	24	<b>23</b>	23	29	41	<b>34</b>	26	28	28	<b>28</b>	<b>28</b>
			V/C	0.34	0.68	0.68		0.73	0.60	0.60		0.30	0.41	0.80		0.48	0.33	0.35		
Q	16	88	86		41	78	79		22	40	80		23	32	32					
Stor.	28	-	-		25	-	-		30	-	-		20	-	-					
Avail.	12	-	-		-16	-	-		8	-	-		-3	-	-					
PM Peak Hour	Site Driveway & Scottsdale Drive	TWSC	LOS	B		>	<b>B</b>					A	A		<b>A</b>		A	A	<b>A</b>	
			Delay	12		>	<b>12</b>					8	0		<b>0</b>		0	0	<b>0</b>	
			V/C	0.02		>						0.01	0.00				0.00	0.00		
Q	1		>						0	0				0	0					

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

Stor. - Existing Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

</> - Shared with through movement



**TABLE 4.10A: 2035 BACKGROUND RIGHT-TURN STORAGE LENGTHS**

Intersection	Parameter	Direction/Movement	
		AM Peak Hour	PM Peak Hour
		NBR	NBR
Highway 6 and Stone Road West	Volume (vph)	439	362
	Cycle Length (s)	148.7	148.7
	Design Speed (km/h)	100	100
	Queue (m)	272	225
	Storage (m)	150	150
	Available (m)	-122	-75

Transportation Association of Canada, *Geometric Design Guide for Canadian Roads: Section 9.14.4*, (Ottawa: TAC, 2017).

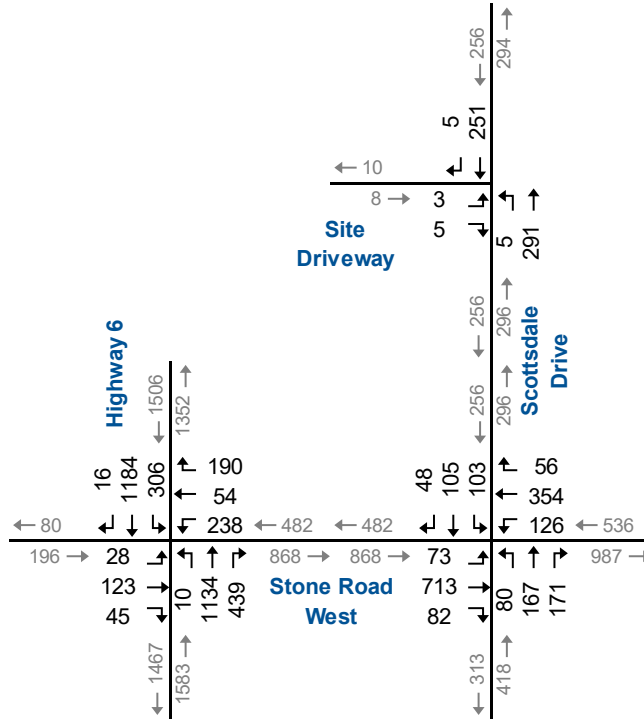
**TABLE 4.10B: 2035 BACKGROUND THROUGH, RIGHT-TURN, AND SHARED QUEUE LENGTHS**

Analysis Period	Intersection	Parameter	Direction/Movement										
			EBL	EBTR	WBL	WBTR1	WBTR2	NBL	NBT	SBL1	SBL2	SBTR1	SBTR2
AM Peak Hour	Highway 6 and Stone Road West	Volume (vph)	28	168	238	146	98	10	1134	184	122	720	480
		Heavy Vehicle %	4%	2%	5%	4%	4%	11%	12%	3%	3%	10%	10%
		Cycle Length (s)	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7
		Passenger Cars Per Hour	30	172	250	152	102	12	1271	190	126	792	528
		Number of Lanes	1	1	1	1	1	1	2	1	1	1	1
		Arrival Rate (veh/s/lane)	1.2	7.1	10.3	6.3	4.2	0.5	26.2	7.8	5.2	32.7	21.8
		Queue (vehicles)*	3	12	16	11	8	2	35	13	9	35	30
		Queue (m)	23	90	120	83	60	15	263	98	68	263	225
		Storage (m)	65	-	35	-	-	160	-	195	195	-	-
Available (m)	42	-	-85	-	-	145	-	97	127	-	-		
PM Peak Hour	Highway 6 and Stone Road West	Volume (vph)	21	135	394	327	218	37	1371	263	175	876	584
		Heavy Vehicle %	0%	2%	1%	1%	1%	0%	5%	1%	1%	4%	4%
		Cycle Length (s)	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7
		Passenger Cars Per Hour	21	138	398	331	221	37	1440	266	177	912	608
		Number of Lanes	1	1	1	1	1	1	2	1	1	1	1
		Arrival Rate (veh/s/lane)	0.9	5.7	16.4	13.7	9.1	1.5	29.7	11.0	7.3	37.7	25.1
		Queue (vehicles)*	3	10	23	20	14	4	35	17	12	35	33
		Queue (m)	23	75	173	150	105	30	263	128	90	263	248
		Storage (m)	65	-	35	-	-	160	-	195	195	-	-
Available (m)	42	-	-138	-	-	130	-	67	105	-	-		

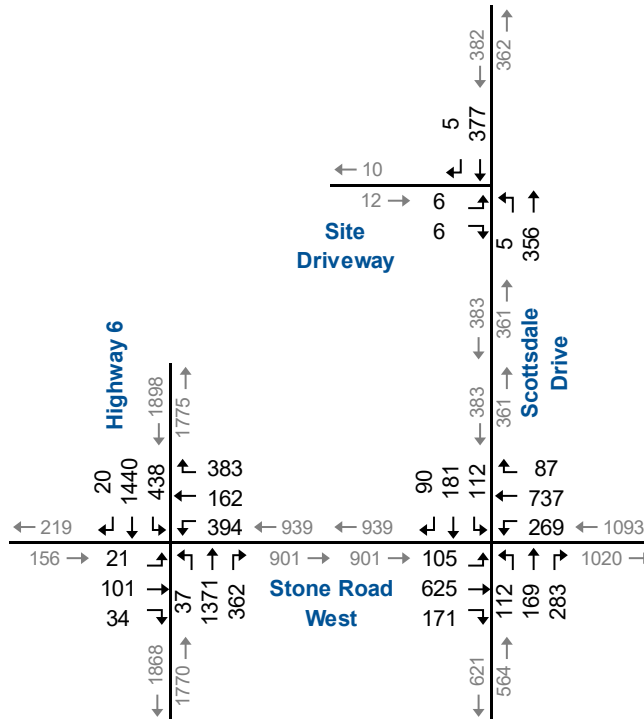
\*Ontario Ministry of Transportation, *Implementation of the Traffic Signal Operating & Timing Policy # 2010-02*, (Toronto: Queen's Printer for Ontario, 2017).



**AM Peak Hour**



**PM Peak Hour**



# 2035 Background Traffic Volumes



#### 4.4.2 Total Traffic Operations

**Figure 4.6** illustrates the 2035 total traffic volumes, including trips generated by the subject development.

The 2035 total traffic volumes have been analyzed using the same methodology as under 2035 background traffic conditions. Although, the signal timing splits were optimized. **Table 4.11** summarizes the results of the 2035 total traffic operations.

**Table 4.12a** summarizes the northbound right-turn storage lengths at the intersection of Highway 6 and Stone Road West using the Geometric Design Guide for Canadian Roads.

**Table 4.12b** summarizes the through, left turn, and shared movement queue lengths at the intersection of Highway 6 and Stone Road West using MTO's Traffic Signal Operating & Timing Policy.

All study area intersections are forecast to operate at acceptable levels of service during the AM and PM peak hours with the following critical movements noted:

- ▶ Highway 6 and Stone Road West:
  - The eastbound through/right-turn movement is forecast to have a queue length that blocks the eastbound left-turn lane during the AM and PM peak hours;
  - The westbound left-turn movement is forecast to have a v/c ratio surpassing 1.00 and a queue length that surpasses its storage length by 85 and 145 metres during the AM and PM peak hours;
  - The westbound through/right-turn movement is forecast to have a v/c ratio surpassing 0.85 during the PM peak hour and a queue length that blocks the westbound left-turn lane during the AM and PM peak hours;
  - The northbound through movement is forecast to have a v/c ratio equal to 1.00 during the PM peak hour and a queue length that is forecast to block the northbound left-turn and right-turn lanes during the AM and PM peak hours;
  - The northbound right-turn movement is forecast to have a queue length that surpasses its storage length by 124 and 80 metres during the AM and PM peak hours;
  - The southbound left-turn movement is forecast to have a v/c ratio equal to 0.85 and 1.00 during the AM and PM peak hours; and



- The southbound through/right-turn is forecast to have a v/c ratio surpassing 0.85 during the PM peak hour and a queue length that blocks the southbound left-turn lane during the AM and PM peak hours.
- ▶ Stone Road West and Scottsdale Drive:
  - The westbound left-turn movement is forecast to have a queue length that surpasses its storage length by 16 metres during the PM peak hour; and
  - The southbound left-turn movement is forecast to have a queue length that surpasses its storage length by 5 and 6 metres during the AM and PM peak hours.

**Appendix I** contains the supporting detailed Synchro 11 reports.



**TABLE 4.11: 2035 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	Highway 6 & Stone Road West	TCS	LOS	E	E	>	<b>E</b>	F	D	E	<b>F</b>	D	C	C	<b>C</b>	F	D	D	<b>D</b>	<b>E</b>
			Delay	67	68	>	<b>68</b>	342	50	58	<b>197</b>	54	26	24	<b>25</b>	92	39	38	<b>49</b>	<b>59</b>
			V/C	0.24	0.78	>		1.56	0.18	0.70		0.04	0.68	0.55		0.91	0.78	0.78		
Q	14	82	>		187	24	86		4	148	112		87	189	196					
Stor.	65	-	>		35	-	-		160	-	150		195	-	-					
Avail.	51	-	>		-152	-	-		156	-	38		108	-	-					
AM Peak Hour	Scottsdale Drive & Stone Road West	TCS	LOS	B	C	C	<b>C</b>	B	B	B	<b>B</b>	C	C	C	<b>C</b>	C	C	C	<b>C</b>	<b>C</b>
			Delay	13	24	24	<b>23</b>	16	18	18	<b>17</b>	24	31	32	<b>30</b>	26	28	28	<b>27</b>	<b>23</b>
			V/C	0.20	0.62	0.62		0.45	0.33	0.33		0.23	0.48	0.58		0.43	0.22	0.25		
Q	10	82	82		17	38	38		18	45	48		25	20	20					
Stor.	28	-	-		25	-	-		30	-	-		20	-	-					
Avail.	18	-	-		8	-	-		12	-	-		-5	-	-					
AM Peak Hour	Site Driveway & Scottsdale Drive	TWSC	LOS	B		>	<b>B</b>					A	A		<b>A</b>		A	A	<b>A</b>	
			Delay	11		>	<b>11</b>					8	0		<b>0</b>		0	0	<b>0</b>	
			V/C	0.04		>					0.01	0.00					0.00	0.00		
Q	1		>					0	0					0	0					
PM Peak Hour	Highway 6 & Stone Road West	TCS	LOS	E	D	>	<b>D</b>	F	D	E	<b>F</b>	E	E	D	<b>E</b>	F	D	D	<b>E</b>	<b>E</b>
			Delay	70	49	>	<b>52</b>	185	40	63	<b>110</b>	72	65	36	<b>59</b>	156	55	54	<b>78</b>	<b>77</b>
			V/C	0.24	0.36	>		1.24	0.32	0.87		0.40	1.00	0.59		1.15	0.93	0.93		
Q	11	59	>		231	62	165		20	284	121		148	268	280					
Stor.	65	-	>		35	-	-		160	-	150		195	-	-					
Avail.	54	-	>		-196	-	-		140	-	29		47	-	-					
PM Peak Hour	Scottsdale Drive & Stone Road West	TCS	LOS	B	C	C	<b>C</b>	C	C	C	<b>C</b>	C	C	D	<b>C</b>	C	C	C	<b>C</b>	<b>C</b>
			Delay	18	30	30	<b>28</b>	22	24	24	<b>24</b>	23	29	41	<b>34</b>	27	28	28	<b>28</b>	<b>28</b>
			V/C	0.39	0.68	0.68		0.73	0.61	0.61		0.31	0.41	0.80		0.53	0.35	0.37		
Q	19	88	86		41	80	80		22	40	80		26	34	34					
Stor.	28	-	-		25	-	-		30	-	-		20	-	-					
Avail.	9	-	-		-16	-	-		8	-	-		-6	-	-					
PM Peak Hour	Site Driveway & Scottsdale Drive	TWSC	LOS	B		>	<b>B</b>					A	A		<b>A</b>		A	A	<b>A</b>	
			Delay	13		>	<b>13</b>					8	0		<b>1</b>		0	0	<b>0</b>	
			V/C	0.13		>					0.03	0.00					0.00	0.00		
Q	4		>					1	0					0	0					

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

Stor. - Existing Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

</> - Shared with through movement



**TABLE 4.12A: 2035 TOTAL RIGHT-TURN STORAGE LENGTHS**

Intersection	Parameter	Direction/Movement	
		AM Peak Hour	PM Peak Hour
		NBR	NBR
Highway 6 and Stone Road West	Volume (vph)	442	371
	Cycle Length (s)	148.7	148.7
	Design Speed (km/h)	100	100
	Queue (m)	274	230
	Storage (m)	150	150
	Available (m)	-124	-80

Transportation Association of Canada, *Geometric Design Guide for Canadian Roads: Section 9.14.4*, (Ottawa: TAC, 2017).

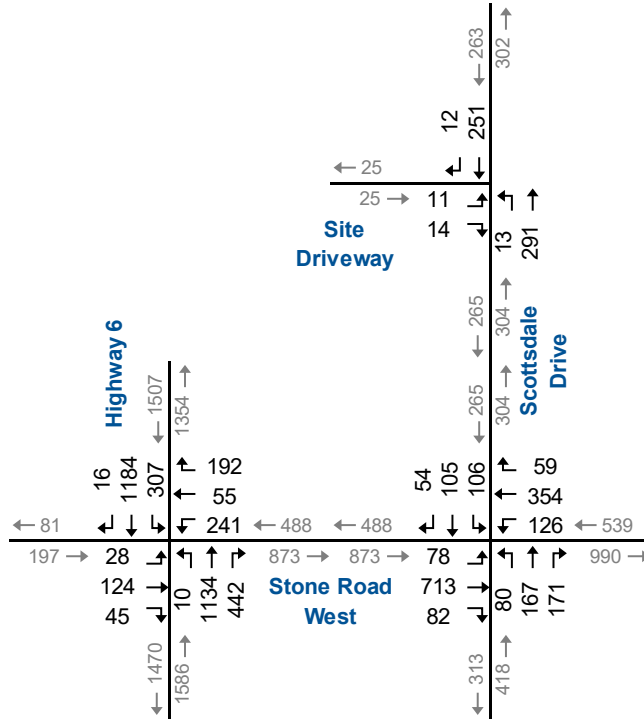
**TABLE 4.12B: 2035 TOTAL THROUGH, RIGHT-TURN, AND SHARED QUEUE LENGTHS**

Analysis Period	Intersection	Parameter	Direction/Movement										
			EBL	EBTR	WBL	WBTR1	WBTR2	NBL	NBT	SBL1	SBL2	SBTR1	SBTR2
AM Peak Hour	Highway 6 and Stone Road West	Volume (vph)	28	169	241	148	99	10	1134	184	123	720	480
		Heavy Vehicle %	4%	2%	5%	4%	4%	11%	12%	3%	3%	10%	10%
		Cycle Length (s)	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7
		Passenger Cars Per Hour	30	173	254	154	103	12	1271	190	127	792	528
		Number of Lanes	1	1	1	1	1	1	2	1	1	1	1
		Arrival Rate (veh/s/lane)	1.2	7.1	10.5	6.4	4.3	0.5	26.2	7.8	5.2	32.7	21.8
		Queue (vehicles)*	3	12	16	11	8	2	35	13	9	35	30
		Queue (m)	23	90	120	83	60	15	263	98	68	263	225
PM Peak Hour	Highway 6 and Stone Road West	Volume (vph)	21	137	404	332	221	37	1371	266	177	876	584
		Heavy Vehicle %	0%	2%	1%	1%	1%	0%	5%	1%	1%	4%	4%
		Cycle Length (s)	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7	148.7
		Passenger Cars Per Hour	21	140	409	336	224	37	1440	269	179	912	608
		Number of Lanes	1	1	1	1	1	1	2	1	1	1	1
		Arrival Rate (veh/s/lane)	0.9	5.8	16.9	13.9	9.3	1.5	29.7	11.1	7.4	37.7	25.1
		Queue (vehicles)*	3	10	24	20	15	4	35	17	12	35	33
		Queue (m)	23	75	180	150	113	30	263	128	90	263	248
Storage (m)	65	-	35	-	-	160	-	195	195	-	-		
Available (m)	42	-	-145	-	-	130	-	67	105	-	-		

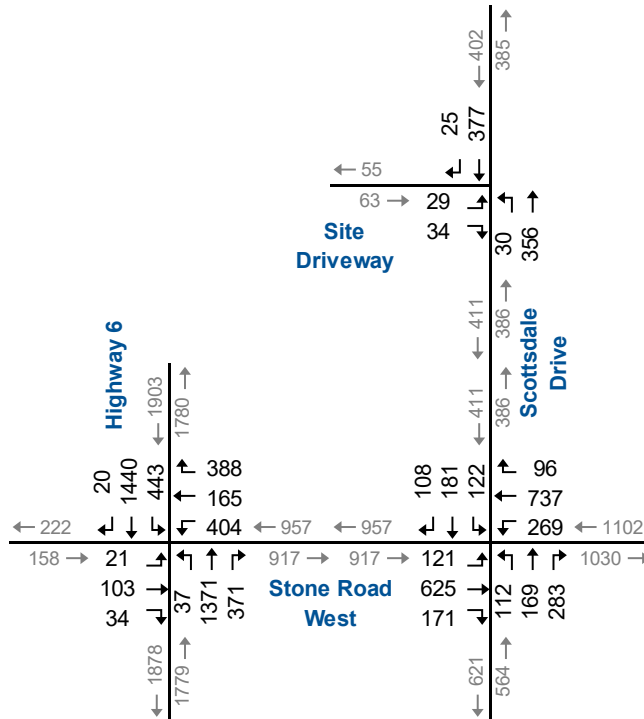
\*Ontario Ministry of Transportation, *Implementation of the Traffic Signal Operating & Timing Policy # 2010-02*, (Toronto: Queen's Printer for Ontario, 2017).



AM Peak Hour



PM Peak Hour



# 2035 Total Traffic Volumes

## 5 Remedial Measures

### 5.1 Left-Turn Lane Warrants

The intersection of Scottsdale Drive and the Site Driveway was assessed to determine if the projected traffic volumes warrant installation of left-turn lanes. The warrants for left-turn lanes follow the requirements in the Ministry of Transportation's (MTO) Geometric Design Standards<sup>9</sup> using the warrants for a four-lane undivided road.

**Table 5.1** summarizes the left-turn lane warrant for the intersection of Scottsdale Drive and the Site Driveway. The warrant analysis suggests that a 15 metres westbound left-turn lane is warranted under 2035 total traffic conditions.

**TABLE 5.1: LEFT TURN LANE WARRANT SUMMARY – SCOTTSDALE DRIVE**

Roadway	Scottsdale Drive			
Intersection	Site Driveway			
Approach Direction	Northbound			
Horizon	Total (2035)		Background (2035)	
Peak Hour	AM	PM	AM	PM
Opposing Volume	263	402	256	382
Left Turning Traffic	13	30	5	5
Figure Used*	9A-31	9A-31	9A-31	9A-31
Warranted	No	Yes	No	No
Storage Length Required	--	15m	--	--

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

**Figure 5.1** and **Figure 5.2** illustrate the left-turn lane warrant nomographs for the intersection of Scottsdale Drive and the Site Driveway.

### 5.2 Critical Movements

#### 5.2.1 Highway 6 at Stone Road West

At the intersection of Highway 6 and Stone Road West, all through or shared through/right movements are forecast to block auxiliary turns under 2023 base year conditions. The westbound left-turn and northbound right-turn movements at the intersection of Highway 6 and Stone Road West are forecast to surpass their storage lengths under 2023 base year conditions too.

However, the intersection of Highway 6 and Stone Road West is to be converted to an interchange as identified in the Hanlon Expressway

<sup>9</sup> Ontario Ministry of Transportation, *MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads*, (Toronto: Queen's Printer for Ontario, 2020).



Environmental Assessment (EA)<sup>10</sup>. Therefore, no additional roadway improvements are suggested for the intersection of Highway 6 and Stone Road West.

### 5.2.2 Stone Road West at Scottsdale Drive

Under existing conditions, the westbound left-turn and southbound left-turn movements at the intersection of Stone Road West and Scottsdale Drive are forecast to exceed their storage lengths.

For the westbound left-turn lane:

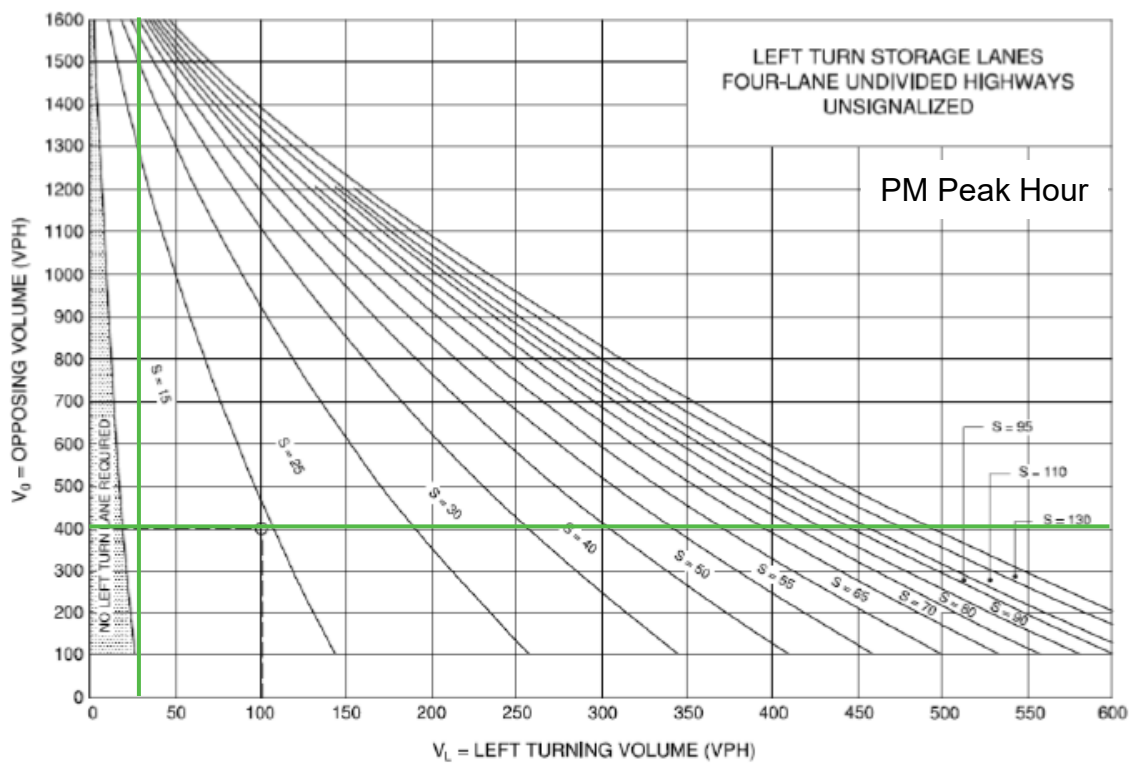
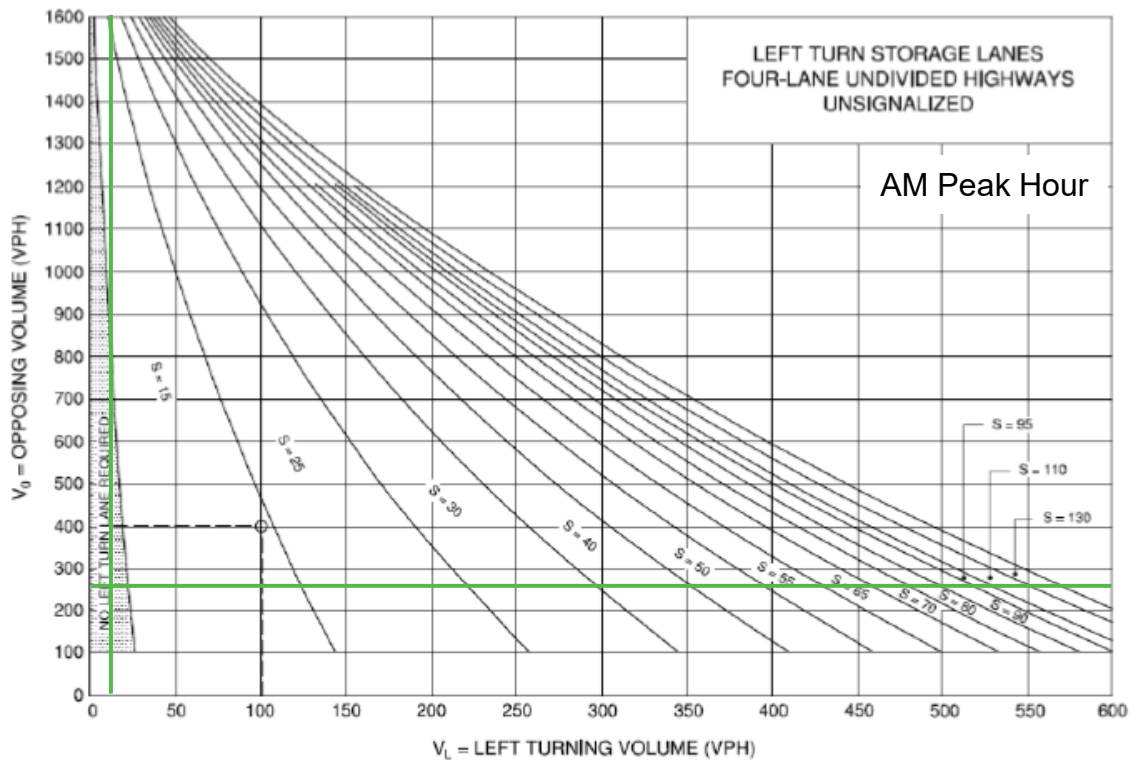
- ▶ Under existing conditions, the 95<sup>th</sup> percentile queue length exceeds the storage length by 2 metres in the PM peak hour.
- ▶ Under 2035 background conditions, the 95<sup>th</sup> percentile queue length exceeds the storage length by 16 metres in the PM peak hour.
- ▶ Under 2035 total conditions, the 95<sup>th</sup> percentile queue length also exceeds the storage length by 16 metres in the PM peak hour.
- ▶ Therefore, the subject development does not contribute to the westbound queue length on Stone Road at Scottsdale Road.

For the southbound left-turn lane:

- ▶ Under 2035 background conditions, the 95<sup>th</sup> percentile queue length exceeds the storage length by 3 metres in the PM peak hour.
- ▶ Under 2035 total conditions, the 95<sup>th</sup> percentile queue length also exceeds the storage length by 6 metres in the PM peak hour.
- ▶ Therefore, the southbound queue is forecast to exceed the existing storage length regardless of whether the subject development is completed. The subject development does contribute 3 metres to the 95<sup>th</sup> percentile queue length out of the 6 metres it is forecast to exceed the storage length. To accommodate the forecast queue, it is recommended that the storage length be increased from 20 metres to 30 metres.

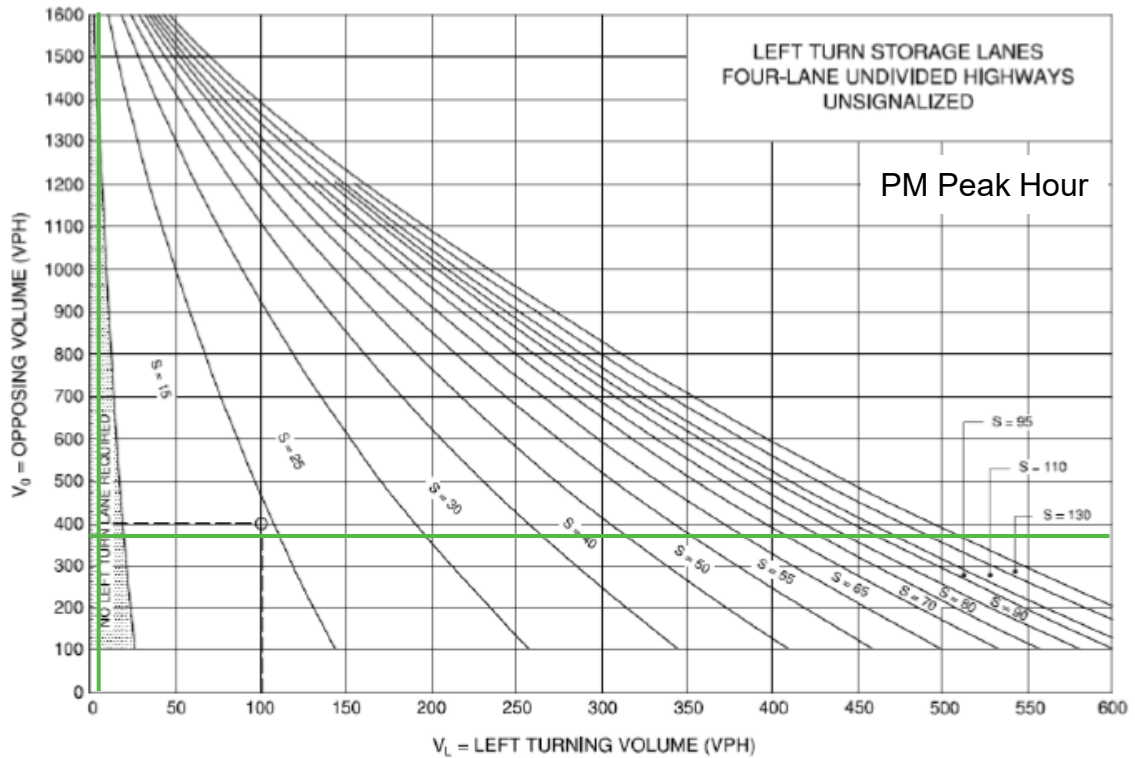
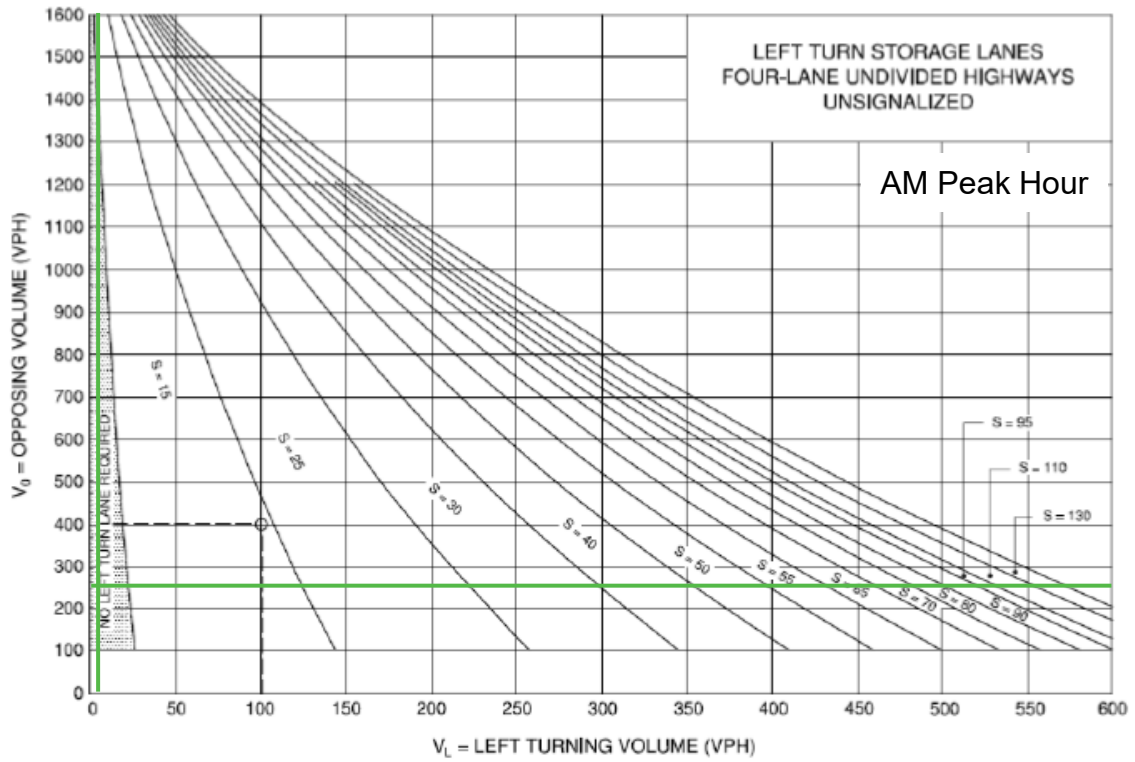
<sup>10</sup> Ontario Ministry of Transportation and Stantec, *Highway 6 (Hanlon Expressway) Maltby Road to the Speed River: Sheet 12 Recommended Plan Stone Road at Highway 6 Station 9+700 To Station 10+349*.





# Scottsdale Drive and Site Driveway Left Turn Lane Warrant (2035 Total)





## Scottsdale Drive and Site Driveway Left Turn Lane Warrant (2035 Background)

## 6 Parking Study

### 6.1 Proposed Parking Supply (Phases 1 and 2)

A total of 153 residential parking spaces will be provided on-site (0.23 spaces per unit).

A total of 38 visitor parking spaces will be provided on-site (0.06 spaces per unit).

A total of 191 parking spaces will be provided on-site (0.29 spaces per unit).

### 6.2 Zoning By-Law

The City of Guelph Zoning By-Law 1995 - 14864<sup>11</sup> indicates that lodging houses (most similar to off-campus student housing) require a total parking supply equal to a third of the total unit count and one parking spot for the building (219 spaces for Phases 1 and 2).

With a proposed supply of 191 parking spaces, this results in a potential deficiency of 28 spaces, as compared to the by-law.

The City of Hamilton Zoning By-Law 05-200<sup>12</sup> indicates that no parking is needed for on-campus student housing.

### 6.3 Parking Demand

#### 6.3.1 Northdale Neighbourhood (City of Waterloo)

In November 2016, the Northdale Neighbourhood Streetscape Master Plan Class Environment Assessment<sup>13</sup> (Class EA Study) presented mobility and parking recommendations that will help to shape travel and mode choice within the neighbourhood and not look to accommodate all future demand for vehicular traffic.

To achieve this goal, the vision of the Northdale neighbourhood was to encourage active transportation modes and lower operating speeds while maintaining neighbourhood access and existing capacity. The study outlines new walking and cycle routes, and not increasing vehicular capacity. The increase in active transportation infrastructure

<sup>11</sup> City of Guelph Zoning Bylaw 1995 - 14864, Section 4 – General Provisions

<sup>12</sup> City of Hamilton Zoning By-Law 05-200, Section 5: Parking

<sup>13</sup> IBI Group, *Part A: Northdale Neighbourhood Streetscape Master Plan Class Environmental Assessment Schedule 'B'*, (IBI Group, 2016).



enhances the subject site location to the two universities and Uptown Waterloo.

Zoning By-Law 2018-050<sup>14</sup> indicates that apartments in the Northdale Neighbourhood require a total of 0.25 parking spaces per bedroom including 0.20 resident spaces per bedroom and 0.05 visitor spaces per bedroom (191 spaces for Phases 1 and 2).

With a proposed supply of 191 parking spaces, this represents neither a surplus nor deficiency.

### **6.3.2 Phase 1 Parking Survey**

To better understand the actual parking demand that can be expected for Phases 1 and 2, a parking demand survey has been completed for Phase 1 of this development.

The parking demand survey was completed on a Tuesday and Wednesday (typical weekday) in March from 3:00 PM to 3:00 PM.

The Phase 1 survey results show a peak demand of 0.18 spaces per unit. This rate is considerably lower than the parking supply equal to a third of the total unit count and one parking spot for the building requirement in the zoning by-law.

Using the observed rate of 0.18 spaces per unit, the parking supply for the subject site (Phases 1 and 2) would be 118 parking spaces. With a proposed supply of 191 parking spaces, this represents a surplus of 73 parking spaces.

### **6.3.3 Parking Summary**

Zoning By-Law 1995 - 14864<sup>15</sup> requires a total parking supply equal to a third of the total unit count and one parking spot for the building (219 spaces for Phases 1 and 2). The proposed parking supply is 0.29 per unit, which is a difference of 28 spaces.

The Northdale Neighbourhood requires a parking demand rate of 0.25 spaces per bedroom (191 spaces for Phases 1 and 2).

The Phase 1 survey results show a peak demand of 0.18 spaces per unit (118 spaces for Phases 1 and 2).

<sup>14</sup> City of Waterloo Zoning Bylaw 2018-050, Section 7

<sup>15</sup> City of Guelph Zoning Bylaw 1995 - 14864, Section 4 – General Provisions



Given the results of the Northdale Neighbourhood and Phase 1 survey rates, the forecast parking demand for this site is between 118 and 219 residential spaces for Phases 1 and 2.



## 7 Transportation Demand Management

### 7.1 Transportation Demand Management Techniques

Transportation Demand Management (TDM) refers to ways of making the capacity of our roads more efficient by reducing vehicle demand. TDM approaches consider how people's choices of travel mode are affected by land use patterns, development design, parking availability, parking cost, and the relative cost, convenience and availability of alternative modes of travel. Various TDM strategies are used to influence those factors so that the alternatives are more competitive with driving alone and potentially reduce reliance on motor vehicles.

TDM strategies at a development can be divided into two basic categories:

- ▶ Pre-occupancy: things that need to be done while a development is being designed and built; and
- ▶ Post-occupancy: things that can be done once people are using the development.

The pre-occupancy actions are critical as they are most likely to determine how attractive, convenient, and safe alternative travel will be once the site is occupied. Before a site is occupied, it can be designed to be convenient and safe for pedestrians and cyclists, and vehicle parking can be provided to meet but not exceed demand.

After the development is built, incentives can be offered, but those incentives will not work as well if the site and its surroundings are oriented to cars. The incentives generally include subsidies to use transit, access to rideshare programs, and information about where and how to use alternatives.

### 7.2 Pre-Occupancy Strategies

The owner may want to observe following TDM strategies as they will help to lower the required-on site parking from the existing Zoning By-Law requirements.

#### 7.2.1 Transit Support

The development facilitates on-site pedestrian access to the greater sidewalk network, which in turn, provides access to the transit stops. The development is located near multiple bus routes, described in **Section 2.2**.



This is very beneficial to encouraging residents to utilize transit, by providing easy access to multiple locations. The provision of high-capacity, high-frequency transit service will be a significant factor contributing to a reduction of automobile trips to/from the site.

As many of the residents are expected to be University of Guelph student, and therefore their transit passes will be included in their tuition, utilization of transit is expected to be high.

### **7.2.2 Cycling Support**

The development is recommended to provide bicycle parking through secure storage lockers and bike repair stations for residents. A total of 191 bicycle parking spaces are proposed for Phases 1 and 2: 151 for residents and 40 visitor spaces.

Near the development site, Silvercreek Trail is available north of Janefield Avenue, and cycling lanes are present on College Avenue and Stone Road east of Edinburgh Road. To assist in the use of these cycling facilities, as per City comment, the developer should consider providing trail and cycling route information to all residents on site.

## **7.3 Post-Occupancy Strategies**

### **7.3.1 On-Site Transit Support**

The owner should investigate the feasibility of providing access to real-time transit information for area transit routes, and that this information is readily available in public areas of the development.

### **7.3.2 Car Share Program**

Car share programs provide shared vehicles to members, allowing people use of a car when needed, while not owning a car. A local organization providing such services is Community CarShare.

Community CarShare is a co-operative which provides a car share service within City of Guelph. The availability of a shared vehicle will allow residents who normally would not need a vehicle for their daily activities to be comfortable with the decision to not own a vehicle. The owner should consider providing a parking space as a designated Community CarShare space, pending demand. The owner should liaise with the “CarShare Anywhere” program, to determine the feasibility of providing a vehicle stored on site in a surface lot space.



### **7.3.3 Unbundled Parking**

Unbundled parking is the supply of parking as a separate charge to the occupants. For students, this means parking spaces would be rented separately from the units.

## **7.4 Parking and TDM Assessment**

The site has been designed to be supportive of the TDM objectives of the City of Guelph by providing and incorporating the design objectives in the Master Plan document for the site development. Most important of these is flexibility of the plan to evolve over time to increase development density and reduce parking.

To remain consistent with the City TDM initiatives, the developer should consider providing the proposed parking supply.



## 8 Conclusions and Recommendations

### 8.1 Conclusions

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

#### Transportation Impact Study:

- ▶ **Existing Traffic Operations:** The study area intersections are currently operating at acceptable levels of service with the following critical movements noted:

#### Highway 6 and Stone Road West:

- The eastbound through/right-turn movement is forecast to have a queue length that blocks the eastbound left-turn lane during the AM and PM peak hours;
- The westbound left-turn movement is forecast to have a v/c ratio surpassing 1.00 and a queue length that surpasses its storage length by 70 and 115 metres during the AM and PM peak hours;
- The westbound through/right-turn movement is forecast to have a queue length that blocks the westbound left-turn lane during the AM and PM peak hours;
- The northbound through movement is forecast to have a v/c ratio surpassing 0.85 during the PM peak hour and a queue length that is forecast to block the northbound left-turn and right-turn lanes during the AM and PM peak hours;
- The northbound right-turn movement is forecast to have a queue length that surpasses its storage length by 80 and 39 metres during the AM and PM peak hours;
- The southbound left-turn movement is forecast to have a v/c ratio equal to 0.85 during the PM peak hour; and
- The southbound through/right-turn is forecast to have a v/c ratio surpassing 0.85 and 1.00 during the AM and PM peak hours respectively and a queue length that blocks the southbound left-turn lane during the AM and PM peak hours.

#### Stone Road West and Scottsdale Drive:

- The westbound left-turn movement is forecast to have a queue length that surpasses its storage length by 2 metres during the PM peak hour.





- ▶ **Trip Generation:** The development is forecast to generate 32 and 96 new trips during the AM and PM peak hours, respectively;
- ▶ **Future Background Traffic Operations:** The study area intersections are forecast to operate at acceptable levels of service similar to existing traffic conditions. Although, the southbound left-turn movement at the intersection of Stone Road West and Scottsdale Drive is forecast to have a queue length that surpasses its storage length;
- ▶ **Future Total Traffic Operations:** The study area intersections are forecast to operate at acceptable levels of service similar to future background traffic conditions;
- ▶ **Left-Turn Lanes:**
  - At the intersection of Stone Road and Scottsdale Drive, the westbound left-turn queue is forecast to exceed the existing storage length by 16 metres under future conditions regardless of whether the subject development is built. The southbound left-turn lane is forecast to exceed the existing storage length by 6 metres under future traffic conditions, of which 3 metres are attributable to the subject development.
  - A northbound left-turn lane is forecast to be warranted at the site entrance on Scottsdale Drive.

#### **Parking Study:**

- ▶ **Zoning Bylaw:** The City of Guelph Zoning By-Law 1995 - 14864 indicates that lodging houses (most similar to off-campus student housing) require a total parking supply equal to a third of the total unit count and one parking spot for the building (219 spaces for Phases 1 and 2);
- ▶ **Northdale Neighbourhood Waterloo:** Zoning By-Law 2018-050 indicates that apartments in the Northdale Neighbourhood require a total of 0.25 parking spaces per bedroom including 0.20 resident spaces per bedroom and 0.05 visitor spaces per bedroom (191 spaces for Phases 1 and 2);
- ▶ **Parking Survey:** The Phase 1 survey results show a peak demand of 0.18 spaces per unit (118 parking spaces for Phases 1 and 2); and
- ▶ **Estimated Parking Demand:** Given the results of the Northdale Neighbourhood and Phase 1 survey rates, the forecast parking demand for this site is between 118 and 219 residential spaces for Phases 1 and 2.



- ▶ **Transportation Demand Management:** The site concept plan is able to support multiple TDM measures that can assist in mitigating the site's transportation and parking impacts on the adjacent road network, promote a strong and vibrant economy, and create a livable community that has a balanced transportation network.

## 8.2 Recommendations

Based on the findings of this study, it is recommended that:

- ▶ The proposed development be approved with the proposed parking supply and consideration given to the discussed TDM measures; and
- ▶ A northbound left-turn lane with 15 metres of storage be considered by the City of Guelph on Scottsdale Drive at the Site Driveway.

The Phase II Development includes measures to accommodate traffic into and out of both developments on the Lands. In the event that the Phase II Development does not proceed, it is understood that the City requires a new median be constructed in the municipal right-of-way cross the south driveway access to manage traffic flow. Regardless of whether the subject development proceeds, it is recommended to:

- ▶ Proceed with the planned conversion of the intersection of Highway 6 and Stone Road West to an interchange as identified in the Hanlon Expressway Environmental Assessment;
- ▶ Extend the westbound and southbound left-turn lanes at the intersection of Stone Road West and Scottsdale Drive to meet the forecast queue lengths.



# Appendix A

## Traffic Data





Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

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

Count Name: Scottsdale Drive & Stone Road  
West (Weekday)  
Site Code: 210420  
Start Date: 09/14/2021  
Page No: 1

### Turning Movement Data

Start Time	Stone Road West Eastbound						Stone Road West Westbound						Scottsdale Drive Northbound						Scottsdale Drive Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	5	46	6	0	0	57	3	44	5	0	0	52	5	7	13	0	0	25	10	5	12	0	3	27	161
7:15 AM	8	81	7	0	2	96	9	55	8	0	2	72	15	7	26	0	1	48	12	5	9	0	2	26	242
7:30 AM	5	90	11	0	0	106	9	69	5	0	0	83	18	22	30	0	0	70	13	10	9	0	0	32	291
7:45 AM	11	116	13	0	2	140	18	67	4	0	7	89	22	34	35	0	3	91	7	10	12	0	4	29	349
Hourly Total	29	333	37	0	4	399	39	235	22	0	9	296	60	70	104	0	4	234	42	30	42	0	9	114	1043
8:00 AM	9	144	8	0	3	161	15	44	7	0	3	66	9	20	43	0	1	72	11	11	17	0	1	39	338
8:15 AM	20	124	17	0	12	161	11	65	4	0	5	80	12	30	26	0	8	68	14	18	13	0	2	45	354
8:30 AM	14	139	13	0	18	166	23	73	12	0	6	108	17	40	31	0	4	88	16	15	16	0	4	47	409
8:45 AM	19	144	19	0	7	182	40	58	20	0	3	118	21	48	39	0	4	108	27	34	11	0	3	72	480
Hourly Total	62	551	57	0	40	670	89	240	43	0	17	372	59	138	139	0	17	336	68	78	57	0	10	203	1581
9:00 AM	7	115	23	1	6	146	24	87	7	0	1	118	12	25	34	0	3	71	19	23	8	0	1	50	385
9:15 AM	12	147	8	0	6	167	15	69	5	0	2	89	15	23	35	0	3	73	20	13	1	0	3	34	363
9:30 AM	18	115	15	0	1	148	22	84	9	0	3	115	17	19	33	0	1	69	12	10	8	0	1	30	362
9:45 AM	20	129	13	0	2	162	25	64	8	0	5	97	18	18	30	0	0	66	11	16	4	0	5	31	356
Hourly Total	57	506	59	1	15	623	86	304	29	0	11	419	62	85	132	0	7	279	62	62	21	0	10	145	1466
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30 AM	13	118	18	0	5	149	37	100	14	0	8	151	13	23	46	0	6	82	39	29	12	0	6	80	462
11:45 AM	11	123	16	0	1	150	40	106	13	0	5	159	20	18	57	0	5	95	22	25	8	1	3	56	460
Hourly Total	24	241	34	0	6	299	77	206	27	0	13	310	33	41	103	0	11	177	61	54	20	1	9	136	922
12:00 PM	14	123	27	0	17	164	30	130	12	0	14	172	21	24	52	0	14	97	16	26	12	0	5	54	487
12:15 PM	13	121	24	0	7	158	35	111	15	0	9	161	22	20	56	0	9	98	22	26	9	0	7	57	474
12:30 PM	13	111	11	0	4	135	43	126	7	0	5	176	19	34	60	0	4	113	26	23	13	0	2	62	486
12:45 PM	5	119	23	0	4	147	39	125	11	0	4	175	25	34	57	0	6	116	12	24	20	0	1	56	494
Hourly Total	45	474	85	0	32	604	147	492	45	0	32	684	87	112	225	0	33	424	76	99	54	0	15	229	1941
1:00 PM	17	97	20	0	10	134	33	117	10	0	5	160	20	25	53	0	5	98	19	20	15	0	3	54	446
1:15 PM	16	102	11	0	7	129	33	110	7	0	12	150	22	24	41	0	7	87	9	21	15	0	4	45	411
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	33	199	31	0	17	263	66	227	17	0	17	310	42	49	94	0	12	185	28	41	30	0	7	99	857
4:30 PM	22	112	33	0	6	167	47	176	13	0	2	236	23	39	60	0	0	122	29	46	25	0	3	100	625
4:45 PM	23	123	31	0	5	177	68	141	21	0	3	230	21	36	54	0	0	111	21	35	21	0	9	77	595
Hourly Total	45	235	64	0	11	344	115	317	34	0	5	466	44	75	114	0	0	233	50	81	46	0	12	177	1220
5:00 PM	15	120	36	0	3	171	53	165	14	1	6	233	23	32	61	0	0	116	20	36	15	0	8	71	591
5:15 PM	17	117	29	0	8	163	49	116	21	0	6	186	24	30	55	0	0	109	19	30	8	0	5	57	515
5:30 PM	23	124	32	0	5	179	63	143	14	0	4	220	27	36	49	0	2	112	17	44	8	0	10	69	580
5:45 PM	22	125	44	0	2	191	53	135	9	0	6	197	23	44	35	0	0	102	23	34	14	0	3	71	561

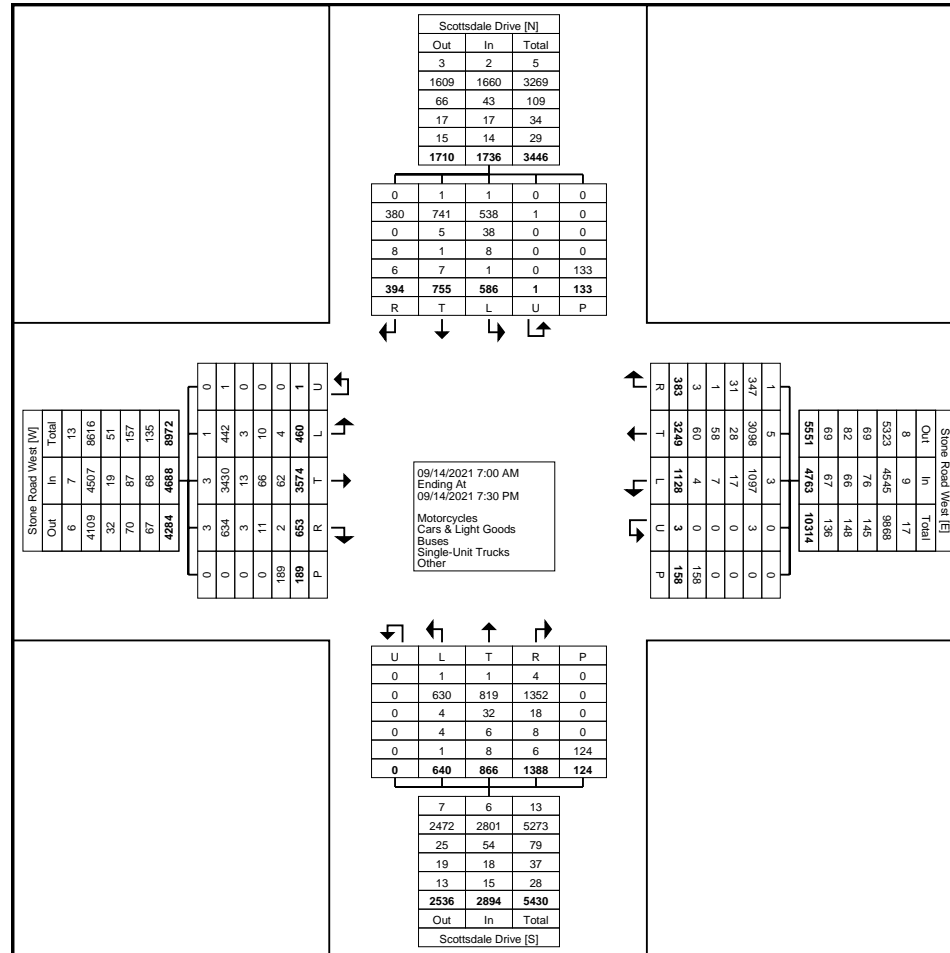
Hourly Total	77	486	141	0	18	704	218	559	58	1	22	836	97	142	200	0	2	439	79	144	45	0	26	268	2247
6:00 PM	16	95	33	0	10	144	50	133	17	0	3	200	33	29	45	0	7	107	24	25	23	0	7	72	523
6:15 PM	23	107	26	0	6	156	51	109	20	0	7	180	30	31	52	0	10	113	17	28	9	0	2	54	503
6:30 PM	14	113	20	0	9	147	46	105	16	1	6	168	20	15	53	0	6	88	27	27	12	0	8	66	469
6:45 PM	17	74	24	0	10	115	51	124	21	0	5	196	25	18	47	0	7	90	18	26	7	0	11	51	452
Hourly Total	70	389	103	0	35	562	198	471	74	1	21	744	108	93	197	0	30	398	86	106	51	0	28	243	1947
7:00 PM	10	86	23	0	6	119	49	106	24	1	8	180	28	28	35	0	3	91	20	33	10	0	6	63	453
7:15 PM	8	74	19	0	5	101	44	92	10	0	3	146	20	33	45	0	5	98	14	27	18	0	1	59	404
Grand Total	460	3574	653	1	189	4688	1128	3249	383	3	158	4763	640	866	1388	0	124	2894	586	755	394	1	133	1736	14081
Approach %	9.8	76.2	13.9	0.0	-	-	23.7	68.2	8.0	0.1	-	-	22.1	29.9	48.0	0.0	-	-	33.8	43.5	22.7	0.1	-	-	-
Total %	3.3	25.4	4.6	0.0	-	33.3	8.0	23.1	2.7	0.0	-	33.8	4.5	6.2	9.9	0.0	-	20.6	4.2	5.4	2.8	0.0	-	12.3	-
Motorcycles	1	3	3	0	-	7	3	5	1	0	-	9	1	1	4	0	-	6	1	1	0	0	-	2	24
% Motorcycles	0.2	0.1	0.5	0.0	-	0.1	0.3	0.2	0.3	0.0	-	0.2	0.2	0.1	0.3	-	-	0.2	0.2	0.1	0.0	0.0	-	0.1	0.2
Cars & Light Goods	442	3430	634	1	-	4507	1097	3098	347	3	-	4545	630	819	1352	0	-	2801	538	741	380	1	-	1660	13513
% Cars & Light Goods	96.1	96.0	97.1	100.0	-	96.1	97.3	95.4	90.6	100.0	-	95.4	98.4	94.6	97.4	-	-	96.8	91.8	98.1	96.4	100.0	-	95.6	96.0
Buses	3	13	3	0	-	19	17	28	31	0	-	76	4	32	18	0	-	54	38	5	0	0	-	43	192
% Buses	0.7	0.4	0.5	0.0	-	0.4	1.5	0.9	8.1	0.0	-	1.6	0.6	3.7	1.3	-	-	1.9	6.5	0.7	0.0	0.0	-	2.5	1.4
Single-Unit Trucks	10	66	11	0	-	87	7	58	1	0	-	66	4	6	8	0	-	18	8	1	8	0	-	17	188
% Single-Unit Trucks	2.2	1.8	1.7	0.0	-	1.9	0.6	1.8	0.3	0.0	-	1.4	0.6	0.7	0.6	-	-	0.6	1.4	0.1	2.0	0.0	-	1.0	1.3
Articulated Trucks	2	61	2	0	-	65	1	60	2	0	-	63	1	1	1	0	-	3	0	0	6	0	-	6	137
% Articulated Trucks	0.4	1.7	0.3	0.0	-	1.4	0.1	1.8	0.5	0.0	-	1.3	0.2	0.1	0.1	-	-	0.1	0.0	0.0	1.5	0.0	-	0.3	1.0
Bicycles on Road	2	1	0	0	-	3	3	0	1	0	-	4	0	7	5	0	-	12	1	7	0	0	-	8	27
% Bicycles on Road	0.4	0.0	0.0	0.0	-	0.1	0.3	0.0	0.3	0.0	-	0.1	0.0	0.8	0.4	-	-	0.4	0.2	0.9	0.0	0.0	-	0.5	0.2
Bicycles on Crosswalk	-	-	-	-	33	-	-	-	-	-	19	-	-	-	-	-	10	-	-	-	-	-	20	-	-
% Bicycles on Crosswalk	-	-	-	-	17.5	-	-	-	-	-	12.0	-	-	-	-	-	8.1	-	-	-	-	-	15.0	-	-
Pedestrians	-	-	-	-	156	-	-	-	-	-	139	-	-	-	-	-	114	-	-	-	-	-	113	-	-
% Pedestrians	-	-	-	-	82.5	-	-	-	-	-	88.0	-	-	-	-	-	91.9	-	-	-	-	-	85.0	-	-



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Count Name: Scottsdale Drive & Stone Road West (Weekday)  
Site Code: 210420  
Start Date: 09/14/2021  
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Turning Movement Data Plot



Paradigm Transportation Solutions Limited  
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Count Name: Scottsdale Drive & Stone Road  
West (Weekday)  
Site Code: 210420  
Start Date: 09/14/2021  
Page No: 4

### Turning Movement Peak Hour Data (8:30 AM)

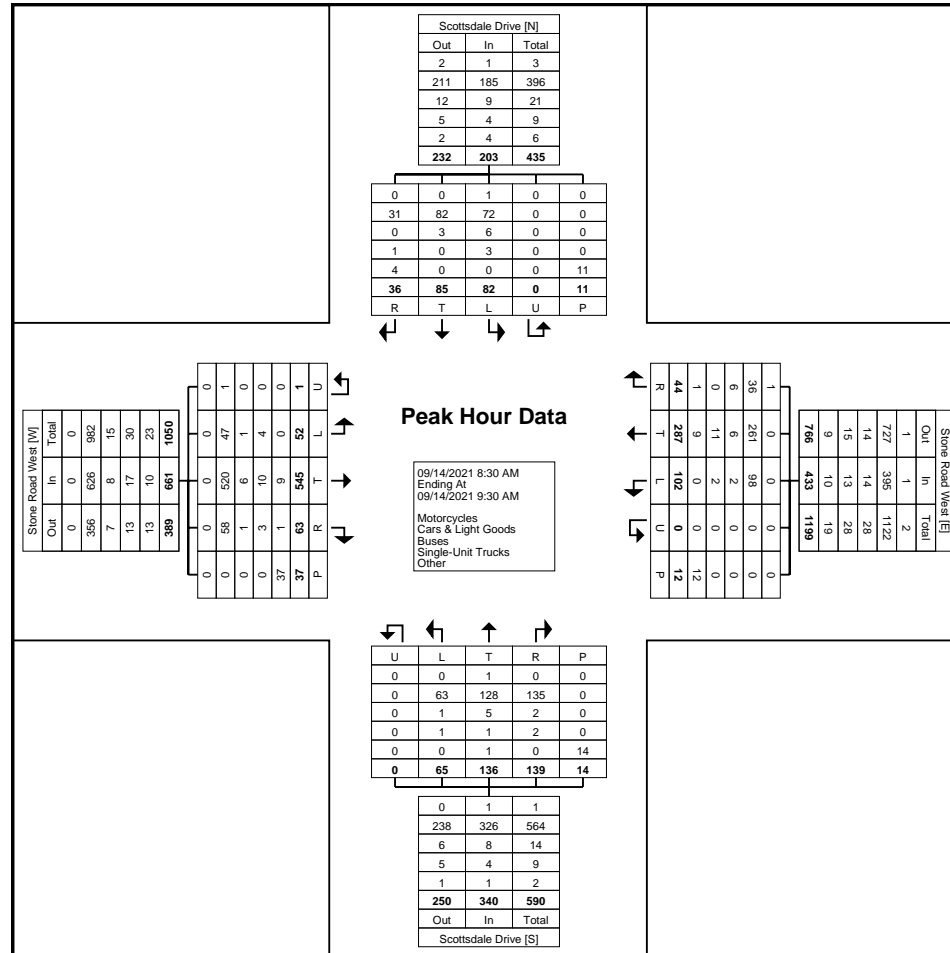
Start Time	Stone Road West Eastbound						Stone Road West Westbound						Scottsdale Drive Northbound						Scottsdale Drive Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
8:30 AM	14	139	13	0	18	166	23	73	12	0	6	108	17	40	31	0	4	88	16	15	16	0	4	47	409
8:45 AM	19	144	19	0	7	182	40	58	20	0	3	118	21	48	39	0	4	108	27	34	11	0	3	72	480
9:00 AM	7	115	23	1	6	146	24	87	7	0	1	118	12	25	34	0	3	71	19	23	8	0	1	50	385
9:15 AM	12	147	8	0	6	167	15	69	5	0	2	89	15	23	35	0	3	73	20	13	1	0	3	34	363
<b>Total</b>	<b>52</b>	<b>545</b>	<b>63</b>	<b>1</b>	<b>37</b>	<b>661</b>	<b>102</b>	<b>287</b>	<b>44</b>	<b>0</b>	<b>12</b>	<b>433</b>	<b>65</b>	<b>136</b>	<b>139</b>	<b>0</b>	<b>14</b>	<b>340</b>	<b>82</b>	<b>85</b>	<b>36</b>	<b>0</b>	<b>11</b>	<b>203</b>	<b>1637</b>
Approach %	7.9	82.5	9.5	0.2	-	-	23.6	66.3	10.2	0.0	-	-	19.1	40.0	40.9	0.0	-	-	40.4	41.9	17.7	0.0	-	-	-
Total %	3.2	33.3	3.8	0.1	-	40.4	6.2	17.5	2.7	0.0	-	26.5	4.0	8.3	8.5	0.0	-	20.8	5.0	5.2	2.2	0.0	-	12.4	-
PHF	0.684	0.927	0.685	0.250	-	0.908	0.638	0.825	0.550	0.000	-	0.917	0.774	0.708	0.891	0.000	-	0.787	0.759	0.625	0.563	0.000	-	0.705	0.853
Motorcycles	0	0	0	0	-	0	0	0	1	0	-	1	0	1	0	0	-	1	1	0	0	0	-	1	3
% Motorcycles	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	2.3	-	-	0.2	0.0	0.7	0.0	-	-	0.3	1.2	0.0	0.0	-	-	0.5	0.2
Cars & Light Goods	47	520	58	1	-	626	98	261	36	0	-	395	63	128	135	0	-	326	72	82	31	0	-	185	1532
% Cars & Light Goods	90.4	95.4	92.1	100.0	-	94.7	96.1	90.9	81.8	-	-	91.2	96.9	94.1	97.1	-	-	95.9	87.8	96.5	86.1	-	-	91.1	93.6
Buses	1	6	1	0	-	8	2	6	6	0	-	14	1	5	2	0	-	8	6	3	0	0	-	9	39
% Buses	1.9	1.1	1.6	0.0	-	1.2	2.0	2.1	13.6	-	-	3.2	1.5	3.7	1.4	-	-	2.4	7.3	3.5	0.0	-	-	4.4	2.4
Single-Unit Trucks	4	10	3	0	-	17	2	11	0	0	-	13	1	1	2	0	-	4	3	0	1	0	-	4	38
% Single-Unit Trucks	7.7	1.8	4.8	0.0	-	2.6	2.0	3.8	0.0	-	-	3.0	1.5	0.7	1.4	-	-	1.2	3.7	0.0	2.8	-	-	2.0	2.3
Articulated Trucks	0	9	1	0	-	10	0	9	1	0	-	10	0	0	0	0	-	0	0	0	4	0	-	4	24
% Articulated Trucks	0.0	1.7	1.6	0.0	-	1.5	0.0	3.1	2.3	-	-	2.3	0.0	0.0	0.0	-	-	0.0	0.0	0.0	11.1	-	-	2.0	1.5
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	0	-	1	0	0	0	0	-	0	1
% Bicycles on Road	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.7	0.0	-	-	0.3	0.0	0.0	0.0	-	-	0.0	0.1
Bicycles on Crosswalk	-	-	-	-	6	-	-	-	-	-	2	-	-	-	-	-	3	-	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	-	16.2	-	-	-	-	-	16.7	-	-	-	-	-	21.4	-	-	-	-	-	9.1	-	-
Pedestrians	-	-	-	-	31	-	-	-	-	-	10	-	-	-	-	-	11	-	-	-	-	-	10	-	-
% Pedestrians	-	-	-	-	83.8	-	-	-	-	-	83.3	-	-	-	-	-	78.6	-	-	-	-	-	90.9	-	-



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Count Name: Scottsdale Drive & Stone Road  
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Site Code: 210420  
Start Date: 09/14/2021  
Page No: 5



Turning Movement Peak Hour Data Plot (8:30 AM)





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Count Name: Scottsdale Drive & Stone Road  
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Start Date: 09/14/2021  
Page No: 6

### Turning Movement Peak Hour Data (12:00 PM)

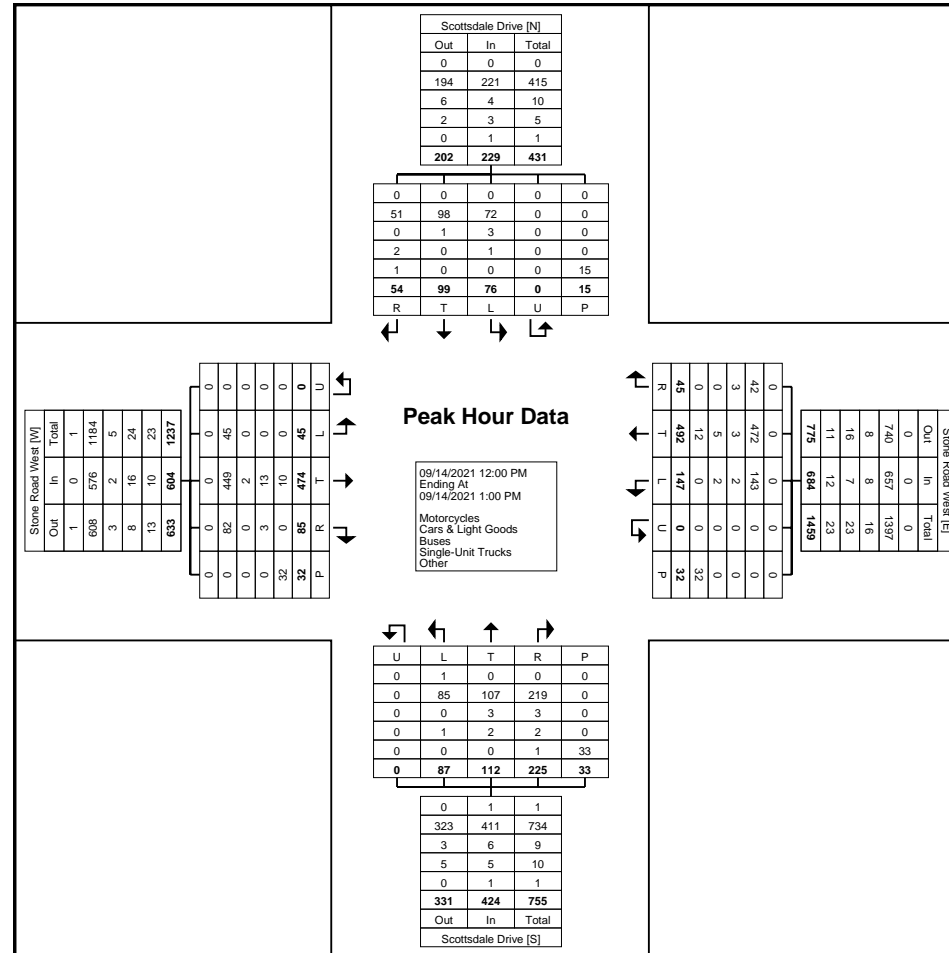
Start Time	Stone Road West Eastbound						Stone Road West Westbound						Scottsdale Drive Northbound						Scottsdale Drive Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
12:00 PM	14	123	27	0	17	164	30	130	12	0	14	172	21	24	52	0	14	97	16	26	12	0	5	54	487
12:15 PM	13	121	24	0	7	158	35	111	15	0	9	161	22	20	56	0	9	98	22	26	9	0	7	57	474
12:30 PM	13	111	11	0	4	135	43	126	7	0	5	176	19	34	60	0	4	113	26	23	13	0	2	62	486
12:45 PM	5	119	23	0	4	147	39	125	11	0	4	175	25	34	57	0	6	116	12	24	20	0	1	56	494
Total	45	474	85	0	32	604	147	492	45	0	32	684	87	112	225	0	33	424	76	99	54	0	15	229	1941
Approach %	7.5	78.5	14.1	0.0	-	-	21.5	71.9	6.6	0.0	-	-	20.5	26.4	53.1	0.0	-	-	33.2	43.2	23.6	0.0	-	-	-
Total %	2.3	24.4	4.4	0.0	-	31.1	7.6	25.3	2.3	0.0	-	35.2	4.5	5.8	11.6	0.0	-	21.8	3.9	5.1	2.8	0.0	-	11.8	-
PHF	0.804	0.963	0.787	0.000	-	0.921	0.855	0.946	0.750	0.000	-	0.972	0.870	0.824	0.938	0.000	-	0.914	0.731	0.952	0.675	0.000	-	0.923	0.982
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	1	0	0	0	-	1	0	0	0	0	-	0	1
% Motorcycles	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	1.1	0.0	0.0	-	-	0.2	0.0	0.0	0.0	-	-	0.0	0.1
Cars & Light Goods	45	449	82	0	-	576	143	472	42	0	-	657	85	107	219	0	-	411	72	98	51	0	-	221	1865
% Cars & Light Goods	100.0	94.7	96.5	-	-	95.4	97.3	95.9	93.3	-	-	96.1	97.7	95.5	97.3	-	-	96.9	94.7	99.0	94.4	-	-	96.5	96.1
Buses	0	2	0	0	-	2	2	3	3	0	-	8	0	3	3	0	-	6	3	1	0	0	-	4	20
% Buses	0.0	0.4	0.0	-	-	0.3	1.4	0.6	6.7	-	-	1.2	0.0	2.7	1.3	-	-	1.4	3.9	1.0	0.0	-	-	1.7	1.0
Single-Unit Trucks	0	13	3	0	-	16	2	5	0	0	-	7	1	2	2	0	-	5	1	0	2	0	-	3	31
% Single-Unit Trucks	0.0	2.7	3.5	-	-	2.6	1.4	1.0	0.0	-	-	1.0	1.1	1.8	0.9	-	-	1.2	1.3	0.0	3.7	-	-	1.3	1.6
Articulated Trucks	0	10	0	0	-	10	0	12	0	0	-	12	0	0	1	0	-	1	0	0	1	0	-	1	24
% Articulated Trucks	0.0	2.1	0.0	-	-	1.7	0.0	2.4	0.0	-	-	1.8	0.0	0.0	0.4	-	-	0.2	0.0	0.0	1.9	-	-	0.4	1.2
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	7	-	-	-	-	-	4	-	-	-	-	-	2	-	-	-	-	-	2	-	-
% Bicycles on Crosswalk	-	-	-	-	21.9	-	-	-	-	-	12.5	-	-	-	-	-	6.1	-	-	-	-	-	13.3	-	-
Pedestrians	-	-	-	-	25	-	-	-	-	-	28	-	-	-	-	-	31	-	-	-	-	-	13	-	-
% Pedestrians	-	-	-	-	78.1	-	-	-	-	-	87.5	-	-	-	-	-	93.9	-	-	-	-	-	86.7	-	-



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Turning Movement Peak Hour Data Plot (12:00 PM)



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Count Name: Scottsdale Drive & Stone Road  
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Site Code: 210420  
Start Date: 09/14/2021  
Page No: 8

### Turning Movement Peak Hour Data (4:30 PM)

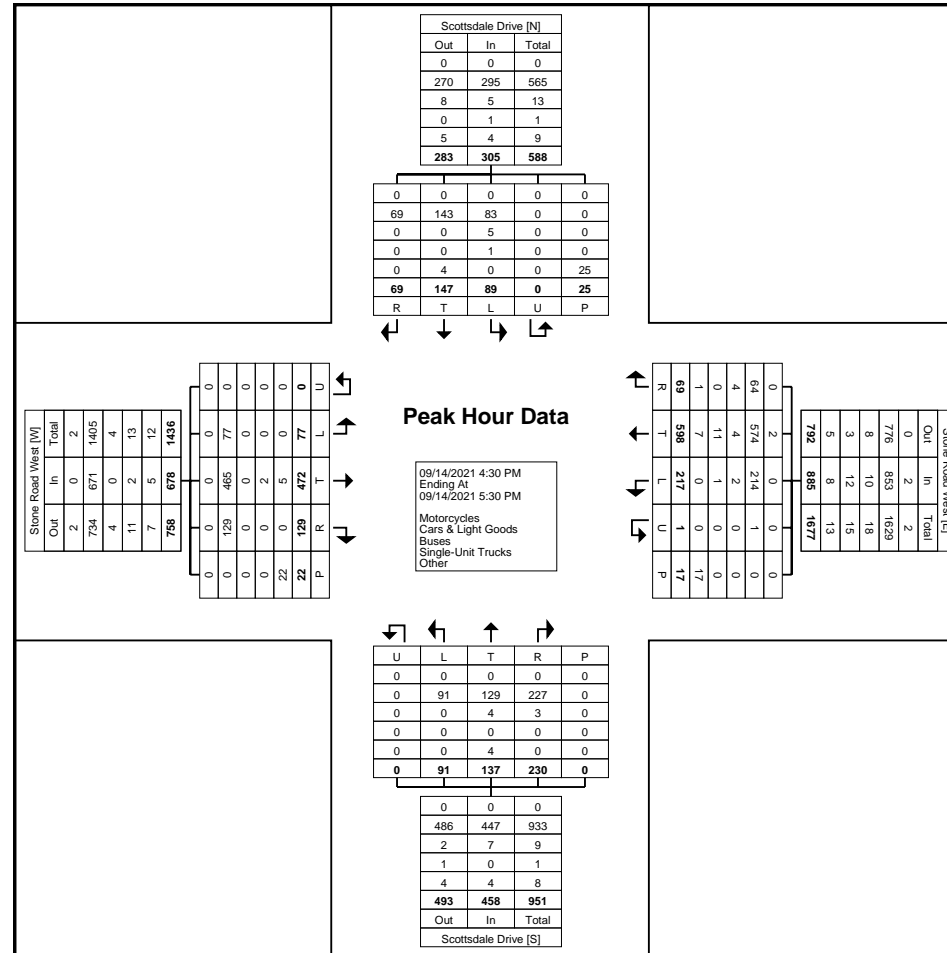
Start Time	Stone Road West Eastbound						Stone Road West Westbound						Scottsdale Drive Northbound						Scottsdale Drive Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:30 PM	22	112	33	0	6	167	47	176	13	0	2	236	23	39	60	0	0	122	29	46	25	0	3	100	625
4:45 PM	23	123	31	0	5	177	68	141	21	0	3	230	21	36	54	0	0	111	21	35	21	0	9	77	595
5:00 PM	15	120	36	0	3	171	53	165	14	1	6	233	23	32	61	0	0	116	20	36	15	0	8	71	591
5:15 PM	17	117	29	0	8	163	49	116	21	0	6	186	24	30	55	0	0	109	19	30	8	0	5	57	515
<b>Total</b>	<b>77</b>	<b>472</b>	<b>129</b>	<b>0</b>	<b>22</b>	<b>678</b>	<b>217</b>	<b>598</b>	<b>69</b>	<b>1</b>	<b>17</b>	<b>885</b>	<b>91</b>	<b>137</b>	<b>230</b>	<b>0</b>	<b>0</b>	<b>458</b>	<b>89</b>	<b>147</b>	<b>69</b>	<b>0</b>	<b>25</b>	<b>305</b>	<b>2326</b>
Approach %	11.4	69.6	19.0	0.0	-	-	24.5	67.6	7.8	0.1	-	-	19.9	29.9	50.2	0.0	-	-	29.2	48.2	22.6	0.0	-	-	-
Total %	3.3	20.3	5.5	0.0	-	29.1	9.3	25.7	3.0	0.0	-	38.0	3.9	5.9	9.9	0.0	-	19.7	3.8	6.3	3.0	0.0	-	13.1	-
PHF	0.837	0.959	0.896	0.000	-	0.958	0.798	0.849	0.821	0.250	-	0.938	0.948	0.878	0.943	0.000	-	0.939	0.767	0.799	0.690	0.000	-	0.763	0.930
Motorcycles	0	0	0	0	-	0	0	2	0	0	-	2	0	0	0	0	-	0	0	0	0	0	-	0	2
% Motorcycles	0.0	0.0	0.0	-	-	0.0	0.0	0.3	0.0	0.0	-	0.2	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.1
Cars & Light Goods	77	465	129	0	-	671	214	574	64	1	-	853	91	129	227	0	-	447	83	143	69	0	-	295	2266
% Cars & Light Goods	100.0	98.5	100.0	-	-	99.0	98.6	96.0	92.8	100.0	-	96.4	100.0	94.2	98.7	-	-	97.6	93.3	97.3	100.0	-	-	96.7	97.4
Buses	0	0	0	0	-	0	2	4	4	0	-	10	0	4	3	0	-	7	5	0	0	0	-	5	22
% Buses	0.0	0.0	0.0	-	-	0.0	0.9	0.7	5.8	0.0	-	1.1	0.0	2.9	1.3	-	-	1.5	5.6	0.0	0.0	-	-	1.6	0.9
Single-Unit Trucks	0	2	0	0	-	2	1	11	0	0	-	12	0	0	0	0	-	0	1	0	0	0	-	1	15
% Single-Unit Trucks	0.0	0.4	0.0	-	-	0.3	0.5	1.8	0.0	0.0	-	1.4	0.0	0.0	0.0	-	-	0.0	1.1	0.0	0.0	-	-	0.3	0.6
Articulated Trucks	0	5	0	0	-	5	0	7	0	0	-	7	0	0	0	0	-	0	0	0	0	0	-	0	12
% Articulated Trucks	0.0	1.1	0.0	-	-	0.7	0.0	1.2	0.0	0.0	-	0.8	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.5
Bicycles on Road	0	0	0	0	-	0	0	0	1	0	-	1	0	4	0	0	-	4	0	4	0	0	-	4	9
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	1.4	0.0	-	0.1	0.0	2.9	0.0	-	-	0.9	0.0	2.7	0.0	-	-	1.3	0.4
Bicycles on Crosswalk	-	-	-	-	6	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	5	-	-
% Bicycles on Crosswalk	-	-	-	-	27.3	-	-	-	-	-	11.8	-	-	-	-	-	-	-	-	-	-	-	20.0	-	-
Pedestrians	-	-	-	-	16	-	-	-	-	-	15	-	-	-	-	-	0	-	-	-	-	-	20	-	-
% Pedestrians	-	-	-	-	72.7	-	-	-	-	-	88.2	-	-	-	-	-	-	-	-	-	-	-	80.0	-	-



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

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

Count Name: Scottsdale Drive & Stone Road  
West (Weekday)  
Site Code: 210420  
Start Date: 09/14/2021  
Page No: 9



Turning Movement Peak Hour Data Plot (4:30 PM)



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

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

Count Name: Hanlon Parkway & Stone Road -  
Weekday  
Site Code: 220563  
Start Date: 03/23/2023  
Page No: 1

### Turning Movement Data

Start Time	Stone Road Eastbound						Stone Road Westbound						Hanlon Parkway Northbound						Hanlon Parkway Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	3	9	14	0	0	26	39	1	24	0	0	64	1	201	34	0	0	236	23	239	1	0	0	263	589
7:15 AM	0	10	10	0	0	20	31	2	37	0	0	70	3	213	37	0	0	253	22	244	0	0	1	266	609
7:30 AM	4	8	11	0	0	23	43	7	38	0	0	88	2	252	54	0	0	308	41	243	2	0	0	286	705
7:45 AM	6	14	14	0	0	34	42	5	36	0	0	83	0	294	88	0	0	382	60	279	1	0	0	340	839
Hourly Total	13	41	49	0	0	103	155	15	135	0	0	305	6	960	213	0	0	1179	146	1005	4	0	1	1155	2742
8:00 AM	3	20	4	0	0	27	52	4	31	0	0	87	4	253	64	0	0	321	53	249	5	0	1	307	742
8:15 AM	9	27	8	0	0	44	46	16	38	0	0	100	1	236	108	0	0	345	69	265	4	0	0	338	827
8:30 AM	8	26	16	0	0	50	55	13	48	0	0	116	3	247	83	0	0	333	60	280	4	0	1	344	843
8:45 AM	5	25	12	0	0	42	44	10	42	0	0	96	1	270	113	0	0	384	75	257	1	0	0	333	855
Hourly Total	25	98	40	0	0	163	197	43	159	0	0	399	9	1006	368	0	0	1383	257	1051	14	0	2	1322	3267
9:00 AM	3	14	2	0	0	19	42	14	46	0	0	102	1	191	82	0	0	274	70	241	1	0	0	312	707
9:15 AM	2	9	5	0	0	16	29	12	30	0	0	71	0	189	68	0	0	257	58	216	2	0	0	276	620
9:30 AM	7	12	1	0	0	20	38	12	33	0	0	83	2	188	72	0	0	262	54	157	1	1	0	213	578
9:45 AM	4	10	4	0	0	18	39	6	36	0	0	81	3	215	75	0	0	293	66	173	2	0	0	241	633
Hourly Total	16	45	12	0	0	73	148	44	145	0	0	337	6	783	297	0	0	1086	248	787	6	1	0	1042	2538
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30 AM	3	22	8	0	0	33	69	22	68	0	0	159	6	165	55	0	0	226	65	170	3	0	0	238	656
11:45 AM	3	22	1	0	0	26	45	20	70	0	0	135	5	202	78	0	0	285	76	210	1	0	0	287	733
Hourly Total	6	44	9	0	0	59	114	42	138	0	0	294	11	367	133	0	0	511	141	380	4	0	0	525	1389
12:00 PM	3	18	6	0	0	27	70	25	59	0	0	154	7	191	71	0	0	269	72	193	3	0	1	268	718
12:15 PM	8	22	4	0	0	34	56	23	66	0	0	145	1	208	75	0	0	284	81	188	2	0	2	271	734
12:30 PM	3	19	4	0	0	26	64	18	67	0	0	149	4	201	48	0	0	253	48	211	3	1	0	263	691
12:45 PM	5	19	4	0	0	28	63	14	63	0	0	140	3	209	49	0	0	261	69	183	3	0	1	255	684
Hourly Total	19	78	18	0	0	115	253	80	255	0	0	588	15	809	243	0	0	1067	270	775	11	1	4	1057	2827
1:00 PM	6	22	3	0	0	31	54	20	57	0	0	131	5	173	62	0	0	240	66	263	2	0	1	331	733
1:15 PM	4	18	4	0	0	26	65	15	70	0	0	150	3	168	46	0	0	217	60	195	1	0	31	256	649
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	10	40	7	0	0	57	119	35	127	0	0	281	8	341	108	0	0	457	126	458	3	0	32	587	1382
4:30 PM	8	17	7	0	0	32	80	34	94	0	0	208	12	300	73	0	0	385	90	279	5	0	6	374	999
4:45 PM	4	12	8	0	0	24	86	31	76	0	0	193	3	312	65	0	0	380	94	376	6	0	1	476	1073
Hourly Total	12	29	15	0	0	56	166	65	170	0	0	401	15	612	138	0	0	765	184	655	11	0	7	850	2072
5:00 PM	5	27	6	0	0	38	75	30	87	0	0	192	7	294	78	0	0	379	95	319	3	0	3	417	1026
5:15 PM	2	24	9	0	0	35	87	32	61	0	0	180	11	311	87	0	0	409	89	304	4	0	2	397	1021
5:30 PM	5	19	6	0	0	30	79	22	79	0	0	180	9	271	71	0	0	351	80	252	8	0	4	340	901
5:45 PM	7	21	8	0	0	36	61	22	89	0	0	172	14	260	65	0	0	339	84	231	4	0	3	319	866

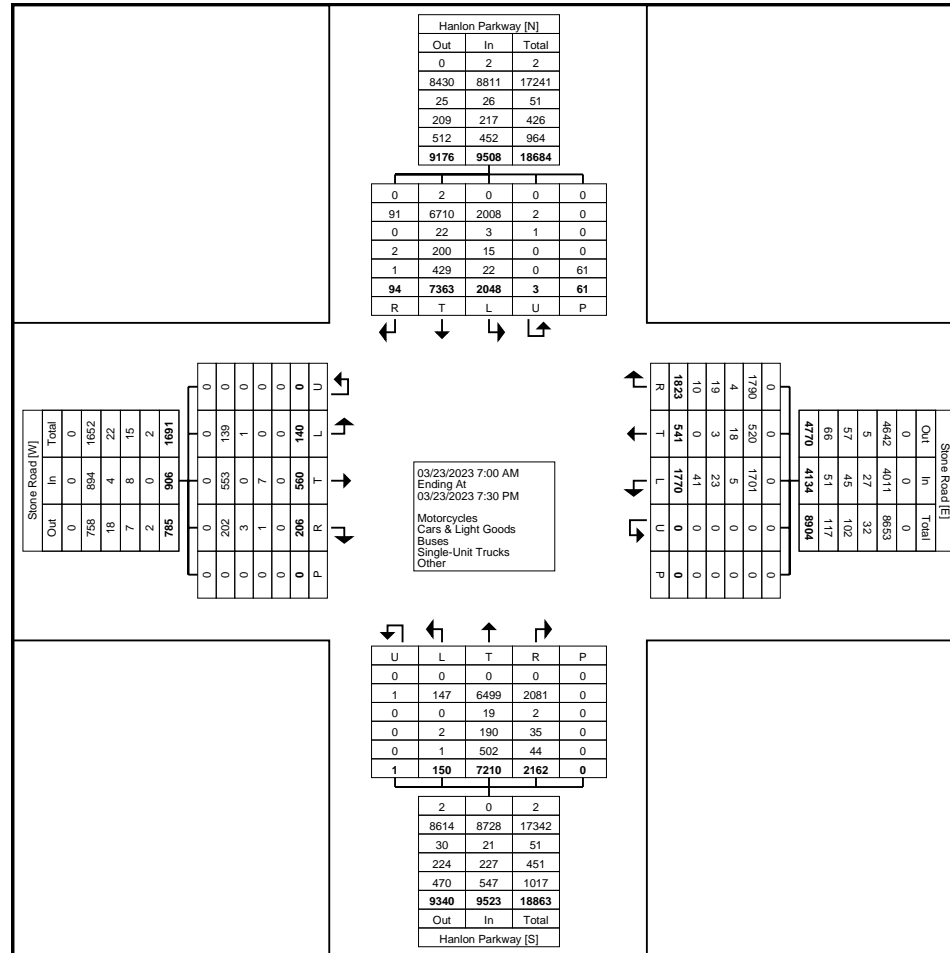
Hourly Total	19	91	29	0	0	139	302	106	316	0	0	724	41	1136	301	0	0	1478	348	1106	19	0	12	1473	3814
6:00 PM	3	11	5	0	0	19	65	18	66	0	0	149	5	231	73	0	0	309	78	245	7	0	1	330	807
6:15 PM	2	18	6	0	0	26	60	14	61	0	0	135	9	197	62	1	0	269	43	232	3	0	0	278	708
6:30 PM	5	15	5	0	0	25	54	19	63	0	0	136	7	190	53	0	0	250	47	184	1	0	0	232	643
6:45 PM	3	19	5	0	0	27	44	20	60	0	0	124	5	236	60	0	0	301	51	163	3	1	0	218	670
Hourly Total	13	63	21	0	0	97	223	71	250	0	0	544	26	854	248	1	0	1129	219	824	14	1	1	1058	2828
7:00 PM	3	20	2	0	0	25	54	22	70	0	0	146	7	166	58	0	0	231	54	159	2	0	1	215	617
7:15 PM	4	11	4	0	0	19	39	18	58	0	0	115	6	176	55	0	0	237	55	163	6	0	1	224	595
Grand Total	140	560	206	0	0	906	1770	541	1823	0	0	4134	150	7210	2162	1	0	9523	2048	7363	94	3	61	9508	24071
Approach %	15.5	61.8	22.7	0.0	-	-	42.8	13.1	44.1	0.0	-	-	1.6	75.7	22.7	0.0	-	-	21.5	77.4	1.0	0.0	-	-	-
Total %	0.6	2.3	0.9	0.0	-	3.8	7.4	2.2	7.6	0.0	-	17.2	0.6	30.0	9.0	0.0	-	39.6	8.5	30.6	0.4	0.0	-	39.5	-
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	2	0	0	-	2	2
% Motorcycles	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	0.0	-	0.0	0.0
Cars & Light Goods	139	553	202	0	-	894	1701	520	1790	0	-	4011	147	6499	2081	1	-	8728	2008	6710	91	2	-	8811	22444
% Cars & Light Goods	99.3	98.8	98.1	-	-	98.7	96.1	96.1	98.2	-	-	97.0	98.0	90.1	96.3	100.0	-	91.7	98.0	91.1	96.8	66.7	-	92.7	93.2
Buses	1	0	3	0	-	4	5	18	4	0	-	27	0	19	2	0	-	21	3	22	0	1	-	26	78
% Buses	0.7	0.0	1.5	-	-	0.4	0.3	3.3	0.2	-	-	0.7	0.0	0.3	0.1	0.0	-	0.2	0.1	0.3	0.0	33.3	-	0.3	0.3
Single-Unit Trucks	0	7	1	0	-	8	23	3	19	0	-	45	2	190	35	0	-	227	15	200	2	0	-	217	497
% Single-Unit Trucks	0.0	1.3	0.5	-	-	0.9	1.3	0.6	1.0	-	-	1.1	1.3	2.6	1.6	0.0	-	2.4	0.7	2.7	2.1	0.0	-	2.3	2.1
Articulated Trucks	0	0	0	0	-	0	41	0	10	0	-	51	1	502	44	0	-	547	22	429	1	0	-	452	1050
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	2.3	0.0	0.5	-	-	1.2	0.7	7.0	2.0	0.0	-	5.7	1.1	5.8	1.1	0.0	-	4.8	4.4
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-	2	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.3	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-	59	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	96.7	-	-



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8  
519-896-3163 cbowness@pts1.com

Count Name: Hanlon Parkway & Stone Road - Weekday  
Site Code: 220563  
Start Date: 03/23/2023  
Page No: 3



Turning Movement Data Plot



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

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

Count Name: Hanlon Parkway & Stone Road -  
Weekday  
Site Code: 220563  
Start Date: 03/23/2023  
Page No: 4

### Turning Movement Peak Hour Data (8:00 AM)

Start Time	Stone Road Eastbound						Stone Road Westbound						Hanlon Parkway Northbound						Hanlon Parkway Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
8:00 AM	3	20	4	0	0	27	52	4	31	0	0	87	4	253	64	0	0	321	53	249	5	0	1	307	742
8:15 AM	9	27	8	0	0	44	46	16	38	0	0	100	1	236	108	0	0	345	69	265	4	0	0	338	827
8:30 AM	8	26	16	0	0	50	55	13	48	0	0	116	3	247	83	0	0	333	60	280	4	0	1	344	843
8:45 AM	5	25	12	0	0	42	44	10	42	0	0	96	1	270	113	0	0	384	75	257	1	0	0	333	855
Total	25	98	40	0	0	163	197	43	159	0	0	399	9	1006	368	0	0	1383	257	1051	14	0	2	1322	3267
Approach %	15.3	60.1	24.5	0.0	-	-	49.4	10.8	39.8	0.0	-	-	0.7	72.7	26.6	0.0	-	-	19.4	79.5	1.1	0.0	-	-	-
Total %	0.8	3.0	1.2	0.0	-	5.0	6.0	1.3	4.9	0.0	-	12.2	0.3	30.8	11.3	0.0	-	42.3	7.9	32.2	0.4	0.0	-	40.5	-
PHF	0.694	0.907	0.625	0.000	-	0.815	0.895	0.672	0.828	0.000	-	0.860	0.563	0.931	0.814	0.000	-	0.900	0.857	0.938	0.700	0.000	-	0.961	0.955
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Motorcycles	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	0.0
Cars & Light Goods	24	98	37	0	-	159	187	40	153	0	-	380	8	882	357	0	-	1247	250	946	13	0	-	1209	2995
% Cars & Light Goods	96.0	100.0	92.5	-	-	97.5	94.9	93.0	96.2	-	-	95.2	88.9	87.7	97.0	-	-	90.2	97.3	90.0	92.9	-	-	91.5	91.7
Buses	1	0	3	0	-	4	1	3	2	0	-	6	0	11	0	0	-	11	2	8	0	0	-	10	31
% Buses	4.0	0.0	7.5	-	-	2.5	0.5	7.0	1.3	-	-	1.5	0.0	1.1	0.0	-	-	0.8	0.8	0.8	0.0	-	-	0.8	0.9
Single-Unit Trucks	0	0	0	0	-	0	2	0	3	0	-	5	0	44	4	0	-	48	3	36	0	0	-	39	92
% Single-Unit Trucks	0.0	0.0	0.0	-	-	0.0	1.0	0.0	1.9	-	-	1.3	0.0	4.4	1.1	-	-	3.5	1.2	3.4	0.0	-	-	3.0	2.8
Articulated Trucks	0	0	0	0	-	0	7	0	1	0	-	8	1	69	7	0	-	77	2	61	1	0	-	64	149
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	3.6	0.0	0.6	-	-	2.0	11.1	6.9	1.9	-	-	5.6	0.8	5.8	7.1	-	-	4.8	4.6
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

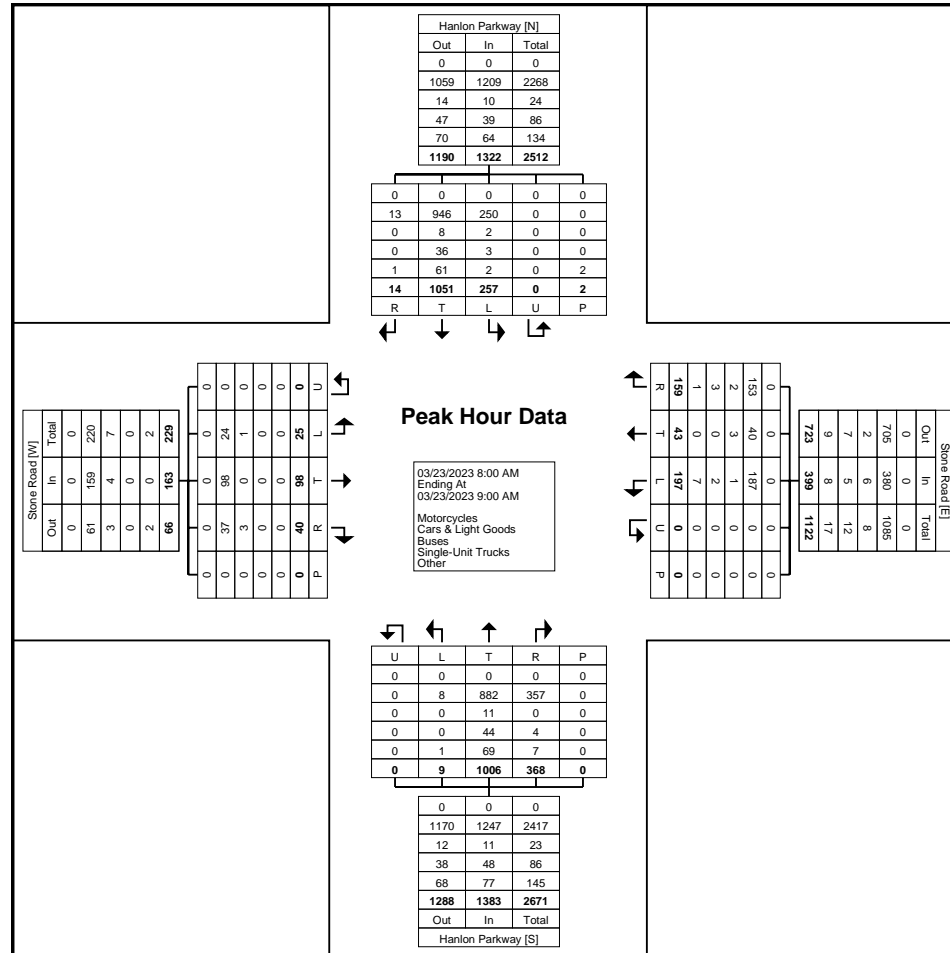




Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

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

Count Name: Hanlon Parkway & Stone Road -  
Weekday  
Site Code: 220563  
Start Date: 03/23/2023  
Page No: 5



Turning Movement Peak Hour Data Plot (8:00 AM)



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

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

Count Name: Hanlon Parkway & Stone Road -  
Weekday  
Site Code: 220563  
Start Date: 03/23/2023  
Page No: 6

### Turning Movement Peak Hour Data (11:45 AM)

Start Time	Stone Road Eastbound						Stone Road Westbound						Hanlon Parkway Northbound						Hanlon Parkway Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
11:45 AM	3	22	1	0	0	26	45	20	70	0	0	135	5	202	78	0	0	285	76	210	1	0	0	287	733
12:00 PM	3	18	6	0	0	27	70	25	59	0	0	154	7	191	71	0	0	269	72	193	3	0	1	268	718
12:15 PM	8	22	4	0	0	34	56	23	66	0	0	145	1	208	75	0	0	284	81	188	2	0	2	271	734
12:30 PM	3	19	4	0	0	26	64	18	67	0	0	149	4	201	48	0	0	253	48	211	3	1	0	263	691
<b>Total</b>	17	81	15	0	0	113	235	86	262	0	0	583	17	802	272	0	0	1091	277	802	9	1	3	1089	2876
Approach %	15.0	71.7	13.3	0.0	-	-	40.3	14.8	44.9	0.0	-	-	1.6	73.5	24.9	0.0	-	-	25.4	73.6	0.8	0.1	-	-	-
Total %	0.6	2.8	0.5	0.0	-	3.9	8.2	3.0	9.1	0.0	-	20.3	0.6	27.9	9.5	0.0	-	37.9	9.6	27.9	0.3	0.0	-	37.9	-
PHF	0.531	0.920	0.625	0.000	-	0.831	0.839	0.860	0.936	0.000	-	0.946	0.607	0.964	0.872	0.000	-	0.957	0.855	0.950	0.750	0.250	-	0.949	0.980
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	2	0	0	-	2	2
% Motorcycles	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	0.2	0.0	0.0	-	0.2	0.1
Cars & Light Goods	17	80	15	0	-	112	225	83	257	0	-	565	16	680	259	0	-	955	274	692	9	1	-	976	2608
% Cars & Light Goods	100.0	98.8	100.0	-	-	99.1	95.7	96.5	98.1	-	-	96.9	94.1	84.8	95.2	-	-	87.5	98.9	86.3	100.0	100.0	-	89.6	90.7
Buses	0	0	0	0	-	0	1	2	0	0	-	3	0	0	1	0	-	1	0	0	0	0	-	0	4
% Buses	0.0	0.0	0.0	-	-	0.0	0.4	2.3	0.0	-	-	0.5	0.0	0.0	0.4	-	-	0.1	0.0	0.0	0.0	0.0	-	0.0	0.1
Single-Unit Trucks	0	1	0	0	-	1	5	1	4	0	-	10	1	36	9	0	-	46	3	38	0	0	-	41	98
% Single-Unit Trucks	0.0	1.2	0.0	-	-	0.9	2.1	1.2	1.5	-	-	1.7	5.9	4.5	3.3	-	-	4.2	1.1	4.7	0.0	0.0	-	3.8	3.4
Articulated Trucks	0	0	0	0	-	0	4	0	1	0	-	5	0	86	3	0	-	89	0	70	0	0	-	70	164
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	1.7	0.0	0.4	-	-	0.9	0.0	10.7	1.1	-	-	8.2	0.0	8.7	0.0	0.0	-	6.4	5.7
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	3	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-





Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8  
519-896-3163 cbowness@pts1.com

Count Name: Hanlon Parkway & Stone Road -  
Weekday  
Site Code: 220563  
Start Date: 03/23/2023  
Page No: 8

### Turning Movement Peak Hour Data (4:30 PM)

Start Time	Stone Road Eastbound						Stone Road Westbound						Hanlon Parkway Northbound						Hanlon Parkway Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:30 PM	8	17	7	0	0	32	80	34	94	0	0	208	12	300	73	0	0	385	90	279	5	0	6	374	999
4:45 PM	4	12	8	0	0	24	86	31	76	0	0	193	3	312	65	0	0	380	94	376	6	0	1	476	1073
5:00 PM	5	27	6	0	0	38	75	30	87	0	0	192	7	294	78	0	0	379	95	319	3	0	3	417	1026
5:15 PM	2	24	9	0	0	35	87	32	61	0	0	180	11	311	87	0	0	409	89	304	4	0	2	397	1021
Total	19	80	30	0	0	129	328	127	318	0	0	773	33	1217	303	0	0	1553	368	1278	18	0	12	1664	4119
Approach %	14.7	62.0	23.3	0.0	-	-	42.4	16.4	41.1	0.0	-	-	2.1	78.4	19.5	0.0	-	-	22.1	76.8	1.1	0.0	-	-	-
Total %	0.5	1.9	0.7	0.0	-	3.1	8.0	3.1	7.7	0.0	-	18.8	0.8	29.5	7.4	0.0	-	37.7	8.9	31.0	0.4	0.0	-	40.4	-
PHF	0.594	0.741	0.833	0.000	-	0.849	0.943	0.934	0.846	0.000	-	0.929	0.688	0.975	0.871	0.000	-	0.949	0.968	0.850	0.750	0.000	-	0.874	0.960
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Motorcycles	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	0.0
Cars & Light Goods	19	79	29	0	-	127	326	125	317	0	-	768	33	1163	297	0	-	1493	367	1229	18	0	-	1614	4002
% Cars & Light Goods	100.0	98.8	96.7	-	-	98.4	99.4	98.4	99.7	-	-	99.4	100.0	95.6	98.0	-	-	96.1	99.7	96.2	100.0	-	-	97.0	97.2
Buses	0	0	0	0	-	0	0	2	0	0	-	2	0	0	1	0	-	1	0	0	0	0	-	0	3
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	1.6	0.0	-	-	0.3	0.0	0.0	0.3	-	-	0.1	0.0	0.0	0.0	-	-	0.0	0.1
Single-Unit Trucks	0	1	1	0	-	2	0	0	1	0	-	1	0	14	2	0	-	16	0	15	0	0	-	15	34
% Single-Unit Trucks	0.0	1.3	3.3	-	-	1.6	0.0	0.0	0.3	-	-	0.1	0.0	1.2	0.7	-	-	1.0	0.0	1.2	0.0	-	-	0.9	0.8
Articulated Trucks	0	0	0	0	-	0	2	0	0	0	-	2	0	40	3	0	-	43	1	34	0	0	-	35	80
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.6	0.0	0.0	-	-	0.3	0.0	3.3	1.0	-	-	2.8	0.3	2.7	0.0	-	-	2.1	1.9
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	12	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-





Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

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

Count Name: 601 Scottsdale Drive North  
Driveway  
Site Code: 220563  
Start Date: 03/07/2023  
Page No: 1

**Direction (Westbound)**

Start Time	Motorcycles	Cars & Light Goods	Buses	Single-Unit Trucks	Articulated Trucks	Bicycles on Road	Total
3:00 PM	0	0	0	1	0	0	1
3:15 PM	0	1	0	0	0	0	1
3:30 PM	0	1	0	0	0	0	1
3:45 PM	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0
4:30 PM	0	2	0	0	0	0	2
4:45 PM	0	1	0	0	0	0	1
5:00 PM	0	0	0	0	0	0	0
5:15 PM	0	1	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0
5:45 PM	0	1	0	0	0	0	1
6:00 PM	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0
6:30 PM	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0
7:00 PM	0	1	0	0	0	0	1
7:15 PM	0	0	0	0	0	0	0
7:30 PM	0	0	0	0	0	0	0
7:45 PM	0	2	0	0	0	0	2
8:00 PM	0	2	0	0	0	0	2
8:15 PM	0	0	0	0	0	0	0
8:30 PM	0	0	0	0	0	0	0
8:45 PM	0	0	0	0	0	0	0
9:00 PM	0	1	0	0	0	0	1
9:15 PM	0	1	0	0	0	0	1
9:30 PM	0	0	0	0	0	0	0
9:45 PM	0	0	0	0	0	0	0
10:00 PM	0	0	0	0	0	0	0
10:15 PM	0	0	0	0	0	0	0
10:30 PM	0	0	0	0	0	0	0
10:45 PM	0	0	0	0	0	0	0
11:00 PM	0	2	0	0	0	0	2
11:15 PM	0	0	0	0	0	0	0
11:30 PM	0	0	0	0	0	0	0
11:45 PM	0	0	0	0	0	0	0
03/08/2023 12:00 AM	0	0	0	0	0	0	0
12:15 AM	0	0	0	0	0	0	0
12:30 AM	0	0	0	0	0	0	0

12:45 AM	0	0	0	0	0	0	0
1:00 AM	0	0	0	0	0	0	0
1:15 AM	0	0	0	0	0	0	0
1:30 AM	0	0	0	0	0	0	0
1:45 AM	0	1	0	0	0	0	1
2:00 AM	0	0	0	0	0	0	0
2:15 AM	0	0	0	0	0	0	0
2:30 AM	0	0	0	0	0	0	0
2:45 AM	0	1	0	0	0	0	1
3:00 AM	0	1	0	0	0	0	1
3:15 AM	0	0	0	0	0	0	0
3:30 AM	0	0	0	0	0	0	0
3:45 AM	0	0	0	0	0	0	0
4:00 AM	0	1	0	0	0	0	1
4:15 AM	0	0	0	0	0	0	0
4:30 AM	0	0	0	0	0	0	0
4:45 AM	0	0	0	0	0	0	0
5:00 AM	0	0	0	0	0	0	0
5:15 AM	0	1	0	0	1	0	2
5:30 AM	0	1	0	0	0	0	1
5:45 AM	0	0	0	0	0	0	0
6:00 AM	0	0	0	0	0	0	0
6:15 AM	0	2	0	0	0	0	2
6:30 AM	0	1	0	0	0	0	1
6:45 AM	0	1	0	0	0	0	1
7:00 AM	0	3	0	0	0	0	3
7:15 AM	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0
8:15 AM	0	1	0	0	0	0	1
8:30 AM	0	1	0	1	0	0	2
8:45 AM	0	2	0	0	0	0	2
9:00 AM	0	1	0	0	0	0	1
9:15 AM	0	0	0	0	0	0	0
9:30 AM	0	3	0	1	0	0	4
9:45 AM	0	0	0	0	0	0	0
10:00 AM	0	1	0	0	0	0	1
10:15 AM	0	2	0	0	0	0	2
10:30 AM	0	2	0	0	0	0	2
10:45 AM	0	0	0	0	0	0	0
11:00 AM	0	1	0	0	0	0	1
11:15 AM	0	0	0	0	0	0	0
11:30 AM	0	1	0	0	0	0	1
11:45 AM	0	0	0	0	0	0	0
12:00 PM	0	2	0	0	0	0	2
12:15 PM	0	1	0	0	0	0	1
12:30 PM	0	1	0	0	0	0	1
12:45 PM	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0
1:15 PM	0	1	0	0	0	0	1
1:30 PM	0	1	0	0	0	0	1

1:45 PM	0	0	0	1	0	0	1
2:00 PM	0	1	0	0	0	0	1
2:15 PM	0	0	0	0	0	0	0
2:30 PM	0	2	0	0	0	0	2
2:45 PM	0	0	0	0	0	0	0
Total	0	53	0	4	1	0	58
Total %	0.0	91.4	0.0	6.9	1.7	0.0	100.0
AM Times	12:00 AM	8:45 AM	12:00 AM	7:45 AM	4:45 AM	12:00 AM	8:45 AM
AM Peaks	0	6	0	1	1	0	7
PM Times	3:00 PM	3:00 PM	3:00 PM	1:45 PM	3:00 PM	3:00 PM	1:45 PM
PM Peaks	0	2	0	1	0	0	4





Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

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

Count Name: 601 Scottsdale Drive North  
Driveway  
Site Code: 220563  
Start Date: 03/07/2023  
Page No: 4

**Direction (Eastbound)**

Start Time	Motorcycles	Cars & Light Goods	Buses	Single-Unit Trucks	Articulated Trucks	Bicycles on Road	Total
3:00 PM	0	2	0	1	0	0	3
3:15 PM	0	1	0	0	0	0	1
3:30 PM	0	1	0	0	0	0	1
3:45 PM	0	2	0	0	0	0	2
4:00 PM	0	1	0	0	0	0	1
4:15 PM	0	2	0	0	0	0	2
4:30 PM	0	1	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0
5:00 PM	0	1	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0
5:45 PM	0	2	0	0	0	0	2
6:00 PM	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0
6:30 PM	0	1	0	0	0	0	1
6:45 PM	0	0	0	0	0	0	0
7:00 PM	0	0	0	0	0	0	0
7:15 PM	0	1	0	0	0	0	1
7:30 PM	0	0	0	0	0	0	0
7:45 PM	0	2	0	0	0	0	2
8:00 PM	0	0	0	0	0	0	0
8:15 PM	0	0	0	0	0	0	0
8:30 PM	0	0	0	0	0	0	0
8:45 PM	0	0	0	0	0	0	0
9:00 PM	0	0	0	0	0	0	0
9:15 PM	0	0	0	0	0	0	0
9:30 PM	0	0	0	0	0	0	0
9:45 PM	0	0	0	0	0	0	0
10:00 PM	0	0	0	0	0	0	0
10:15 PM	0	0	0	0	0	0	0
10:30 PM	0	0	0	0	0	0	0
10:45 PM	0	1	0	0	0	0	1
11:00 PM	0	1	0	0	0	0	1
11:15 PM	0	0	0	0	0	0	0
11:30 PM	0	0	0	0	0	0	0
11:45 PM	0	0	0	0	0	0	0
03/08/2023 12:00 AM	0	0	0	0	0	0	0
12:15 AM	0	0	0	0	0	0	0
12:30 AM	0	0	0	0	0	0	0

12:45 AM  
1:00 AM  
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12:00 PM  
12:15 PM  
12:30 PM  
12:45 PM  
1:00 PM  
1:15 PM  
1:30 PM

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	1	0	0	0	0	1
0	1	0	0	0	0	1
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0	1	0	0	0	0	1
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0	1	0	0	0	0	1
0	1	0	0	0	0	1
0	0	0	0	0	0	0
0	1	0	0	0	0	1
0	0	0	0	0	0	0
0	2	0	0	0	0	2
0	0	0	0	0	0	0
0	1	0	0	0	0	1
0	1	0	0	0	0	1
0	0	0	0	0	0	0
0	0	0	1	0	0	1
0	1	0	0	0	0	1
0	0	0	0	0	0	0

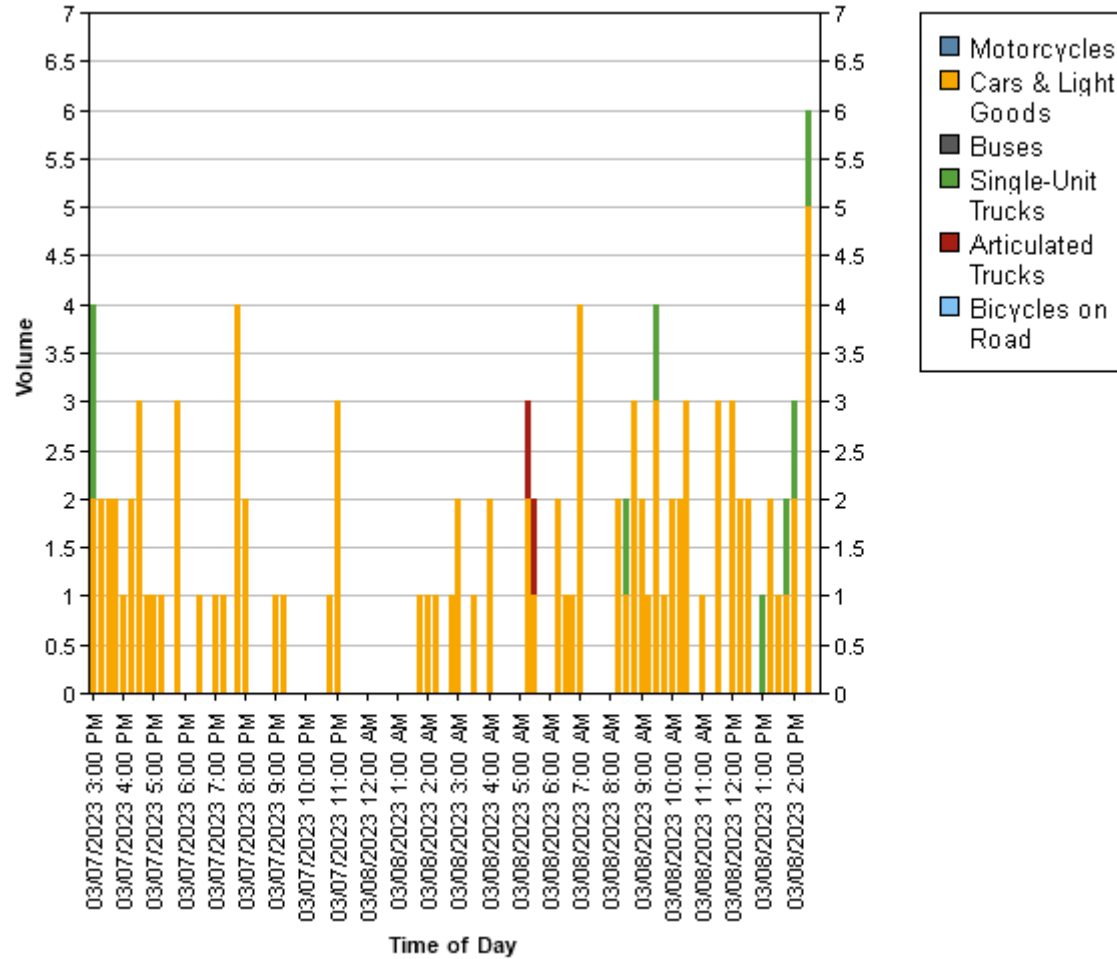
1:45 PM	0	1	0	0	0	0	1
2:00 PM	0	1	0	1	0	0	2
2:15 PM	0	0	0	0	0	0	0
2:30 PM	0	3	0	1	0	0	4
2:45 PM	0	0	0	0	0	0	0
Total	0	44	0	4	1	0	49
Total %	0.0	89.8	0.0	8.2	2.0	0.0	100.0
AM Times	12:00 AM	8:45 AM	12:00 AM	7:45 AM	4:45 AM	12:00 AM	8:45 AM
AM Peaks	0	3	0	0	1	0	3
PM Times	3:00 PM	3:00 PM	3:00 PM	1:45 PM	3:00 PM	3:00 PM	1:45 PM
PM Peaks	0	6	0	2	0	0	7



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

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

Count Name: 601 Scottsdale Drive North  
Driveway  
Site Code: 220563  
Start Date: 03/07/2023  
Page No: 7





Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

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

Count Name: 601 Scottsdale Drive South  
Driveway  
Site Code: 220563  
Start Date: 03/07/2023  
Page No: 1

**Direction (Westbound)**

Start Time	Motorcycles	Cars & Light Goods	Buses	Single-Unit Trucks	Articulated Trucks	Bicycles on Road	Total
3:01 PM	0	0	0	0	0	0	0
3:16 PM	0	0	0	0	0	0	0
3:31 PM	0	1	0	0	0	0	1
3:46 PM	0	1	0	0	0	0	1
4:01 PM	0	0	0	0	0	0	0
4:16 PM	0	1	0	0	0	0	1
4:31 PM	0	0	0	0	0	0	0
4:46 PM	0	0	0	0	0	0	0
5:01 PM	0	0	0	0	0	0	0
5:16 PM	0	0	0	0	0	0	0
5:31 PM	0	0	0	0	0	0	0
5:46 PM	0	0	0	0	0	0	0
6:01 PM	0	1	0	0	0	0	1
6:16 PM	0	1	0	0	0	0	1
6:31 PM	0	0	0	0	0	0	0
6:46 PM	0	0	0	0	0	0	0
7:01 PM	0	1	0	0	0	0	1
7:16 PM	0	0	0	0	0	0	0
7:31 PM	0	1	0	0	0	0	1
7:46 PM	0	2	0	0	0	0	2
8:01 PM	0	0	0	0	0	0	0
8:16 PM	0	1	0	0	0	0	1
8:31 PM	0	3	0	0	0	0	3
8:46 PM	0	1	0	0	0	0	1
9:01 PM	0	0	0	0	0	0	0
9:16 PM	0	0	0	0	0	0	0
9:31 PM	0	1	0	0	0	0	1
9:46 PM	0	3	0	0	0	0	3
10:01 PM	0	0	0	0	0	0	0
10:16 PM	0	0	0	0	0	0	0
10:31 PM	0	0	0	0	0	0	0
10:46 PM	0	1	0	0	0	0	1
11:01 PM	0	0	0	0	0	0	0
11:16 PM	0	0	0	0	0	0	0
11:31 PM	0	0	0	0	0	0	0
11:46 PM	0	0	0	0	0	0	0
12:01 AM	0	0	0	0	0	0	0
12:16 AM	0	0	0	0	0	0	0
12:31 AM	0	0	0	0	0	0	0

12:46 AM	0	0	0	0	0	0	0
1:01 AM	0	0	0	0	0	0	0
1:16 AM	0	0	0	0	0	0	0
1:31 AM	0	0	0	0	0	0	0
1:46 AM	0	0	0	0	0	0	0
2:01 AM	0	0	0	0	0	0	0
2:16 AM	0	0	0	0	0	0	0
2:31 AM	0	0	0	0	0	0	0
2:46 AM	0	0	0	0	0	0	0
3:01 AM	0	0	0	0	0	0	0
3:16 AM	0	0	0	0	0	0	0
3:31 AM	0	0	0	0	0	0	0
3:46 AM	0	0	0	0	0	0	0
4:01 AM	0	0	0	0	0	0	0
4:16 AM	0	0	0	0	0	0	0
4:31 AM	0	0	0	0	0	0	0
4:46 AM	0	0	0	0	0	0	0
5:01 AM	0	0	0	0	0	0	0
5:16 AM	0	0	0	0	0	0	0
5:31 AM	0	0	0	0	0	0	0
5:46 AM	0	0	0	0	0	0	0
6:01 AM	0	0	0	0	0	0	0
6:16 AM	0	0	0	0	0	0	0
6:31 AM	0	0	0	0	0	0	0
6:46 AM	0	1	0	0	0	0	1
7:01 AM	0	2	0	0	0	0	2
7:16 AM	0	0	0	0	0	0	0
7:31 AM	0	0	0	0	0	0	0
7:46 AM	0	0	0	0	0	0	0
8:01 AM	0	1	0	0	0	0	1
8:16 AM	0	1	0	0	0	0	1
8:31 AM	0	0	0	0	0	0	0
8:46 AM	0	0	0	0	0	0	0
9:01 AM	0	0	0	0	0	0	0
9:16 AM	0	1	0	0	0	0	1
9:31 AM	0	0	0	0	0	0	0
9:46 AM	0	0	0	0	0	0	0
10:01 AM	0	0	0	0	0	0	0
10:16 AM	0	0	0	0	0	0	0
10:31 AM	0	1	0	0	0	0	1
10:46 AM	0	0	0	0	0	0	0
11:01 AM	0	1	0	0	0	0	1
11:16 AM	0	0	0	0	0	0	0
11:31 AM	0	2	0	0	0	0	2
11:46 AM	0	0	0	0	0	0	0
12:01 PM	0	0	0	0	0	0	0
12:16 PM	0	1	0	0	0	0	1
12:31 PM	0	0	0	0	0	0	0
12:46 PM	0	0	0	1	0	0	1
1:01 PM	0	0	0	0	0	0	0
1:16 PM	0	0	0	0	0	0	0
1:31 PM	0	0	0	0	0	0	0

1:46 PM	0	0	0	0	0	2	2
2:01 PM	0	1	0	0	0	0	1
2:16 PM	0	1	0	0	0	0	1
2:31 PM	0	0	0	0	0	0	0
2:46 PM	0	1	0	0	0	0	1
Total	0	33	0	1	0	2	36
Total %	0.0	91.7	0.0	2.8	0.0	5.6	100.0
AM Times	12:01 AM	11:01 AM	12:01 AM	12:01 AM	12:01 AM	7:31 AM	11:01 AM
AM Peaks	0	3	0	0	0	0	3
PM Times	3:01 PM	7:46 PM	3:01 PM	12:46 PM	3:01 PM	1:01 PM	7:46 PM
PM Peaks	0	6	0	1	0	2	6



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

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

Count Name: 601 Scottsdale Drive South  
Driveway  
Site Code: 220563  
Start Date: 03/07/2023  
Page No: 4

**Direction (Eastbound)**

Start Time	Motorcycles	Cars & Light Goods	Buses	Single-Unit Trucks	Articulated Trucks	Bicycles on Road	Total
3:01 PM	0	2	0	0	0	0	2
3:16 PM	0	1	0	0	0	0	1
3:31 PM	0	0	0	0	0	0	0
3:46 PM	0	1	0	0	0	0	1
4:01 PM	0	1	0	0	0	0	1
4:16 PM	0	0	0	0	0	0	0
4:31 PM	0	0	0	0	0	0	0
4:46 PM	0	0	0	0	0	0	0
5:01 PM	0	0	0	0	0	0	0
5:16 PM	0	0	0	0	0	0	0
5:31 PM	0	0	0	0	0	0	0
5:46 PM	0	0	0	0	0	0	0
6:01 PM	0	1	0	0	0	0	1
6:16 PM	0	1	0	0	0	0	1
6:31 PM	0	0	0	0	0	0	0
6:46 PM	0	0	0	0	0	0	0
7:01 PM	0	0	0	0	0	0	0
7:16 PM	0	2	0	0	0	0	2
7:31 PM	0	1	0	0	0	0	1
7:46 PM	0	2	0	0	0	0	2
8:01 PM	0	0	0	0	0	0	0
8:16 PM	0	2	0	0	0	0	2
8:31 PM	0	1	0	0	0	0	1
8:46 PM	0	2	0	0	0	0	2
9:01 PM	0	1	0	0	0	0	1
9:16 PM	0	1	0	0	0	0	1
9:31 PM	0	2	0	0	0	0	2
9:46 PM	0	0	0	0	0	0	0
10:01 PM	0	0	0	0	0	0	0
10:16 PM	0	0	0	0	0	0	0
10:31 PM	0	0	0	0	0	0	0
10:46 PM	0	2	0	0	0	0	2
11:01 PM	0	0	0	0	0	0	0
11:16 PM	0	0	0	0	0	0	0
11:31 PM	0	0	0	0	0	0	0
11:46 PM	0	0	0	0	0	0	0
12:01 AM	0	0	0	0	0	0	0
12:16 AM	0	0	0	0	0	0	0
12:31 AM	0	0	0	0	0	0	0



12:46 AM	0	0	0	0	0	0	0
1:01 AM	0	0	0	0	0	0	0
1:16 AM	0	0	0	0	0	0	0
1:31 AM	0	0	0	0	0	0	0
1:46 AM	0	0	0	0	0	0	0
2:01 AM	0	0	0	0	0	0	0
2:16 AM	0	0	0	0	0	0	0
2:31 AM	0	0	0	0	0	0	0
2:46 AM	0	0	0	0	0	0	0
3:01 AM	0	0	0	0	0	0	0
3:16 AM	0	0	0	0	0	0	0
3:31 AM	0	0	0	0	0	0	0
3:46 AM	0	0	0	0	0	0	0
4:01 AM	0	0	0	0	0	0	0
4:16 AM	0	0	0	0	0	0	0
4:31 AM	0	0	0	0	0	0	0
4:46 AM	0	0	0	0	0	0	0
5:01 AM	0	0	0	0	0	0	0
5:16 AM	0	0	0	0	0	0	0
5:31 AM	0	0	0	0	0	0	0
5:46 AM	0	0	0	0	0	0	0
6:01 AM	0	0	0	0	0	0	0
6:16 AM	0	1	0	0	0	0	1
6:31 AM	0	0	0	0	0	0	0
6:46 AM	0	0	0	0	0	0	0
7:01 AM	0	0	0	0	0	0	0
7:16 AM	0	1	0	0	0	0	1
7:31 AM	0	0	0	0	0	0	0
7:46 AM	0	0	0	0	0	0	0
8:01 AM	0	1	0	0	0	0	1
8:16 AM	0	0	0	0	0	1	1
8:31 AM	0	0	0	0	0	0	0
8:46 AM	0	2	0	0	0	0	2
9:01 AM	0	1	0	0	0	0	1
9:16 AM	0	0	0	0	0	0	0
9:31 AM	0	0	0	0	0	0	0
9:46 AM	0	0	0	0	0	0	0
10:01 AM	0	0	0	0	0	0	0
10:16 AM	0	1	0	0	0	0	1
10:31 AM	0	1	0	0	0	0	1
10:46 AM	0	0	0	0	0	0	0
11:01 AM	0	0	0	0	0	0	0
11:16 AM	0	1	0	0	0	0	1
11:31 AM	0	3	0	0	0	0	3
11:46 AM	0	1	0	0	0	0	1
12:01 PM	0	0	0	0	0	0	0
12:16 PM	0	0	0	0	0	0	0
12:31 PM	0	1	0	0	0	0	1
12:46 PM	0	0	0	0	0	0	0
1:01 PM	0	2	0	0	0	0	2
1:16 PM	0	1	0	0	0	0	1
1:31 PM	0	1	0	1	0	0	2

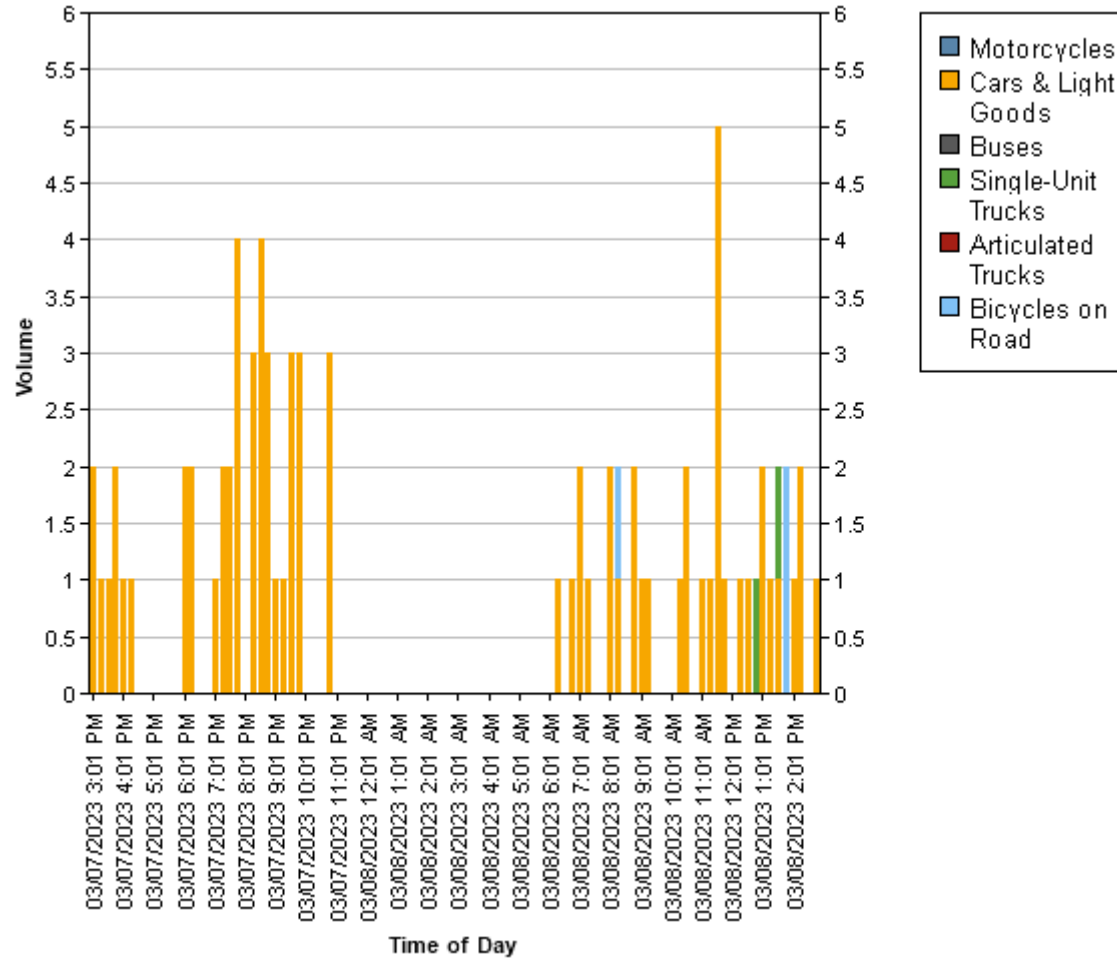
1:46 PM	0	0	0	0	0	0	0
2:01 PM	0	0	0	0	0	0	0
2:16 PM	0	1	0	0	0	0	1
2:31 PM	0	0	0	0	0	0	0
2:46 PM	0	0	0	0	0	0	0
Total	0	42	0	1	0	1	44
Total %	0.0	95.5	0.0	2.3	0.0	2.3	100.0
AM Times	12:01 AM	11:01 AM	12:01 AM	12:01 AM	12:01 AM	7:31 AM	11:01 AM
AM Peaks	0	5	0	0	0	1	5
PM Times	3:01 PM	7:46 PM	3:01 PM	12:46 PM	3:01 PM	1:01 PM	7:46 PM
PM Peaks	0	5	0	1	0	0	5



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

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

Count Name: 601 Scottsdale Drive South  
Driveway  
Site Code: 220563  
Start Date: 03/07/2023  
Page No: 7



# CITY OF GUELPH

## Traffic Signal Timing Parameters

Database Date	Field		Prepared Date:	Tuesday, September 14, 2021
Database Rev	Field		Completed By:	I.T.
Timing Card / Field rev	Field		Checked By:	

<b>Location:</b> Stone Rd. @ Scottsdale Dr.							<b>TIME PERIOD</b> (sec.) (Green+Amber+All Red)		
Phase #	Direction	Vehicle Minimum (sec.)	Pedestrian Minimum (sec.)		Amber (sec.)	All Red (sec.)	AM MAX	Off Peak MAX	PM MAX
			WALK	FDWALK					
1	WBLT - Stone Rd. P+P	6.0			3.0		9.0	13.0	13.0
2	EB - Stone Rd.	10.0	7.0	14.0	3.7	2.4	40.0	37.0	37.0
3	SBLT - Scottsdale Dr. P+P	6.0			3.0		9.0	9.0	9.0
4	NB - Scottsdale Dr.	10.0	9.0	16.0	4.0	2.0	32.0	31.0	31.0
5	EBLT - Stone Rd. P+P	6.0			3.0		9.0	13.0	13.0
6	WB - Stone Rd.	10.0	7.0	14.0	3.7	2.4	40.0	37.0	37.0
7	NBLT - Scottsdale Dr. P+P	6.0			3.0		9.0	9.0	9.0
8	SB - Scottsdale Dr.	10.0	9.0	16.0	4.0	2.0	32.0	31.0	31.0

System Control	No
Local Control	Yes
Semi-Actuated Mode	Yes

**Note: P+P = Protected Permissive Phase**  
**Prot. = Fully Protected Phase**

TIME (M-F)	PEAK	CYCLE LENGTH (sec.)	OFFSET (sec.)
7:00 - 9:00	AM	<b>90</b>	<b>42</b>
9:00 - 15:00	Off Peak	<b>90</b>	<b>76</b>
15:00 - 21:00	PM	<b>90</b>	<b>35</b>

**Cover Sheet**

**NOTE: Phases 1 and 5 RESTRICTED, and LAG PHASE configuration modified to - Phases 2, 4, 5, 8**

Location: Hwy 6 (Hanlon) @ Stone

Area/District: \_\_\_\_\_

Timing Based On T.M. Dated: \_\_\_\_\_

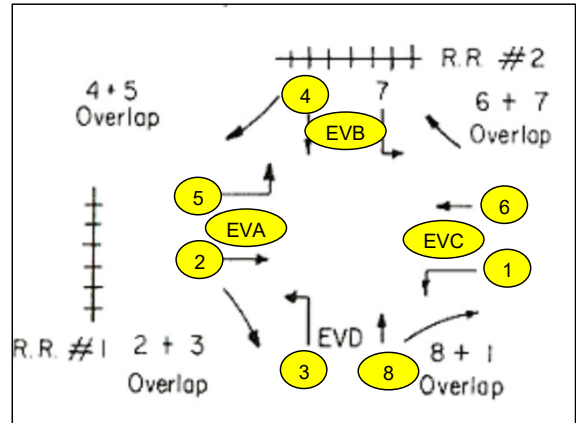
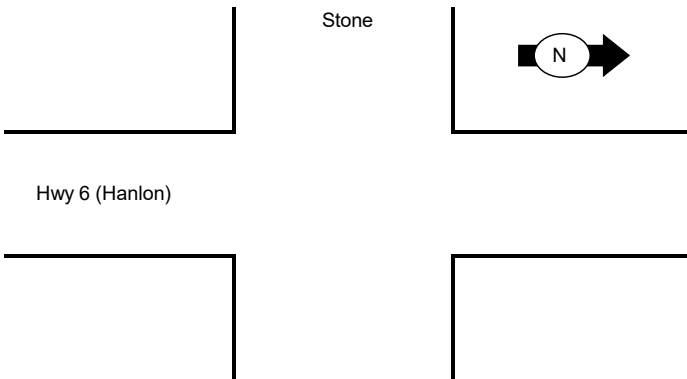
Traffic Signal # 112

Timing Developed By: H Nichols

Approved By: K Plut

Installed By: \_\_\_\_\_

Installation Date: 18-Oct-11



Circle Movements and Operations

**Note: Phase Sequence 1/6, 2/6, 2/5, 3/8, 4/8**

**Dial Out Telephone**

Number	D
0	# OF DIGITS
1	1st DIGIT
2	2nd DIGIT
3	3rd DIGIT
4	4th DIGIT
5	5th DIGIT
6	6th DIGIT
7	7th DIGIT
8	8th DIGIT
9	9th DIGIT
A	10th DIGIT
B	11th DIGIT
C	
D	
E	
F	

**Redial Time = 10**

( C/5 + C + 0 )

Default is Report All Alarms (no flags set)

**Disable Alarm Reporting**

Column F

0	OMIT ALARMS	1	2	3	4	5	6	7	8
						X			

< C + 0 + C = 5 >

- 1 = STOP TIME
- 2 = FLASH SENSE
- 3 = KEYBOARD ENTRY
- 4 = MANUAL PLAN SELECT
- 5 = ENABLE POLICE CNTRL (Not Used)
- 6 = EXTERNAL ALARM (Door Alarm)
- 7 = DETECTOR FAILURE

**Observe Redial Timer**

( E/2 + D + 6 )

**NOTE:** If Local Controller is part of an Interconnect Ensure Phone Number Is Removed

**COMMUNICATIONS ADDRESSING**

**COMM ADDRESS**

( C/0 + 0 + 0 ) = 2

**ZONE ADDRESS**

( C/0 + 0 + 1 ) = 1

**AREA NUMBER**

( C/0 + 0 + 2 ) = 1

**AREA ADDRESS**

( C/0 + 0 + 3 ) = 112

**Revisions to Timing Sheet - Oct 18, 2011**

Add Faze 2/6 SEMI ACTUATED  
 Revise MANUAL PLAN to 0 from 14  
 Revise DETECTOR ASSIGNMENTS, PHASE(S) for C1 PIN # 58 as per Timing Sheet  
 Revise COORDINATION as per Timing Sheet

# ACTUATED INTERVAL TIMING AND FAZE FUNCTIONS

		PHASE							
		1	2	3	4	5	6	7	8
0	WALK	-	41	-	21	-	41	-	21
1	DON'T WALK	-	12	-	16	-	12	-	16
2	MIN INITIAL	8		7	10	8			10
3	TYPE 3 LIMIT	-		-		-		-	
4	ADD PER VEH	-		-		-		-	
5	VEH EXT	4.0	3.0	3.0	3.0	4.0	3.0		3.0
6	MAX GAP	4.0	3.0	3.0	3.0	4.0	3.0		3.0
7	MIN GAP	4.0	3.0	3.0	3.0	4.0	3.0		3.0
8	MAX LIMIT	25	53	10	18	20	58		31
9	MAXIMUM 2	24	54	15	13	20	58		31
A	ADV /DLY WALK	-		-		-		-	
B	SEQUENCE TO	-		-		-		-	
C	COND SRV MIN	-		-		-		-	
D	REDUCE EVERY	-		-		-		-	
E	YELLOW	3.0	5.9	3.0	5.0	3.0	5.9		5.0
F	RED CLEAR	2.0	1.9		2.9	2.0	1.9		2.9

**PHASE BANK # 1 < C + O + F = 1 >**

		9	A	B	C	D			E
0								RR1 DLY	
1	PHASE 1	-						RR1 CLR	
2	PHASE 2	-						EVA DLY	
3	PHASE 3	-						EVA CLR	
4	PHASE 4	-						EV B DLY	
5	PHASE 5	-						EV B CLR	5
6	PHASE 6	-						EVC DLY	
7	PHASE 7	-						EVC CLR	
8	PHASE 8	-						EVD DLY	
								EVD CLR	
								RR2 DLY	
								RR2 CLR	
								EV CLR	
								EV DLY	
								RR CLR	
								RR DLY	

ALL RED START  
(F/1 + C + O) = **5.0**  
RED REVERT  
(F/1 + O + F) = **5.0**

MAX ALT INT WALK  
ALT FLH  
ALT INT  
ALT EXT  
D/W

## COLUMN F PHASES

		1	2	3	4	5	6	7	8
0	PERMIT	X	X	X	X	X	X		X
1	RED LOCK								
2	YELLOW LOCK								
3	VEH MIN CALL								
4	PED RECALL		X				X		
5	PEDESTRIANS								
6	YIELD AT FL SH D/W								
7	RED REST								
8	DOUBLE ENTRY				X				X
9	VEH MAX CALL		X				X		
A	SOFT RECALL								
B	MAXIMUM 2								
C	COND SERVICE								
D	MAN CONT CALL								
E	YELLOW START		X				X		
F	FIRST PHASES			X					X

**< C + O + F = 1 >**

**BI Tran Systems, Inc.**  
510 Bercut Dr., Sacramento, Calif. 95814  
916/441-0260  
Traffic Signal Program 233 Ontario

**Date:** 18-Oct-11

### LOCATION

Hwy: Hwy 6

At:

Stone

	A	B	C
PREEMPT	RR1-2	SP	EMER
MINIMUMS	SPEV1	EV2	VEH
A	WLK (DFLT)	4.0	4.0
B	FD WALK		12
C	INITIAL		5

**< C + O + F = 1 >**

## Column E Phases / Bits

		1	2	3	4	5	6	7	8
0	EXCLUSIVE								
1	RR1 CLEAR								
2	RR2 CLEAR								
3	RR2 LTD SRV								
4	PROT/PERM			X					
5	FLH TO PREMT								
6	FLASH ENTRY								
7	DISABL MIN YEL								
8	DISABL OVP YEL								
9	OVP FLH YEL								
A	EM VEH A		X			X			
B	EM VEH B				X				X
C	EM VEH C	X					X		
D	EM VEH D								
E	EXTRA 1	X		X					
F	IC SELECT		X						

**< C + O + E = 125 >**

## Column F Phases / Bits

		1	2	3	4	5	6	7	8
0									
1	EXT PERMIT 1								
2	EXT PERMIT 2								
3	EXCLU PED								
4									
5	PED 2P OUT		X						
6	PED 6P OUT						X		
7	PED 4P OUT				X				
8	PED 8P OUT								X
9	FLH YELLOW								
A									
B									
C									
D									
E	RESTRICTED	X				X			
F	EXTRA 2								

**SPECIALS < C + O + F = 2 >**

## Column F Phases / Bits

		1	2	3	4	5	6	7	8
0	ADV GRN FLH								
1	PHASE FLASH								
2	FLASH WALK								
3	GUAR PASS								
4	SIMUL GAP				X				X
5	SEQ TIMING								
6	ADV WALK								
7	DELAY WALK								
8	EXT RECALL								
9									
A	MAX EXTEN								
B	INH PED RSRV								
C	SEMI ACTUATED		X				X		
D									
E	STRT VEH CALL	X		X		X			
F	STRT PED CALL		X		X		X		X

MANUAL PLAN	0
< C/O + A + 1 >	
MANUAL OFFSET	0
< C/O + A + 1 >	

### MANUAL SELECTION

### MANUAL PLAN

- 0 = Automatic (Master)
- 9 = Control Plan 1 - 9
- 14 (E) = Free ( Isolated )
- 15 (F) = Software Flash

### MANUAL OFFSET

- 0 = Automatic (Master)
- 1 = Offset A
- 2 = Offset B
- 3 = Offset C

### FLASH TO PREEMPT

- 1 = EVA
- 2 = EVB
- 3 = EVC
- 4 = EVD
- 5 = RR1
- 6 = RR2
- 7 = SE1
- 8 = SE2
- 1 = TBC TYPE 1
- 2 = NEMA EXT. COORD.
- 3 = DAYLIGHT SAVINGS
- 4 =

### EXTRA 1

- 5 = EXPANDED STATUS REPORTING
- 6 = INTERNATIONAL PED
- 7 = CLEAR OUTPUTS DURING FLASH
- 8 = SPLIT RING

### EXTRA 2

- 1 = AWR ON DURING PHASE INITIAL
- 2 = LMU INSTALLED
- 2 = 2 WAY MODEM
- 3 = 7 WIRE SLAVE
- 4 = FLASH / FREE

### IC SELECT

- 5 = SIMPLER MASTER
- 7 = 7 WIRE MASTER
- 8 = OFFSET INTURP

**PRETIMED ONTARIO 233 PROGRAM**

**T.O.D. FUNCTIONS**

PHASE								Column F PHASES								TIME			DAY OF WEEK							Column 4 PHASES / BITS											
	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8	HH	MM	FUN	S	M	T	W	T	F	S	1	2	3	4	5	6	7	8		
WALK	-	41	-	21	-	41	-	21	0	PERMIT	X	X	X	X	X	X		0	15:00	B		X	X	X	X	X		X	X	X	X	X	X	X			
DON'T WALK	-	12	-	16	-	12	-	16	1	RED LOCK								1	18:00	B		X	X	X	X	X											
MIN INTIAL	8		7	10	8			10	2	YELLOW LOCK								2																			
TYPE 3 LIMIT	-	-	-	-	-	-	-	-	3	VEH MIN CALL								3																			
ADD PER VEH	-	-	-	-	-	-	-	-	4	PED RECALL		X	X	X	X	X		4																			
VEH EXT	4.0	3.0	3.0	3.0	4.0	3.0		3.0	5	PEDESTRIANS								5																			
MAX GAP	4.0	3.0	3.0	3.0	4.0	3.0		3.0	6	REST IN WALK								6																			
MIN GAP	4.0	3.0	3.0	3.0	4.0	3.0		3.0	7	RED REST								7																			
MAX LIMIT	25	53	10	18	20	58		31	8	DOUBLE ENTRY				X				8																			
MAXIMUM 2	24	54	15	13	20	58	-	31	9	VEH MAX CALL	X	X	X	X	X			9																			
ADV / DLY WALK	-	-	-	-	-	-	-	-	A	SOFT RECALL								A																			
SEQUENCE TO	-	-	-	-	-	-	-	-	B	MAXIMUM 2								B																			
COND SRV MIN	-	-	-	-	-	-	-	-	C	CORD SERVICE								C																			
REDUCE EVERY	-	-	-	-	-	-	-	-	D	MAN CONT CALL								D																			
YELLOW	3.0	5.9	3.0	5.0	3.0	5.9		5.0	E	YELLOW START		X			X			E																			
RED CLEAR	2.0	1.9		2.9	2.0	1.9		2.9	F	FIRST PHASES			X					F																			

PHASE BANK # < C + O + F = 1 >

< C + O + F = 1 >

< C + O + 7 = 1 >

< C + O + E = 27 >

**LOCATION:**

**Hwy 6 (Hanlon) @ Stone**

**BI Tran Systems, Inc.**  
 510 Bercut Dr., Sacramento, Calif. 95814  
 916/441-0260  
 Traffic Signal Program 233 Ontario  
 Timing Sheet #2  
 Revised (02/95)

**Issued Date: 20-Dec-10**

**Installed Date: 20-Dec-10**

**T.O.D. FUNCTIONS**

- 0 = PERMIT PHASES
- 1 = RED LOCK
- 2 = YELLOW LOCK
- 3 = VEH MIN RECALL
- 4 = PED RECALL
- 5 =
- 6 = REST IN WALK
- 7 = RED REST
- 8 = DOUBLE ENTRY
- 9 = VEH MAX RECALL
- A = VEH SOFT RECALL
- B = MAXIMUM 2
- C = CONDITIONAL SERVICE
- D = LAG PHASES
- E = BIT 1 - LOCAL OVERRIDE
- BIT 4 - DISABLE DET OFF MONITOR
- BIT 7 - DET COUNT MONITOR
- BIT 8 - REAL TIME SPLIT MONITOR
- F = OUTPUT BITS 1 THRU 4

# DETECTOR ASSIGNMENTS

STANDARD 332 CABINET LOCATION	column	1	3	carry over	DETECTOR ASSIGNMENT SHEET ONTARIO 233 PROGRAM																												
					Column 0	Column 1								Column 2								Column 3											
						C1 Pin #	ATTRIBUTES								PHASE(S)								ASSIGNMENTS										
						1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8				
I-2 U	0				0	39																									<b>LOCATION:</b>		
J-2 U	1				1	40																									Hwy at	Hwy 6 Stone	
I-6 U	2				2	41			X	X		X				X							X	X	X					X	Issued Date:	18-Oct-11	
J-6 U	3				3	42			X	X		X				X							X	X	X					X	Installed Date:	18-Oct-11	
1-2 L	4				4	43																									<b>DETECTOR ATTRIBUTES</b>		
J-2 L	5				5	44																									1 = FULL TIME DELAY		
1-6 L	6				6	45			X	X		X				X							X	X	X					X	2 = PEDESTRIAN CALL		
J-6 L	7				7	46			X	X		X				X							X	X	X					X	3 =		
I-4	8				8	47																									4 = COUNT		
J-4	9				9	48																									5 = EXTENSION		
I-8	A				A	49																									6 = TYPE 3		
J-8	B				B	50																									7 = CALLING		
J-1	C				C	55			X	X		X			X							X	X	X					X	8 = ALTERNATE			
I-1	D				D	56			X	X		X			X							X	X	X					X	<b>DETECTOR ASSIGNMENTS</b>			
J-5	E				E	57																									1 = DET. SET # 1		
I-5	F				F	58			X	X		X			X							X	X	X					X	2 = DET. SET # 2			
< C + O + D = 0 >					DETECTOR ASSIGNMENTS < C + O + E = 126 >																								3 = DET. SET # 3				
																													4 =				
																													5 =				
																													6 = MIN RECALL ON FAILURE				
																													7 = MAX RECALL ON FAILURE				
																													8 - REPORT ON FAILURE				
																													<b>DETECTOR MONITOR</b>				
																													MAX OFF: D/0+0+1=120				
																													MAX ON: D/0+0+2=60				
																													<b>ADVANCE WARNING BEACONS</b>				
																													SIGN #1                  SIGN #2				
																													PHASE NUMBER				
																													(F/1+C+F)=                  (F/1+D+F)=				
																													TIME BEFORE YELLOW				
																													(F/1+C+E)=                  (F/1+D+E)=				
																													OUTPUT PIN NUMBER				
																													(E/127+E+8)=                  (E/127+E+9)=				
< C + O + D = 0 >					DETECTOR ASSIGNMENTS < C + O + E = 126 >																												



Input File Layout

Input File Slot No. →

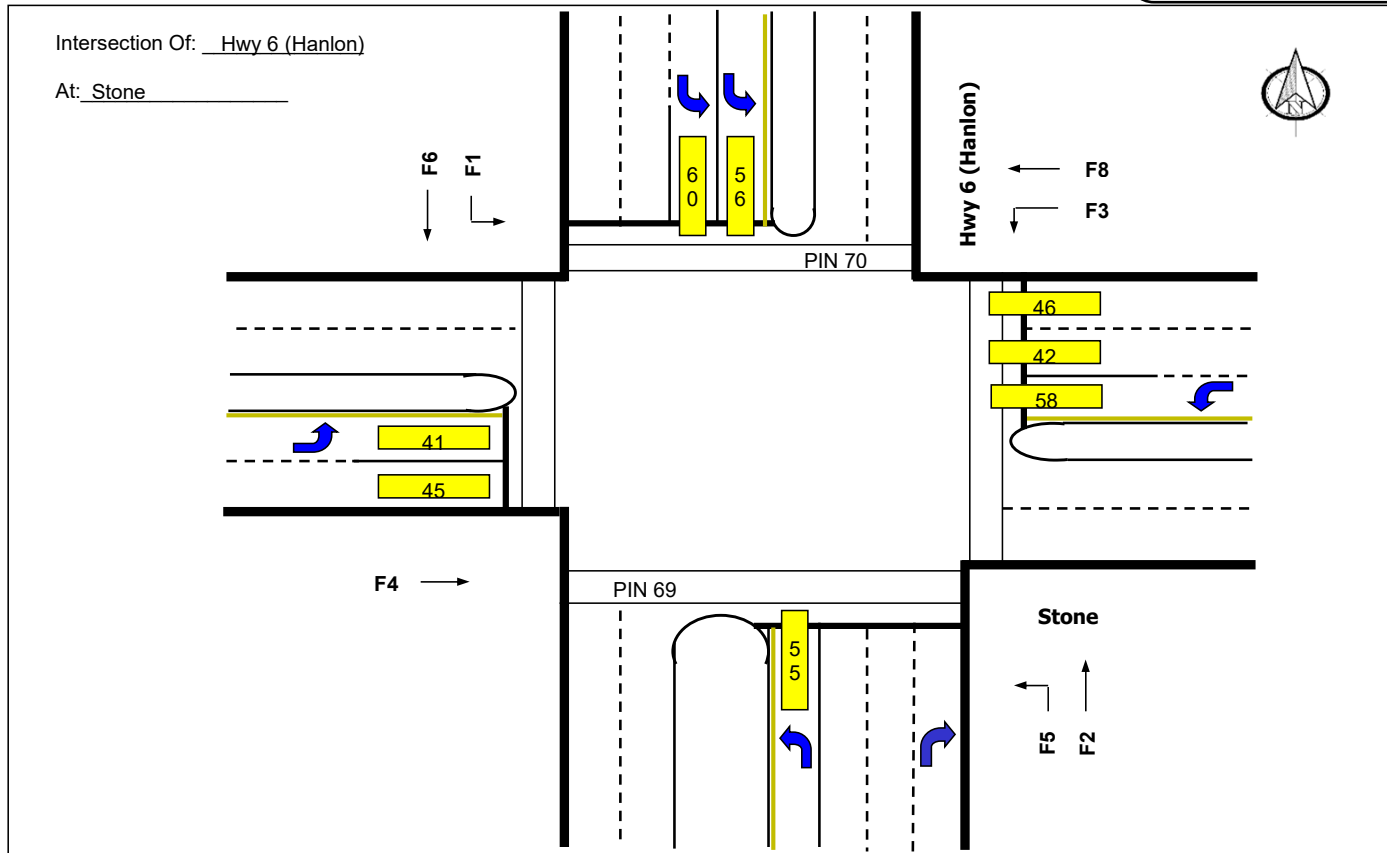
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>"I" FILE</b>	<b>1</b> Ext, Cnt, Call <C1-56>	<b>2</b> Ext, Cnt, Call <C1-39>	<b>2</b> Ext, Cnt, Call <C1-63>	<b>2</b> Type 3, Call <C1-47>	<b>3</b> Ext, Cnt, Call <C1-58>	<b>4</b> Ext, Cnt, Call <C1-41>	<b>4</b> Ext, Cnt, Call <C1-65>	<b>4</b> Type 3, Call <C1-49>	<b>1</b> Ext, Cnt, Call <C1-60>	NOT WIRED	Not Assigned <C1-80>	<b>2</b> Ped Call <C1-67>	<b>6</b> Ped Call <C1-68>	Flash Sense <C1-81>
		<b>2</b> Ext, Cnt, Call <C1-43>	<b>2</b> Ext, Cnt, Call <C1-76>			<b>4</b> Ext, Cnt, Call <C1-45>	<b>4</b> Ext, Cnt, Call <C1-78>		<b>3</b> Ext, Cnt, Call <C1-62>		Not Assigned <C1-53>	<b>4</b> Ped Call <C1-69>	<b>8</b> Ped Call <C1-70>	Stop Time <C1-82>

<b>"J" FILE</b>	<b>5</b> Ext, Cnt, Call <C1-55>	<b>6</b> Ext, Cnt, Call <C1-40>	<b>6</b> Ext, Cnt, Call <C1-64>	<b>6</b> Type 3, Call <C1-48>	<b>7</b> Ext, Cnt, Call <C1-57>	<b>8</b> Ext, Cnt, Call <C1-42>	<b>8</b> Ext, Cnt, Call <C1-66>	<b>8</b> Type 3, Call <C1-50>	<b>5</b> Ext, Cnt, Call <C1-59>	NOT WIRED	Not Assigned <C1-54>	<b>EV A</b> Preempt <C1-71>	<b>EV B</b> Preempt <C1-72>	Railroad 1 <C1-51>
		<b>6</b> Ext, Cnt, Call <C1-44>	<b>6</b> Ext, Cnt, Call <C1-77>			<b>8</b> Ext, Cnt, Call <C1-46>	<b>8</b> Ext, Cnt, Call <C1-79>		<b>7</b> Ext, Cnt, Call <C1-61>		Not Assigned <C1-75>	<b>EV C</b> Preempt <C1-73>	<b>EV D</b> Preempt <C1-74>	Railroad 2 <C1-52>

DETECTOR TYPES

- Ext = Extension Detector  
Detector is only active during the Phase's GREEN Intervals (ie, will NOT Call the Phase)
- Cnt = Count Detector  
Used in computing "Added Initial"
- Call = Calling Detector  
Detector is only active during the Phase's NON-GREEN Intervals (ie, will NOT Extend the Phase)
- Type 3 = Type 3 Disconnect  
Will allow a Calling Detector to Extend its Phase until the Call first drops or the "Type 3 Limit" is reached

**BI Tran Systems, Inc.**  
 510 Bercut Dr., Sacramento, Calif. 95814  
 916/441-0260  
 Traffic Signal Program 233  
 Initialized Detector Assignments  
 (Revised 8/92) 332 Cabinet



**COORDINATION**

Row	Column Numbers ---->	PLAN								
		1	2	3	4	5	6	7	8	9
	Plan Name ---->									
0	Cycle Length	0	0	0	0	0	0	0	0	0
1	Phase 1 - ForceOff	0	0	0	0	0	0	0	0	0
2	Phase 2 - ForceOff	0	0	0	0	0	0	0	0	0
3	Phase 3 - ForceOff	0	0	0	0	0	0	0	0	0
4	Phase 4 - ForceOff	0	0	0	0	0	0	0	0	0
5	Phase 5 - ForceOff	0	0	0	0	0	0	0	0	0
6	Phase 6 - ForceOff	0	0	0	0	0	0	0	0	0
7	Phase 7 - ForceOff	0	0	0	0	0	0	0	0	0
8	Phase 8 - ForceOff	0	0	0	0	0	0	0	0	0
9	Ring Offset	0	0	0	0	0	0	0	0	0
A	Offset 1	0	0	0	0	0	0	0	0	0
B	Offset 2	0	0	0	0	0	0	0	0	0
C	Offset 3	0	0	0	0	0	0	0	0	0
D	Perm 1 - End	0	0	0	0	0	0	0	0	0
E	Hold Release	0	0	0	0	0	0	0	0	0
F	Zone Offset	0	0	0	0	0	0	0	0	0

Coordination - Bank 1 <C+0+C=1>

Row										
0	Ped Adjustment	0	0	0	0	0	0	0	0	0
1	Perm 2 - Start	0	0	0	0	0	0	0	0	0
2	Perm 2 - End	0	0	0	0	0	0	0	0	0
3	Perm 3 - Start	0	0	0	0	0	0	0	0	0
4	Perm 3 - End	0	0	0	0	0	0	0	0	0
5	Reservice Time	0	0	0	0	0	0	0	0	0
6	Reservice Phases									
7										
8	Pretimed Phases									
9	Max Recall									
A	Perm 1 Veh Phase	1234567	1234567	1234567	1234567	1234567	1234567	1234567	1234567	1234567
B	Perm 1 Ped Phase	1234567	1234567	1234567	1234567	1234567	1234567	1234567	1234567	1234567
C	Perm 2 Veh Phase									
D	Perm 2 Ped Phase									
E	Perm 3 Veh Phase									
F	Perm 3 Ped Phase									

Coordination - Bank 2 <C+0+C=2>

Row		2
0		
1	Phase 1	5
2	Phase 2	5
3	Phase 3	5
4	Phase 4	5
5	Phase 5	5
6	Phase 6	5
7	Phase 7	5
8	Phase 8	5

Coordination Transition  
Minimums < C+0+C = 5 >

Transition Type  < C/5+1+9 >  
**TBC TRANSITION**

Lag Hold Phases  < C/5+1+A >  
**Coordinated Lag Hold Phases**

Sync Output Time  < C/5+1+C >  
**7 - Wire Master**

Transition Type \_\_\_\_\_  
0.X = Shortway  
1.X = Lengthen  
X.1 thru X.4 = # of cycles  
when lengthening

DATE: 18-Oct-11

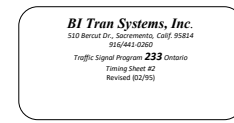
(Coord Extra Bit 1 = Programmed WALK Time for Sync Phases)

Row	E	Time	Plan	Offset	Day of Week
0		0:01	E	0	1,2,3,4,5,6,7
1	Plan 1 - Sync	2_6_	1	0:00	0 0 0
2	Plan 2 - Sync	2_6_	2	0:00	0 0 0
3	Plan 3 - Sync	2_6_	3	0:00	0 0 0
4	Plan 4 - Sync	2_6_	4	0:00	0 0 0
5	Plan 5 - Sync	2_6_	5	0:00	0 0 0
6	Plan 6 - Sync	2_6_	6	0:00	0 0 0
7	Plan 7 - Sync	2_6_	7	0:00	0 0 0
8	Plan 8 - Sync	2_6_	8	0:00	0 0 0
9	Plan 9 - Sync	2_6_	9	0:00	0 0 0
A	NEMA Sync	0:00	0	0	0
B	NEMA Hold	0:00	0	0	0
C		0:00	0	0	0
D		0:00	0	0	0
E	Coord Extra #NAME?	0:00	0	0	0
F		0:00	0	0	0

Sync Phases < C+0+C = 1 > TOD Coordination < C+0+9 = 0.1 > (Bank 1)

Row	F	Time	Plan	Offset	Day of Week
0	Free Lag	2_45_8	0	0:00	0 0 0
1	Plan 1 - Lag	2_4_6_8	1	0:00	0 0 0
2	Plan 2 - Lag	2_4_6_8	2	0:00	0 0 0
3	Plan 3 - Lag	2_4_6_8	3	0:00	0 0 0
4	Plan 4 - Lag	2_4_6_8	4	0:00	0 0 0
5	Plan 5 - Lag	2_4_6_8	5	0:00	0 0 0
6	Plan 6 - Lag	2_4_6_8	6	0:00	0 0 0
7	Plan 7 - Lag	2_4_6_8	7	0:00	0 0 0
8	Plan 8 - Lag	2_4_6_8	8	0:00	0 0 0
9	Plan 9 - Lag	2_4_6_8	9	0:00	0 0 0
A	External Lag	0:00	0	0	0
B		0:00	0	0	0
C		0:00	0	0	0
D		0:00	0	0	0
E		0:00	0	0	0
F		0:00	0	0	0

Lag Phases <C+0+C=1> TOD Coordination < C+0+9 = 0.2 > (Bank 2)



LOCATION: Hwy 6 (Hanlon) @ Stone

# DEFAULT DETECTOR ASSIGNMENTS

Standard 332 Cabinet Location	Column 0	Column 1 ATTRIBUTES								Column 2 PHASE(S)								Column 3 ASSIGNMENTS							
	C1 PIN NUMBER	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
		I-2 U	0	39		X	X	X		X					X	X	X		X						
J-2 U	1	40		X	X	X				X				X	X	X		X						X	
I-6 U	2	41		X	X	X				X				X	X	X		X						X	
J-6 U	3	42		X	X	X							X	X	X	X		X						X	
I-2 L	4	43		X	X	X		X						X	X	X		X						X	
J-2 L	5	44		X	X	X				X				X	X	X		X						X	
I-6 L	6	45		X	X	X				X				X	X	X		X						X	
J-6 L	7	46		X	X	X							X	X	X	X		X						X	
I-4	8	47			X	X		X						X	X	X		X						X	
J-4	9	48			X	X				X				X	X	X		X						X	
I-8	A	49			X	X				X				X	X	X		X						X	
J-8	B	50			X	X							X	X	X	X		X						X	
J-1	C	55		X	X	X				X				X	X	X		X						X	
I-1	D	56		X	X	X		X						X	X	X		X						X	
J-5	E	57		X	X	X							X	X	X		X							X	
I-5	F	58		X	X	X				X				X	X	X		X						X	

"INITIALIZED" DETECTOR ASSIGNMENTS  
< C + 0 + E = 126 >

Standard 332 Cabinet Location	Column 4	Column 5 ATTRIBUTES								Column 6 PHASE(S)								Column 7 ASSIGNMENTS							
	C1 PIN NUMBER	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
		J-9 U	0	59		X	X	X				X				X			X						
I-9 U	1	60		X	X	X		X						X			X							X	
J-9 L	2	61		X	X	X							X			X		X						X	
I-9 L	3	62		X	X	X				X				X			X							X	
I-3 U	4	63		X	X	X		X						X			X							X	
J-3 U	5	64		X	X	X							X			X		X						X	
I-7 U	6	65		X	X	X				X				X			X							X	
J-7 U	7	66		X	X	X							X			X		X						X	
I-12 U	8	67	X							X				X			X							X	
I-13 U	9	68	X										X			X		X						X	
I-12 L	A	69	X										X			X		X						X	
I-13 L	B	70	X											X			X							X	
I-3 L	C	76		X	X	X		X						X			X							X	
J-3 L	D	77		X	X	X							X			X		X						X	
I-7 L	E	78		X	X	X				X				X			X							X	
J-7 L	F	79		X	X	X								X			X							X	

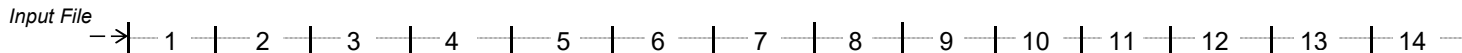
"INITIALIZED" DETECTOR ASSIGNMENTS  
< C + 0 + E = 126 >

**DETECTOR ATTRIBUTES**

- 1 = Full time Delay
- 2 = Pedestrian call
- 3 =
- 4 = Count
- 5 = Extension
- 6 = Type 3
- 7 = Calling
- 8 = Alternate

**DETECTOR ASSIGNMENTS**

- 1 = Det. Set #1
- 2 = Det. Set #2
- 3 = Det. Set #3
- 4 =
- 5 =
- 6 = MIN Recall On Failure
- 7 = MAX Recall On Failure
- 8 = Report On Failure



**"I" FILE**

1 Ext, Cnt, Call <C1-56>	2 Ext, Cnt, Call <C1-39>	2 Ext, Cnt, Call <C1-63>	2 Type 3, Call <C1-47>	3 Ext, Cnt, Call <C1-58>	4 Ext, Cnt, Call <C1-41>	4 Ext, Cnt, Call <C1-65>	4 Type 3, Call <C1-49>	1 Ext, Cnt, Call <C1-60>	NOT WIRED	Not Assigned <C1-80>	2 Ped Call <C1-67>	6 Ped Call <C1-68>	Flash Sense <C1-81>
	2 Ext, Cnt, Call <C1-43>	2 Ext, Cnt, Call <C1-76>			4 Ext, Cnt, Call <C1-45>	4 Ext, Cnt, Call <C1-78>				3 Ext, Cnt, Call <C1-53>	4 Ped Call <C1-69>	8 Ped Call <C1-82>	

**"J" FILE**

5 Ext, Cnt, Call <C1-55>	6 Ext, Cnt, Call <C1-40>	6 Ext, Cnt, Call <C1-64>	6 Type 3, Call <C1-48>	7 Ext, Cnt, Call <C1-57>	8 Ext, Cnt, Call <C1-42>	8 Ext, Cnt, Call <C1-66>	8 Type 3, Call <C1-50>	5 Ext, Cnt, Call <C1-59>	NOT WIRED	Not Assigned <C1-54>	EV A Preempt <C1-71>	EV B Preempt <C1-72>	Railroad 1 <C1-51>
	6 Ext, Cnt, Call <C1-44>	6 Ext, Cnt, Call <C1-77>			8 Ext, Cnt, Call <C1-46>	8 Ext, Cnt, Call <C1-79>				7 Ext, Cnt, Call <C1-61>	Not Assigned <C1-75>	EV C Ped Call <C1-73>	EV D Preempt <C1-74>

**DETECTOR TYPES**

- Ext = Extension Detector  
Detector is only active during the Phase's GREEN Intervals (ie, will NOT Call the Phase)
- Cnt = Count Detector  
Used in computing "Added Initial"
- Call = Calling Detector  
Detector is only active during the Phase's NON-GREEN Intervals (ie, will NOT Extend the Phase)
- Type 3 = Type 3 Disconnect  
Will allow a Calling Detector to Extend its Phase until the Call first drops or the "Type 3 Limit" is reached

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 Traffic Signal Program 233  
 Initialized Detector Assignments  
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# REFERENCE SHEET

## Controller Intervals

0 = Walk	8 = Red Rest
1 = FDW	9 = Preemption
2 = Min. Green	A = Stop Time
3 =	B = Red Revert
4= Var. Initial	C = Yellow-Gap Termination
5 = Extension	D = Yellow-Max. Termination
6 =	E = Yellow-Forceoff Termination
7 = Reduce Gap	F = Red Clearance

## Continuous Memory Error Monitoring

The controller's RAM and EPROM memories are continuously checked for errors. If an error is found, the intersection will go into FLASH (via Watch Dog Timer), and one of the following will be shown on the controller's display:

- bAd A = An error was detected in the CPU's RAM, or a new program has been installed on the memory module.  
Often caused by a bad controller "gel-cell" battery.
- bAd b = An error was detected in the memory module's RAM.  
Often caused by a bad "lithium" battery on the memory module.
- bAd E = An error was detected in the 233 Program EPROM.
- bAd F = An error was detected in the Z-RAM (Dallas chip) on the memory module.

## 412/C Memory Module Lithium Battery Condition

To check the condition of the 3.6 volt Lithium Battery on the 412/C Memory Module:

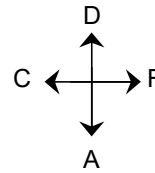
- If  $E/112 + 0 + A = 84$  - the battery is BAD
- If  $E/112 + 0 + A = 85$  - the battery is O.K.

## Monitor "Activate" Flags

(Also Requires T.O.D. Function "E" Flag)  
Detector Count Recording:  
 $E/2 + 0 + 9 =$  Not Zero  
Real Time Split Monitor:  
 $E/2 + 0 + E =$  Not Zero

**E Page Enable:  $F/1 + 9 + E =$  Not Zero**

## Display Movement Codes



A = Advance ROW  
D = Decrement ROW  
C = COLUMN Back  
F = Forward COLUMN

## Special Event Schedules

Special Event #1:  $C + 0 + E = 27$   
Special Event #2:  $C + 0 + E = 28$

Current Interval =  $E + 5 + 0$   
Current Interval Timer =  $E + 5 + B$   
Current Interval  
Clearance Phases =  $E + 5 + C$

## Time of Day Function (7 Key)

Current T.O.D. "E Function"  
Control Bits =  $C/0 + E + E$   
Current T.O.D. "F Function"  
Output Bits =  $C/0 + E + F$

## Logic DELAY Gate

### Delay Timer Display

DELAY A Timer =  $C/0 + 9 + A$   
DELAY B Timer =  $C/0 + 9 + B$   
thru thru  
DELAY F Timer =  $C/0 + 9 + F$

### Interval Timer Display

Ring A =  $F/0 + A +$  Interval Row  
Ring B =  $F/0 + B +$  (Interval Row From  
PHASE BANK data)

## Display Locations

### Plan Select      Offset Select

Manual =  $C/0 + A + 1$        $C/0 + B + 1$   
Master =  $C/0 + A + 2$        $C/0 + B + 2$   
Current =  $C/0 + A + 3$        $C/0 + B + 3$   
Next =  $C/0 + A + 4$        $C/0 + B + 4$   
TOD =  $C/0 + A + 5$        $C/0 + B + 5$   
Master Cycle =  $C/0 + A + 0$   
Ring A Cycle =  $C/0 + B + 0$   
Ring B Cycle =  $C/0 + D + 0$

MIN Cycle =  $C/0 + A + E$   
MAX Cycle =  $C/0 + B + E$

Phase Hold =  $C/0 + F + D$   
Phase Next =  $C/0 + F + E$   
Force Off =  $C/0 + F + F$   
(with Ring A Cycle Timer)

Current Calculated Cycle  
Length =  $C/0 + B + F$   
Current Permitted  
Phases =  $E/0 + 7 + 8$   
Current Phase  
Bank =  $F/0 + C + E$

Last Power Failure:  
(HR-MIN-DOW) =  $8 + 4$   
(DOW-YR-MONTH) =  $8 + 5$   
Last Cabinet Flash  
(HR-MIN-DOW) =  $8 + 6$   
(DOW-YR-MONTH) =  $8 + 7$   
Power Fail Counts:  
(Long Failures) =  $F/1 + 0 + C$   
(Short Failures) =  $F/1 + 0 + D$   
Current Time:  
(HR-MIN-DOW) =  $8 + 0$   
(DOW-YR-MONTH) =  $8 + 1$   
(MIN-SEC-1/10SEC) =  $8 + F$

**BI Tran Systems, Inc.**  
510 Bercut Dr., Sacramento, Calif.  
95814  
916/441-0260  
Traffic Signal Program 233  
"View" Locations  
(Revised 03/94)

# Appendix B

## Base Year Operations



Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Base Year AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	25	98	40	200	43	160	9	1006	370	258	1051	14
Future Volume (vph)	25	98	40	200	43	160	9	1006	370	258	1051	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	65.0	0.0	35.0	0.0	160.0	0.0	160.0	150.0	195.0	0.0	0.0	0.0
Storage Lanes	1	0	1	0	1	0	1	2	0	0	0	0
Taper Length (m)	7.5	0.0	7.5	0.0	7.5	0.0	7.5	7.5	0.0	0.0	0.0	0.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	0.95
Ped Bike Factor	1.00	0.957	0.882	0.850	0.998	0.99	0.882	0.850	0.998	0.99	0.998	0.998
Fit Protected	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
Satd. Flow (prot)	1736	1778	0	1719	3008	0	1626	3223	1568	3400	3276	0
Fit Permitted	0.614	0.614	0.426	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
Satd. Flow (perm)	1120	1778	0	771	3008	0	1626	3223	1568	3400	3276	0
Right Turn on Red		Yes		Yes		Yes		Yes		Yes		Yes
Satd. Flow (RTOR)	13	13	174	1	13	13	174	1	13	13	174	1
Link Speed (k/h)	60	60	60	60	60	60	60	60	60	60	60	60
Link Distance (m)	101.8	101.8	339.3	467.1	460.6	101.8	101.8	339.3	467.1	460.6	101.8	101.8
Travel Time (s)	6.1	6.1	20.4	21.0	23.7	6.1	6.1	20.4	21.0	23.7	6.1	6.1
Confl. Peds. (#/hr)	2	2	2	2	2	2	2	2	2	2	2	2
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 (%)	4%	0%	8%	5%	7%	4%	11%	12%	3%	3%	10%	7%
Adj. Flow (vph)	27	107	43	217	47	174	10	1093	402	280	1142	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	27	150	0	217	221	0	10	1093	402	280	1157	0
Turn Type	Perm	NA	pm+pt	NA	Prot	NA	Perm	Prot	NA	NA	NA	NA
Protected Phases	4	4	3	8	5	2	2	1	6	4	4	3
Permitted Phases	4	4	8	4	4	4	4	4	4	4	4	4
Detector Phase	4	4	3	8	5	2	2	1	6	4	4	3
Switch Phase												
Minimum Initial (s)	10.0	10.0	7.0	10.0	8.0	53.0	53.0	8.0	53.0	8.0	53.0	8.0
Minimum Split (s)	44.9	44.9	10.0	44.9	13.0	60.8	60.8	13.0	60.8	13.0	60.8	13.0
Total Split (s)	44.9	44.9	13.0	57.9	25.0	60.8	60.8	30.0	65.8	30.0	65.8	30.0
Total Split (%)	30.2%	30.2%	8.7%	38.9%	16.8%	40.9%	40.9%	20.2%	44.3%	20.2%	44.3%	20.2%
Maximum Green (s)	37.0	37.0	10.0	50.0	20.0	53.0	53.0	25.0	58.0	25.0	58.0	25.0
Yellow Time (s)	5.0	5.0	3.0	5.0	3.0	5.9	5.9	3.0	5.9	3.0	5.9	3.0
All-Red Time (s)	2.9	2.9	0.0	2.9	2.0	1.9	1.9	2.0	1.9	2.0	1.9	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.9	7.9	3.0	7.9	5.0	7.8	7.8	5.0	7.8	5.0	7.8	5.0
Lead/Lag	Lag	Lag	Lead	Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lead	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	3.0
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max	None	C-Max	C-Max
Walk Time (s)	21.0	21.0	21.0	21.0	41.0	41.0	41.0	21.0	41.0	21.0	41.0	21.0
Flash Dont Walk (s)	16.0	16.0	16.0	16.0	12.0	12.0	12.0	16.0	12.0	16.0	12.0	16.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Act Effct Green (s)	16.9	16.9	34.8	29.9	12.8	79.7	79.7	18.4	93.1	18.4	93.1	18.4
Actuated g/C Ratio	0.11	0.11	0.23	0.20	0.09	0.54	0.54	0.12	0.63	0.12	0.63	0.12
v/c Ratio	0.21	0.70	0.89	0.30	0.07	0.63	0.39	0.67	0.56	0.67	0.56	0.67

Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Base Year AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	61.6	74.8	86.6	12.8	59.7	27.7	3.1	69.9	20.6	0.0	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.6	74.8	86.6	12.8	59.7	27.7	3.1	69.9	20.6	0.0	0.0	0.0
LOS	E	E	F	B	E	C	A	E	C			
Approach Delay	72.8	49.4	21.3	30.2	72.8	49.4	21.3	30.2	72.8	49.4	21.3	30.2
Approach LOS	E	E	D	C	E	E	C	E	E	E	E	E
Queue Length 50th (m)	7.3	39.1	55.9	5.8	2.8	114.4	0.0	40.7	77.6	0.0	0.0	0.0
Queue Length 95th (m)	16.3	59.8	#86.0	16.2	8.4	160.3	17.6	54.0	165.6	0.0	0.0	0.0
Internal Link Dist (m)	77.8	315.3	443.1	436.6	77.8	315.3	443.1	436.6	77.8	315.3	443.1	436.6
Turn Bay Length (m)	65.0	35.0	160.0	150.0	65.0	35.0	160.0	150.0	65.0	35.0	160.0	150.0
Base Capacity (vph)	278	452	244	1126	218	1726	1026	571	2051	278	452	244
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.33	0.89	0.20	0.05	0.63	0.39	0.49	0.56	0.33	0.67	0.56
<b>Intersection Summary</b>												
Area Type:	Other											
Cycle Length:	148.7											
Actuated Cycle Length:	148.7											
Offset:	0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green											
Natural Cycle:	130											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	0.89											
Intersection Signal Delay:	30.9											
Intersection Capacity Utilization:	93.5%											
ICU Level of Service:	F											
Analysis Period (min):	15											
# 95th percentile volume exceeds capacity, queue may be longer.												
Queue shown is maximum after two cycles.												
<b>Splits and Phases: 1: Highway 6 &amp; Stone Road West</b>												
Ø1	Ø2 (R)	Ø3	Ø4	Ø5	Ø6 (R)	Ø7	Ø8					
30 s	50.8 s	13 s	44.9 s	25 s	55.8 s	25 s	57.9 s					

HCM 6th Signalized Intersection Summary  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Base Year AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	25	98	40	200	43	160	9	1006	370	258	1051	14
Future Volume (veh/h)	25	98	40	200	43	160	9	1006	370	258	1051	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1841	1900	1781	1826	1796	1841	1737	1722	1856	1856	1752	1796
Adj Flow Rate, veh/h	27	107	43	217	47	174	10	1093	402	280	1142	15
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
Percent Heavy Veh, %	4	0	8	5	7	4	11	12	3	3	10	7
Cap, veh/h	158	145	58	204	341	304	419	1828	878	351	1309	17
Arrive On Green	0.11	0.11	0.11	0.07	0.20	0.20	0.25	0.56	0.56	0.10	0.39	0.39
Sat Flow, veh/h	1137	1287	517	1739	1706	1518	1654	3272	1572	3428	3364	44
Grp Volume(v), veh/h	27	0	150	217	47	174	10	1093	402	280	565	592
Grp Sat Flow(s),veh/h/ln	1137	0	1804	1739	1706	1518	1654	1636	1572	1714	1664	1744
Q Serve(g_s), s	3.3	0.0	12.0	10.0	3.4	15.4	0.7	33.0	22.6	11.9	46.8	46.8
Cycle Q Clear(g_c), s	5.7	0.0	12.0	10.0	3.4	15.4	0.7	33.0	22.6	11.9	46.8	46.8
Prop In Lane	1.00		0.29	1.00		1.00	1.00		1.00	1.00		0.03
Lane Grp Cap(c), veh/h	158	0	203	204	341	304	419	1828	878	351	648	679
V/C Ratio(X)	0.17	0.00	0.74	1.06	0.14	0.57	0.02	0.60	0.46	0.80	0.87	0.87
Avail Cap(c_a), veh/h	312	0	448	204	573	509	419	1828	878	575	648	679
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	62.3	0.0	64.0	60.4	49.0	53.9	41.8	21.8	19.5	65.4	42.1	42.1
Incr Delay (d2), s/veh	0.5	0.0	5.1	81.0	0.2	1.7	0.0	1.5	1.7	5.8	15.0	14.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.7	0.0	9.3	11.8	2.5	9.6	0.5	16.7	12.1	8.9	27.3	28.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	62.8	0.0	69.1	141.4	49.2	55.6	41.9	23.2	21.2	71.2	57.1	56.5
LnGrp LOS	E	A	E	F	D	E	D	C	C	E	E	E
Approach Vol, veh/h		177			438			1505			1437	
Approach Delay, s/veh		68.1			97.4			22.8			59.6	
Approach LOS		E			F			C			E	
Timer - Assigned Phs	1	2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s	20.3	91.0	13.0	24.7	45.5	65.8		37.7				
Change Period (Y+Rc), s	5.0	* 7.8	3.0	7.9	* 7.8	* 7.8		7.9				
Max Green Setting (Gmax), s	25.0	* 53	10.0	37.0	* 20	* 58		50.0				
Max Q Clear Time (g_c+I1), s	13.9	35.0	12.0	14.0	2.7	48.8		17.4				
Green Ext Time (p_c), s	1.4	10.5	0.0	1.0	0.0	5.5		1.7				

Intersection Summary												
HCM 6th Ctrl Delay	49.1											
HCM 6th LOS	D											

Notes  
\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Base Year AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	61	596	69	105	296	47	67	140	143	86	88	40
Future Volume (vph)	61	596	69	105	296	47	67	140	143	86	88	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	27.5		0.0	25.0		0.0	30.0		0.0	20.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	30.0			25.0			60.0			60.0		
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	0.95
Ped Bike Factor	0.99	1.00		1.00	1.00		0.97	0.99		0.99	0.98	
Frt		0.984			0.980			0.924			0.953	
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1641	3363	0	1736	3206	0	1752	3183	0	1626	3161	0
Fit Permitted	0.515			0.296			0.656			0.431		
Satd. Flow (perm)	883	3363	0	538	3206	0	1171	3183	0	732	3161	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16			22			168			47	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		339.3			210.0			117.2			40.4	
Travel Time (s)		20.4			12.6			8.4			2.9	
Conf. Peds. (#/hr)	11		14	14		11	37		12	12		37
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	10%	5%	8%	4%	9%	16%	3%	4%	3%	11%	4%	14%
Adj. Flow (vph)	72	701	81	124	348	55	79	165	168	101	104	47
Shared Lane Traffic (%)												
Lane Group Flow (vph)	72	782	0	124	403	0	79	333	0	101	151	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		
Detector Phase	5	2		1	6		7	4		3	8	
Switch Phase												
Minimum Initial (s)	6.0	10.0		6.0	10.0		6.0	10.0		6.0	10.0	
Minimum Split (s)	9.0	27.1		9.0	27.1		9.0	31.0		9.0	31.0	
Total Split (s)	9.0	40.0		9.0	40.0		9.0	32.0		9.0	32.0	
Total Split (%)	10.0%	44.4%		10.0%	44.4%		10.0%	35.6%		10.0%	35.6%	
Maximum Green (s)	6.0	33.9		6.0	33.9		6.0	26.0		6.0	26.0	
Yellow Time (s)	3.0	3.7		3.0	3.7		3.0	4.0		3.0	4.0	
All-Red Time (s)	0.0	2.4		0.0	2.4		0.0	2.0		0.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	6.1		3.0	6.1		3.0	6.0		3.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			9.0			9.0	
Flash Dont Walk (s)		14.0			14.0			16.0			16.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	58.6	48.5		60.9	51.2		19.2	11.4		19.2	11.4	
Actuated g/C Ratio	0.65	0.54		0.68	0.57		0.21	0.13		0.21	0.13	
v/c Ratio	0.11	0.43		0.27	0.22		0.27	0.61		0.47	0.34	

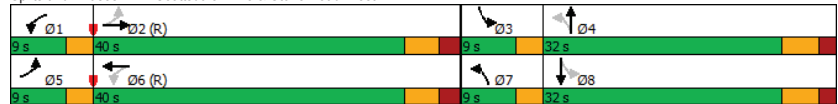
Lanes, Volumes, Timings  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Base Year AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	6.0	14.1		6.9	10.9		28.0	22.9		34.0	26.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.0	14.1		6.9	10.9		28.0	22.9		34.0	26.3	
LOS	A	B		A	B		C	C		C	C	
Approach Delay	13.5		10.0		23.9		29.4					
Approach LOS	B		A		C		C					
Queue Length 50th (m)	3.5	39.1		6.2	16.6		10.7	14.1		13.9	8.7	
Queue Length 95th (m)	8.2	57.4		12.8	26.7		18.9	23.2		23.5	15.3	
Internal Link Dist (m)	315.3		186.0		93.2		16.4					
Turn Bay Length (m)	27.5		25.0		30.0		20.0					
Base Capacity (vph)	633	1820		467	1832		288	1039		215	946	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.11	0.43		0.27	0.22		0.27	0.32		0.47	0.16	

Intersection Summary	
Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	42 (47%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle:	80
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.61
Intersection Signal Delay:	16.6
Intersection Capacity Utilization:	63.6%
Analysis Period (min):	15
Intersection LOS:	B
ICU Level of Service:	B

Splits and Phases: 2: Scottsdale Drive & Stone Road West



HCM 6th Signalized Intersection Summary  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Base Year AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	61	596	69	105	296	47	67	140	143	86	88	40
Future Volume (veh/h)	61	596	69	105	296	47	67	140	143	86	88	40
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	0.96		0.95	0.98		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No	No	No	No	No	No	No	No	No	No	No	No
Adj Sat Flow, veh/h/ln	1752	1826	1781	1841	1767	1663	1856	1841	1856	1737	1841	1693
Adj Flow Rate, veh/h	72	701	81	124	348	55	79	165	168	101	104	47
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	10	5	8	4	9	16	3	4	3	11	4	14
Cap, veh/h	521	1398	161	386	1320	207	409	395	335	304	545	230
Arrive On Green	0.06	0.45	0.45	0.06	0.45	0.45	0.06	0.23	0.23	0.06	0.23	0.23
Sat Flow, veh/h	1668	3130	361	1753	2904	454	1767	1749	1483	1654	2359	993
Grp Volume(v), veh/h	72	388	394	124	200	203	79	165	168	101	75	76
Grp Sat Flow(s), veh/h/ln	1668	1735	1757	1753	1678	1680	1767	1749	1483	1654	1749	1603
Q Serve(g_s), s	2.0	14.4	14.4	3.4	6.6	6.8	3.0	7.3	8.9	4.2	3.1	3.4
Cycle Q Clear(g_c), s	2.0	14.4	14.4	3.4	6.6	6.8	3.0	7.3	8.9	4.2	3.1	3.4
Prop In Lane	1.00		0.21	1.00		0.27	1.00		1.00	1.00		0.62
Lane Grp Cap(c), veh/h	521	775	785	386	763	764	409	395	335	304	404	371
V/C Ratio(X)	0.14	0.50	0.50	0.32	0.26	0.27	0.19	0.42	0.50	0.33	0.19	0.20
Avail Cap(c_a), veh/h	539	775	785	392	763	764	426	505	428	311	505	463
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	11.9	17.8	17.8	13.0	15.2	15.2	24.3	29.8	30.4	24.7	27.8	27.9
Incr Delay (d2), s/veh	0.1	2.3	2.3	0.5	0.8	0.9	0.2	0.7	1.2	0.6	0.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.0	8.5	8.6	1.8	3.8	3.9	2.0	5.0	5.3	2.7	2.1	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.0	20.1	20.1	13.5	16.0	16.1	24.5	30.5	31.6	25.4	28.0	28.2
LnGrp LOS	B	C	C	B	B	B	C	C	C	C	C	C
Approach Vol, veh/h	854			527			412			252		
Approach Delay, s/veh	19.4			15.5			29.8			27.0		
Approach LOS	B			B			C			C		

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.7	46.3	8.7	26.3	8.0	47.0	8.2	26.8
Change Period (Y+Rc), s	3.0	* 6.1	3.0	6.0	3.0	* 6.1	3.0	6.0
Max Green Setting (Gmax), s	6.0	* 34	6.0	26.0	6.0	* 34	6.0	26.0
Max Q Clear Time (g_c+I1), s	5.4	16.4	6.2	10.9	4.0	8.8	5.0	5.4
Green Ext Time (p_c), s	0.0	5.3	0.0	2.0	0.0	2.8	0.0	0.9

Intersection Summary	
HCM 6th Ctrl Delay	21.4
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Lanes, Volumes, Timings  
3: Scottsdale Drive & South Driveway

601 Scottsdale Drive, Guelph TIS and PS  
Base Year AM

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↘			↕	↕	
Traffic Volume (vph)	2	3	2	246	211	1
Future Volume (vph)	2	3	2	246	211	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Fr <sub>t</sub>	0.919			0.999		
Flt Protected	0.980					
Satd. Flow (prot)	1678	0	0	3344	3340	0
Flt Permitted	0.980					
Satd. Flow (perm)	1678	0	0	3344	3340	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	48.6			40.4	88.1	
Travel Time (s)	3.5			2.9	6.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	8%	8%	2%
Adj. Flow (vph)	2	3	2	267	229	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	5	0	0	269	230	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	18.2%
ICU Level of Service A	
Analysis Period (min)	15

HCM 6th TWSC  
3: Scottsdale Drive & South Driveway

601 Scottsdale Drive, Guelph TIS and PS  
Base Year AM

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↘			↕	↕	
Traffic Vol, veh/h	2	3	2	246	211	1
Future Vol, veh/h	2	3	2	246	211	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	8	8	2
Mvmt Flow	2	3	2	267	229	1

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	368	115	230
Stage 1	230	-	-
Stage 2	138	-	-
Critical Hdwy	6.84	6.94	4.14
Critical Hdwy Stg 1	5.84	-	-
Critical Hdwy Stg 2	5.84	-	-
Follow-up Hdwy	3.52	3.32	2.22
Pot Cap-1 Maneuver	605	916	1335
Stage 1	786	-	-
Stage 2	874	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	604	916	1335
Mov Cap-2 Maneuver	604	-	-
Stage 1	784	-	-
Stage 2	874	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.8	0.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT	SBR
Capacity (veh/h)	1335	-	759	-
HCM Lane V/C Ratio	0.002	-	0.007	-
HCM Control Delay (s)	7.7	0	9.8	-
HCM Lane LOS	A	A	A	-
HCM 95th %tile Q(veh)	0	-	0	-

Lanes, Volumes, Timings  
4: North Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Base Year AM

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↘			↕↕	↕↕	
Traffic Volume (vph)	1	2	3	245	210	4
Future Volume (vph)	1	2	3	245	210	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Fr <sub>t</sub>	0.910				0.997	
Fit Protected	0.984			0.999		
Satd. Flow (prot)	1668	0	0	3341	3336	0
Fit Permitted	0.984			0.999		
Satd. Flow (perm)	1668	0	0	3341	3336	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	33.1			88.1	60.3	
Travel Time (s)	2.4			6.3	4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	8%	8%	2%
Adj. Flow (vph)	1	2	3	266	228	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	3	0	0	269	232	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	18.9%
ICU Level of Service	A
Analysis Period (min)	15

HCM 6th TWSC  
4: North Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Base Year AM

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↘			↕↕	↕↕	
Traffic Vol, veh/h	1	2	3	245	210	4
Future Vol, veh/h	1	2	3	245	210	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	8	8	2
Mvmt Flow	1	2	3	266	228	4

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	369	116	232
Stage 1	230	-	-
Stage 2	139	-	-
Critical Hdwy	6.84	6.94	4.14
Critical Hdwy Stg 1	5.84	-	-
Critical Hdwy Stg 2	5.84	-	-
Follow-up Hdwy	3.52	3.32	2.22
Pot Cap-1 Maneuver	604	914	1333
Stage 1	786	-	-
Stage 2	873	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	602	914	1333
Mov Cap-2 Maneuver	602	-	-
Stage 1	784	-	-
Stage 2	873	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.6	0.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1333	-	779	-	-
HCM Lane V/C Ratio	0.002	-	0.004	-	-
HCM Control Delay (s)	7.7	0	9.6	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Lanes, Volumes, Timings 601 Scottsdale Drive, Guelph TIS and PS  
1: Highway 6 & Stone Road West Base Year PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	19	80	30	333	129	323	33	1217	305	369	1278	18
Future Volume (vph)	19	80	30	333	129	323	33	1217	305	369	1278	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	65.0		0.0	35.0		0.0	160.0		150.0	195.0		0.0
Storage Lanes	1		0	1		0	1		1	2		0
Taper Length (m)	7.5			7.5			7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	0.95
Ped Bike Factor	0.99				0.98							
Frt		0.959			0.893				0.850		0.998	
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1794	0	1787	3123	0	1805	3438	1583	3467	3466	0
Fit Permitted	0.473			0.499			0.950			0.950		
Satd. Flow (perm)	892	1794	0	939	3123	0	1805	3438	1583	3467	3466	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			351				332		1	
Link Speed (k/h)		60			60			80			70	
Link Distance (m)		101.8			339.3			467.1			460.6	
Travel Time (s)		6.1			20.4			21.0			23.7	
Confl. Peds. (#/hr)	12				12							
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%	1%	3%	1%	2%	1%	0%	5%	2%	1%	4%	0%
Adj. Flow (vph)	21	87	33	362	140	351	36	1323	332	401	1389	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	21	120	0	362	491	0	36	1323	332	401	1409	0
Turn Type	Perm	NA		pm+pt	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases		4		8				2		2		
Detector Phase		4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	10.0		8.0	53.0	53.0	8.0	53.0	
Minimum Split (s)	44.9	44.9		10.0	44.9		13.0	60.8	60.8	13.0	60.8	
Total Split (s)	44.9	44.9		13.0	57.9		25.0	60.8	60.8	30.0	65.8	
Total Split (%)	30.2%	30.2%		8.7%	38.9%		16.8%	40.9%	40.9%	20.2%	44.3%	
Maximum Green (s)	37.0	37.0		10.0	50.0		20.0	53.0	53.0	25.0	58.0	
Yellow Time (s)	5.0	5.0		3.0	5.0		3.0	5.9	5.9	3.0	5.9	
All-Red Time (s)	2.9	2.9		0.0	2.9		2.0	1.9	1.9	2.0	1.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.9	7.9		3.0	7.9		5.0	7.8	7.8	5.0	7.8	
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.0	3.0	3.0	4.0	3.0	
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	
Walk Time (s)	21.0	21.0			21.0		41.0	41.0		41.0		
Flash Dont Walk (s)	16.0	16.0			16.0		12.0	12.0		12.0		
Pedestrian Calls (#/hr)	0	0			0		0	0		0		
Act Effct Green (s)	14.6	14.6		32.5	27.6		17.6	77.2	77.2	23.2	85.4	
Actuated g/C Ratio	0.10	0.10		0.22	0.19		0.12	0.52	0.52	0.16	0.57	
v/c Ratio	0.24	0.64		1.38	0.57		0.17	0.74	0.34	0.74	0.71	

Lanes, Volumes, Timings 601 Scottsdale Drive, Guelph TIS and PS  
1: Highway 6 & Stone Road West Base Year PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	66.8	73.0		235.2	17.3		59.1	32.5	3.2	68.4	27.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	66.8	73.0		235.2	17.3		59.1	32.5	3.2	68.4	27.4	
LOS	E	E		F	B		E	C	A	E	C	
Approach Delay		72.1			109.8			27.3			36.5	
Approach LOS		E			F			C			D	
Queue Length 50th (m)	5.8	30.8		~139.6	18.5		9.4	154.1	0.0	58.1	161.5	
Queue Length 95th (m)	14.1	50.0		#190.3	34.6		20.6	210.5	16.7	72.9	206.6	
Internal Link Dist (m)		77.8			315.3			443.1			436.6	
Turn Bay Length (m)	65.0			35.0			160.0		150.0	195.0		
Base Capacity (vph)	221	455		262	1283		242	1783	981	599	1990	
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	0.10	0.26		1.38	0.38		0.15	0.74	0.34	0.67	0.71	
<b>Intersection Summary</b>												
Area Type: Other												
Cycle Length: 148.7												
Actuated Cycle Length: 148.7												
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green												
Natural Cycle: 130												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.38												
Intersection Signal Delay: 48.1 Intersection LOS: D												
Intersection Capacity Utilization 98.9% ICU Level of Service F												
Analysis Period (min) 15												
~ Volume exceeds capacity, queue is theoretically infinite.												
Queue shown is maximum after two cycles.												
# 95th percentile volume exceeds capacity, queue may be longer.												
Queue shown is maximum after two cycles.												
<b>Spits and Phases: 1: Highway 6 &amp; Stone Road West</b>												
↔ Ø1	↔ Ø2 (R)	↔ Ø3	↔ Ø4									
30 s	60.8 s	13 s	44.9 s									
↓ Ø5 (R)		↔ Ø5	↔ Ø6									
55.8 s		25 s	57.9 s									



Lanes, Volumes, Timings

601 Scottsdale Drive, Guelph TIS and PS

2: Scottsdale Drive & Stone Road West

Base Year PM

	↖	→	↘	↙	←	↖	↙	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	6.6	14.8		8.4	13.0		29.7	18.9		35.1	27.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.6	14.8		8.4	13.0		29.7	18.9		35.1	27.1	
LOS	A	B		A	B		C	B		D	C	
Approach Delay	13.8				11.9		21.1				29.5	
Approach LOS	B				B		C				C	
Queue Length 50th (m)	4.6	35.0		12.8	35.6		13.8	12.9		13.9	13.7	
Queue Length 95th (m)	11.0	59.3		25.8	57.4		24.5	25.4		24.6	23.4	
Internal Link Dist (m)	315.3				186.0		93.2				16.4	
Turn Bay Length (m)	27.5				25.0		30.0				20.0	
Base Capacity (vph)	575		1782		554		1922		285		1060	
Starvation Cap Reductn	0		0		0		0		0		0	
Spillback Cap Reductn	0		0		0		0		0		0	
Storage Cap Reductn	0		0		0		0		0		0	
Reduced v/c Ratio	0.17		0.40		0.44		0.39		0.35		0.38	
									0.50		0.24	

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	35 (39%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle:	80
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.65
Intersection Signal Delay:	16.5
Intersection Capacity Utilization:	69.6%
Analysis Period (min)	15
Intersection LOS:	B
ICU Level of Service:	C

Spits and Phases: 2: Scottsdale Drive & Stone Road West



HCM 6th Signalized Intersection Summary

601 Scottsdale Drive, Guelph TIS and PS

2: Scottsdale Drive & Stone Road West

Base Year PM

	↖	→	↘	↙	←	↖	↙	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖	↖↗		↖	↖↗	
Traffic Volume (veh/h)	88	523	143	225	616	73	94	141	237	94	151	75
Future Volume (veh/h)	88	523	143	225	616	73	94	141	237	94	151	75
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	0.98		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1900	1870	1900	1885	1841	1811	1900	1856	1885	1796	1900	1900
Adj Flow Rate, veh/h	95	562	154	242	662	78	101	152	255	101	162	81
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	2	0	1	4	6	0	3	1	7	0	0
Cap, veh/h	405	1121	306	443	1399	165	386	409	355	258	546	258
Arrive On Green	0.06	0.41	0.41	0.10	0.44	0.44	0.06	0.23	0.23	0.06	0.23	0.23
Sat Flow, veh/h	1810	2746	750	1795	3145	370	1810	1763	1528	1711	2353	1113
Grp Volume(v), veh/h	95	363	353	242	368	372	101	152	255	101	122	121
Grp Sat Flow(s),veh/h/ln	1810	1777	1719	1795	1749	1767	1810	1763	1528	1711	1805	1661
Q Serve(g_s), s	2.6	13.7	13.8	6.6	13.3	13.3	3.8	6.5	13.8	4.0	5.0	5.4
Cycle Q Clear(g_c), s	2.6	13.7	13.8	6.6	13.3	13.3	3.8	6.5	13.8	4.0	5.0	5.4
Prop In Lane	1.00		0.44	1.00		0.21	1.00		1.00	1.00		0.67
Lane Grp Cap(c), veh/h	405	726	702	443	778	786	386	409	355	258	419	386
V/C Ratio(X)	0.23	0.50	0.50	0.55	0.47	0.47	0.26	0.37	0.72	0.39	0.29	0.31
Avail Cap(c_a), veh/h	497	726	702	468	778	786	396	490	424	267	501	461
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.0	19.8	19.8	13.7	17.6	17.6	24.0	29.0	31.8	25.1	28.5	28.6
Incr Delay (d2), s/veh	0.3	2.5	2.6	1.2	2.1	2.0	0.4	0.6	4.7	1.0	0.4	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.5	8.6	8.4	3.6	8.0	8.1	2.6	4.5	8.6	2.7	3.6	3.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.3	22.3	22.4	14.8	19.6	19.6	24.3	29.6	36.5	26.0	28.8	29.1
LnGrp LOS	B	C	C	B	B	B	C	C	D	C	C	C
Approach Vol, veh/h	811			982			508			344		
Approach Delay, s/veh	21.4			18.4			32.0			28.1		
Approach LOS	C			B			C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.7	42.8	8.5	26.9	8.4	46.1	8.5	26.9				
Change Period (Y+Rc), s	3.0	* 6.1	3.0	6.0	3.0	* 6.1	3.0	6.0				
Max Green Setting (Gmax), s	10.0	* 31	6.0	25.0	10.0	* 31	6.0	25.0				
Max Q Clear Time (g_c+I1), s	8.6	15.8	6.0	15.8	4.6	15.3	5.8	7.4				
Green Ext Time (p_c), s	0.1	4.5	0.0	2.0	0.1	4.7	0.0	1.5				

Intersection Summary

HCM 6th Ctrl Delay	23.2
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
3: Scottsdale Drive & South Driveway

601 Scottsdale Drive, Guelph TIS and PS  
Base Year PM

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Volume (vph)	2	3	3	299	317	3
Future Volume (vph)	2	3	3	299	317	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Frt	0.919				0.999	
Flt Protected	0.980					
Satd. Flow (prot)	1678	0	0	3505	3536	0
Flt Permitted	0.980					
Satd. Flow (perm)	1678	0	0	3505	3536	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	48.6			40.4	88.1	
Travel Time (s)	3.5			2.9	6.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%
Adj. Flow (vph)	2	3	3	325	345	3
Shared Lane Traffic (%)						
Lane Group Flow (vph)	5	0	0	328	348	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	20.4%
ICU Level of Service A	
Analysis Period (min)	15

HCM 6th TWSC  
3: Scottsdale Drive & South Driveway

601 Scottsdale Drive, Guelph TIS and PS  
Base Year PM

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Vol, veh/h	2	3	3	299	317	3
Future Vol, veh/h	2	3	3	299	317	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	3	2	2
Mvmt Flow	2	3	3	325	345	3

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	516	174	348
Stage 1	347	-	-
Stage 2	169	-	-
Critical Hdwy	6.84	6.94	4.14
Critical Hdwy Stg 1	5.84	-	-
Critical Hdwy Stg 2	5.84	-	-
Follow-up Hdwy	3.52	3.32	2.22
Pot Cap-1 Maneuver	489	839	1208
Stage 1	687	-	-
Stage 2	843	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	488	839	1208
Mov Cap-2 Maneuver	488	-	-
Stage 1	685	-	-
Stage 2	843	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.6	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1208	-	652	-	-
HCM Lane V/C Ratio	0.003	-	0.008	-	-
HCM Control Delay (s)	8	0	10.6	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Lanes, Volumes, Timings  
4: North Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Base Year PM

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	4	3	2	299	317	2
Future Volume (vph)	4	3	2	299	317	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Fr <sub>t</sub>	0.942				0.999	
Fit Protected	0.972					
Satd. Flow (prot)	1706	0	0	3505	3536	0
Fit Permitted	0.972					
Satd. Flow (perm)	1706	0	0	3505	3536	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	33.1			88.1	60.3	
Travel Time (s)	2.4			6.3	4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%
Adj. Flow (vph)	4	3	2	325	345	2
Shared Lane Traffic (%)						
Lane Group Flow (vph)	7	0	0	327	347	0
Sign Control	Stop			Free	Free	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	19.7%			ICU Level of Service A		
Analysis Period (min)	15					

HCM 6th TWSC  
4: North Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Base Year PM

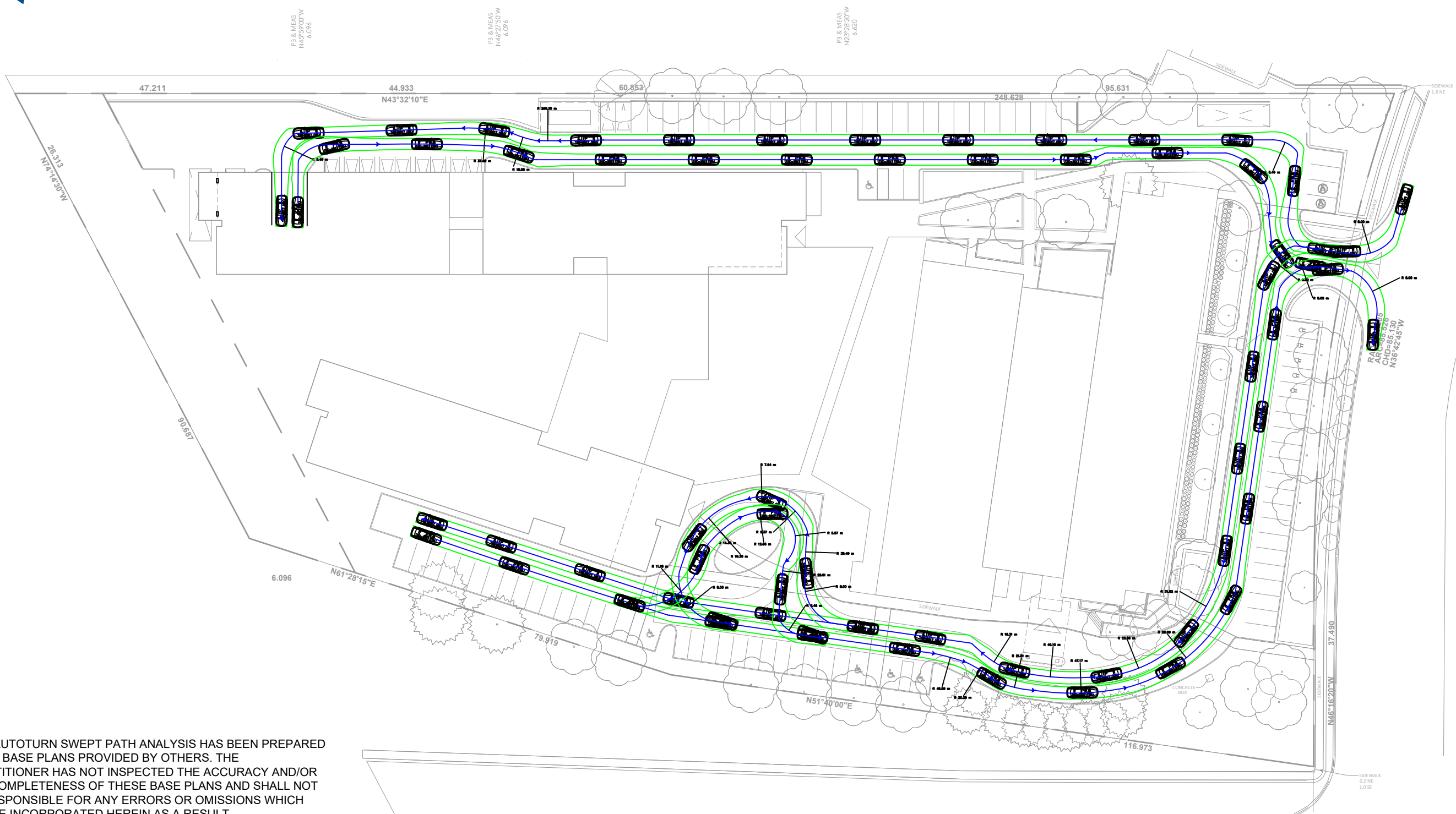
Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	3	2	299	317	2
Future Vol, veh/h	4	3	2	299	317	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	3	2	2
Mvmt Flow	4	3	2	325	345	2
Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	513	174	347	0	-	0
Stage 1	346	-	-	-	-	-
Stage 2	167	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	491	839	1209	-	-	-
Stage 1	688	-	-	-	-	-
Stage 2	845	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	490	839	1209	-	-	-
Mov Cap-2 Maneuver	490	-	-	-	-	-
Stage 1	687	-	-	-	-	-
Stage 2	845	-	-	-	-	-
Approach	EB	NB	SB			
HCM Control Delay, s	11.1	0.1	0			
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1209	-	596	-	-	
HCM Lane V/C Ratio	0.002	-	0.013	-	-	
HCM Control Delay (s)	8	0	11.1	-	-	
HCM Lane LOS	A	A	B	-	-	
HCM 95th %tile Q(veh)	0	-	0	-	-	

# Appendix C

## AutoTURN Analysis







THIS AUTOTURN SWEEP PATH ANALYSIS HAS BEEN PREPARED USING BASE PLANS PROVIDED BY OTHERS. THE PRACTITIONER HAS NOT INSPECTED THE ACCURACY AND/OR THE COMPLETENESS OF THESE BASE PLANS AND SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH MAY BE INCORPORATED HEREIN AS A RESULT.

NO.	DATE	INITIAL	REVISION DETAIL
1	2023-09-13	LC	UPDATED SITE PLAN

DESIGN VEHICLE:

P

Width : 2.00 meters  
 Track : 2.00  
 Lock to Lock Time : 6.0  
 Steering Angle : 35.9

## AUTOTURN ASSESSMENT 601 SCOTTSDALE DRIVE GUELPH, ON



PROJECT NO.: 220563

DATE: JULY 2023

SCALE: 1:750

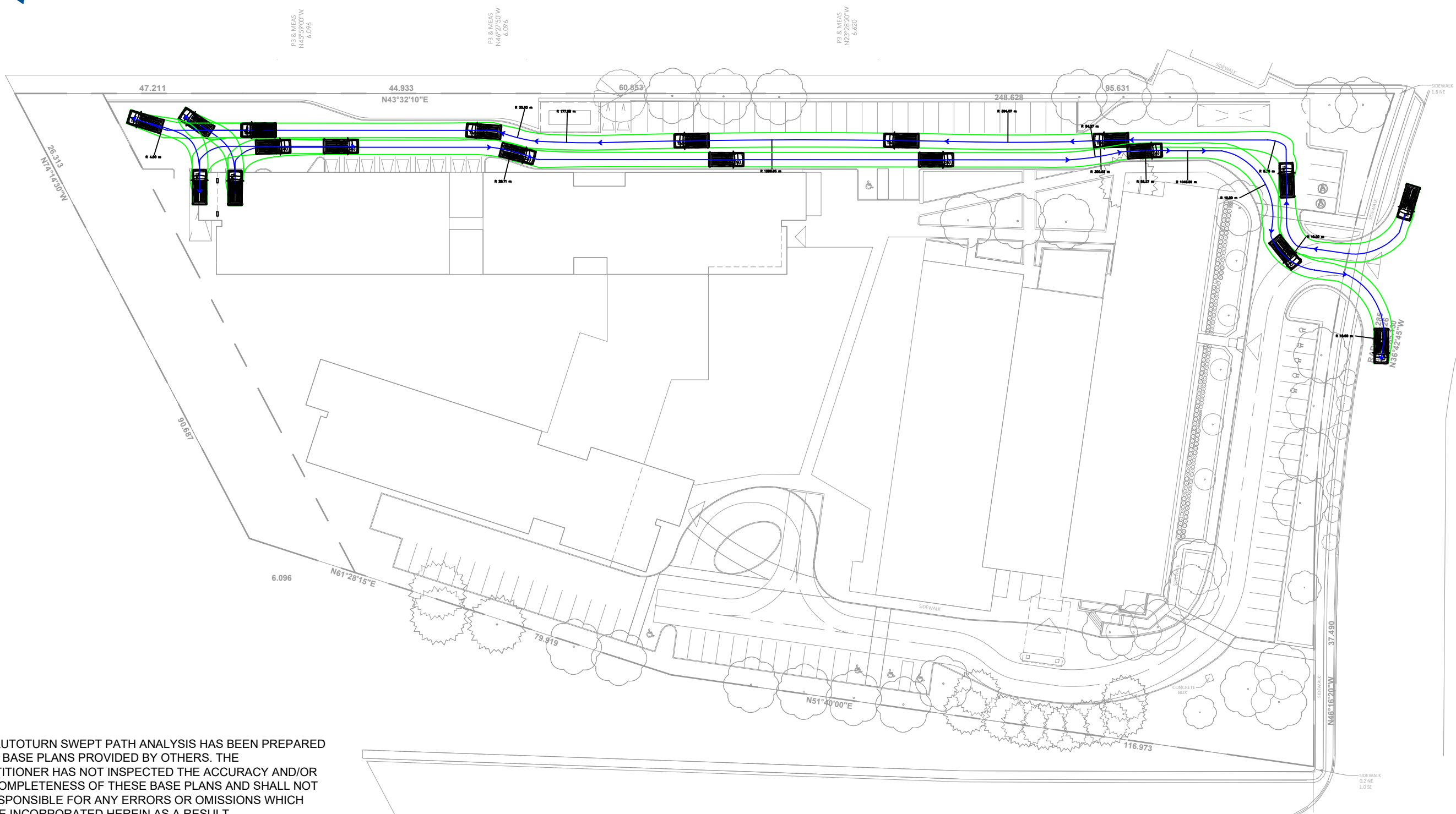
DRAWING NO.:

DRAWN: LC

DESIGN: LC

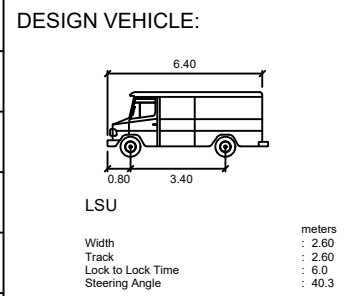
CHECK: MB

01



THIS AUTOTURN SWEEP PATH ANALYSIS HAS BEEN PREPARED USING BASE PLANS PROVIDED BY OTHERS. THE PRACTITIONER HAS NOT INSPECTED THE ACCURACY AND/OR THE COMPLETENESS OF THESE BASE PLANS AND SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH MAY BE INCORPORATED HEREIN AS A RESULT.

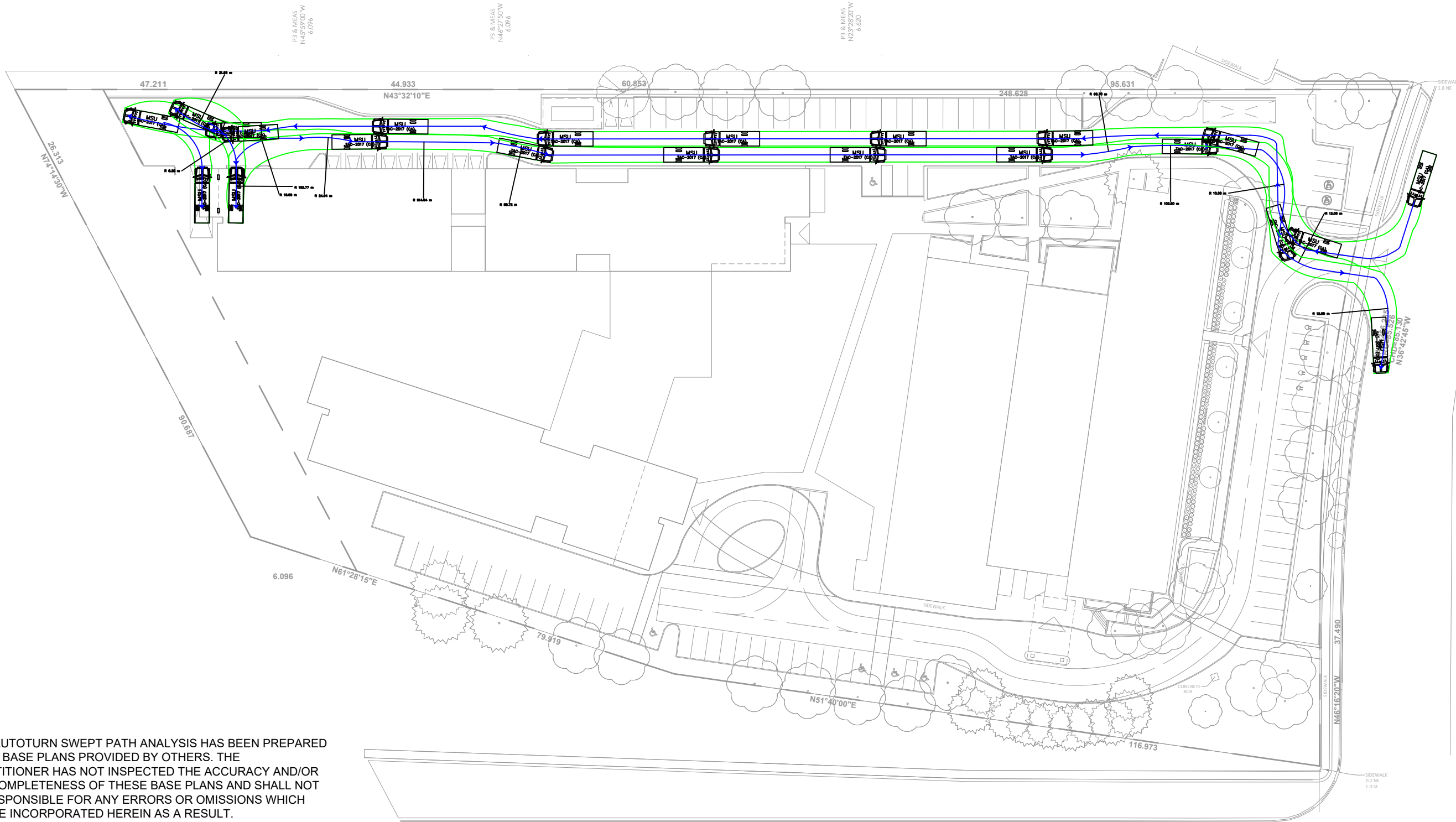
NO.	DATE	INITIAL	REVISION DETAIL
1	2023-09-13	LC	UPDATED SITE PLAN



## AUTOTURN ASSESSMENT 601 SCOTTSDALE DRIVE GUELPH, ON



PROJECT NO.: 220563	DATE: JULY 2023	SCALE: 1:750	DRAWING NO.: <b>02</b>
DRAWN: LC	DESIGN: LC	CHECK: MB	



THIS AUTOTURN SWEEP PATH ANALYSIS HAS BEEN PREPARED USING BASE PLANS PROVIDED BY OTHERS. THE PRACTITIONER HAS NOT INSPECTED THE ACCURACY AND/OR THE COMPLETENESS OF THESE BASE PLANS AND SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH MAY BE INCORPORATED HEREIN AS A RESULT.

NO.	DATE	INITIAL	REVISION DETAIL
1	2023-09-13	LC	UPDATED SITE PLAN

DESIGN VEHICLE:

MSU

meters

- Width : 2.60
- Track : 2.60
- Lock to Lock Time : 6.0
- Steering Angle : 40.2

## AUTOTURN ASSESSMENT 601 SCOTTSDALE DRIVE GUELPH, ON



PROJECT NO.: 220563

DATE: JULY 2023

SCALE: 1:750

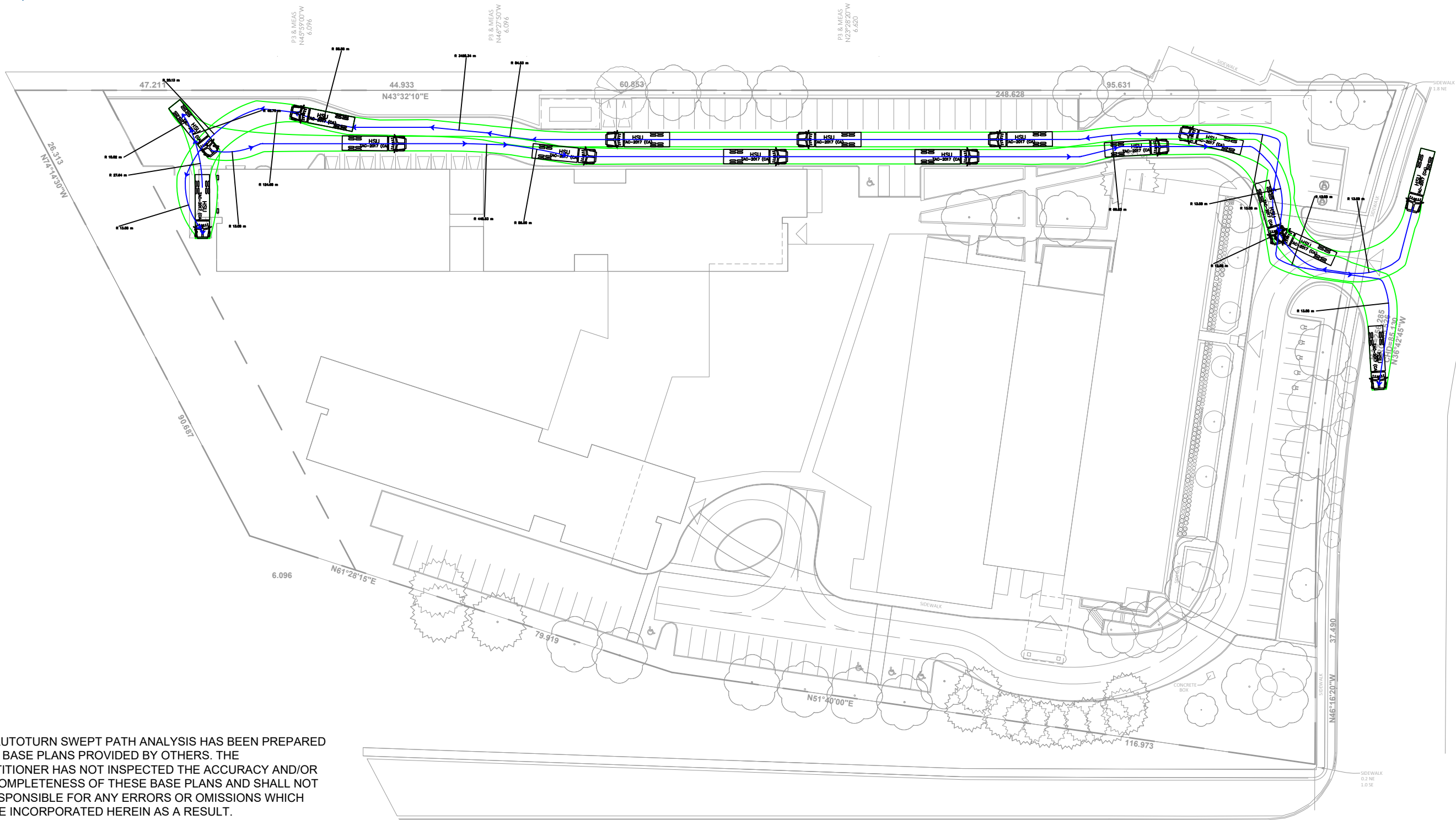
DRAWING NO.:

DRAWN: LC

DESIGN: LC

CHECK: MB

03



THIS AUTOTURN SWEEP PATH ANALYSIS HAS BEEN PREPARED USING BASE PLANS PROVIDED BY OTHERS. THE PRACTITIONER HAS NOT INSPECTED THE ACCURACY AND/OR THE COMPLETENESS OF THESE BASE PLANS AND SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH MAY BE INCORPORATED HEREIN AS A RESULT.

NO.	DATE	INITIAL	REVISION DETAIL
1	2023-09-13	LC	UPDATED SITE PLAN

DESIGN VEHICLE:

HSU

meters

- Width : 2.60
- Track : 2.60
- Lock to Lock Time : 6.0
- Steering Angle : 40.0

## AUTOTURN ASSESSMENT 601 SCOTTSDALE DRIVE GUELPH, ON



PROJECT NO.: 220563

DATE: JULY 2023

SCALE: 1:750

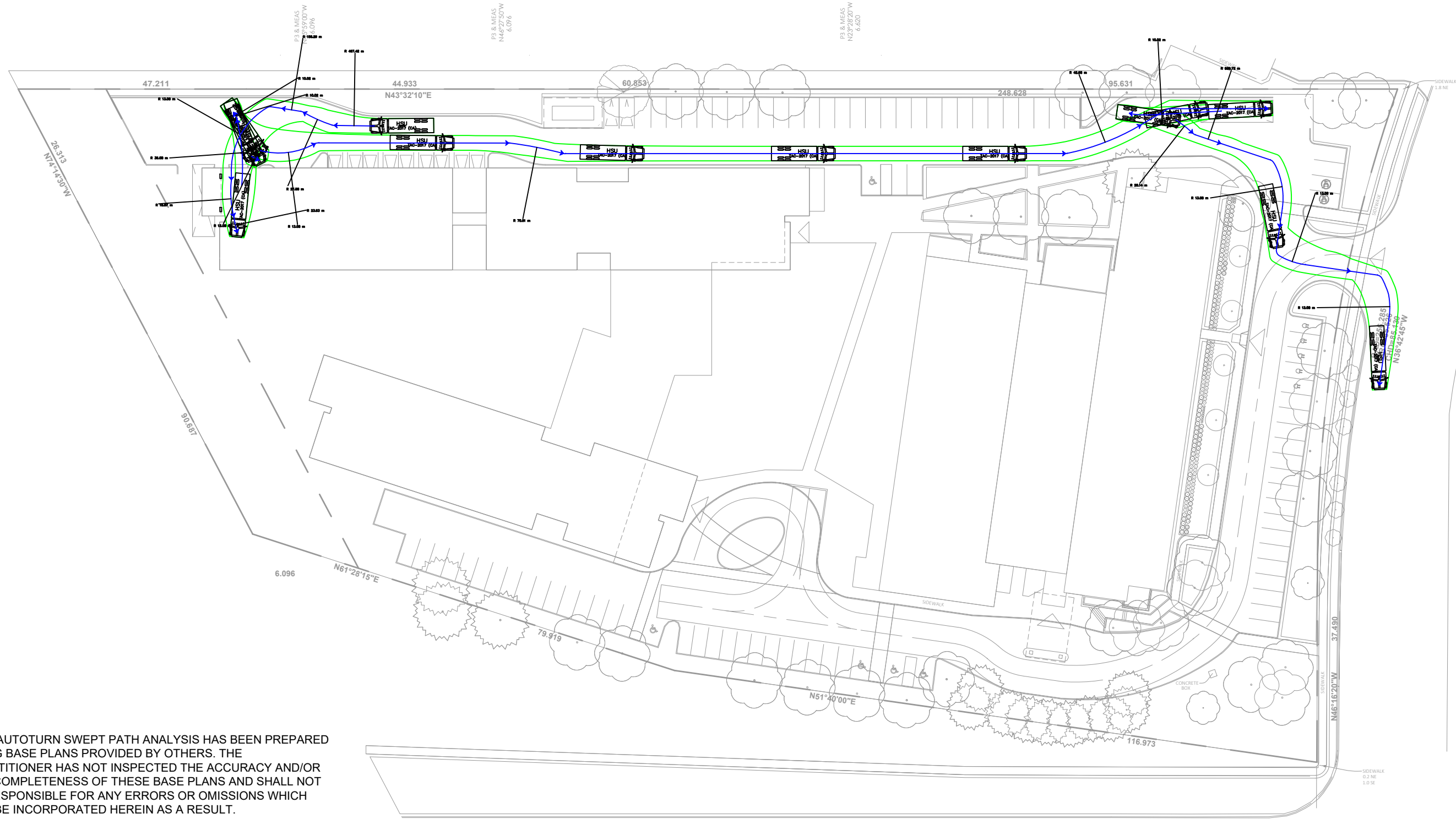
DRAWING NO.:

DRAWN: LC

DESIGN: LC

CHECK: MB

04



THIS AUTOTURN SWEEP PATH ANALYSIS HAS BEEN PREPARED USING BASE PLANS PROVIDED BY OTHERS. THE PRACTITIONER HAS NOT INSPECTED THE ACCURACY AND/OR THE COMPLETENESS OF THESE BASE PLANS AND SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH MAY BE INCORPORATED HEREIN AS A RESULT.

NO.	DATE	INITIAL	REVISION DETAIL
1	2023-09-13	LC	UPDATED SITE PLAN

DESIGN VEHICLE:

HSU

Width : 2.60  
Track : 2.60  
Lock to Lock Time : 6.0  
Steering Angle : 40.0

## AUTOTURN ASSESSMENT 601 SCOTTSDALE DRIVE GUELPH, ON



PROJECT NO.: 220563	DATE: JULY 2023	SCALE: 1:750	DRAWING NO.: <b>05</b>
DRAWN: LC	DESIGN: LC	CHECK: MB	



THIS AUTOTURN SWEEP PATH ANALYSIS HAS BEEN PREPARED USING BASE PLANS PROVIDED BY OTHERS. THE PRACTITIONER HAS NOT INSPECTED THE ACCURACY AND/OR THE COMPLETENESS OF THESE BASE PLANS AND SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH MAY BE INCORPORATED HEREIN AS A RESULT.

NO.	DATE	INITIAL	REVISION DETAIL
1	2023-09-13	LC	UPDATED SITE PLAN

DESIGN VEHICLE:

Pumper Fire Truck

meters

- Width : 2.59
- Track : 2.59
- Lock to Lock Time : 6.0
- Steering Angle : 37.8

## AUTOTURN ASSESSMENT 601 SCOTTSDALE DRIVE GUELPH, ON

	PROJECT NO.: 220563	DATE: JULY 2023	SCALE: 1:750	DRAWING NO.: <b>06</b>
	DRAWN: LC	DESIGN: LC	CHECK: MB	

# Appendix D

## 2025 Background Traffic Operations



Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background AM (Opening Year)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗	↖	↗	↖	↗
Traffic Volume (vph)	26	102	41	206	44	165	9	1026	381	265	1072	14
Future Volume (vph)	26	102	41	206	44	165	9	1026	381	265	1072	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	65.0		0.0	35.0		0.0	160.0		150.0	195.0		0.0
Storage Lanes	1		0	1		0	1		1	2		0
Taper Length (m)	7.5			7.5			7.5		7.5			7.5
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	0.95
Ped Bike Factor	1.00					0.99						
Frt		0.957				0.882			0.850		0.998	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1736	1777	0	1719	3009	0	1626	3223	1568	3400	3276	0
Flt Permitted	0.610			0.414			0.950			0.950		
Satd. Flow (perm)	1112	1777	0	749	3009	0	1626	3223	1568	3400	3276	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			179				414		1	
Link Speed (k/h)		60			60			80			70	
Link Distance (m)		101.8			339.3			467.1			460.6	
Travel Time (s)		6.1			20.4			21.0			23.7	
Confl. Peds. (#/hr)	2				2							
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 (%)	4%	0%	8%	5%	7%	4%	11%	12%	3%	3%	10%	7%
Adj. Flow (vph)	28	111	45	224	48	179	10	1115	414	288	1165	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	156	0	224	227	0	10	1115	414	288	1180	0
Turn Type	Perm	NA		pm+pt	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases		4		8					2			
Detector Phase	4	4		3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	10.0		8.0	53.0	53.0	8.0	53.0	
Minimum Split (s)	44.9	44.9		10.0	44.9		13.0	60.8	60.8	13.0	60.8	
Total Split (s)	44.9	44.9		13.0	57.9		13.0	69.8	69.8	21.0	77.8	
Total Split (%)	30.2%	30.2%		8.7%	38.9%		8.7%	46.9%	46.9%	14.1%	52.3%	
Maximum Green (s)	37.0	37.0		10.0	50.0		8.0	62.0	62.0	16.0	70.0	
Yellow Time (s)	5.0	5.0		3.0	5.0		3.0	5.9	5.9	3.0	5.9	
All-Red Time (s)	2.9	2.9		0.0	2.9		2.0	1.9	1.9	2.0	1.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.9	7.9		3.0	7.9		5.0	7.8	7.8	5.0	7.8	
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.0	3.0	3.0	4.0	3.0	
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	
Walk Time (s)	21.0	21.0		21.0			41.0	41.0		41.0		
Flash Dont Walk (s)	16.0	16.0		16.0			12.0	12.0		12.0		
Pedestrian Calls (#/hr)	0	0		0			0	0		0		
Act Effct Green (s)	17.4	17.4		35.3	30.4		8.0	78.6	78.6	18.9	97.4	
Actuated g/C Ratio	0.12	0.12		0.24	0.20		0.05	0.53	0.53	0.13	0.66	
v/c Ratio	0.22	0.71		0.92	0.30		0.11	0.65	0.40	0.67	0.55	

Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background AM (Opening Year)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	61.1	74.8		92.5	12.5		70.1	28.9	3.2	69.4	16.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	61.1	74.8		92.5	12.5		70.1	28.9	3.2	69.4	16.7	
LOS	E	E		F	B		E	C	A	E	B	
Approach Delay		72.7			52.2			22.3			27.0	
Approach LOS		E			D			C			C	
Queue Length 50th (m)	7.5	40.7		57.6	6.0		2.8	119.7	0.0	41.8	81.0	
Queue Length 95th (m)	16.8	61.7		#91.9	16.3		9.2	167.1	17.9	55.4	143.4	
Internal Link Dist (m)		77.8			315.3			443.1			436.6	
Turn Bay Length (m)	65.0			35.0			160.0		150.0	195.0		
Base Capacity (vph)	276	451		243	1130		87	1704	1024	439	2145	
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	0.10	0.35		0.92	0.20		0.11	0.65	0.40	0.66	0.55	
<b>Intersection Summary</b>												
Area Type: Other												
Cycle Length: 148.7												
Actuated Cycle Length: 148.7												
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green												
Natural Cycle: 130												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 0.92												
Intersection Signal Delay: 30.5						Intersection LOS: C						
Intersection Capacity Utilization 93.7%						ICU Level of Service F						
Analysis Period (min) 15												
# 95th percentile volume exceeds capacity, queue may be longer.												
Queue shown is maximum after two cycles.												
<b>Splits and Phases: 1: Highway 6 &amp; Stone Road West</b>												
<p>The diagram shows the following phase durations and offsets:</p> <ul style="list-style-type: none"> <li>Ø1 (Left Turn): 21 s</li> <li>Ø2 (Right Turn): 69.8 s</li> <li>Ø3 (Through/Left): 13 s</li> <li>Ø4 (Through/Right): 44.9 s</li> <li>Ø5 (Through/Left): 13 s</li> <li>Ø6 (Right Turn): 77.8 s</li> <li>Ø7 (Through/Right): 13 s</li> <li>Ø8 (Through/Left): 57.9 s</li> </ul>												





Lanes, Volumes, Timings  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background AM (Opening Year)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	6.0	14.5		7.1	11.0		28.1	22.9		34.9	26.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.0	14.5		7.1	11.0		28.1	22.9		34.9	26.3	
LOS	A	B		A	B		C	C		C	C	
Approach Delay	13.8			10.1			23.9			29.8		
Approach LOS	B			B			C			C		
Queue Length 50th (m)	3.6	41.1		6.4	17.2		10.9	14.4		14.4	8.9	
Queue Length 95th (m)	8.5	60.2		13.1	27.6		19.4	23.5		24.1	15.6	
Internal Link Dist (m)	315.3			186.0			93.2			16.4		
Turn Bay Length (m)	27.5			25.0			30.0			20.0		
Base Capacity (vph)	626	1812		478	1827		289	1009		212	913	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.12	0.44		0.27	0.23		0.28	0.34		0.50	0.17	

Intersection Summary	
Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	42 (47%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle:	80
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.62
Intersection Signal Delay:	16.8
Intersection Capacity Utilization:	64.3%
Analysis Period (min):	15
Intersection LOS:	B
ICU Level of Service:	C

Splits and Phases: 2: Scottsdale Drive & Stone Road West



HCM 6th Signalized Intersection Summary  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background AM (Opening Year)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	63	614	71	108	305	48	69	144	147	89	91	41
Future Volume (veh/h)	63	614	71	108	305	48	69	144	147	89	91	41
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	0.96		0.95	0.98		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1752	1826	1781	1841	1767	1663	1856	1841	1856	1737	1841	1693
Adj Flow Rate, veh/h	74	722	84	127	359	56	81	169	173	105	107	48
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	10	5	8	4	9	16	3	4	3	11	4	14
Cap, veh/h	511	1386	161	375	1312	203	412	397	336	305	553	232
Arrive On Green	0.06	0.44	0.44	0.06	0.45	0.45	0.06	0.23	0.23	0.07	0.23	0.23
Sat Flow, veh/h	1668	3127	364	1753	2909	450	1767	1749	1484	1654	2364	989
Grp Volume(v), veh/h	74	400	406	127	206	209	81	169	173	105	77	78
Grp Sat Flow(s), veh/h/ln	1668	1735	1756	1753	1678	1681	1767	1749	1484	1654	1749	1605
Q Serve(g_s), s	2.1	15.0	15.1	3.5	6.9	7.0	3.1	7.4	9.2	4.3	3.2	3.5
Cycle Q Clear(g_c), s	2.1	15.0	15.1	3.5	6.9	7.0	3.1	7.4	9.2	4.3	3.2	3.5
Prop In Lane	1.00		0.21	1.00		0.27	1.00		1.00	1.00		0.62
Lane Grp Cap(c), veh/h	511	769	778	375	757	758	412	397	336	305	409	375
V/C Ratio(X)	0.14	0.52	0.52	0.34	0.27	0.28	0.20	0.43	0.51	0.34	0.19	0.21
Avail Cap(c_a), veh/h	529	769	778	439	757	758	427	486	412	308	486	446
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.0	18.1	18.1	13.3	15.5	15.5	24.2	29.8	30.5	24.6	27.6	27.7
Incr Delay (d2), s/veh	0.1	2.5	2.5	0.5	0.9	0.9	0.2	0.7	1.2	0.7	0.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.1	8.9	9.0	1.9	4.0	4.1	2.1	5.2	5.4	2.8	2.2	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.2	20.7	20.6	13.9	16.4	16.4	24.4	30.5	31.7	25.3	27.8	28.0
LnGrp LOS	B	C	C	B	B	B	C	C	C	C	C	C
Approach Vol, veh/h	880			542			423			260		
Approach Delay, s/veh	19.9			15.8			29.8			26.9		
Approach LOS	B			B			C			C		

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.7	46.0	8.9	26.4	8.1	46.7	8.2	27.1
Change Period (Y+Rc), s	3.0	* 6.1	3.0	6.0	3.0	* 6.1	3.0	6.0
Max Green Setting (Gmax), s	9.0	* 32	6.0	25.0	6.0	* 35	6.0	25.0
Max Q Clear Time (g_c+I1), s	5.5	17.1	6.3	11.2	4.1	9.0	5.1	5.5
Green Ext Time (p_c), s	0.1	5.1	0.0	2.0	0.0	2.9	0.0	0.9

Intersection Summary	
HCM 6th Ctrl Delay	21.7
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Background AM (Opening Year)

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Volume (vph)	3	5	5	250	216	5
Future Volume (vph)	3	5	5	250	216	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Frt	0.916				0.997	
Flt Protected	0.982			0.999		
Satd. Flow (prot)	1676	0	0	3343	3336	0
Flt Permitted	0.982			0.999		
Satd. Flow (perm)	1676	0	0	3343	3336	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	33.1			88.1	60.3	
Travel Time (s)	2.4			6.3	4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	8%	8%	2%
Adj. Flow (vph)	3	5	5	272	235	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	8	0	0	277	240	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	20.5%
ICU Level of Service	A
Analysis Period (min)	15

HCM 6th TWSC  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Background AM (Opening Year)

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Vol, veh/h	3	5	5	250	216	5
Future Vol, veh/h	3	5	5	250	216	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	8	8	2
Mvmt Flow	3	5	5	272	235	5

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	384	120	240
Stage 1	238	-	-
Stage 2	146	-	-
Critical Hdwy	6.84	6.94	4.14
Critical Hdwy Stg 1	5.84	-	-
Critical Hdwy Stg 2	5.84	-	-
Follow-up Hdwy	3.52	3.32	2.22
Pot Cap-1 Maneuver	591	909	1324
Stage 1	779	-	-
Stage 2	866	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	589	909	1324
Mov Cap-2 Maneuver	589	-	-
Stage 1	776	-	-
Stage 2	866	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.8	0.2	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT	SBR
Capacity (veh/h)	1324	-	755	-
HCM Lane V/C Ratio	0.004	-	0.012	-
HCM Control Delay (s)	7.7	0	9.8	-
HCM Lane LOS	A	A	A	-
HCM 95th %tile Q(veh)	0	-	0	-

Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Opening Year)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	19	83	31	343	134	332	34	1241	314	380	1304	18
Future Volume (vph)	19	83	31	343	134	332	34	1241	314	380	1304	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	65.0		0.0	35.0		0.0	160.0		150.0	195.0		0.0
Storage Lanes	1		0	1		0	1		1	2		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	0.95
Ped Bike Factor	0.99				0.98							
Frt		0.959			0.893				0.850		0.998	
Fit Protected	0.950			0.950		0.950			0.950			
Satd. Flow (prot)	1805	1794	0	1787	3123	0	1805	3438	1583	3467	3466	0
Fit Permitted	0.425			0.488		0.950			0.950			
Satd. Flow (perm)	802	1794	0	918	3123	0	1805	3438	1583	3467	3466	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			270				341			1
Link Speed (k/h)		60			60			80				70
Link Distance (m)		101.8			339.3			467.1				460.6
Travel Time (s)		6.1			20.4			21.0				23.7
Confl. Peds. (#/hr)	12					12						
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%	1%	3%	1%	2%	1%	0%	5%	2%	1%	4%	0%
Adj. Flow (vph)	21	90	34	373	146	361	37	1349	341	413	1417	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	21	124	0	373	507	0	37	1349	341	413	1437	0
Turn Type	Perm	NA		pm+pt	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases		4		8					2			
Detector Phase		4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	10.0		8.0	53.0	53.0	8.0	53.0	
Minimum Split (s)	44.9	44.9		10.0	44.9		13.0	60.8	60.8	13.0	60.8	
Total Split (s)	44.9	44.9		12.0	56.9		13.0	69.8	69.8	22.0	78.8	
Total Split (%)	30.2%	30.2%		8.1%	38.3%		8.7%	46.9%	46.9%	14.8%	53.0%	
Maximum Green (s)	37.0	37.0		9.0	49.0		8.0	62.0	62.0	17.0	71.0	
Yellow Time (s)	5.0	5.0		3.0	5.0		3.0	5.9	5.9	3.0	5.9	
All-Red Time (s)	2.9	2.9		0.0	2.9		2.0	1.9	1.9	2.0	1.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.9	7.9		3.0	7.9		5.0	7.8	7.8	5.0	7.8	
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.0	3.0	3.0	4.0	3.0	
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	
Walk Time (s)	21.0	21.0			21.0		41.0	41.0		41.0		
Flash Dont Walk (s)	16.0	16.0			16.0		12.0	12.0		12.0		
Pedestrian Calls (#/hr)	0	0			0		0	0		0		
Act Effct Green (s)	14.9	14.9		31.8	26.9		8.0	74.0	74.0	27.1	95.7	
Actuated g/C Ratio	0.10	0.10		0.21	0.18		0.05	0.50	0.50	0.18	0.64	
v/c Ratio	0.26	0.65		1.50	0.64		0.38	0.79	0.36	0.65	0.64	

Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Opening Year)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	68.1	73.3		283.2	29.2		79.6	35.9	3.3	61.9	19.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	68.1	73.3		283.2	29.2		79.6	35.9	3.3	61.9	19.1	
LOS	E	E		F	C		E	D	A	E	B	
Approach Delay		72.6			136.9			30.4			28.6	
Approach LOS		E			F			C			C	
Queue Length 50th (m)	5.8	31.9		~150.3	33.8		10.6	165.5	0.0	58.5	133.0	
Queue Length 95th (m)	14.1	51.4		#201.4	50.5		22.6	216.5	16.9	74.7	174.0	
Internal Link Dist (m)		77.8			315.3			443.1			436.6	
Turn Bay Length (m)	65.0			35.0			160.0		150.0	195.0		
Base Capacity (vph)	199	455		249	1210		97	1710	958	631	2230	
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	0.11	0.27		1.50	0.42		0.38	0.79	0.36	0.65	0.64	
Intersection Summary												
Area Type:	Other											
Cycle Length:	148.7											
Actuated Cycle Length:	148.7											
Offset:	0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green											
Natural Cycle:	130											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	1.50											
Intersection Signal Delay:	51.4						Intersection LOS: D					
Intersection Capacity Utilization:	99.6%						ICU Level of Service F					
Analysis Period (min):	15											
- Volume exceeds capacity, queue is theoretically infinite.												
Queue shown is maximum after two cycles.												
# 95th percentile volume exceeds capacity, queue may be longer.												
Queue shown is maximum after two cycles.												
Splits and Phases: 1: Highway 6 & Stone Road West												



Lanes, Volumes, Timings  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Opening Year)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	6.9	15.7		8.8	13.2		29.9	18.9		35.7	27.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.9	15.7		8.8	13.2		29.9	18.9		35.7	27.3	
LOS	A	B		A	B		C	B		D	C	
Approach Delay	14.7				12.1		21.1				29.7	
Approach LOS	B				B		C				C	
Queue Length 50th (m)	4.8	37.0		13.4	37.3		14.2	13.2		14.3	14.3	
Queue Length 95th (m)	11.4	64.6		26.7	60.0		25.0	26.0		25.2	24.0	
Internal Link Dist (m)	315.3				186.0		93.2				16.4	
Turn Bay Length (m)	27.5				25.0		30.0				20.0	
Base Capacity (vph)	505	1752		583	1916		282	1065		202	1001	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.19	0.42		0.43	0.40		0.37	0.39		0.51	0.25	

Intersection Summary	
Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	35 (39%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle:	80
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.66
Intersection Signal Delay:	16.9
Intersection LOS:	B
Intersection Capacity Utilization:	70.9%
ICU Level of Service:	C
Analysis Period (min):	15

Splits and Phases: 2: Scottsdale Drive & Stone Road West



HCM 6th Signalized Intersection Summary  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Opening Year)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	
Traffic Volume (veh/h)	91	539	147	232	635	75	97	145	244	97	156	77
Future Volume (veh/h)	91	539	147	232	635	75	97	145	244	97	156	77
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	0.98		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1900	1870	1900	1885	1841	1811	1900	1856	1885	1796	1900	1900
Adj Flow Rate, veh/h	98	580	158	249	683	81	104	156	262	104	168	83
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	2	0	1	4	6	0	3	1	7	0	0
Cap, veh/h	393	1094	297	437	1385	164	387	414	359	258	557	261
Arrive On Green	0.06	0.40	0.40	0.10	0.44	0.44	0.06	0.23	0.23	0.06	0.24	0.24
Sat Flow, veh/h	1810	2749	747	1795	3142	372	1810	1763	1528	1711	2362	1106
Grp Volume(v), veh/h	98	374	364	249	380	384	104	156	262	104	126	125
Grp Sat Flow(s),veh/h/ln	1810	1777	1719	1795	1749	1766	1810	1763	1528	1711	1805	1663
Q Serve(g_s), s	2.8	14.5	14.5	6.9	14.0	14.0	3.9	6.7	14.3	4.1	5.2	5.6
Cycle Q Clear(g_c), s	2.8	14.5	14.5	6.9	14.0	14.0	3.9	6.7	14.3	4.1	5.2	5.6
Prop In Lane	1.00		0.43	1.00		0.21	1.00		1.00	1.00		0.66
Lane Grp Cap(c), veh/h	393	707	684	437	770	778	387	414	359	258	425	392
V/C Ratio(X)	0.25	0.53	0.53	0.57	0.49	0.49	0.27	0.38	0.73	0.40	0.30	0.32
Avail Cap(c_a), veh/h	403	707	684	531	770	778	396	490	425	264	501	462
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.6	20.7	20.7	14.2	18.0	18.0	23.8	28.9	31.8	24.9	28.3	28.4
Incr Delay (d2), s/veh	0.3	2.8	2.9	1.2	2.2	2.2	0.4	0.6	5.2	1.0	0.4	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.6	9.1	8.9	3.8	8.4	8.5	2.7	4.6	8.9	2.7	3.7	3.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.9	23.5	23.6	15.3	20.2	20.2	24.2	29.5	37.0	25.9	28.6	28.9
LnGrp LOS	B	C	C	B	C	C	C	C	D	C	C	C
Approach Vol, veh/h	836			1013			522			355		
Approach Delay, s/veh	22.6			19.0			32.2			27.9		
Approach LOS	C			B			C			C		

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	12.3	41.9	8.6	27.1	8.5	45.8	8.6	27.2
Change Period (Y+Rc), s	3.0	* 6.1	3.0	6.0	3.0	* 6.1	3.0	6.0
Max Green Setting (Gmax), s	14.0	* 27	6.0	25.0	6.0	* 35	6.0	25.0
Max Q Clear Time (g_c+I1), s	8.9	16.5	6.1	16.3	4.8	16.0	5.9	7.6
Green Ext Time (p_c), s	0.4	3.8	0.0	2.0	0.0	5.3	0.0	1.5

Intersection Summary	
HCM 6th Ctrl Delay	23.8
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Opening Year)

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Volume (vph)	6	6	5	306	324	5
Future Volume (vph)	6	6	5	306	324	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Fr <sub>t</sub>	0.932				0.998	
Fit Protected	0.976			0.999		
Satd. Flow (prot)	1694	0	0	3502	3532	0
Fit Permitted	0.976			0.999		
Satd. Flow (perm)	1694	0	0	3502	3532	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	33.1			88.1	60.3	
Travel Time (s)	2.4			6.3	4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%
Adj. Flow (vph)	7	7	5	333	352	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	14	0	0	338	357	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	22.0%
ICU Level of Service	A
Analysis Period (min)	15

HCM 6th TWSC  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Opening Year)

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Vol, veh/h	6	6	5	306	324	5
Future Vol, veh/h	6	6	5	306	324	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	3	2	2
Mvmt Flow	7	7	5	333	352	5

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	532	179	357
Stage 1	355	-	-
Stage 2	177	-	-
Critical Hdwy	6.84	6.94	4.14
Critical Hdwy Stg 1	5.84	-	-
Critical Hdwy Stg 2	5.84	-	-
Follow-up Hdwy	3.52	3.32	2.22
Pot Cap-1 Maneuver	477	833	1198
Stage 1	681	-	-
Stage 2	836	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	475	833	1198
Mov Cap-2 Maneuver	475	-	-
Stage 1	678	-	-
Stage 2	836	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.1	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1198	-	605	-	-
HCM Lane V/C Ratio	0.005	-	0.022	-	-
HCM Control Delay (s)	8	0	11.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

# Appendix E

## 2025 Total Traffic Operations





Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total AM (Opening Year)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	26	103	41	209	45	167	9	1026	384	266	1072	14
Future Volume (vph)	26	103	41	209	45	167	9	1026	384	266	1072	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	65.0		0.0	35.0		0.0	160.0		150.0	195.0		0.0
Storage Lanes	1		0	1		0	1		1	2		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	0.95
Ped Bike Factor	1.00					0.99						
Frt		0.957			0.882				0.850		0.998	
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1736	1778	0	1719	3009	0	1626	3223	1568	3400	3276	0
Fit Permitted	0.608			0.413			0.950			0.950		
Satd. Flow (perm)	1109	1778	0	747	3009	0	1626	3223	1568	3400	3276	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			182				417		1	
Link Speed (k/h)		60			60			80			70	
Link Distance (m)		101.8			339.3			467.1			460.6	
Travel Time (s)		6.1			20.4			21.0			23.7	
Confl. Peds. (#/hr)	2					2						
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 (%)	4%	0%	8%	5%	7%	4%	11%	12%	3%	3%	10%	7%
Adj. Flow (vph)	28	112	45	227	49	182	10	1115	417	289	1165	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	157	0	227	231	0	10	1115	417	289	1180	0
Turn Type	Perm	NA		pm+pt	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases		4		8				2		2		
Detector Phase	4	4		3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	10.0		8.0	53.0	53.0	8.0	53.0	
Minimum Split (s)	44.9	44.9		10.0	44.9		13.0	60.8	60.8	13.0	60.8	
Total Split (s)	44.9	44.9		13.0	57.9		13.0	69.8	69.8	21.0	77.8	
Total Split (%)	30.2%	30.2%		8.7%	38.9%		8.7%	46.9%	46.9%	14.1%	52.3%	
Maximum Green (s)	37.0	37.0		10.0	50.0		8.0	62.0	62.0	16.0	70.0	
Yellow Time (s)	5.0	5.0		3.0	5.0		3.0	5.9	5.9	3.0	5.9	
All-Red Time (s)	2.9	2.9		0.0	2.9		2.0	1.9	1.9	2.0	1.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.9	7.9		3.0	7.9		5.0	7.8	7.8	5.0	7.8	
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.0	3.0	3.0	4.0	3.0	
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	
Walk Time (s)	21.0	21.0			21.0		41.0	41.0		41.0		
Flash Dont Walk (s)	16.0	16.0			16.0		12.0	12.0		12.0		
Pedestrian Calls (#/hr)	0	0			0		0	0		0		
Act Effct Green (s)	17.5	17.5		35.4	30.5		8.0	78.5	78.5	19.0	97.3	
Actuated g/C Ratio	0.12	0.12		0.24	0.21		0.05	0.53	0.53	0.13	0.65	
v/c Ratio	0.22	0.71		0.93	0.30		0.11	0.66	0.41	0.67	0.55	

Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total AM (Opening Year)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	61.1	74.9		94.9	12.5		70.1	29.0	3.2	69.4	16.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	61.1	74.9		94.9	12.5		70.1	29.0	3.2	69.4	16.8	
LOS	E	E		F	B		E	C	A	E	B	
Approach Delay		72.8			53.4			22.3			27.1	
Approach LOS		E			D			C			C	
Queue Length 50th (m)	7.5	41.0		58.5	6.1		2.8	120.1	0.0	41.9	81.1	
Queue Length 95th (m)	16.8	62.1		#94.1	16.6		9.2	167.4	18.0	55.5	143.4	
Internal Link Dist (m)		77.8			315.3			443.1			436.6	
Turn Bay Length (m)	65.0			35.0			160.0		150.0	195.0		
Base Capacity (vph)	275	452		243	1132		87	1702	1025	440	2144	
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	0.10	0.35		0.93	0.20		0.11	0.66	0.41	0.66	0.55	
<b>Intersection Summary</b>												
Area Type:	Other											
Cycle Length:	148.7											
Actuated Cycle Length:	148.7											
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green												
Natural Cycle:	130											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	0.93											
Intersection Signal Delay:	30.7						Intersection LOS: C					
Intersection Capacity Utilization:	93.7%						ICU Level of Service F					
Analysis Period (min)	15											
# 95th percentile volume exceeds capacity, queue may be longer.												
Queue shown is maximum after two cycles.												
<b>Splits and Phases: 1: Highway 6 &amp; Stone Road West</b>												

HCM 6th Signalized Intersection Summary  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total AM (Opening Year)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	26	103	41	209	45	167	9	1026	384	266	1072	14
Future Volume (veh/h)	26	103	41	209	45	167	9	1026	384	266	1072	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1841	1900	1781	1826	1796	1841	1737	1722	1856	1856	1752	1796
Adj Flow Rate, veh/h	28	112	45	227	49	182	10	1115	417	289	1165	15
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
Percent Heavy Veh, %	4	0	8	5	7	4	11	12	3	3	10	7
Cap, veh/h	156	150	60	204	348	309	279	1829	879	337	1581	20
Arrive On Green	0.12	0.12	0.12	0.07	0.20	0.20	0.17	0.56	0.56	0.10	0.47	0.47
Sat Flow, veh/h	1127	1287	517	1739	1706	1518	1654	3272	1572	3428	3365	43
Grp Volume(v), veh/h	28	0	157	227	49	182	10	1115	417	289	576	604
Grp Sat Flow(s), veh/h/ln	1127	0	1804	1739	1706	1518	1654	1636	1572	1714	1664	1744
Q Serve(g_s), s	3.4	0.0	12.5	10.0	3.5	16.2	0.8	34.0	23.7	12.4	41.8	41.8
Cycle Q Clear(g_c), s	6.6	0.0	12.5	10.0	3.5	16.2	0.8	34.0	23.7	12.4	41.8	41.8
Prop In Lane	1.00		0.29	1.00		1.00	1.00		1.00	1.00		0.02
Lane Grp Cap(c), veh/h	156	0	210	204	348	309	279	1829	879	337	782	819
V/C Ratio(X)	0.18	0.00	0.75	1.11	0.14	0.59	0.04	0.61	0.47	0.86	0.74	0.74
Avail Cap(c_a), veh/h	304	0	448	204	573	509	279	1829	879	368	782	819
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	62.5	0.0	63.7	60.1	48.6	53.7	51.8	22.0	19.7	66.1	32.0	32.0
Incr Delay (d2), s/veh	0.5	0.0	5.2	97.1	0.2	1.8	0.1	1.5	1.8	17.6	6.1	5.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.7	0.0	9.7	13.2	2.6	9.9	0.5	17.1	12.6	9.9	22.8	23.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.1	0.0	68.9	157.2	48.8	55.4	51.9	23.5	21.6	83.7	38.2	37.9
LnGrp LOS	E	A	E	F	D	E	D	C	C	F	D	D
Approach Vol, veh/h		185			458			1542			1469	
Approach Delay, s/veh		68.0			105.2			23.2			47.0	
Approach LOS		E			F			C			D	
Timer - Assigned Phs	1	2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s	19.7	91.1	13.0	25.3	32.9	77.8		38.3				
Change Period (Y+Rc), s	5.0	* 7.8	3.0	7.9	* 7.8	* 7.8		7.9				
Max Green Setting (Gmax), s	16.0	* 62	10.0	37.0	* 8	* 7.0		50.0				
Max Q Clear Time (g_c+I1), s	14.4	36.0	12.0	14.5	2.8	43.8		18.2				
Green Ext Time (p_c), s	0.3	13.4	0.0	1.1	0.0	10.6						
Intersection Summary												
HCM 6th Ctrl Delay			45.3									
HCM 6th LOS			D									
Notes												

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total AM (Opening Year)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	68	614	71	108	305	51	69	144	147	92	91	47
Future Volume (vph)	68	614	71	108	305	51	69	144	147	92	91	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	27.5		0.0	25.0		0.0	30.0		0.0	20.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	30.0			25.0			60.0			60.0		
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	0.95
Ped Bike Factor	0.99	1.00		1.00	1.00		0.97	0.99		0.99	0.98	
Frt		0.984			0.979			0.924			0.949	
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1641	3363	0	1736	3201	0	1752	3183	0	1626	3135	0
Fit Permitted	0.507			0.285			0.649			0.417		
Satd. Flow (perm)	869	3363	0	519	3201	0	1159	3183	0	708	3135	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			24			173			55	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		339.3			210.0			117.2			40.4	
Travel Time (s)		20.4			12.6			8.4			2.9	
Conf. Peds. (#/hr)	11		14	14		11	37		12	12		37
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	10%	5%	8%	4%	9%	16%	3%	4%	3%	11%	4%	14%
Adj. Flow (vph)	80	722	84	127	359	60	81	169	173	108	107	55
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	806	0	127	419	0	81	342	0	108	162	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		
Detector Phase	5	2		1	6		7	4		3	8	
Switch Phase												
Minimum Initial (s)	6.0	10.0		6.0	10.0		6.0	10.0		6.0	10.0	
Minimum Split (s)	9.0	27.1		9.0	27.1		9.0	31.0		9.0	31.0	
Total Split (s)	9.0	38.0		12.0	41.0		9.0	31.0		9.0	31.0	
Total Split (%)	10.0%	42.2%		13.3%	45.6%		10.0%	34.4%		10.0%	34.4%	
Maximum Green (s)	6.0	31.9		9.0	34.9		6.0	25.0		6.0	25.0	
Yellow Time (s)	3.0	3.7		3.0	3.7		3.0	4.0		3.0	4.0	
All-Red Time (s)	0.0	2.4		0.0	2.4		0.0	2.0		0.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	6.1		3.0	6.1		3.0	6.0		3.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			9.0			9.0	
Flash Dont Walk (s)		14.0			14.0			16.0			16.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	58.5	48.3		60.7	50.9		19.3	11.5		19.3	11.5	
Actuated g/C Ratio	0.65	0.54		0.67	0.57		0.21	0.13		0.21	0.13	
v/c Ratio	0.13	0.44		0.28	0.23		0.28	0.62		0.51	0.36	

Lanes, Volumes, Timings  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total AM (Opening Year)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	6.1	14.5		7.1	11.1		28.1	22.9		35.5	25.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.1	14.5		7.1	11.1		28.1	22.9		35.5	25.4	
LOS	A	B		A	B		C	C		D	C	
Approach Delay	13.7		10.2		23.9		29.4					
Approach LOS	B		B		C		C					
Queue Length 50th (m)	3.9	41.1		6.4	17.4		10.9	14.4		14.9	8.9	
Queue Length 95th (m)	9.0	60.2		13.1	28.0		19.4	23.5		24.8	15.7	
Internal Link Dist (m)	315.3		186.0		93.2		16.4					
Turn Bay Length (m)	27.5		25.0		30.0		20.0					
Base Capacity (vph)	626	1812		479	1820		287	1009		212	910	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.13	0.44		0.27	0.23		0.28	0.34		0.51	0.18	

Intersection Summary	
Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	42 (47%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle:	80
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.62
Intersection Signal Delay:	16.8
Intersection Capacity Utilization:	64.3%
Analysis Period (min):	15
Intersection LOS:	B
ICU Level of Service:	C

Splits and Phases: 2: Scottsdale Drive & Stone Road West



HCM 6th Signalized Intersection Summary  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total AM (Opening Year)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	68	614	71	108	305	51	69	144	147	92	91	47
Future Volume (veh/h)	68	614	71	108	305	51	69	144	147	92	91	47
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	0.96		0.95	0.98		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1752	1826	1781	1841	1767	1663	1856	1841	1856	1737	1841	1693
Adj Flow Rate, veh/h	80	722	84	127	359	60	81	169	173	108	107	55
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	10	5	8	4	9	16	3	4	3	11	4	14
Cap, veh/h	509	1381	161	374	1289	213	410	397	336	308	532	253
Arrive On Green	0.06	0.44	0.44	0.06	0.45	0.45	0.06	0.23	0.23	0.07	0.24	0.24
Sat Flow, veh/h	1668	3127	364	1753	2878	476	1767	1749	1484	1654	2259	1074
Grp Volume(v), veh/h	80	400	406	127	208	211	81	169	173	108	81	81
Grp Sat Flow(s), veh/h/ln	1668	1735	1756	1753	1678	1676	1767	1749	1484	1654	1749	1585
Q Serve(g_s), s	2.3	15.1	15.1	3.5	7.0	7.2	3.1	7.4	9.2	4.4	3.3	3.7
Cycle Q Clear(g_c), s	2.3	15.1	15.1	3.5	7.0	7.2	3.1	7.4	9.2	4.4	3.3	3.7
Prop In Lane	1.00		0.21	1.00		0.28	1.00		1.00	1.00		0.68
Lane Grp Cap(c), veh/h	509	766	776	374	752	750	410	397	336	308	412	373
V/C Ratio(X)	0.16	0.52	0.52	0.34	0.28	0.28	0.20	0.43	0.51	0.35	0.20	0.22
Avail Cap(c_a), veh/h	524	766	776	437	752	750	425	486	412	308	486	440
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.1	18.2	18.2	13.4	15.7	15.7	24.2	29.8	30.5	24.6	27.6	27.7
Incr Delay (d2), s/veh	0.1	2.5	2.5	0.5	0.9	0.9	0.2	0.7	1.2	0.7	0.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.2	8.9	9.0	1.9	4.1	4.2	2.1	5.2	5.4	2.8	2.3	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.3	20.8	20.8	14.0	16.6	16.6	24.4	30.5	31.7	25.2	27.8	28.0
LnGrp LOS	B	C	C	B	B	B	C	C	C	C	C	C
Approach Vol, veh/h	886			546			423			270		
Approach Delay, s/veh	20.0			16.0			29.8			26.8		
Approach LOS	C			B			C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.7	45.8	9.0	26.4	8.2	46.4	8.2	27.2				
Change Period (Y+Rc), s	3.0	* 6.1	3.0	6.0	3.0	* 6.1	3.0	6.0				
Max Green Setting (Gmax), s	9.0	* 32	6.0	25.0	6.0	* 35	6.0	25.0				
Max Q Clear Time (g_c+I1), s	5.5	17.1	6.4	11.2	4.3	9.2	5.1	5.7				
Green Ext Time (p_c), s	0.1	5.1	0.0	2.0	0.0	3.0	0.0	0.9				

Intersection Summary	
HCM 6th Ctrl Delay	21.8
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Total AM (Opening Year)

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↘			↕	↕	
Traffic Volume (vph)	11	14	13	250	216	12
Future Volume (vph)	11	14	13	250	216	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Frt	0.925			0.992		
Flt Protected	0.978			0.998		
Satd. Flow (prot)	1685	0	0	3345	3326	0
Flt Permitted	0.978			0.998		
Satd. Flow (perm)	1685	0	0	3345	3326	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	33.1			88.1	60.3	
Travel Time (s)	2.4			6.3	4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	8%	8%	2%
Adj. Flow (vph)	12	15	14	272	235	13
Shared Lane Traffic (%)						
Lane Group Flow (vph)	27	0	0	286	248	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	26.6%
ICU Level of Service A	
Analysis Period (min)	15

HCM 6th TWSC  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Total AM (Opening Year)

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↘			↕	↕	
Traffic Vol, veh/h	11	14	13	250	216	12
Future Vol, veh/h	11	14	13	250	216	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	8	8	2
Mvmt Flow	12	15	14	272	235	13

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	406	124	248
Stage 1	242	-	-
Stage 2	164	-	-
Critical Hdwy	6.84	6.94	4.14
Critical Hdwy Stg 1	5.84	-	-
Critical Hdwy Stg 2	5.84	-	-
Follow-up Hdwy	3.52	3.32	2.22
Pot Cap-1 Maneuver	573	904	1315
Stage 1	776	-	-
Stage 2	848	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	566	904	1315
Mov Cap-2 Maneuver	566	-	-
Stage 1	766	-	-
Stage 2	848	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.2	0.4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT	SBR
Capacity (veh/h)	1315	-	716	-
HCM Lane V/C Ratio	0.011	-	0.038	-
HCM Control Delay (s)	7.8	0	10.2	-
HCM Lane LOS	A	A	B	-
HCM 95th %tile Q(veh)	0	-	0.1	-

Lanes, Volumes, Timings  
 1: Highway 6 & Stone Road West  
 601 Scottsdale Drive, Guelph TIS and PS  
 Total PM (Opening Year)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	19	85	31	353	137	337	34	1241	323	385	1304	18
Future Volume (vph)	19	85	31	353	137	337	34	1241	323	385	1304	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	65.0		0.0	35.0		0.0	160.0		150.0	195.0		0.0
Storage Lanes	1		0	1		0	1		1	2		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	0.95
Ped Bike Factor	0.99				0.98							
Frt		0.960			0.893				0.850		0.998	
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1796	0	1787	3123	0	1805	3438	1583	3467	3466	0
Fit Permitted	0.411			0.484			0.950			0.950		
Satd. Flow (perm)	775	1796	0	910	3123	0	1805	3438	1583	3467	3466	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			285				351		1	
Link Speed (k/h)		60			60			80			70	
Link Distance (m)		101.8			339.3			467.1			460.6	
Travel Time (s)		6.1			20.4			21.0			23.7	
Confl. Peds. (#/hr)	12				12							
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%	1%	3%	1%	2%	1%	0%	5%	2%	1%	4%	0%
Adj. Flow (vph)	21	92	34	384	149	366	37	1349	351	418	1417	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	21	126	0	384	515	0	37	1349	351	418	1437	0
Turn Type	Perm	NA		pm+pt	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases		4		8					2			
Detector Phase		4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	10.0		8.0	53.0	53.0	8.0	53.0	
Minimum Split (s)	44.9	44.9		10.0	44.9		13.0	60.8	60.8	13.0	60.8	
Total Split (s)	44.9	44.9		12.0	56.9		13.0	68.8	68.8	23.0	78.8	
Total Split (%)	30.2%	30.2%		8.1%	38.3%		8.7%	46.3%	46.3%	15.5%	53.0%	
Maximum Green (s)	37.0	37.0		9.0	49.0		8.0	61.0	61.0	18.0	71.0	
Yellow Time (s)	5.0	5.0		3.0	5.0		3.0	5.9	5.9	3.0	5.9	
All-Red Time (s)	2.9	2.9		0.0	2.9		2.0	1.9	1.9	2.0	1.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.9	7.9		3.0	7.9		5.0	7.8	7.8	5.0	7.8	
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.0	3.0	3.0	4.0	3.0	
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	
Walk Time (s)	21.0	21.0		21.0	21.0		41.0	41.0	41.0	41.0	41.0	
Flash Dont Walk (s)	16.0	16.0		16.0	16.0		12.0	12.0	12.0	12.0	12.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	
Act Effct Green (s)	15.1	15.1		32.0	27.1		8.0	74.6	74.6	26.3	95.5	
Actuated g/C Ratio	0.10	0.10		0.22	0.18		0.05	0.50	0.50	0.18	0.64	
v/c Ratio	0.27	0.66		1.55	0.64		0.38	0.78	0.36	0.68	0.65	

Lanes, Volumes, Timings  
 1: Highway 6 & Stone Road West  
 601 Scottsdale Drive, Guelph TIS and PS  
 Total PM (Opening Year)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	68.4	73.4		302.2	27.8		79.6	35.4	3.3	63.3	19.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	68.4	73.4		302.2	27.8		79.6	35.4	3.3	63.3	19.2	
LOS	E	E		F	C		E	D	A	E	B	
Approach Delay		72.7			145.0			29.9			29.1	
Approach LOS		E			F			C			C	
Queue Length 50th (m)	5.8	32.5		~156.9	32.7		10.6	165.4	0.0	59.4	133.4	
Queue Length 95th (m)	14.2	52.0		#209.4	49.5		22.6	218.0	17.4	75.6	174.5	
Internal Link Dist (m)		77.8			315.3			443.1			436.6	
Turn Bay Length (m)	65.0			35.0			160.0		150.0	195.0		
Base Capacity (vph)	192	455		248	1220		97	1724	969	613	2226	
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	0.11	0.28		1.55	0.42		0.38	0.78	0.36	0.68	0.65	
<b>Intersection Summary</b>												
Area Type: Other												
Cycle Length: 148.7												
Actuated Cycle Length: 148.7												
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green												
Natural Cycle: 140												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.55												
Intersection Signal Delay: 53.2												
Intersection Capacity Utilization 100.1%												
ICU Level of Service G												
Analysis Period (min) 15												
- Volume exceeds capacity, queue is theoretically infinite.												
Queue shown is maximum after two cycles.												
# 95th percentile volume exceeds capacity, queue may be longer.												
Queue shown is maximum after two cycles.												
<b>Spits and Phases: 1: Highway 6 &amp; Stone Road West</b>												

HCM 6th Signalized Intersection Summary  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total PM (Opening Year)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	19	85	31	353	137	337	34	1241	323	385	1304	18
Future Volume (veh/h)	19	85	31	353	137	337	34	1241	323	385	1304	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1900	1885	1856	1885	1870	1885	1900	1826	1870	1885	1841	1900
Adj Flow Rate, veh/h	21	92	34	384	149	366	37	1349	351	418	1417	20
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
Percent Heavy Veh, %	0	1	3	1	2	1	0	5	2	1	4	0
Cap, veh/h	109	268	99	340	508	448	144	1576	720	421	1682	24
Arrive On Green	0.21	0.21	0.21	0.06	0.29	0.29	0.08	0.45	0.45	0.12	0.48	0.48
Sat Flow, veh/h	895	1306	483	1795	1777	1565	1810	3469	1585	3483	3531	50
Grp Volume(v), veh/h	21	0	126	384	149	366	37	1349	351	418	701	736
Grp Sat Flow(s),veh/h/ln	895	0	1788	1795	1777	1565	1810	1735	1585	1742	1749	1832
Q Serve(g_s), s	3.3	0.0	9.0	9.0	9.7	32.5	2.9	51.7	23.1	17.9	52.2	52.3
Cycle Q Clear(g_c), s	23.8	0.0	9.0	9.0	9.7	32.5	2.9	51.7	23.1	17.9	52.2	52.3
Prop In Lane	1.00		0.27	1.00		1.00	1.00		1.00	1.00		0.03
Lane Grp Cap(c), veh/h	109	0	367	340	508	448	144	1576	720	421	833	873
V/C Ratio(X)	0.19	0.00	0.34	1.13	0.29	0.82	0.26	0.86	0.49	0.99	0.84	0.84
Avail Cap(c_a), veh/h	148	0	444	340	584	515	144	1576	720	421	833	873
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	66.3	0.0	50.6	56.8	41.5	49.6	64.4	36.3	28.5	65.4	34.1	34.1
Incr Delay (d2), s/veh	0.8	0.0	0.6	88.9	0.3	8.9	1.3	6.2	2.4	42.1	10.1	9.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.3	0.0	6.9	23.9	7.2	18.7	2.3	28.2	13.1	15.1	29.4	30.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	67.1	0.0	51.2	145.8	41.8	58.5	65.7	42.5	30.8	107.5	44.2	43.8
LnGrp LOS	E	A	D	F	D	E	E	D	C	F	D	D
Approach Vol, veh/h		147			899			1737			1855	
Approach Delay, s/veh		53.4			93.0			40.6			58.3	
Approach LOS		D			F			D			E	
Timer - Assigned Phs	1	2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s	23.0	75.5	12.0	38.5	19.7	78.8		50.5				
Change Period (Y+Rc), s	5.0	* 7.8	3.0	7.9	* 7.8	* 7.8		7.9				
Max Green Setting (Gmax), s	18.0	* 61	9.0	37.0	* 8	* 71		49.0				
Max Q Clear Time (g_c+I1), s	19.9	53.7	11.0	25.8	4.9	54.3		34.5				
Green Ext Time (p_c), s	0.0	5.8	0.0	0.6	0.0	10.2		3.3				
Intersection Summary												
HCM 6th Ctrl Delay			58.3									
HCM 6th LOS			E									
Notes												

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total PM (Opening Year)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	107	539	147	232	635	84	97	145	244	107	156	95
Future Volume (vph)	107	539	147	232	635	84	97	145	244	107	156	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	27.5		0.0	25.0		0.0	30.0		0.0	20.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	30.0			25.0			60.0			60.0		
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	0.95
Ped Bike Factor	0.99				0.99		0.98	0.98		0.99	0.99	
Frt		0.968			0.983		0.906		0.943			
Fit Protected	0.950			0.950			0.950		0.950			
Satd. Flow (prot)	1805	3440	0	1787	3387	0	1805	3154	0	1687	3359	0
Fit Permitted	0.347			0.298			0.549		0.345			
Satd. Flow (perm)	652	3440	0	561	3387	0	1026	3154	0	607	3359	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		39			19			262			102	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		339.3			210.0			117.2			40.4	
Travel Time (s)		20.4			12.6			8.4			2.9	
Confl. Peds. (#/hr)	25					25	22		17	17		22
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	2%	0%	1%	4%	6%	0%	3%	1%	7%	0%	0%
Adj. Flow (vph)	115	580	158	249	683	90	104	156	262	115	168	102
Shared Lane Traffic (%)												
Lane Group Flow (vph)	115	738	0	249	773	0	104	418	0	115	270	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		
Detector Phase	5	2		1	6		7	4		3	8	
Switch Phase												
Minimum Initial (s)	6.0	10.0		6.0	10.0		6.0	10.0		6.0	10.0	
Minimum Split (s)	9.0	27.1		9.0	27.1		9.0	31.0		9.0	31.0	
Total Split (s)	9.0	33.0		17.0	41.0		9.0	31.0		9.0	31.0	
Total Split (%)	10.0%	36.7%		18.9%	45.6%		10.0%	34.4%		10.0%	34.4%	
Maximum Green (s)	6.0	26.9		14.0	34.9		6.0	25.0		6.0	25.0	
Yellow Time (s)	3.0	3.7		3.0	3.7		3.0	4.0		3.0	4.0	
All-Red Time (s)	0.0	2.4		0.0	2.4		0.0	2.0		0.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	6.1		3.0	6.1		3.0	6.0		3.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			9.0			9.0	
Flash Dont Walk (s)		14.0			14.0			16.0			16.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	56.0	45.3		62.0	50.4		19.4	11.6		19.4	11.6	
Actuated g/C Ratio	0.62	0.50		0.69	0.56		0.22	0.13		0.22	0.13	
v/c Ratio	0.23	0.42		0.47	0.41		0.38	0.66		0.57	0.52	

Lanes, Volumes, Timings  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total PM (Opening Year)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	7.0	15.7		8.8	13.5		30.3	18.9		38.3	25.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	7.0	15.7		8.8	13.5		30.3	18.9		38.3	25.9	
LOS	A	B		A	B		C	B		D	C	
Approach Delay	14.6				12.3		21.2				29.6	
Approach LOS	B				B		C				C	
Queue Length 50th (m)	5.7	37.0		13.4	38.0		14.2	13.2		15.9	14.3	
Queue Length 95th (m)	13.1	64.6		26.7	61.4		25.0	26.0		27.4	24.4	
Internal Link Dist (m)	315.3				186.0		93.2				16.4	
Turn Bay Length (m)	27.5				25.0		30.0				20.0	
Base Capacity (vph)	502	1752		583	1903		272	1065		202	1006	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.23	0.42		0.43	0.41		0.38	0.39		0.57	0.27	

Intersection Summary	
Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	35 (39%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle:	80
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.66
Intersection Signal Delay:	17.1
Intersection LOS:	B
Intersection Capacity Utilization:	71.5%
ICU Level of Service:	C
Analysis Period (min):	15

Splits and Phases: 2: Scottsdale Drive & Stone Road West



HCM 6th Signalized Intersection Summary  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total PM (Opening Year)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	107	539	147	232	635	84	97	145	244	107	156	95
Future Volume (veh/h)	107	539	147	232	635	84	97	145	244	107	156	95
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	0.98		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1900	1870	1900	1885	1841	1811	1900	1856	1885	1796	1900	1900
Adj Flow Rate, veh/h	115	580	158	249	683	90	104	156	262	115	168	102
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	2	0	1	4	6	0	3	1	7	0	0
Cap, veh/h	388	1081	294	434	1347	177	382	414	359	264	525	299
Arrive On Green	0.06	0.39	0.39	0.10	0.43	0.43	0.06	0.23	0.23	0.07	0.24	0.24
Sat Flow, veh/h	1810	2749	747	1795	3100	408	1810	1763	1528	1711	2189	1249
Grp Volume(v), veh/h	115	374	364	249	385	388	104	156	262	115	137	133
Grp Sat Flow(s), veh/h/ln	1810	1777	1719	1795	1749	1759	1810	1763	1528	1711	1805	1633
Q Serve(g_s), s	3.3	14.6	14.7	7.0	14.4	14.4	3.9	6.7	14.3	4.5	5.6	6.1
Cycle Q Clear(g_c), s	3.3	14.6	14.7	7.0	14.4	14.4	3.9	6.7	14.3	4.5	5.6	6.1
Prop In Lane	1.00		0.43	1.00		0.23	1.00		1.00	1.00		0.76
Lane Grp Cap(c), veh/h	388	699	676	434	760	764	382	414	359	264	433	391
V/C Ratio(X)	0.30	0.54	0.54	0.57	0.51	0.51	0.27	0.38	0.73	0.44	0.32	0.34
Avail Cap(c_a), veh/h	394	699	676	526	760	764	391	490	425	264	501	454
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.0	21.0	21.0	14.4	18.4	18.5	23.8	28.9	31.8	24.8	28.1	28.3
Incr Delay (d2), s/veh	0.4	2.9	3.1	1.2	2.4	2.4	0.4	0.6	5.2	1.1	0.4	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.0	9.2	9.0	3.9	8.7	8.7	2.7	4.6	8.9	3.0	4.0	3.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.4	23.9	24.1	15.6	20.9	20.9	24.2	29.5	37.0	26.0	28.6	28.8
LnGrp LOS	B	C	C	B	C	C	C	C	D	C	C	C
Approach Vol, veh/h	853			1022			522			385		
Approach Delay, s/veh	22.8			19.6			32.2			27.9		
Approach LOS	C			B			C			C		

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	12.4	41.5	9.0	27.1	8.7	45.2	8.6	27.6
Change Period (Y+Rc), s	3.0	* 6.1	3.0	6.0	3.0	* 6.1	3.0	6.0
Max Green Setting (Gmax), s	14.0	* 27	6.0	25.0	6.0	* 35	6.0	25.0
Max Q Clear Time (g_c+I1), s	9.0	16.7	6.5	16.3	5.3	16.4	5.9	8.1
Green Ext Time (p_c), s	0.4	3.7	0.0	2.0	0.0	5.4	0.0	1.6

Intersection Summary	
HCM 6th Ctrl Delay	24.1
HCM 6th LOS	C

Notes  
\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Total PM (Opening Year)

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Volume (vph)	29	34	30	306	324	25
Future Volume (vph)	29	34	30	306	324	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Fr <sub>t</sub>	0.928				0.989	
Fit Protected	0.977			0.996		
Satd. Flow (prot)	1689	0	0	3494	3500	0
Fit Permitted	0.977			0.996		
Satd. Flow (perm)	1689	0	0	3494	3500	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	33.1			88.1	60.3	
Travel Time (s)	2.4			6.3	4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%
Adj. Flow (vph)	32	37	33	333	352	27
Shared Lane Traffic (%)						
Lane Group Flow (vph)	69	0	0	366	379	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	32.8%
ICU Level of Service	A
Analysis Period (min)	15

HCM 6th TWSC  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Total PM (Opening Year)

Intersection						
Int Delay, s/veh	1.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Vol, veh/h	29	34	30	306	324	25
Future Vol, veh/h	29	34	30	306	324	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	3	2	2
Mvmt Flow	32	37	33	333	352	27

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	599	190	379
Stage 1	366	-	-
Stage 2	233	-	-
Critical Hdwy	6.84	6.94	4.14
Critical Hdwy Stg 1	5.84	-	-
Critical Hdwy Stg 2	5.84	-	-
Follow-up Hdwy	3.52	3.32	2.22
Pot Cap-1 Maneuver	433	820	1176
Stage 1	672	-	-
Stage 2	784	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	418	820	1176
Mov Cap-2 Maneuver	418	-	-
Stage 1	649	-	-
Stage 2	784	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.2	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1176	-	568	-	-
HCM Lane V/C Ratio	0.028	-	0.121	-	-
HCM Control Delay (s)	8.1	0.1	12.2	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.4	-	-



# Appendix F

## 2030 Background Traffic Operations



Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background AM (Five-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	27	112	43	220	50	177	10	1079	409	285	1127	15
Future Volume (vph)	27	112	43	220	50	177	10	1079	409	285	1127	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	65.0		0.0	35.0		0.0	160.0		150.0	195.0		0.0
Storage Lanes	1		0	1		0	1		1	2		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	0.95
Ped Bike Factor	1.00				0.99							
Frt		0.958			0.883				0.850		0.998	
Fit Protected	0.950			0.950		0.950			0.950			
Satd. Flow (prot)	1736	1781	0	1719	3012	0	1626	3223	1568	3400	3276	0
Fit Permitted	0.599			0.392		0.950			0.950			
Satd. Flow (perm)	1092	1781	0	709	3012	0	1626	3223	1568	3400	3276	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			192				445			1
Link Speed (k/h)		60			60			80				70
Link Distance (m)		101.8			339.3			467.1				460.6
Travel Time (s)		6.1			20.4			21.0				23.7
Confl. Peds. (#/hr)	2					2						
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 (%)	4%	0%	8%	5%	7%	4%	11%	12%	3%	3%	10%	7%
Adj. Flow (vph)	29	122	47	239	54	192	11	1173	445	310	1225	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	29	169	0	239	246	0	11	1173	445	310	1241	0
Turn Type	Perm	NA		pm+pt	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases		4		8					2			
Detector Phase		4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	10.0		8.0	53.0	53.0	8.0	53.0	
Minimum Split (s)	44.9	44.9		10.0	44.9		13.0	60.8	60.8	13.0	60.8	
Total Split (s)	44.9	44.9		11.0	55.9		13.0	72.8	72.8	20.0	79.8	
Total Split (%)	30.2%	30.2%		7.4%	37.6%		8.7%	49.0%	49.0%	13.4%	53.7%	
Maximum Green (s)	37.0	37.0		8.0	48.0		8.0	65.0	65.0	15.0	72.0	
Yellow Time (s)	5.0	5.0		3.0	5.0		3.0	5.9	5.9	3.0	5.9	
All-Red Time (s)	2.9	2.9		0.0	2.9		2.0	1.9	1.9	2.0	1.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.9	7.9		3.0	7.9		5.0	7.8	7.8	5.0	7.8	
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.0	3.0	3.0	4.0	3.0	
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	
Walk Time (s)	21.0	21.0			21.0		41.0	41.0		41.0		
Flash Dont Walk (s)	16.0	16.0			16.0		12.0	12.0		12.0		
Pedestrian Calls (#/hr)	0	0			0		0	0		0		
Act Effct Green (s)	18.6	18.6		34.5	29.6		8.0	77.9	77.9	20.5	98.2	
Actuated g/C Ratio	0.13	0.13		0.23	0.20		0.05	0.52	0.52	0.14	0.66	
v/c Ratio	0.21	0.73		1.10	0.33		0.13	0.69	0.43	0.66	0.57	

Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West


601 Scottsdale Drive, Guelph TIS and PS  
Background AM (Five-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	59.9	75.3		137.8	13.0		70.5	30.7	3.3	67.6	16.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	59.9	75.3		137.8	13.0		70.5	30.7	3.3	67.6	16.8	
LOS	E	E		F	B		E	C	A	E	B	
Approach Delay		73.0			74.5			23.5			27.0	
Approach LOS		E			E			C			C	
Queue Length 50th (m)	7.7	44.7		-69.4	6.8		3.1	131.8	0.0	44.6	86.1	
Queue Length 95th (m)	17.2	66.5		#113.4	17.6		9.8	181.2	18.4	59.0	153.1	
Internal Link Dist (m)		77.8			315.3			443.1			436.6	
Turn Bay Length (m)	65.0			35.0			160.0		150.0	195.0		
Base Capacity (vph)	271	452		218	1102		87	1688	1033	469	2164	
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	0.11	0.37		1.10	0.22		0.13	0.69	0.43	0.66	0.57	
<b>Intersection Summary</b>												
Area Type: Other												
Cycle Length: 148.7												
Actuated Cycle Length: 148.7												
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green												
Natural Cycle: 130												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.10												
Intersection Signal Delay: 33.8 Intersection LOS: C												
Intersection Capacity Utilization 94.2% ICU Level of Service F												
Analysis Period (min) 15												
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.												
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.												
<b>Spits and Phases: 1: Highway 6 &amp; Stone Road West</b>												



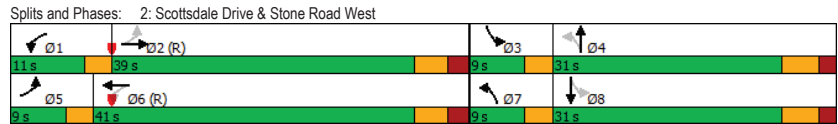
Lanes, Volumes, Timings  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background AM (Five-Year Horizon)




Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	6.3	15.4		7.7	11.5		28.2	23.0		37.1	26.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.3	15.4		7.7	11.5		28.2	23.0		37.1	26.1	
LOS	A	B		A	B		C	C		D	C	
Approach Delay	14.6				10.6		24.0				30.5	
Approach LOS	B				B		C				C	
Queue Length 50th (m)	4.0	46.2		7.1	19.2		11.7	15.4		15.3	9.5	
Queue Length 95th (m)	9.2	67.5		14.4	30.5		20.2	24.8		25.2	16.4	
Internal Link Dist (m)	315.3				186.0		93.2				16.4	
Turn Bay Length (m)	27.5				25.0		30.0				20.0	
Base Capacity (vph)	608	1794		437	1811		290	1019		204	915	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.13	0.48		0.32	0.25		0.30	0.36		0.55	0.18	

Intersection Summary	
Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	42 (47%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle:	80
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.64
Intersection Signal Delay:	17.4
Intersection LOS:	B
Intersection Capacity Utilization:	66.3%
ICU Level of Service:	C
Analysis Period (min):	15



HCM 6th Signalized Intersection Summary  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background AM (Five-Year Horizon)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	68	661	77	117	329	52	74	155	159	95	98	44
Future Volume (veh/h)	68	661	77	117	329	52	74	155	159	95	98	44
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	0.96		0.95	0.98		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1752	1826	1781	1841	1767	1663	1856	1841	1856	1737	1841	1693
Adj Flow Rate, veh/h	80	778	91	138	387	61	87	182	187	112	115	52
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	10	5	8	4	9	16	3	4	3	11	4	14
Cap, veh/h	491	1366	160	350	1289	202	413	403	343	301	562	237
Arrive On Green	0.06	0.44	0.44	0.06	0.44	0.44	0.06	0.23	0.23	0.07	0.24	0.24
Sat Flow, veh/h	1668	3125	365	1753	2904	454	1767	1749	1485	1654	2357	996
Grp Volume(v), veh/h	80	432	437	138	222	226	87	182	187	112	83	84
Grp Sat Flow(s), veh/h/ln	1668	1735	1756	1753	1678	1680	1767	1749	1485	1654	1749	1604
Q Serve(g_s), s	2.3	16.8	16.8	3.8	7.6	7.8	3.3	8.0	10.0	4.6	3.4	3.8
Cycle Q Clear(g_c), s	2.3	16.8	16.8	3.8	7.6	7.8	3.3	8.0	10.0	4.6	3.4	3.8
Prop In Lane	1.00		0.21	1.00		0.27	1.00		1.00	1.00		0.62
Lane Grp Cap(c), veh/h	491	758	767	350	745	746	413	403	343	301	417	382
V/C Ratio(X)	0.16	0.57	0.57	0.39	0.30	0.30	0.21	0.45	0.55	0.37	0.20	0.22
Avail Cap(c_a), veh/h	506	758	767	393	745	746	427	486	412	301	486	446
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.4	19.0	19.0	14.1	16.0	16.1	23.9	29.7	30.5	24.5	27.4	27.5
Incr Delay (d2), s/veh	0.2	3.1	3.1	0.7	1.0	1.0	0.3	0.8	1.4	0.8	0.2	0.3
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%), veh/ln	1.2	9.8	9.9	2.1	4.5	4.5	2.2	5.6	5.9	2.9	2.3	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	12.5	22.1	22.1	14.9	17.1	17.1	24.2	30.5	31.8	25.2	27.6	27.8
LnGrp LOS	B	C	C	B	B	B	C	C	C	C	C	C
Approach Vol, veh/h	949			586			456			279		
Approach Delay, s/veh	21.3			16.6			29.8			26.7		
Approach LOS	C			B			C			C		

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.8	45.4	9.0	26.8	8.2	46.0	8.3	27.4
Change Period (Y+Rc), s	3.0	* 6.1	3.0	6.0	3.0	* 6.1	3.0	6.0
Max Green Setting (Gmax), s	8.0	* 33	6.0	25.0	6.0	* 35	6.0	25.0
Max Q Clear Time (g_c+I1), s	5.8	18.8	6.6	12.0	4.3	9.8	5.3	5.8
Green Ext Time (p_c), s	0.1	5.4	0.0	2.1	0.0	3.2	0.0	1.0

Intersection Summary	
HCM 6th Ctrl Delay	22.4
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Background AM (Five-Year Horizon)

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Volume (vph)	3	5	5	270	232	5
Future Volume (vph)	3	5	5	270	232	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Fr <sub>t</sub>	0.916				0.997	
Fit Protected	0.982			0.999		
Satd. Flow (prot)	1676	0	0	3342	3336	0
Fit Permitted	0.982			0.999		
Satd. Flow (perm)	1676	0	0	3342	3336	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	33.1			88.1	60.3	
Travel Time (s)	2.4			6.3	4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	8%	8%	2%
Adj. Flow (vph)	3	5	5	293	252	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	8	0	0	298	257	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	21.0%
ICU Level of Service	A
Analysis Period (min)	15

HCM 6th TWSC  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Background AM (Five-Year Horizon)

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Vol, veh/h	3	5	5	270	232	5
Future Vol, veh/h	3	5	5	270	232	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	8	8	2
Mvmt Flow	3	5	5	293	252	5

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	412	129	257
Stage 1	255	-	-
Stage 2	157	-	-
Critical Hdwy	6.84	6.94	4.14
Critical Hdwy Stg 1	5.84	-	-
Critical Hdwy Stg 2	5.84	-	-
Follow-up Hdwy	3.52	3.32	2.22
Pot Cap-1 Maneuver	568	897	1305
Stage 1	764	-	-
Stage 2	855	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	565	897	1305
Mov Cap-2 Maneuver	565	-	-
Stage 1	760	-	-
Stage 2	855	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT	SBR
Capacity (veh/h)	1305	-	735	-
HCM Lane V/C Ratio	0.004	-	0.012	-
HCM Control Delay (s)	7.8	0	10	-
HCM Lane LOS	A	A	B	-
HCM 95th %tile Q(veh)	0	-	0	-

Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Five-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	20	92	32	368	147	356	35	1305	337	408	1370	19
Future Volume (vph)	20	92	32	368	147	356	35	1305	337	408	1370	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	65.0		0.0	35.0		0.0	160.0		150.0	195.0		0.0
Storage Lanes	1		0	1		0	1		1	2		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	0.95
Ped Bike Factor	0.99					0.98						
Frt		0.961			0.894				0.850		0.998	
Fit Protected	0.950			0.950		0.950			0.950			
Satd. Flow (prot)	1805	1799	0	1787	3127	0	1805	3438	1583	3467	3466	0
Fit Permitted	0.359			0.461		0.950			0.950			
Satd. Flow (perm)	677	1799	0	867	3127	0	1805	3438	1583	3467	3466	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			283				366		1	
Link Speed (k/h)		60			60			80			70	
Link Distance (m)		101.8			339.3			467.1			460.6	
Travel Time (s)		6.1			20.4			21.0			23.7	
Confl. Peds. (#/hr)	12					12						
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%	1%	3%	1%	2%	1%	0%	5%	2%	1%	4%	0%
Adj. Flow (vph)	22	100	35	400	160	387	38	1418	366	443	1489	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	22	135	0	400	547	0	38	1418	366	443	1510	0
Turn Type	Perm	NA		pm+pt	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases		4		8					2			
Detector Phase		4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	10.0		8.0	53.0	53.0	8.0	53.0	
Minimum Split (s)	44.9	44.9		10.0	44.9		13.0	60.8	60.8	13.0	60.8	
Total Split (s)	44.9	44.9		12.0	56.9		13.0	68.8	68.8	23.0	78.8	
Total Split (%)	30.2%	30.2%		8.1%	38.3%		8.7%	46.3%	46.3%	15.5%	53.0%	
Maximum Green (s)	37.0	37.0		9.0	49.0		8.0	61.0	61.0	18.0	71.0	
Yellow Time (s)	5.0	5.0		3.0	5.0		3.0	5.9	5.9	3.0	5.9	
All-Red Time (s)	2.9	2.9		0.0	2.9		2.0	1.9	1.9	2.0	1.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.9	7.9		3.0	7.9		5.0	7.8	7.8	5.0	7.8	
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.0	3.0	3.0	4.0	3.0	
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	
Walk Time (s)	21.0	21.0		21.0	21.0		41.0	41.0	41.0	41.0	41.0	
Flash Dont Walk (s)	16.0	16.0		16.0	16.0		12.0	12.0	12.0	12.0	12.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	
Act Effct Green (s)	15.8	15.8		32.7	27.8		8.0	71.5	71.5	28.8	94.8	
Actuated g/C Ratio	0.11	0.11		0.22	0.19		0.05	0.48	0.48	0.19	0.64	
v/c Ratio	0.31	0.68		1.63	0.67		0.39	0.86	0.39	0.66	0.68	

Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West


601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Five-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	71.0	74.7		335.8	30.3		80.2	41.1	3.5	60.8	20.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	71.0	74.7		335.8	30.3		80.2	41.1	3.5	60.8	20.6	
LOS	E	E		F	C		F	D	A	E	C	
Approach Delay		74.2			159.3			34.4			29.8	
Approach LOS		E			F			C			C	
Queue Length 50th (m)	6.0	35.3		~167.2	38.0		10.9	186.6	0.0	62.4	147.8	
Queue Length 95th (m)	14.8	55.4		#220.5	55.1		23.2	#256.3	18.0	79.4	193.1	
Internal Link Dist (m)		77.8			315.3			443.1			436.6	
Turn Bay Length (m)		65.0			35.0			160.0		150.0	195.0	
Base Capacity (vph)	168	455		246	1220		97	1652	950	671	2210	
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	0.13	0.30		1.63	0.45		0.39	0.86	0.39	0.66	0.68	
<b>Intersection Summary</b>												
Area Type: Other												
Cycle Length: 148.7												
Actuated Cycle Length: 148.7												
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green												
Natural Cycle: 150												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.63												
Intersection Signal Delay: 58.1												
Intersection Capacity Utilization 109.1%												
Intersection LOS: E												
ICU Level of Service H												
Analysis Period (min) 15												
~ Volume exceeds capacity, queue is theoretically infinite.												
Queue shown is maximum after two cycles.												
# 95th percentile volume exceeds capacity, queue may be longer.												
Queue shown is maximum after two cycles.												
<b>Spits and Phases: 1: Highway 6 &amp; Stone Road West</b>												



Lanes, Volumes, Timings  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Five-Year Horizon)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	7.5	17.8		9.7	14.0		30.5	19.0		37.2	27.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	7.5	17.8		9.7	14.0		30.5	19.0		37.2	27.4	
LOS	A	B		A	B		C	B		D	C	
Approach Delay	16.6			12.9			21.3			30.2		
Approach LOS	B			B			C			C		
Queue Length 50th (m)	5.3	43.7		15.0	41.7		15.3	14.3		15.3	15.4	
Queue Length 95th (m)	12.5	74.7		29.6	67.0		26.3	27.4		26.5	25.4	
Internal Link Dist (m)	315.3			186.0			93.2			16.4		
Turn Bay Length (m)	27.5			25.0			30.0			20.0		
Base Capacity (vph)	476	1681		558	1899		276	1080		202	1006	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.22	0.47		0.48	0.43		0.41	0.42		0.55	0.27	

**Intersection Summary**

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 35 (39%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.68

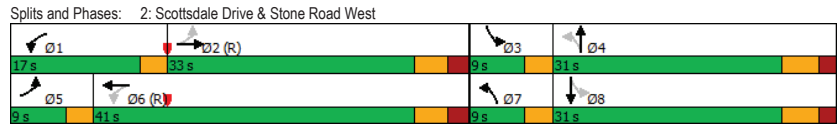
Intersection Signal Delay: 17.9

Intersection LOS: B

Intersection Capacity Utilization 74.3%


ICU Level of Service D

Analysis Period (min) 15



HCM 6th Signalized Intersection Summary  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Five-Year Horizon)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	98	580	159	250	684	81	104	156	263	104	168	83
Future Volume (veh/h)	98	580	159	250	684	81	104	156	263	104	168	83
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	0.98		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1900	1870	1900	1885	1841	1811	1900	1856	1885	1796	1900	1900
Adj Flow Rate, veh/h	105	624	171	269	735	87	112	168	283	112	181	89
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	2	0	1	4	6	0	3	1	7	0	0
Cap, veh/h	363	1036	283	416	1346	159	394	427	371	256	579	271
Arrive On Green	0.06	0.38	0.38	0.11	0.43	0.43	0.06	0.24	0.24	0.07	0.24	0.24
Sat Flow, veh/h	1810	2744	751	1795	3143	372	1810	1763	1530	1711	2365	1105
Grp Volume(v), veh/h	105	404	391	269	409	413	112	168	283	112	136	134
Grp Sat Flow(s),veh/h/ln	1810	1777	1717	1795	1749	1766	1810	1763	1530	1711	1805	1665
Q Serve(g_s), s	3.1	16.5	16.5	7.7	15.7	15.7	4.1	7.2	15.5	4.4	5.5	6.0
Cycle Q Clear(g_c), s	3.1	16.5	16.5	7.7	15.7	15.7	4.1	7.2	15.5	4.4	5.5	6.0
Prop In Lane	1.00		0.44	1.00		0.21	1.00		1.00	1.00		0.66
Lane Grp Cap(c), veh/h	363	671	648	416	749	757	394	427	371	256	442	408
V/C Ratio(X)	0.29	0.60	0.60	0.65	0.55	0.55	0.28	0.39	0.76	0.44	0.31	0.33
Avail Cap(c_a), veh/h	372	671	648	493	749	757	399	490	425	257	501	462
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.8	22.6	22.6	15.7	19.2	19.2	23.3	28.6	31.7	24.5	27.8	27.9
Incr Delay (d2), s/veh	0.4	4.0	4.1	2.3	2.8	2.8	0.4	0.6	7.0	1.2	0.4	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.9	10.3	10.1	4.5	9.4	9.4	2.8	5.0	9.7	2.9	3.9	3.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.3	26.5	26.7	18.0	22.0	22.0	23.7	29.1	38.7	25.7	28.1	28.4
LnGrp LOS	B	C	C	B	C	C	C	C	D	C	C	C
Approach Vol, veh/h	900			1091			563			382		
Approach Delay, s/veh	25.4			21.0			32.9			27.5		
Approach LOS	C			C			C			C		

**Timer - Assigned Phs**

	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.1	40.1	9.0	27.8	8.6	44.7	8.7	28.0
Change Period (Y+Rc), s	3.0	* 6.1	3.0	6.0	3.0	* 6.1	3.0	6.0
Max Green Setting (Gmax), s	14.0	* 27	6.0	25.0	6.0	* 35	6.0	25.0
Max Q Clear Time (g_c+I1), s	9.7	18.5	6.4	17.5	5.1	17.7	6.1	8.0
Green Ext Time (p_c), s	0.4	3.5	0.0	1.9	0.0	5.6	0.0	1.6

**Intersection Summary**

HCM 6th Ctrl Delay 25.5

HCM 6th LOS C

**Notes**  
\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Lanes, Volumes, Timings  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Five-Year Horizon)

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Volume (vph)	6	6	5	330	349	5
Future Volume (vph)	6	6	5	330	349	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Fr <sub>t</sub>	0.932				0.998	
Fit Protected	0.976			0.999		
Satd. Flow (prot)	1694	0	0	3502	3532	0
Fit Permitted	0.976			0.999		
Satd. Flow (perm)	1694	0	0	3502	3532	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	33.1			88.1	60.3	
Travel Time (s)	2.4			6.3	4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%
Adj. Flow (vph)	7	7	5	359	379	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	14	0	0	364	384	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	22.7%
ICU Level of Service	A
Analysis Period (min)	15

HCM 6th TWSC  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Five-Year Horizon)

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Vol, veh/h	6	6	5	330	349	5
Future Vol, veh/h	6	6	5	330	349	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	3	2	2
Mvmt Flow	7	7	5	359	379	5

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	572	192	384
Stage 1	382	-	-
Stage 2	190	-	-
Critical Hdwy	6.84	6.94	4.14
Critical Hdwy Stg 1	5.84	-	-
Critical Hdwy Stg 2	5.84	-	-
Follow-up Hdwy	3.52	3.32	2.22
Pot Cap-1 Maneuver	450	817	1171
Stage 1	660	-	-
Stage 2	823	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	448	817	1171
Mov Cap-2 Maneuver	448	-	-
Stage 1	657	-	-
Stage 2	823	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.4	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT	SBR
Capacity (veh/h)	1171	-	579	-
HCM Lane V/C Ratio	0.005	-	0.023	-
HCM Control Delay (s)	8.1	0	11.4	-
HCM Lane LOS	A	A	B	-
HCM 95th %tile Q(veh)	0	-	0.1	-

# Appendix G

## 2030 Total Traffic Operations



Lanes, Volumes, Timings  
 1: Highway 6 & Stone Road West  
 601 Scottsdale Drive, Guelph TIS and PS  
 Total AM (Five-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	27	113	43	223	51	179	10	1079	412	286	1127	15
Future Volume (vph)	27	113	43	223	51	179	10	1079	412	286	1127	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	65.0		0.0	35.0		0.0	160.0		150.0	195.0		0.0
Storage Lanes	1		0	1		0	1		1	2		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	0.95
Ped Bike Factor	1.00				0.99							
Frt		0.959			0.883				0.850		0.998	
Fit Protected	0.950			0.950		0.950			0.950			
Satd. Flow (prot)	1736	1783	0	1719	3012	0	1626	3223	1568	3400	3276	0
Fit Permitted	0.597			0.389		0.950			0.950			
Satd. Flow (perm)	1089	1783	0	704	3012	0	1626	3223	1568	3400	3276	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			195				448			1
Link Speed (k/h)		60			60			80				70
Link Distance (m)		101.8			339.3			467.1				460.6
Travel Time (s)		6.1			20.4			21.0				23.7
Confl. Peds. (#/hr)	2				2							
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 (%)	4%	0%	8%	5%	7%	4%	11%	12%	3%	3%	10%	7%
Adj. Flow (vph)	29	123	47	242	55	195	11	1173	448	311	1225	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	29	170	0	242	250	0	11	1173	448	311	1241	0
Turn Type	Perm	NA		pm+pt	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases		4		8					2			
Detector Phase		4	4		3	8		5	2	2	1	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	10.0		8.0	53.0	53.0	8.0	53.0	
Minimum Split (s)	44.9	44.9		10.0	44.9		13.0	60.8	60.8	13.0	60.8	
Total Split (s)	44.9	44.9		11.0	55.9		13.0	71.8	71.8	21.0	79.8	
Total Split (%)	30.2%	30.2%		7.4%	37.6%		8.7%	48.3%	48.3%	14.1%	53.7%	
Maximum Green (s)	37.0	37.0		8.0	48.0		8.0	64.0	64.0	16.0	72.0	
Yellow Time (s)	5.0	5.0		3.0	5.0		3.0	5.9	5.9	3.0	5.9	
All-Red Time (s)	2.9	2.9		0.0	2.9		2.0	1.9	1.9	2.0	1.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.9	7.9		3.0	7.9		5.0	7.8	7.8	5.0	7.8	
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.0	3.0	3.0	4.0	3.0	
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	
Walk Time (s)	21.0	21.0			21.0		41.0	41.0		41.0		
Flash Dont Walk (s)	16.0	16.0			16.0		12.0	12.0		12.0		
Pedestrian Calls (#/hr)	0	0			0		0	0		0		
Act Effct Green (s)	18.6	18.6		34.5	29.6		8.0	78.2	78.2	20.2	98.2	
Actuated g/C Ratio	0.13	0.13		0.23	0.20		0.05	0.53	0.53	0.14	0.66	
v/c Ratio	0.21	0.73		1.12	0.33		0.13	0.69	0.43	0.67	0.57	

Lanes, Volumes, Timings  
 1: Highway 6 & Stone Road West  
 601 Scottsdale Drive, Guelph TIS and PS  
 Total AM (Five-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	59.9	75.2		143.0	13.0		70.5	30.5	3.3	68.5	16.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	59.9	75.2		143.0	13.0		70.5	30.5	3.3	68.5	16.9	
LOS	E	E		F	B		E	C	A	E	B	
Approach Delay		73.0			77.0			23.3			27.2	
Approach LOS		E			E			C			C	
Queue Length 50th (m)	7.7	45.0		-71.7	6.9		3.1	130.8	0.0	45.0	86.1	
Queue Length 95th (m)	17.2	66.8		#115.7	17.7		9.8	181.3	18.4	59.1	153.4	
Internal Link Dist (m)		77.8			315.3			443.1			436.6	
Turn Bay Length (m)		65.0			35.0			160.0		150.0	195.0	
Base Capacity (vph)	270	452		217	1104		87	1694	1036	462	2163	
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	0.11	0.38		1.12	0.23		0.13	0.69	0.43	0.67	0.57	
<b>Intersection Summary</b>												
Area Type: Other												
Cycle Length: 148.7												
Actuated Cycle Length: 148.7												
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green												
Natural Cycle: 130												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.12												
Intersection Signal Delay: 34.2 Intersection LOS: C												
Intersection Capacity Utilization 94.3% ICU Level of Service F												
Analysis Period (min) 15												
- Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.												
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.												
<b>Spits and Phases: 1: Highway 6 &amp; Stone Road West</b>												
↖ Ø1	↗ Ø2 (R)	↖ Ø3	↗ Ø4									
21 s	71.8 s	11 s	44.9 s									
↓ Ø5 (R)	↖ Ø6	↗ Ø7	↖ Ø8									
79.8 s	13 s	55.9 s										



Lanes, Volumes, Timings

601 Scottsdale Drive, Guelph TIS and PS

2: Scottsdale Drive & Stone Road West

Total AM (Five-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	6.3	15.4		7.7	11.6		28.2	23.0		37.8	25.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
<b>Total Delay</b>	<b>6.3</b>	<b>15.4</b>		<b>7.7</b>	<b>11.6</b>		<b>28.2</b>	<b>23.0</b>		<b>37.8</b>	<b>25.3</b>	
LOS	A	B		A	B		C	C		D	C	
Approach Delay	14.6				10.7		24.0				30.3	
Approach LOS	B				B		C				C	
Queue Length 50th (m)	4.3	46.2		7.1	19.4		11.7	15.4		15.8	9.5	
Queue Length 95th (m)	9.8	67.5		14.4	30.9		20.2	24.8		25.8	16.5	
Internal Link Dist (m)	315.3				186.0		93.2				16.4	
Turn Bay Length (m)	27.5				25.0		30.0				20.0	
Base Capacity (vph)	608	1794		437	1803		289	1019		204	913	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.14	0.48		0.32	0.25		0.30	0.36		0.56	0.19	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 42 (47%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 17.4

Intersection LOS: B

Intersection Capacity Utilization 66.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 2: Scottsdale Drive & Stone Road West

Ø1	Ø2 (R)	Ø3	Ø4
11 s	39 s	9 s	31 s
Ø5	Ø6 (R)	Ø7	Ø8
9 s	41 s	9 s	31 s

HCM 6th Signalized Intersection Summary

601 Scottsdale Drive, Guelph TIS and PS

2: Scottsdale Drive & Stone Road West

Total AM (Five-Year Horizon)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	73	661	77	117	329	55	74	155	159	98	98	50
Future Volume (veh/h)	73	661	77	117	329	55	74	155	159	98	98	50
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	0.97		0.95	0.98		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1752	1826	1781	1841	1767	1663	1856	1841	1856	1737	1841	1693
Adj Flow Rate, veh/h	86	778	91	138	387	65	87	182	187	115	115	59
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	10	5	8	4	9	16	3	4	3	11	4	14
Cap, veh/h	489	1366	160	350	1272	212	409	403	343	301	538	256
Arrive On Green	0.06	0.44	0.44	0.06	0.44	0.44	0.06	0.23	0.23	0.07	0.24	0.24
Sat Flow, veh/h	1668	3125	365	1753	2875	479	1767	1749	1485	1654	2259	1075
Grp Volume(v), veh/h	86	432	437	138	225	227	87	182	187	115	87	87
Grp Sat Flow(s),veh/h/ln	1668	1735	1756	1753	1678	1675	1767	1749	1485	1654	1749	1585
Q Serve(g_s), s	2.5	16.8	16.8	3.8	7.7	7.9	3.3	8.0	10.0	4.7	3.6	4.0
Cycle Q Clear(g_c), s	2.5	16.8	16.8	3.8	7.7	7.9	3.3	8.0	10.0	4.7	3.6	4.0
Prop In Lane	1.00		0.21	1.00		0.29	1.00		1.00	1.00		0.68
Lane Grp Cap(c), veh/h	489	758	767	350	743	741	409	403	343	301	417	378
V/C Ratio(X)	0.18	0.57	0.57	0.39	0.30	0.31	0.21	0.45	0.55	0.38	0.21	0.23
Avail Cap(c_a), veh/h	502	758	767	393	743	741	423	486	412	301	486	440
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.4	19.0	19.0	14.1	16.1	16.2	23.9	29.7	30.5	24.5	27.5	27.6
Incr Delay (d2), s/veh	0.2	3.1	3.1	0.7	1.0	1.1	0.3	0.8	1.4	0.8	0.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.3	9.8	9.9	2.1	4.5	4.6	2.2	5.6	5.9	3.0	2.5	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.6	22.1	22.1	14.9	17.2	17.2	24.2	30.5	31.8	25.3	27.7	27.9
LnGrp LOS	B	C	C	B	B	B	C	C	C	C	C	C
Approach Vol, veh/h	955			590			456			289		
Approach Delay, s/veh	21.2			16.7			29.8			26.8		
Approach LOS	C			B			C			C		

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.8	45.4	9.0	26.8	8.3	45.9	8.3	27.4
Change Period (Y+Rc), s	3.0	* 6.1	3.0	6.0	3.0	* 6.1	3.0	6.0
Max Green Setting (Gmax), s	8.0	* 33	6.0	25.0	6.0	* 35	6.0	25.0
Max Q Clear Time (g_c+I1), s	5.8	18.8	6.7	12.0	4.5	9.9	5.3	6.0
Green Ext Time (p_c), s	0.1	5.4	0.0	2.1	0.0	3.2	0.0	1.0

Intersection Summary

HCM 6th Ctrl Delay 22.5

HCM 6th LOS C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Total AM (Five-Year Horizon)

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↘			↕	↕	
Traffic Volume (vph)	11	14	13	270	232	12
Future Volume (vph)	11	14	13	270	232	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Fr <sub>t</sub>	0.925				0.993	
Fit Protected	0.978			0.998		
Satd. Flow (prot)	1685	0	0	3344	3328	0
Fit Permitted	0.978			0.998		
Satd. Flow (perm)	1685	0	0	3344	3328	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	33.1			88.1	60.3	
Travel Time (s)	2.4			6.3	4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	8%	8%	2%
Adj. Flow (vph)	12	15	14	293	252	13
Shared Lane Traffic (%)						
Lane Group Flow (vph)	27	0	0	307	265	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	27.1% ICU Level of Service A
Analysis Period (min)	15

HCM 6th TWSC  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Total AM (Five-Year Horizon)

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↘			↕	↕	
Traffic Vol, veh/h	11	14	13	270	232	12
Future Vol, veh/h	11	14	13	270	232	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	8	8	2
Mvmt Flow	12	15	14	293	252	13

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	434	133	265
Stage 1	259	-	-
Stage 2	175	-	-
Critical Hdwy	6.84	6.94	4.14
Critical Hdwy Stg 1	5.84	-	-
Critical Hdwy Stg 2	5.84	-	-
Follow-up Hdwy	3.52	3.32	2.22
Pot Cap-1 Maneuver	550	892	1296
Stage 1	761	-	-
Stage 2	838	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	543	892	1296
Mov Cap-2 Maneuver	543	-	-
Stage 1	751	-	-
Stage 2	838	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.4	0.4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT	SBR
Capacity (veh/h)	1296	-	695	-
HCM Lane V/C Ratio	0.011	-	0.039	-
HCM Control Delay (s)	7.8	0	10.4	-
HCM Lane LOS	A	A	B	-
HCM 95th %tile Q(veh)	0	-	0.1	-

Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total PM (Five-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	20	94	32	378	150	361	35	1305	346	413	1370	19
Future Volume (vph)	20	94	32	378	150	361	35	1305	346	413	1370	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	65.0		0.0	35.0		0.0	160.0		150.0	195.0		0.0
Storage Lanes	1		0	1		0	1		1	2		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	0.95
Ped Bike Factor	0.99				0.98							
Fr		0.962			0.894				0.850		0.998	
Fit Protected	0.950			0.950		0.950			0.950			
Satd. Flow (prot)	1805	1801	0	1787	3127	0	1805	3438	1583	3467	3466	0
Fit Permitted	0.346			0.456		0.950			0.950			
Satd. Flow (perm)	653	1801	0	858	3127	0	1805	3438	1583	3467	3466	0
Right Turn on Red			Yes			Yes			Yes		Yes	
Satd. Flow (RTOR)		11			283				376		1	
Link Speed (k/h)		60			60			80			70	
Link Distance (m)		101.8			339.3			467.1			460.6	
Travel Time (s)		6.1			20.4			21.0			23.7	
Confl. Peds. (#/hr)	12					12						
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%	1%	3%	1%	2%	1%	0%	5%	2%	1%	4%	0%
Adj. Flow (vph)	22	102	35	411	163	392	38	1418	376	449	1489	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	22	137	0	411	555	0	38	1418	376	449	1510	0
Turn Type	Perm	NA		pm+pt	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases		4		8				2		2		
Detector Phase		4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	10.0		8.0	53.0	53.0	8.0	53.0	
Minimum Split (s)	44.9	44.9		10.0	44.9		13.0	60.8	60.8	13.0	60.8	
Total Split (s)	44.9	44.9		12.0	56.9		13.0	68.8	68.8	23.0	78.8	
Total Split (%)	30.2%	30.2%		8.1%	38.3%		8.7%	46.3%	46.3%	15.5%	53.0%	
Maximum Green (s)	37.0	37.0		9.0	49.0		8.0	61.0	61.0	18.0	71.0	
Yellow Time (s)	5.0	5.0		3.0	5.0		3.0	5.9	5.9	3.0	5.9	
All-Red Time (s)	2.9	2.9		0.0	2.9		2.0	1.9	1.9	2.0	1.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.9	7.9		3.0	7.9		5.0	7.8	7.8	5.0	7.8	
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.0	3.0	3.0	4.0	3.0	
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	
Walk Time (s)	21.0	21.0			21.0		41.0	41.0		41.0		
Flash Dont Walk (s)	16.0	16.0			16.0		12.0	12.0		12.0		
Pedestrian Calls (#/hr)	0	0			0		0	0		0		
Act Effct Green (s)	15.9	15.9		32.8	27.9		8.0	70.8	70.8	29.4	94.7	
Actuated g/C Ratio	0.11	0.11		0.22	0.19		0.05	0.48	0.48	0.20	0.64	
v/c Ratio	0.32	0.68		1.68	0.68		0.39	0.87	0.40	0.66	0.68	

Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total PM (Five-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	71.7	74.8		356.7	30.9		80.2	42.1	3.6	60.3	20.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	71.7	74.8		356.7	30.9		80.2	42.1	3.6	60.3	20.8	
LOS	E	E		F	C		F	D	A	E	C	
Approach Delay		74.4			169.5			35.0			29.8	
Approach LOS		E			F			C			C	
Queue Length 50th (m)	6.0	35.9		~174.0	39.3		10.9	187.8	0.0	63.2	148.0	
Queue Length 95th (m)	14.8	56.2		#227.8	56.5		23.2	#258.5	18.4	80.4	194.0	
Internal Link Dist (m)		77.8			315.3			443.1			436.6	
Turn Bay Length (m)		65.0			35.0			160.0		150.0	195.0	
Base Capacity (vph)	162	456		245	1220		97	1635	950	684	2208	
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	0.14	0.30		1.68	0.45		0.39	0.87	0.40	0.66	0.68	
<b>Intersection Summary</b>												
Area Type:	Other											
Cycle Length:	148.7											
Actuated Cycle Length:	148.7											
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green												
Natural Cycle:	150											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	1.68											
Intersection Signal Delay:	60.6						Intersection LOS: E					
Intersection Capacity Utilization:	109.5%						ICU Level of Service H					
Analysis Period (min):	15											
- Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.												
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.												
<b>Spits and Phases:</b>	1: Highway 6 & Stone Road West											
	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
	⊙1	⊙2 (R)	⊙3	⊙4	⊙5	⊙6 (R)	⊙7	⊙8				
	23 s	68.8 s	12 s	44.9 s	13 s	78.8 s	56.9 s					





Lanes, Volumes, Timings

601 Scottsdale Drive, Guelph TIS and PS

2: Scottsdale Drive & Stone Road West

Total PM (Five-Year Horizon)

	↖	→	↗	↙	←	↖	↗	↙	↘	↖	↗	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	8.1	18.7		10.4	15.5		29.4	19.0		40.3	24.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	8.1	18.7		10.4	15.5		29.4	19.0		40.3	24.7	
LOS	A	B		B	B		C	B		D	C	
Approach Delay	17.3					14.3		21.1		29.3		
Approach LOS	B					B		C		C		
Queue Length 50th (m)	6.2	43.9		15.0	42.7		15.3	14.3		17.0	15.4	
Queue Length 95th (m)	14.1	75.0		29.6	68.8		26.3	27.4		28.7	25.7	
Internal Link Dist (m)	315.3					186.0		93.2		16.4		
Turn Bay Length (m)	27.5		25.0			30.0		20.0				
Base Capacity (vph)	449	1603		540	1750		297	1080		200	1012	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.27	0.50		0.50	0.48		0.38	0.42		0.61	0.29	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 35 (39%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 18.5

Intersection Capacity Utilization 74.9%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service D

Splits and Phases: 2: Scottsdale Drive & Stone Road West



HCM 6th Signalized Intersection Summary

601 Scottsdale Drive, Guelph TIS and PS

2: Scottsdale Drive & Stone Road West

Total PM (Five-Year Horizon)

	↖	→	↗	↙	←	↖	↗	↙	↘	↖	↗	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖	↖↗		↖	↖↗	
Traffic Volume (veh/h)	114	580	159	250	684	90	104	156	263	114	168	101
Future Volume (veh/h)	114	580	159	250	684	90	104	156	263	114	168	101
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	0.98		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1900	1870	1900	1885	1841	1811	1900	1856	1885	1796	1900	1900
Adj Flow Rate, veh/h	123	624	171	269	735	97	112	168	283	123	181	109
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	2	0	1	4	6	0	3	1	7	0	0
Cap, veh/h	361	1035	283	415	1321	174	384	427	371	257	538	305
Arrive On Green	0.06	0.38	0.38	0.11	0.43	0.43	0.06	0.24	0.24	0.07	0.25	0.25
Sat Flow, veh/h	1810	2744	751	1795	3098	409	1810	1763	1530	1711	2194	1246
Grp Volume(v), veh/h	123	404	391	269	415	417	112	168	283	123	147	143
Grp Sat Flow(s),veh/h/ln	1810	1777	1717	1795	1749	1759	1810	1763	1530	1711	1805	1635
Q Serve(g_s), s	3.7	16.5	16.5	7.7	16.0	16.1	4.1	7.2	15.5	4.8	6.0	6.5
Cycle Q Clear(g_c), s	3.7	16.5	16.5	7.7	16.0	16.1	4.1	7.2	15.5	4.8	6.0	6.5
Prop In Lane	1.00		0.44	1.00		0.23	1.00		1.00	1.00		0.76
Lane Grp Cap(c), veh/h	361	670	648	415	746	750	384	427	371	257	442	401
V/C Ratio(X)	0.34	0.60	0.60	0.65	0.56	0.56	0.29	0.39	0.76	0.48	0.33	0.36
Avail Cap(c_a), veh/h	386	670	648	492	746	750	389	490	425	257	501	454
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.0	22.6	22.6	15.7	19.4	19.4	23.3	28.6	31.7	24.7	27.9	28.1
Incr Delay (d2), s/veh	0.6	4.0	4.1	2.3	3.0	3.0	0.4	0.6	7.0	1.4	0.4	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.2	10.3	10.1	4.5	9.6	9.6	2.8	5.0	9.7	3.2	4.3	4.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.6	26.6	26.8	18.0	22.4	22.4	23.8	29.1	38.7	26.1	28.4	28.6
LnGrp LOS	B	C	C	B	C	C	C	C	D	C	C	C
Approach Vol, veh/h	918			1101			563			413		
Approach Delay, s/veh	25.3			21.3			32.9			27.8		
Approach LOS	C			C			C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	13.2	40.0	9.0	27.8	8.7	44.5	8.7	28.1				
Change Period (Y+Rc), s	3.0	* 6.1	3.0	6.0	3.0	* 6.1	3.0	6.0				
Max Green Setting (Gmax), s	14.0	* 27	6.0	25.0	7.0	* 34	6.0	25.0				
Max Q Clear Time (g_c+1), s	9.7	18.5	6.8	17.5	5.7	18.1	6.1	8.5				
Green Ext Time (p_c), s	0.4	3.5	0.0	1.9	0.0	5.4	0.0	1.7				

Intersection Summary

HCM 6th Ctrl Delay 25.6

HCM 6th LOS C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Total PM (Five-Year Horizon)

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Volume (vph)	29	34	30	330	349	25
Future Volume (vph)	29	34	30	330	349	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Fr <sub>t</sub>	0.928				0.990	
Fit Protected	0.977			0.996		
Satd. Flow (prot)	1689	0	0	3494	3504	0
Fit Permitted	0.977			0.996		
Satd. Flow (perm)	1689	0	0	3494	3504	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	33.1			88.1	60.3	
Travel Time (s)	2.4			6.3	4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%
Adj. Flow (vph)	32	37	33	359	379	27
Shared Lane Traffic (%)						
Lane Group Flow (vph)	69	0	0	392	406	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	34.1%
ICU Level of Service	A
Analysis Period (min)	15

HCM 6th TWSC  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Total PM (Five-Year Horizon)

Intersection						
Int Delay, s/veh	1.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Vol, veh/h	29	34	30	330	349	25
Future Vol, veh/h	29	34	30	330	349	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	3	2	2
Mvmt Flow	32	37	33	359	379	27

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	639	203	406
Stage 1	393	-	-
Stage 2	246	-	-
Critical Hdwy	6.84	6.94	4.14
Critical Hdwy Stg 1	5.84	-	-
Critical Hdwy Stg 2	5.84	-	-
Follow-up Hdwy	3.52	3.32	2.22
Pot Cap-1 Maneuver	408	804	1149
Stage 1	651	-	-
Stage 2	772	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	393	804	1149
Mov Cap-2 Maneuver	393	-	-
Stage 1	628	-	-
Stage 2	772	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.6	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1149	-	543	-	-
HCM Lane V/C Ratio	0.028	-	0.126	-	-
HCM Control Delay (s)	8.2	0.1	12.6	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.4	-	-

# Appendix H

## 2035 Background Traffic Operations



Lanes, Volumes, Timings  
 1: Highway 6 & Stone Road West  
 601 Scottsdale Drive, Guelph TIS and PS  
 Background AM (Ten-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	28	123	45	238	54	190	10	1134	439	306	1184	16
Future Volume (vph)	28	123	45	238	54	190	10	1134	439	306	1184	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	65.0		0.0	35.0		0.0	160.0		150.0	195.0		0.0
Storage Lanes	1		0	1		0	1		1	2		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	0.95
Ped Bike Factor	1.00				0.99							
Frt		0.960			0.883				0.850		0.998	
Fit Protected	0.950			0.950		0.950			0.950			
Satd. Flow (prot)	1736	1786	0	1719	3012	0	1626	3223	1568	3400	3276	0
Fit Permitted	0.588			0.368		0.950			0.950			
Satd. Flow (perm)	1072	1786	0	666	3012	0	1626	3223	1568	3400	3276	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			207				468		1	
Link Speed (k/h)		60			60			80			70	
Link Distance (m)		101.8			339.3			467.1			460.6	
Travel Time (s)		6.1			20.4			21.0			23.7	
Confl. Peds. (#/hr)	2					2						
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 (%)	4%	0%	8%	5%	7%	4%	11%	12%	3%	3%	10%	7%
Adj. Flow (vph)	30	134	49	259	59	207	11	1233	477	333	1287	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	30	183	0	259	266	0	11	1233	477	333	1304	0
Turn Type	Perm	NA		pm+pt	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases		4		8				2		2		
Detector Phase		4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	10.0		8.0	53.0	53.0	8.0	53.0	
Minimum Split (s)	44.9	44.9		10.0	44.9		13.0	60.8	60.8	13.0	60.8	
Total Split (s)	44.9	44.9		10.0	54.9		13.0	72.8	72.8	21.0	80.8	
Total Split (%)	30.2%	30.2%		6.7%	36.9%		8.7%	49.0%	49.0%	14.1%	54.3%	
Maximum Green (s)	37.0	37.0		7.0	47.0		8.0	65.0	65.0	16.0	73.0	
Yellow Time (s)	5.0	5.0		3.0	5.0		3.0	5.9	5.9	3.0	5.9	
All-Red Time (s)	2.9	2.9		0.0	2.9		2.0	1.9	1.9	2.0	1.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.9	7.9		3.0	7.9		5.0	7.8	7.8	5.0	7.8	
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.0	3.0	3.0	4.0	3.0	
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	
Walk Time (s)	21.0	21.0			21.0			41.0	41.0		41.0	
Flash Dont Walk (s)	16.0	16.0			16.0			12.0	12.0		12.0	
Pedestrian Calls (#/hr)	0	0			0			0	0		0	
Act Effct Green (s)	19.7	19.7		34.6	29.7		8.0	76.7	76.7	21.6	98.1	
Actuated g/C Ratio	0.13	0.13		0.23	0.20		0.05	0.52	0.52	0.15	0.66	
v/c Ratio	0.21	0.74		1.27	0.35		0.13	0.74	0.46	0.68	0.60	

Lanes, Volumes, Timings  
 1: Highway 6 & Stone Road West  
 601 Scottsdale Drive, Guelph TIS and PS  
 Background AM (Ten-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	58.8	75.2		197.1	13.0		70.5	33.1	3.8	67.2	17.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	58.8	75.2		197.1	13.0		70.5	33.1	3.8	67.2	17.6	
LOS	E	E		F	B		E	C	A	E	B	
Approach Delay		72.9			103.8			25.2			27.7	
Approach LOS		E			F			C			C	
Queue Length 50th (m)	7.9	48.7		-87.5	7.4		3.1	145.4	1.3	47.8	93.5	
Queue Length 95th (m)	17.3	70.9		#134.3	18.4		9.8	199.5	21.7	62.5	166.7	
Internal Link Dist (m)		77.8			315.3			443.1			436.6	
Turn Bay Length (m)	65.0			35.0			160.0		150.0	195.0		
Base Capacity (vph)	266	453		204	1093		87	1662	1035	493	2161	
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	0.11	0.40		1.27	0.24		0.13	0.74	0.46	0.68	0.60	
<b>Intersection Summary</b>												
Area Type: Other												
Cycle Length: 148.7												
Actuated Cycle Length: 148.7												
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green												
Natural Cycle: 130												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.27												
Intersection Signal Delay: 38.8												
Intersection Capacity Utilization 95.9%												
Intersection LOS: D												
ICU Level of Service F												
Analysis Period (min) 15												
- Volume exceeds capacity, queue is theoretically infinite.												
Queue shown is maximum after two cycles.												
# 95th percentile volume exceeds capacity, queue may be longer.												
Queue shown is maximum after two cycles.												
<b>Spits and Phases: 1: Highway 6 &amp; Stone Road West</b>												



Lanes, Volumes, Timings  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background AM (Ten-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	6.6	17.5		8.9	12.4		27.7	23.2		39.2	25.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.6	17.5		8.9	12.4		27.7	23.2		39.2	25.3	
LOS	A	B		A	B		C	C		D	C	
Approach Delay	16.5				11.6		24.1				30.9	
Approach LOS	B				B		C				C	
Queue Length 50th (m)	4.4	52.2		7.9	21.4		12.6	16.6		16.5	10.3	
Queue Length 95th (m)	10.0	77.1		15.9	33.8		21.4	26.1		26.6	17.2	
Internal Link Dist (m)	315.3				186.0		93.2				16.4	
Turn Bay Length (m)	27.5		25.0				30.0		20.0			
Base Capacity (vph)	572	1700		394	1729		308	1029		202	918	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.15	0.55		0.38	0.28		0.31	0.39		0.60	0.20	

Intersection Summary	
Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	42 (47%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle:	80
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.66
Intersection Signal Delay:	18.6
Intersection Capacity Utilization:	68.4%
Analysis Period (min):	15
Intersection LOS:	B
ICU Level of Service:	C

Splits and Phases: 2: Scottsdale Drive & Stone Road West

Phase	Duration (s)	Green Time (s)	Yellow Time (s)	Red Time (s)
Ø1	11 s	39 s	9 s	31 s
Ø2 (R)	9 s	31 s	9 s	31 s
Ø3	9 s	31 s	9 s	31 s
Ø4	31 s	9 s	31 s	9 s
Ø5	9 s	31 s	9 s	31 s
Ø6 (R)	31 s	9 s	31 s	9 s
Ø7	9 s	31 s	9 s	31 s
Ø8	31 s	9 s	31 s	9 s

HCM 6th Signalized Intersection Summary  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background AM (Ten-Year Horizon)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↔	↔	↕	↔	↔	↕	↔	↔	↕	↔
Traffic Volume (veh/h)	73	713	82	126	354	56	80	167	171	103	105	48
Future Volume (veh/h)	73	713	82	126	354	56	80	167	171	103	105	48
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	0.97		0.95	0.98		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1752	1826	1781	1841	1767	1663	1856	1841	1856	1737	1841	1693
Adj Flow Rate, veh/h	86	839	96	148	416	66	94	196	201	121	124	56
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	10	5	8	4	9	16	3	4	3	11	4	14
Cap, veh/h	471	1347	154	329	1273	200	413	410	349	294	568	240
Arrive On Green	0.06	0.43	0.43	0.07	0.44	0.44	0.06	0.23	0.23	0.07	0.24	0.24
Sat Flow, veh/h	1668	3133	359	1753	2901	457	1767	1749	1486	1654	2356	997
Grp Volume(v), veh/h	86	464	471	148	239	243	94	196	201	121	90	90
Grp Sat Flow(s), veh/h/ln	1668	1735	1757	1753	1678	1679	1767	1749	1486	1654	1749	1604
Q Serve(g_s), s	2.5	18.8	18.8	4.2	8.4	8.5	3.6	8.7	10.8	5.0	3.7	4.1
Cycle Q Clear(g_c), s	2.5	18.8	18.8	4.2	8.4	8.5	3.6	8.7	10.8	5.0	3.7	4.1
Prop In Lane	1.00		0.20	1.00		0.27	1.00		1.00	1.00		0.62
Lane Grp Cap(c), veh/h	471	746	755	329	736	737	413	410	349	294	421	387
V/C Ratio(X)	0.18	0.62	0.62	0.45	0.33	0.33	0.23	0.48	0.58	0.41	0.21	0.23
Avail Cap(c_a), veh/h	484	746	755	366	736	737	424	486	413	294	486	446
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.8	20.0	20.0	15.0	16.5	16.6	23.7	29.7	30.5	24.4	27.3	27.5
Incr Delay (d2), s/veh	0.2	3.9	3.9	1.0	1.2	1.2	0.3	0.9	1.5	0.9	0.2	0.3
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%), veh/ln	1.3	10.9	11.0	2.3	4.9	5.0	2.4	6.0	6.4	3.2	2.5	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	13.0	23.9	23.8	16.0	17.7	17.8	24.0	30.6	32.0	25.4	27.6	27.8
LnGrp LOS	B	C	C	B	B	B	C	C	C	C	C	C
Approach Vol, veh/h	1021			630			491			301		
Approach Delay, s/veh	22.9			17.3			29.9			26.8		
Approach LOS	C			B			C			C		

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.1	44.8	9.0	27.1	8.3	45.6	8.4	27.7
Change Period (Y+Rc), s	3.0	* 6.1	3.0	6.0	3.0	* 6.1	3.0	6.0
Max Green Setting (Gmax), s	8.0	* 33	6.0	25.0	6.0	* 35	6.0	25.0
Max Q Clear Time (g_c+I1), s	6.2	20.8	7.0	12.8	4.5	10.5	5.6	6.1
Green Ext Time (p_c), s	0.1	5.3	0.0	2.2	0.0	3.5	0.0	1.1

Intersection Summary	
HCM 6th Ctrl Delay	23.4
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Background AM (Ten-Year Horizon)

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Volume (vph)	3	5	5	291	251	5
Future Volume (vph)	3	5	5	291	251	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Fr <sub>t</sub>	0.916				0.997	
Fit Protected	0.982			0.999		
Satd. Flow (prot)	1676	0	0	3342	3336	0
Fit Permitted	0.982			0.999		
Satd. Flow (perm)	1676	0	0	3342	3336	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	33.1			88.1	60.3	
Travel Time (s)	2.4			6.3	4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	8%	8%	2%
Adj. Flow (vph)	3	5	5	316	273	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	8	0	0	321	278	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	21.6%
ICU Level of Service	A
Analysis Period (min)	15

HCM 6th TWSC  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Background AM (Ten-Year Horizon)

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Vol, veh/h	3	5	5	291	251	5
Future Vol, veh/h	3	5	5	291	251	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	8	8	2
Mvmt Flow	3	5	5	316	273	5

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	444	139	278
Stage 1	276	-	-
Stage 2	168	-	-
Critical Hdwy	6.84	6.94	4.14
Critical Hdwy Stg 1	5.84	-	-
Critical Hdwy Stg 2	5.84	-	-
Follow-up Hdwy	3.52	3.32	2.22
Pot Cap-1 Maneuver	542	884	1282
Stage 1	746	-	-
Stage 2	844	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	539	884	1282
Mov Cap-2 Maneuver	539	-	-
Stage 1	742	-	-
Stage 2	844	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.1	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1282	-	713	-	-
HCM Lane V/C Ratio	0.004	-	0.012	-	-
HCM Control Delay (s)	7.8	0	10.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Ten-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	21	101	34	394	162	383	37	1371	362	438	1440	20
Future Volume (vph)	21	101	34	394	162	383	37	1371	362	438	1440	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	65.0		0.0	35.0		0.0	160.0		150.0	195.0		0.0
Storage Lanes	1		0	1		0	1		1	2		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	0.95
Ped Bike Factor	0.99				0.98							
Frt		0.962			0.895				0.850		0.998	
Fit Protected	0.950			0.950		0.950			0.950			
Satd. Flow (prot)	1805	1801	0	1787	3131	0	1805	3438	1583	3467	3466	0
Fit Permitted	0.295			0.433		0.950			0.950			
Satd. Flow (perm)	557	1801	0	815	3131	0	1805	3438	1583	3467	3466	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			281				393			1
Link Speed (k/h)		60			60			80				70
Link Distance (m)		101.8			339.3			467.1				460.6
Travel Time (s)		6.1			20.4			21.0				23.7
Confl. Peds. (#/hr)	12					12						
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%	1%	3%	1%	2%	1%	0%	5%	2%	1%	4%	0%
Adj. Flow (vph)	23	110	37	428	176	416	40	1490	393	476	1565	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	23	147	0	428	592	0	40	1490	393	476	1587	0
Turn Type	Perm	NA		pm+pt	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases		4		8					2			
Detector Phase		4	4	3	8		5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	10.0		8.0	53.0	53.0	8.0	53.0	
Minimum Split (s)	44.9	44.9		10.0	44.9		13.0	60.8	60.8	13.0	60.8	
Total Split (s)	44.9	44.9		12.0	56.9		13.0	68.8	68.8	23.0	78.8	
Total Split (%)	30.2%	30.2%		8.1%	38.3%		8.7%	46.3%	46.3%	15.5%	53.0%	
Maximum Green (s)	37.0	37.0		9.0	49.0		8.0	61.0	61.0	18.0	71.0	
Yellow Time (s)	5.0	5.0		3.0	5.0		3.0	5.9	5.9	3.0	5.9	
All-Red Time (s)	2.9	2.9		0.0	2.9		2.0	1.9	1.9	2.0	1.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.9	7.9		3.0	7.9		5.0	7.8	7.8	5.0	7.8	
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.0	3.0	3.0	4.0	3.0	
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	
Walk Time (s)	21.0	21.0			21.0			41.0	41.0		41.0	
Flash Dont Walk (s)	16.0	16.0			16.0			12.0	12.0		12.0	
Pedestrian Calls (#/hr)	0	0			0			0	0		0	
Act Effct Green (s)	16.7	16.7		33.6	28.7		8.0	67.3	67.3	32.1	93.9	
Actuated g/C Ratio	0.11	0.11		0.23	0.19		0.05	0.45	0.45	0.22	0.63	
v/c Ratio	0.37	0.70		1.77	0.71		0.41	0.96	0.42	0.64	0.72	

Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Ten-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	76.2	75.3		394.3	33.5		81.2	54.2	3.9	57.8	22.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	76.2	75.3		394.3	33.5		81.2	54.2	3.9	57.8	22.6	
LOS	E	E		F	C		F	D	A	E	C	
Approach Delay		75.4			184.9			44.4			30.7	
Approach LOS		E			F			D			C	
Queue Length 50th (m)	6.3	38.7		~184.9	45.6		11.5	212.9	0.0	66.5	165.0	
Queue Length 95th (m)	15.5	59.6		#239.6	63.1		24.1	#291.0	19.2	84.2	215.5	
Internal Link Dist (m)		77.8			315.3			443.1			436.6	
Turn Bay Length (m)		65.0			35.0			160.0		150.0	195.0	
Base Capacity (vph)	138	456		242	1220		97	1555	931	747	2190	
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	0.17	0.32		1.77	0.49		0.41	0.96	0.42	0.64	0.72	
<b>Intersection Summary</b>												
Area Type:	Other											
Cycle Length:	148.7											
Actuated Cycle Length:	148.7											
Offset:	0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green											
Natural Cycle:	150											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	1.77											
Intersection Signal Delay:	67.7											
Intersection Capacity Utilization:	110.9%											
ICU Level of Service:	H											
Analysis Period (min):	15											
~ Volume exceeds capacity, queue is theoretically infinite.												
Queue shown is maximum after two cycles.												
# 95th percentile volume exceeds capacity, queue may be longer.												
Queue shown is maximum after two cycles.												
<b>Spits and Phases: 1: Highway 6 &amp; Stone Road West</b>												
↙	↑	↘	↙	↑	↘	↙	↑	↘	↙	↑	↘	↙
23 s	68.8 s		12 s	44.9 s		78.8 s	13 s	56.9 s				





Lanes, Volumes, Timings  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Ten-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	8.6	21.7		11.6	15.5		30.2	19.2		37.1	27.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	8.6	21.7		11.6	15.5		30.2	19.2		37.1	27.7	
LOS	A	C		B	B		C	B		D	C	
Approach Delay	20.2		14.5				21.4		30.4			
Approach LOS	C		B				C		C			
Queue Length 50th (m)	5.8	52.3		16.7	47.1		16.3	15.4		16.4	16.8	
Queue Length 95th (m)	13.6	87.6		33.2	75.6		27.5	29.0		27.8	27.0	
Internal Link Dist (m)	315.3		186.0				93.2		16.4			
Turn Bay Length (m)	27.5		25.0				30.0		20.0			
Base Capacity (vph)	436	1504		522	1811		283	1095		210	1009	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.26	0.57		0.55	0.49		0.42	0.44		0.57	0.29	

Intersection Summary	
Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	35 (39%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle:	80
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.70
Intersection Signal Delay:	19.7
Intersection Capacity Utilization:	78.0%
Analysis Period (min):	15
Intersection LOS:	B
ICU Level of Service:	D

Splits and Phases: 2: Scottsdale Drive & Stone Road West



HCM 6th Signalized Intersection Summary  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Ten-Year Horizon)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	
Traffic Volume (veh/h)	105	625	171	269	737	87	112	169	283	112	181	90
Future Volume (veh/h)	105	625	171	269	737	87	112	169	283	112	181	90
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	0.98		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1900	1870	1900	1885	1841	1811	1900	1856	1885	1796	1900	1900
Adj Flow Rate, veh/h	113	672	184	289	792	94	120	182	304	120	195	97
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	2	0	1	4	6	0	3	1	7	0	0
Cap, veh/h	336	990	271	398	1319	157	394	440	382	249	587	279
Arrive On Green	0.06	0.36	0.36	0.12	0.42	0.42	0.07	0.25	0.25	0.07	0.25	0.25
Sat Flow, veh/h	1810	2743	750	1795	3142	373	1810	1763	1531	1711	2353	1116
Grp Volume(v), veh/h	113	435	421	289	441	445	120	182	304	120	147	145
Grp Sat Flow(s), veh/h/ln	1810	1777	1716	1795	1749	1766	1810	1763	1531	1711	1805	1663
Q Serve(g_s), s	3.5	18.7	18.7	8.6	17.6	17.6	4.4	7.8	16.7	4.6	6.0	6.4
Cycle Q Clear(g_c), s	3.5	18.7	18.7	8.6	17.6	17.6	4.4	7.8	16.7	4.6	6.0	6.4
Prop In Lane	1.00		0.44	1.00		0.21	1.00		1.00	1.00		0.67
Lane Grp Cap(c), veh/h	336	642	620	398	734	741	394	440	382	249	451	415
V/C Ratio(X)	0.34	0.68	0.68	0.73	0.60	0.60	0.30	0.41	0.80	0.48	0.33	0.35
Avail Cap(c_a), veh/h	363	642	620	459	734	741	394	490	425	249	501	462
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.0	24.3	24.3	17.4	20.2	20.3	22.8	28.3	31.6	24.4	27.6	27.7
Incr Delay (d2), s/veh	0.6	5.7	5.9	4.8	3.6	3.6	0.4	0.6	9.2	1.4	0.4	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.1	11.7	11.5	5.5	10.4	10.5	3.0	5.4	10.6	3.1	4.2	4.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.5	30.0	30.2	22.2	23.9	23.8	23.2	28.9	40.8	25.9	28.0	28.2
LnGrp LOS	B	C	C	C	C	C	C	C	D	C	C	C
Approach Vol, veh/h	969			1175			606			412		
Approach Delay, s/veh	28.7			23.4			33.7			27.5		
Approach LOS	C			C			C			C		

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.9	38.6	9.0	28.5	8.6	43.9	9.0	28.5
Change Period (Y+Rc), s	3.0	* 6.1	3.0	6.0	3.0	* 6.1	3.0	6.0
Max Green Setting (Gmax), s	14.0	* 27	6.0	25.0	7.0	* 34	6.0	25.0
Max Q Clear Time (g_c+I1), s	10.6	20.7	6.6	18.7	5.5	19.6	6.4	8.4
Green Ext Time (p_c), s	0.4	3.0	0.0	1.8	0.0	5.5	0.0	1.8

Intersection Summary	
HCM 6th Ctrl Delay	27.5
HCM 6th LOS	C

Notes  
\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Ten-Year Horizon)

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Volume (vph)	6	6	5	356	377	5
Future Volume (vph)	6	6	5	356	377	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Fr <sub>t</sub>	0.932				0.998	
Fit Protected	0.976			0.999		
Satd. Flow (prot)	1694	0	0	3502	3532	0
Fit Permitted	0.976			0.999		
Satd. Flow (perm)	1694	0	0	3502	3532	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	33.1			88.1	60.3	
Travel Time (s)	2.4			6.3	4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%
Adj. Flow (vph)	7	7	5	387	410	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	14	0	0	392	415	0
Sign Control	Stop			Free	Free	

**Intersection Summary**

Area Type: Other  
Control Type: Unsignalized  
Intersection Capacity Utilization 23.4% ICU Level of Service A  
Analysis Period (min) 15

HCM 6th TWSC  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Background PM (Ten-Year Horizon)

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Vol, veh/h	6	6	5	356	377	5
Future Vol, veh/h	6	6	5	356	377	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	3	2	2
Mvmt Flow	7	7	5	387	410	5

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	617	208	415
Stage 1	413	-	-
Stage 2	204	-	-
Critical Hdwy	6.84	6.94	4.14
Critical Hdwy Stg 1	5.84	-	-
Critical Hdwy Stg 2	5.84	-	-
Follow-up Hdwy	3.52	3.32	2.22
Pot Cap-1 Maneuver	422	798	1140
Stage 1	636	-	-
Stage 2	810	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	419	798	1140
Mov Cap-2 Maneuver	419	-	-
Stage 1	632	-	-
Stage 2	810	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.7	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT	SBR
Capacity (veh/h)	1140	-	549	-
HCM Lane V/C Ratio	0.005	-	0.024	-
HCM Control Delay (s)	8.2	0	11.7	-
HCM Lane LOS	A	A	B	-
HCM 95th %tile Q(veh)	0	-	0.1	-

# Appendix I

## 2035 Total Traffic Operations



Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total AM (Ten-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	28	124	45	241	55	192	10	1134	442	307	1184	16
Future Volume (vph)	28	124	45	241	55	192	10	1134	442	307	1184	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	65.0		0.0	35.0		0.0	160.0		150.0	195.0		0.0
Storage Lanes	1		0	1		0	1		1	2		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	0.95
Ped Bike Factor	1.00				0.99							
Frt		0.960			0.883				0.850		0.998	
Fit Protected	0.950			0.950		0.950			0.950			
Satd. Flow (prot)	1736	1786	0	1719	3011	0	1626	3223	1568	3400	3276	0
Fit Permitted	0.586			0.366		0.950			0.950			
Satd. Flow (perm)	1069	1786	0	662	3011	0	1626	3223	1568	3400	3276	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			209				467		1	
Link Speed (k/h)		60			60			80			70	
Link Distance (m)		101.8			339.3			467.1			460.6	
Travel Time (s)		6.1			20.4			21.0			23.7	
Confl. Peds. (#/hr)	2					2						
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 (%)	4%	0%	8%	5%	7%	4%	11%	12%	3%	3%	10%	7%
Adj. Flow (vph)	30	135	49	262	60	209	11	1233	480	334	1287	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	30	184	0	262	269	0	11	1233	480	334	1304	0
Turn Type	Perm	NA		pm+pt	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases		4			8				2			
Detector Phase		4	4		3	8		5	2	2	1	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	10.0		8.0	53.0	53.0	8.0	53.0	
Minimum Split (s)	44.9	44.9		10.0	44.9		13.0	60.8	60.8	13.0	60.8	
Total Split (s)	44.9	44.9		10.0	54.9		13.0	72.8	72.8	21.0	80.8	
Total Split (%)	30.2%	30.2%		6.7%	36.9%		8.7%	49.0%	49.0%	14.1%	54.3%	
Maximum Green (s)	37.0	37.0		7.0	47.0		8.0	65.0	65.0	16.0	73.0	
Yellow Time (s)	5.0	5.0		3.0	5.0		3.0	5.9	5.9	3.0	5.9	
All-Red Time (s)	2.9	2.9		0.0	2.9		2.0	1.9	1.9	2.0	1.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.9	7.9		3.0	7.9		5.0	7.8	7.8	5.0	7.8	
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.0	3.0	3.0	4.0	3.0	
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	
Walk Time (s)	21.0	21.0			21.0			41.0	41.0		41.0	
Flash Dont Walk (s)	16.0	16.0			16.0			12.0	12.0		12.0	
Pedestrian Calls (#/hr)	0	0			0			0	0		0	
Act Effct Green (s)	19.8	19.8		34.7	29.8		8.0	76.6	76.6	21.7	98.0	
Actuated g/C Ratio	0.13	0.13		0.23	0.20		0.05	0.52	0.52	0.15	0.66	
v/c Ratio	0.21	0.74		1.28	0.35		0.13	0.74	0.46	0.67	0.60	

Lanes, Volumes, Timings  
1: Highway 6 & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total AM (Ten-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	58.7	75.4		203.4	13.1		70.5	33.3	3.9	67.1	17.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	58.7	75.4		203.4	13.1		70.5	33.3	3.9	67.1	17.7	
LOS	E	E		F	B		E	C	A	E	B	
Approach Delay		73.0			107.0			25.3			27.8	
Approach LOS		E			F			C			C	
Queue Length 50th (m)	7.9	48.9		-89.5	7.5		3.1	145.8	1.8	47.9	93.8	
Queue Length 95th (m)	17.3	71.5		#137.2	18.6		9.8	199.8	22.6	62.7	167.0	
Internal Link Dist (m)		77.8			315.3			443.1			436.6	
Turn Bay Length (m)	65.0			35.0			160.0		150.0	195.0		
Base Capacity (vph)	265	453		204	1094		87	1659	1034	495	2160	
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	0.11	0.41		1.28	0.25		0.13	0.74	0.46	0.67	0.60	
<b>Intersection Summary</b>												
Area Type: Other												
Cycle Length: 148.7												
Actuated Cycle Length: 148.7												
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green												
Natural Cycle: 130												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.28												
Intersection Signal Delay: 39.3												
Intersection Capacity Utilization 96.1%												
Analysis Period (min) 15												
- Volume exceeds capacity, queue is theoretically infinite.												
Queue shown is maximum after two cycles.												
# 95th percentile volume exceeds capacity, queue may be longer.												
Queue shown is maximum after two cycles.												
<b>Splits and Phases: 1: Highway 6 &amp; Stone Road West</b>												



Lanes, Volumes, Timings  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total AM (Ten-Year Horizon)

	↖	→	↘	↙	←	↖	↙	↗	↘	↖	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	6.7	17.5		8.9	12.5		27.7	23.2		40.4	24.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.7	17.5		8.9	12.5		27.7	23.2		40.4	24.4	
LOS	A	B		A	B		C	C		D	C	
Approach Delay	16.5				11.7		24.1		30.8			
Approach LOS	B				B		C		C			
Queue Length 50th (m)	4.7	52.2		7.9	21.5		12.6	16.6		17.2	10.3	
Queue Length 95th (m)	10.6	77.1		15.9	34.2		21.4	26.1		27.3	17.3	
Internal Link Dist (m)	315.3				186.0		93.2		16.4			
Turn Bay Length (m)	27.5		25.0		30.0		20.0					
Base Capacity (vph)	573	1700		394	1724		306	1029		202	916	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.16	0.55		0.38	0.28		0.31	0.39		0.62	0.21	

Intersection Summary	
Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	42 (47%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle:	80
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.66
Intersection Signal Delay:	18.6
Intersection Capacity Utilization:	68.4%
Analysis Period (min):	15
Intersection LOS:	B
ICU Level of Service:	C

Splits and Phases: 2: Scottsdale Drive & Stone Road West



HCM 6th Signalized Intersection Summary  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total AM (Ten-Year Horizon)

	↖	→	↘	↙	←	↖	↙	↗	↘	↖	↙	↘
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗	↖	↖	↖↗	↖	↖	↖↗	↖	↖	↖↗	↖
Traffic Volume (veh/h)	78	713	82	126	354	59	80	167	171	106	105	54
Future Volume (veh/h)	78	713	82	126	354	59	80	167	171	106	105	54
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	0.97		0.95	0.98		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1752	1826	1781	1841	1767	1663	1856	1841	1856	1737	1841	1693
Adj Flow Rate, veh/h	92	839	96	148	416	69	94	196	201	125	124	64
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	10	5	8	4	9	16	3	4	3	11	4	14
Cap, veh/h	471	1347	154	329	1260	207	408	410	349	294	543	260
Arrive On Green	0.06	0.43	0.43	0.07	0.44	0.44	0.06	0.23	0.23	0.07	0.24	0.24
Sat Flow, veh/h	1668	3133	359	1753	2880	474	1767	1749	1486	1654	2252	1081
Grp Volume(v), veh/h	92	464	471	148	241	244	94	196	201	125	94	94
Grp Sat Flow(s),veh/h/ln	1668	1735	1757	1753	1678	1676	1767	1749	1486	1654	1749	1585
Q Serve(g_s), s	2.7	18.8	18.8	4.2	8.5	8.6	3.6	8.7	10.8	5.1	3.9	4.3
Cycle Q Clear(g_c), s	2.7	18.8	18.8	4.2	8.5	8.6	3.6	8.7	10.8	5.1	3.9	4.3
Prop In Lane	1.00		0.20	1.00		0.28	1.00		1.00	1.00		0.68
Lane Grp Cap(c), veh/h	471	746	755	329	734	733	408	410	349	294	421	382
V/C Ratio(X)	0.20	0.62	0.62	0.45	0.33	0.33	0.23	0.48	0.58	0.43	0.22	0.25
Avail Cap(c_a), veh/h	482	746	755	366	734	733	419	486	413	294	486	440
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.8	20.0	20.0	15.0	16.6	16.7	23.7	29.7	30.5	24.5	27.4	27.6
Incr Delay (d2), s/veh	0.2	3.9	3.9	1.0	1.2	1.2	0.3	0.9	1.5	1.0	0.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.4	10.9	11.0	2.3	5.0	5.1	2.4	6.0	6.4	3.3	2.7	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.0	23.9	23.8	16.0	17.8	17.9	24.0	30.6	32.0	25.5	27.7	27.9
LnGrp LOS	B	C	C	B	B	B	C	C	C	C	C	C
Approach Vol, veh/h	1027			633			491			313		
Approach Delay, s/veh	22.9			17.4			29.9			26.9		
Approach LOS	C			B			C			C		

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.1	44.8	9.0	27.1	8.4	45.5	8.4	27.7
Change Period (Y+Rc), s	3.0	* 6.1	3.0	6.0	3.0	* 6.1	3.0	6.0
Max Green Setting (Gmax), s	8.0	* 33	6.0	25.0	6.0	* 35	6.0	25.0
Max Q Clear Time (g_c+I1), s	6.2	20.8	7.1	12.8	4.7	10.6	5.6	6.3
Green Ext Time (p_c), s	0.1	5.3	0.0	2.2	0.0	3.5	0.0	1.1

Intersection Summary	
HCM 6th Ctrl Delay	23.4
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Total AM (Ten-Year Horizon)

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↘			↕	↕	
Traffic Volume (vph)	11	14	13	291	251	12
Future Volume (vph)	11	14	13	291	251	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Fr <sub>t</sub>	0.925				0.993	
Fit Protected	0.978			0.998		
Satd. Flow (prot)	1685	0	0	3344	3328	0
Fit Permitted	0.978			0.998		
Satd. Flow (perm)	1685	0	0	3344	3328	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	33.1			88.1	60.3	
Travel Time (s)	2.4			6.3	4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	8%	8%	2%
Adj. Flow (vph)	12	15	14	316	273	13
Shared Lane Traffic (%)						
Lane Group Flow (vph)	27	0	0	330	286	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	27.6%
ICU Level of Service	A
Analysis Period (min)	15

HCM 6th TWSC  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Total AM (Ten-Year Horizon)

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↘			↕	↕	
Traffic Vol, veh/h	11	14	13	291	251	12
Future Vol, veh/h	11	14	13	291	251	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	8	8	2
Mvmt Flow	12	15	14	316	273	13

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	466	143	286
Stage 1	280	-	-
Stage 2	186	-	-
Critical Hdwy	6.84	6.94	4.14
Critical Hdwy Stg 1	5.84	-	-
Critical Hdwy Stg 2	5.84	-	-
Follow-up Hdwy	3.52	3.32	2.22
Pot Cap-1 Maneuver	525	879	1273
Stage 1	742	-	-
Stage 2	827	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	518	879	1273
Mov Cap-2 Maneuver	518	-	-
Stage 1	732	-	-
Stage 2	827	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.6	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT	SBR
Capacity (veh/h)	1273	-	673	-
HCM Lane V/C Ratio	0.011	-	0.04	-
HCM Control Delay (s)	7.9	0	10.6	-
HCM Lane LOS	A	A	B	-
HCM 95th %tile Q(veh)	0	-	0.1	-



Lanes, Volumes, Timings  
 1: Highway 6 & Stone Road West  
 601 Scottsdale Drive, Guelph TIS and PS  
 Total PM (Ten-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	21	103	34	404	165	388	37	1371	371	443	1440	20
Future Volume (vph)	21	103	34	404	165	388	37	1371	371	443	1440	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	65.0	0.0	35.0	0.0	160.0	0.0	160.0	150.0	195.0	0.0	0.0	0.0
Storage Lanes	1	0	1	0	1	0	1	2	0	0	0	0
Taper Length (m)	7.5	0.0	7.5	0.0	7.5	0.0	7.5	7.5	0.0	0.0	0.0	0.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	0.95
Ped Bike Factor	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Frt	0.963	0.963	0.963	0.963	0.895	0.895	0.895	0.895	0.850	0.850	0.998	0.998
Fit Protected	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
Satd. Flow (prot)	1805	1803	0	1787	3131	0	1805	3438	1583	3467	3466	0
Fit Permitted	0.282	0.282	0.282	0.282	0.282	0.282	0.282	0.282	0.282	0.282	0.282	0.282
Satd. Flow (perm)	532	1803	0	805	3131	0	1805	3438	1583	3467	3466	0
Right Turn on Red		Yes		Yes		Yes		Yes		Yes		Yes
Satd. Flow (RTOR)	11	11	11	11	281	11	11	11	11	11	11	11
Link Speed (k/h)	60	60	60	60	60	60	60	60	60	60	60	60
Link Distance (m)	101.8	101.8	101.8	101.8	339.3	101.8	101.8	101.8	101.8	101.8	101.8	101.8
Travel Time (s)	6.1	6.1	6.1	6.1	20.4	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Confl. Peds. (#/hr)	12	12	12	12	12	12	12	12	12	12	12	12
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%	1%	3%	1%	2%	1%	0%	5%	2%	1%	4%	0%
Adj. Flow (vph)	23	112	37	439	179	422	40	1490	403	482	1565	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	23	149	0	439	601	0	40	1490	403	482	1587	0
Turn Type	Perm	NA		pm+pt	NA		Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		3	8		5	2		1	6	
Permitted Phases	4	4		8	8		2	2		2	2	
Detector Phase	4	4		3	8		5	2		2	1	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	10.0		8.0	53.0		53.0	8.0	53.0
Minimum Split (s)	44.9	44.9		10.0	44.9		13.0	60.8		60.8	13.0	60.8
Total Split (s)	44.9	44.9		12.0	56.9		13.0	68.8		68.8	23.0	78.8
Total Split (%)	30.2%	30.2%		8.1%	38.3%		8.7%	46.3%		46.3%	15.5%	53.0%
Maximum Green (s)	37.0	37.0		9.0	49.0		8.0	61.0		61.0	18.0	71.0
Yellow Time (s)	5.0	5.0		3.0	5.0		3.0	5.9		5.9	3.0	5.9
All-Red Time (s)	2.9	2.9		0.0	2.9		2.0	1.9		1.9	2.0	1.9
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	7.9	7.9		3.0	7.9		5.0	7.8		7.8	5.0	7.8
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lead	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.0	3.0		3.0	4.0	3.0
Recall Mode	None	None		None	None		None	C-Max		C-Max	None	C-Max
Walk Time (s)	21.0	21.0		21.0	21.0		21.0	21.0		21.0	21.0	21.0
Flash Dont Walk (s)	16.0	16.0		16.0	16.0		12.0	12.0		12.0	12.0	12.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)	16.8	16.8		33.7	28.8		8.0	66.6		66.6	32.6	93.8
Actuated g/C Ratio	0.11	0.11		0.23	0.19		0.05	0.45		0.45	0.22	0.63
v/c Ratio	0.38	0.70		1.82	0.72		0.41	0.97		0.43	0.64	0.73

Lanes, Volumes, Timings  
 1: Highway 6 & Stone Road West  
 601 Scottsdale Drive, Guelph TIS and PS  
 Total PM (Ten-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	77.6	75.3		415.5	34.0		81.2	56.3	3.9	57.5	22.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	77.6	75.3		415.5	34.0		81.2	56.3	3.9	57.5	22.7	
LOS	E	E		F	C		F	E	A	E	C	
Approach Delay		75.6			195.1			45.9			30.8	
Approach LOS		E			F			D			C	
Queue Length 50th (m)	6.3	39.3		~191.8	47.2		11.5	214.4	0.0	67.2	165.3	
Queue Length 95th (m)	15.6	60.1		#247.1	64.6		24.1	#291.0	19.3	85.4	216.2	
Internal Link Dist (m)		77.8			315.3			443.1			436.6	
Turn Bay Length (m)	65.0			35.0			160.0		150.0	195.0		
Base Capacity (vph)	132	456		241	1220		97	1540	931	759	2186	
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.33		1.82	0.49		0.41	0.97	0.43	0.64	0.73	
<b>Intersection Summary</b>												
Area Type:	Other											
Cycle Length:	148.7											
Actuated Cycle Length:	148.7											
Offset:	0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green											
Natural Cycle:	150											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	1.82											
Intersection Signal Delay:	70.6						Intersection LOS: E					
Intersection Capacity Utilization:	111.2%						ICU Level of Service H					
Analysis Period (min):	15											
- Volume exceeds capacity, queue is theoretically infinite.												
Queue shown is maximum after two cycles.												
# 95th percentile volume exceeds capacity, queue may be longer.												
Queue shown is maximum after two cycles.												
<b>Spits and Phases: 1: Highway 6 &amp; Stone Road West</b>												
ϕ1	ϕ2 (R)	ϕ3	ϕ4	ϕ5	ϕ6 (R)	ϕ7	ϕ8					
23 s	68.8 s	12 s	44.9 s	13 s	78.8 s	13 s	56.9 s					



Lanes, Volumes, Timings  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total PM (Ten-Year Horizon)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	9.1	21.7		11.6	16.6		30.8	19.2		40.0	26.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.1	21.7		11.6	16.6		30.8	19.2		40.0	26.1	
LOS	A	C		B	B		C	B		D	C	
Approach Delay	20.1				15.4		21.5				30.2	
Approach LOS	C				B		C				C	
Queue Length 50th (m)	6.8	52.3		16.7	48.1		16.3	15.4		18.0	16.5	
Queue Length 95th (m)	15.3	87.6		33.2	77.4		27.5	29.0		29.9	27.1	
Internal Link Dist (m)	315.3				186.0		93.2				16.4	
Turn Bay Length (m)	27.5				25.0		30.0				20.0	
Base Capacity (vph)	422	1504		522	1729		272	1095		210	1017	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.31	0.57		0.55	0.52		0.44	0.44		0.62	0.31	

Intersection Summary	
Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	35 (39%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle:	80
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.70
Intersection Signal Delay:	20.0
Intersection Capacity Utilization:	78.6%
Analysis Period (min):	15
Intersection LOS:	B
ICU Level of Service:	D

Splits and Phases: 2: Scottsdale Drive & Stone Road West



HCM 6th Signalized Intersection Summary  
2: Scottsdale Drive & Stone Road West

601 Scottsdale Drive, Guelph TIS and PS  
Total PM (Ten-Year Horizon)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	
Traffic Volume (veh/h)	121	625	171	269	737	96	112	169	283	122	181	108
Future Volume (veh/h)	121	625	171	269	737	96	112	169	283	122	181	108
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	0.99		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1900	1870	1900	1885	1841	1811	1900	1856	1885	1796	1900	1900
Adj Flow Rate, veh/h	130	672	184	289	792	103	120	182	304	131	195	116
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	2	0	1	4	6	0	3	1	7	0	0
Cap, veh/h	335	990	271	398	1298	169	385	440	382	249	550	310
Arrive On Green	0.06	0.36	0.36	0.12	0.42	0.42	0.07	0.25	0.25	0.07	0.25	0.25
Sat Flow, veh/h	1810	2743	750	1795	3104	404	1810	1763	1531	1711	2201	1241
Grp Volume(v), veh/h	130	435	421	289	446	449	120	182	304	131	158	153
Grp Sat Flow(s),veh/h/ln	1810	1777	1716	1795	1749	1759	1810	1763	1531	1711	1805	1637
Q Serve(g_s), s	4.0	18.7	18.7	8.6	17.9	17.9	4.4	7.8	16.7	5.1	6.5	7.0
Cycle Q Clear(g_c), s	4.0	18.7	18.7	8.6	17.9	17.9	4.4	7.8	16.7	5.1	6.5	7.0
Prop In Lane	1.00		0.44	1.00		0.23	1.00		1.00	1.00		0.76
Lane Grp Cap(c), veh/h	335	642	620	398	731	736	385	440	382	249	451	409
V/C Ratio(X)	0.39	0.68	0.68	0.73	0.61	0.61	0.31	0.41	0.80	0.53	0.35	0.37
Avail Cap(c_a), veh/h	359	642	620	459	731	736	385	490	425	249	501	455
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.1	24.3	24.3	17.4	20.5	20.5	22.8	28.3	31.6	24.6	27.8	27.9
Incr Delay (d2), s/veh	0.7	5.7	5.9	4.8	3.8	3.8	0.5	0.6	9.2	2.0	0.5	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.5	11.7	11.5	5.5	10.6	10.7	3.0	5.4	10.6	3.5	4.6	4.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.9	30.0	30.2	22.2	24.2	24.2	23.3	28.9	40.8	26.6	28.2	28.5
LnGrp LOS	B	C	C	C	C	C	C	C	D	C	C	C
Approach Vol, veh/h	986			1184			606			442		
Approach Delay, s/veh	28.5			23.7			33.8			27.9		
Approach LOS	C			C			C			C		

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.9	38.6	9.0	28.5	8.8	43.7	9.0	28.5
Change Period (Y+Rc), s	3.0	* 6.1	3.0	6.0	3.0	* 6.1	3.0	6.0
Max Green Setting (Gmax), s	14.0	* 27	6.0	25.0	7.0	* 34	6.0	25.0
Max Q Clear Time (g_c+1), s	10.6	20.7	7.1	18.7	6.0	19.9	6.4	9.0
Green Ext Time (p_c), s	0.4	3.0	0.0	1.8	0.0	5.5	0.0	1.9

Intersection Summary	
HCM 6th Ctrl Delay	27.7
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Total PM (Ten-Year Horizon)

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Volume (vph)	29	34	30	356	377	25
Future Volume (vph)	29	34	30	356	377	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Fr <sub>t</sub>	0.928				0.991	
Fit Protected	0.977			0.996		
Satd. Flow (prot)	1689	0	0	3493	3507	0
Fit Permitted	0.977			0.996		
Satd. Flow (perm)	1689	0	0	3493	3507	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	33.1			88.1	60.3	
Travel Time (s)	2.4			6.3	4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%
Adj. Flow (vph)	32	37	33	387	410	27
Shared Lane Traffic (%)						
Lane Group Flow (vph)	69	0	0	420	437	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	35.6%
ICU Level of Service	A
Analysis Period (min)	15

HCM 6th TWSC  
3: Site Driveway & Scottsdale Drive

601 Scottsdale Drive, Guelph TIS and PS  
Total PM (Ten-Year Horizon)

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕↕	↕↕	
Traffic Vol, veh/h	29	34	30	356	377	25
Future Vol, veh/h	29	34	30	356	377	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	3	2	2
Mvmt Flow	32	37	33	387	410	27

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	684	219	437
Stage 1	424	-	-
Stage 2	260	-	-
Critical Hdwy	6.84	6.94	4.14
Critical Hdwy Stg 1	5.84	-	-
Critical Hdwy Stg 2	5.84	-	-
Follow-up Hdwy	3.52	3.32	2.22
Pot Cap-1 Maneuver	382	785	1119
Stage 1	628	-	-
Stage 2	760	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	367	785	1119
Mov Cap-2 Maneuver	367	-	-
Stage 1	604	-	-
Stage 2	760	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.1	0.7	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1119	-	515	-	-
HCM Lane V/C Ratio	0.029	-	0.133	-	-
HCM Control Delay (s)	8.3	0.1	13.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.5	-	-