



George Street Transportation Impact Study

Paradigm Transportation Solutions Limited

January 2017

Project Summary



Project Number

161910

January 2017

Client

Wastell Homes

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George Street Transportation Impact Study

List of Revisions

Version	Date	Description
1	November 2016	Draft for Comment
2	January 2017	Revised Draft for Comments

Signatures and Seals

A handwritten signature of Jim Mallett in black ink.

Signature



Engineer's Seal

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Executive Summary

Content

Wastell Homes retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study for a proposed residential development located on George Street in Port Stanley, Ontario.

This Transportation Impact Study (TIS) includes an analysis of existing traffic conditions, a description of the proposed development, traffic forecasts for a horizon of five years from full build-out (2026) and recommendations to improve future traffic conditions.

Development Concept

A residential development is proposed for the lands across from Boltville Place on George Street in Port Stanley, Ontario. The 24.3-hectares (60-acre) development includes:

- ▶ 120 Single Family Dwellings;
- ▶ 250 Medium Density (Apartment and Townhouse) Units; and
- ▶ 5.7 hectare (14 acre) Hospitality Park with 125 Campsites.

The development will be constructed in a single phase and is expected to be completed by 2021. The development will include two (2) stop-controlled street connections to George Street (Street "A" and Street "B" which aligned with Boltville Place).

Conclusions

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

- ▶ currently, all intersections within the study area operate at acceptable levels of service during the AM and PM peak hours, with no individual problem movements;
- ▶ at full build-out, the development is forecast to generate 294 and 368 new trips during the AM and PM peak hours, respectively;
- ▶ under 2026 Background Traffic conditions all intersections within the study area are forecast to operate at acceptable levels of service, with no individual problem movements;
- ▶ under 2026 Total Traffic conditions, all intersections within the study area are forecast to operate at acceptable levels of service, with no individual problem movements;
- ▶ under 2026 Summer Total Traffic conditions, all intersections within the study area are forecast to operate at acceptable levels of service, with no individual problem movements; and



- ▶ no remedial measures warranted to mitigate the proposed traffic increases resulting from the site development.

Recommendations

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

It is further recommended that the Municipality review the intersection operation at George Street and William Street and consider a converting the intersection to two-way stop controlled, with right-of-way assigned to George Street.



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1 Introduction

1.1 Overview

Wastell Homes retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study for a proposed residential development located on George Street in Port Stanley, Ontario. **Figure 1.1** details the location of the subject development.

1.2 Purpose and Scope

The purpose of this report is to identify and assess the potential traffic impact resulting from the proposed development. The report analyzes existing traffic conditions, describes the proposed development, forecasts future traffic volumes to a horizon of five years from full build-out (2026) both with and without the proposed site development, identifies any necessary remedial measures to mitigate the forecast traffic impacts and provides recommendations to improve future traffic conditions.

The scope of the study, developed in consultation with Municipality of Central Elgin staff via e-mail in September and October 2016, includes:

- ▶ determination and assessment of the current traffic and conditions in the vicinity of the existing site;
- ▶ traffic forecasts generated by the proposed development;
- ▶ analyses of the impact that future traffic (with and without the subject development at 5-years from study submission) may have on the adjacent street system at:
 - George Street and William Street (three-way stop controlled, one leg free flow);
 - Bridge Street and Carlow Street (two-way stop controlled);
 - Bridge Street/Joseph Street and Colborne Street/Main Street (signalized); and
 - The proposed Street “A” and Street “B” connections to George Street (stop controlled).
- ▶ recommendations with regard to any necessary remedial measures required to mitigate the anticipated impact of site generated traffic in a satisfactory manner.





Study Area and Subject Development Location

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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 roadways in the study area include:

- ▶ **George Street**, an east-west collector road under the jurisdiction of the Municipality of Central Elgin, with a posted speed limit of 40 km/h. George Street has a two-lane rural cross-section. A sidewalk is provided on the south side of ending just east of Front Street.
- ▶ **William Street**, a north-south collector road under the jurisdiction of the Municipality of Central Elgin, with a speed limit of 50 km/h. William Street has a two-lane urban cross-section, with sidewalks provided on both sides of the roadway.
- ▶ **Bridge Street (County Road 4)**, an east-west arterial road under the jurisdiction of Elgin County, with a speed limit of 50 km/h. Bridge Street has a two-lane urban cross-section, with signals at the lift bridge across Kettle Creek. Sidewalks are provided on both sides of the roadway. Bridge Street continues as Joseph Street past Colborne Street/Main Street.
- ▶ **Carlow Road (County Road 20)**, a north-south arterial road under the jurisdiction of Elgin County, with a posted speed limit of 50 km. Carlow Road has a two-lane urban cross-section with a sidewalk provided on the west side of the roadway.
- ▶ **Colborne Street (County Road 4)**, a north-south arterial road under the jurisdiction of Elgin County, with a posted speed limit of 50 km/h. Colborne Street has a two-lane urban cross-section, with sidewalks provided on both sides of the roadway. South of Jamieson Street, Colborne Street continues as Main Street.

All intersections within the study area are stop controlled, except for the intersection of Bridge Street/Joseph Street and Colborne Street/Main Street, which is signalized.

Figure 2.1 shows the existing lane configuration and traffic control.

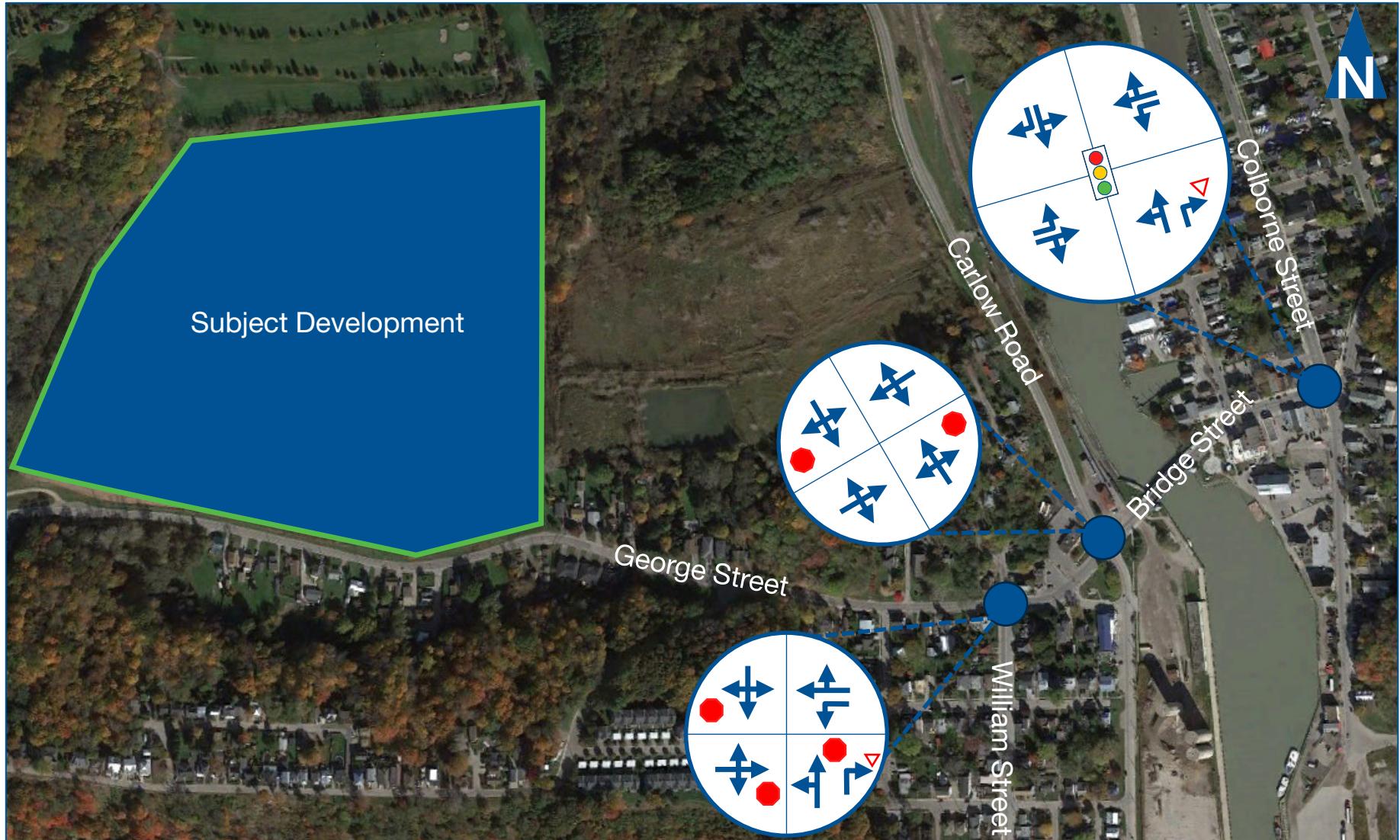
2.2 Traffic Volumes

On September 27, 2016 AM peak period (6:00 AM to 9:00 AM) and PM peak period (3:00 PM to 6:00 PM) Paradigm's Miovision cameras collected



intersection turning movement count data at the study area intersections. **Figure 2.2** summarizes the existing AM and PM peak hour traffic volumes.



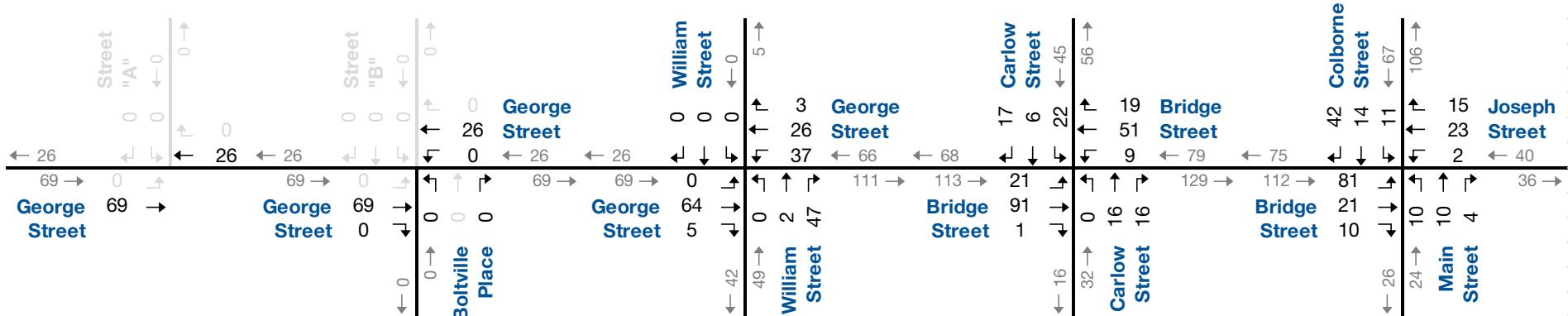


Existing Lane Configuration and Traffic Control

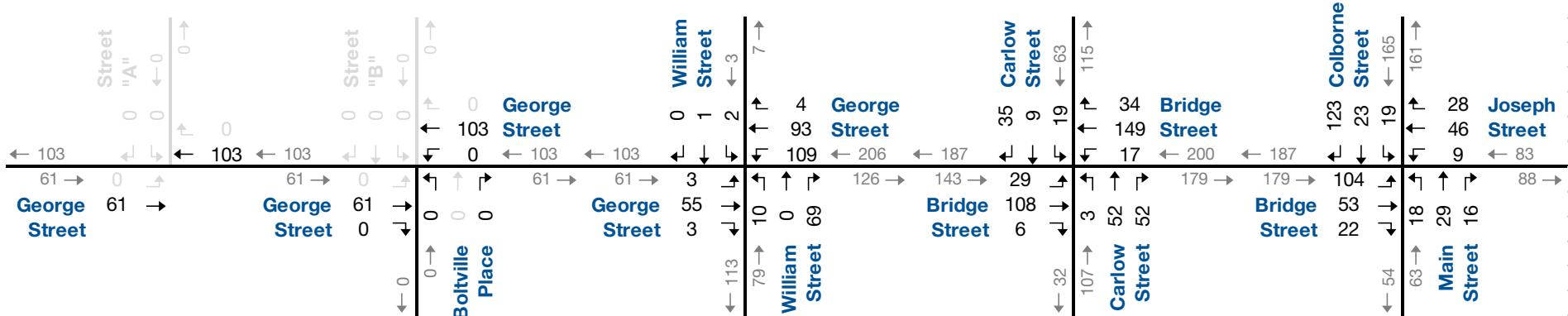
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Figure 2.1

AM Peak Hour



PM Peak Hour



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Base Year Traffic Volumes

Figure 2.2

2.3 Traffic Operations

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

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

The operations of intersections in the study area were evaluated with the existing turning movement volumes using Synchro 9. The current signal timings were provided by the City.

The intersection analysis considered two separate measures of performance:

- ▶ LOS for each movement and the entire intersection;
- ▶ the volume to capacity (v/c) ratio for each movement and the entire intersection; and
- ▶ the estimated 95th percentile queue length for each movement.

The intersection of George Street and William Street operates as a stop-controlled intersection with free-flow conditions on the westbound movement. This configuration is not supported by HCM for analysis in Synchro. The intersection was analyzed as a two-way stop controlled intersection and an all-way stop controlled intersection in Synchro. The results were combined to present a more accurate display of the measures of performance for all movements than modelling as a two-way or all-way stop only.

The existing intersection operations are summarized in **Table 2.1** indicating the existing levels of service (LOS), volume to capacity ratios (V/C) and 95th percentile queues experienced within the study area, for the AM and PM peak hours. **Appendix A** contains the supporting detailed Synchro 9 reports.

The analyses indicate that all movements and intersections within the study area currently operate at acceptable levels of delay and V/C ratios.



TABLE 2.1: BASE YEAR PEAK HOUR TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																Overall	
				Eastbound				Westbound				Northbound				Southbound					
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach		
AM Peak Hour	George Street & William Street	3WSC	LOS	<	A	>	A 7	A 8	A 0	>	A 4	<	A 9	>	A 9	<	A 0	>	A 0	A 4	
			Delay	<	7	>		0.03	0.02	>		<	0.06	>		<	0.00	>			
	Bridge Street & Carlow Road	TWSC	V/C	<	0.08	>		1	0	>		<	2	>		<	0	>			
			Q	<	-	>		-	-	>		<	-	>		<	-	>			
	Bridge Street/ Joseph Street & Colborne Street/ Main Street	TCS	Ex	<	-	>		-	-	>		<	-	>		<	-	>			
			Avail.	<	-	>		-	-	>		<	-	>		<	-	>			
PM Peak Hour	George Street & William Street	3WSC	LOS	C	C	>	C 22	C 24	C 26	>	C 26	<	A 7	A 7	A 7	<	A 7	A 7	A 7	B 17	
			Delay	23	21	>		0.02	0.25	>		<	0.03	0.00		<	0.03	0.03			
	Bridge Street & Carlow Road	TWSC	V/C	0.38	0.10	>		2	10	>		<	5	0		<	6	4	25		
			Q	20	9	>		5	-	>		<	-	-		<	-	21			
	Bridge Street/ Joseph Street & Colborne Street/ Main Street	TCS	Ex	30	-	>		3	-	>		<	-	-		<	-	-			
			Avail.	10	-	>		-	-	>		<	-	-		<	-	-			

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length

Ex. - Existing Available Storage

Avail. - Available Storage

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

3WSC - Three-Way Stop Control

RBT - Roundabout

< - Shared Left-Turn Lane

> - Shared Right-Turn Lane



3 Development Concept

3.1 Development Description

A residential development is proposed for the lands across from Boltville Place on George Street in Port Stanley, Ontario. The 24.3-hectare (60-acre) development includes:

- ▶ 120 Single Family Dwellings;
- ▶ 250 Medium Density (Apartment and Townhouse) Units; and
- ▶ 5.7 hectare (14 acre) Hospitality Park with 125 Campsites.

The development will be constructed in a single phase and is expected to be completed by 2021. The development will include two (2) stop-controlled street connections to George Street (Street "A" and Street "B" which is aligned with Boltville Place).

Figure 3.1 illustrates the proposed site plan.

3.2 Development Trip Generation

Peak hour trips forecast to be generated by the single family and medium density (apartment and townhouse) components of this development are based on the Institute of Transportation Engineers (ITE) Trip Generation Manual¹ for the following Land Use Code (LUC):

- ▶ **LUC 210 (Single-Family Detached Housing):** Includes all single-family detached homes on individual lots.

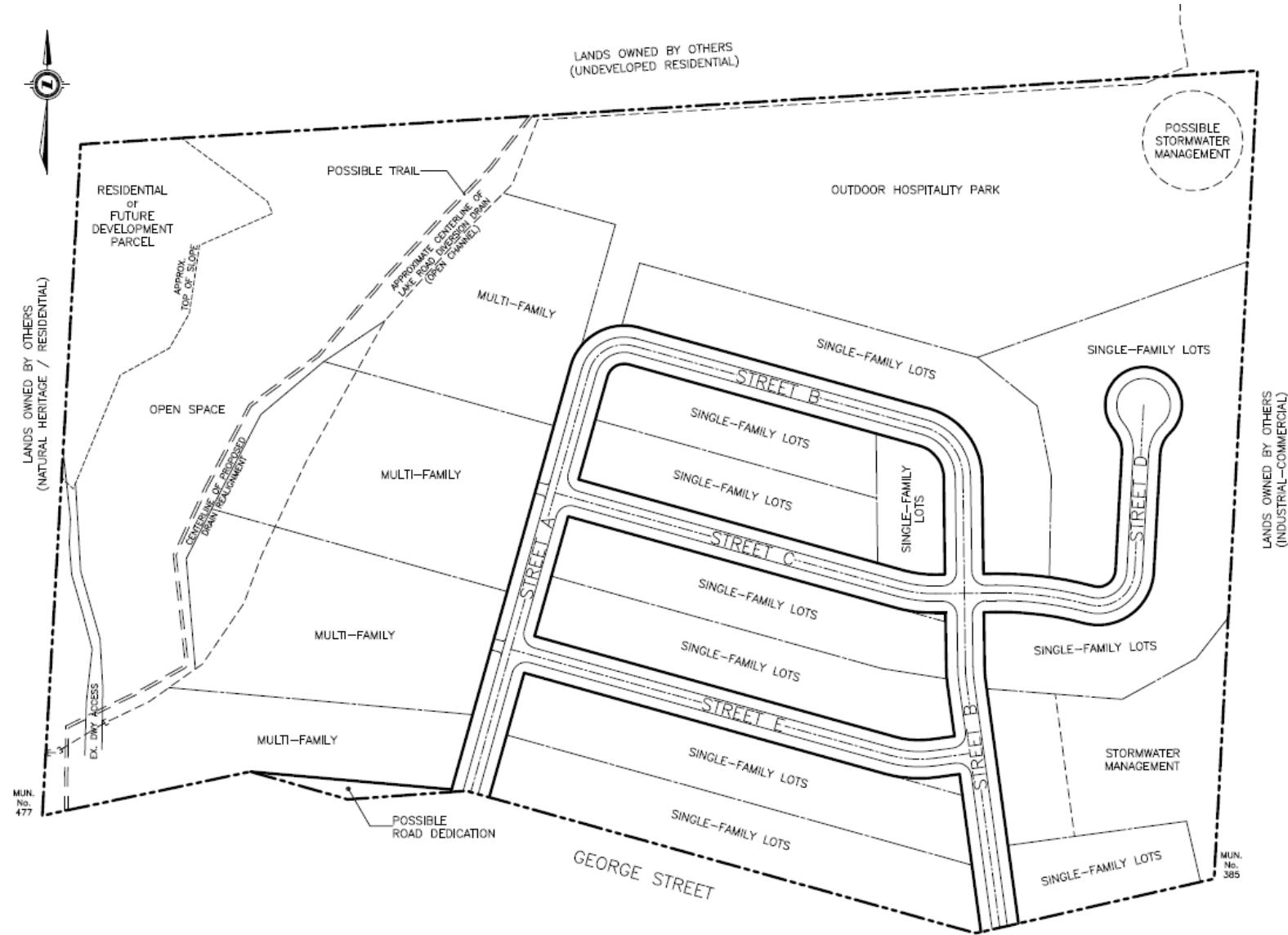
The Land Use Code (LUC) 210 Single-Family Detached House was used in this study for a conservative estimate for the trip generation. LUC 230 Residential Condominium/Townhouse was not used for the study as it is not a high-density development with access to major transit routes and may result in underestimating the trip generation.

The peak hour trips for the hospitality park campsites were determined using trip generation counts from the Lantern Bay Resort² as a proxy site. Lantern Bay Resort is located in Gravenhurst, Ontario, consisting of 145 sites with pre-fabricated cottages. The traffic counts were collected over the Canada Day weekend in July 2015. The results of the counts determined that the peak hour of traffic arriving at Lantern Bay Resort was from 2:00 PM to 3:00 PM on Friday and leaving Lantern Bay Resort from 1:00 PM to 2:00 PM on Sunday.

¹ Trip Generation Manual, 9th Edition, Institute of Transportation Engineers, 2012.

² Lantern Bay Resort, Gravenhurst, Transportation Impact Study, Paradigm Transportation Solutions Limited, December 2015





Development Concept Site Plan

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Figure 3.1

Additionally, the Saturday peak hour was found to be from 11:45 AM to 12:45 PM on Saturday. **Table 3.1** displays the Lantern Bay Resort trip generation.

TABLE 3.1: LANTERN BAY RESORT TRIP GENERATION

Units	Friday Peak Hour				Saturday Peak Hour				Sunday Peak Hour			
	Rate	In	Out	Total	Rate	In	Out	Total	Rate	In	Out	Total
145	0.21	23	7	30	0.26	22	15	37	0.20	5	24	29

The Sunday peak hour rates were used for the AM peak hour trip generation and the Friday peak hour rates were used for the PM peak hour trip generation for the George Street development.

Table 3.2 shows that the development is forecast to produce a net total of 294 and 368 trips during the AM and PM peak hours, respectively.

TABLE 3.2: TRIP GENERATION

Land Use	Units/ GFA	AM Peak Hour				PM Peak Hour				
		Rate	In	Out	Total	Rate	In	Out	Total	
LUC 210 - Single Family Dwelling	370	0.73	67	202	269	0.92	215	126	341	
Hospitality Park - Campsites	125	0.20	4	21	25	0.21	16	11	26	
Full Build-Out New Trips			71	223	294			231	137	368

3.3 Development Trip Distribution and Assignment

The estimated site generated trips were assigned to the roadway network based on the existing distribution of traffic within the study area. The traffic in out of the development was split evenly between the two proposed street connections.

Table 3.3 contains the breakdown of the trip distribution by approaching and departing street.



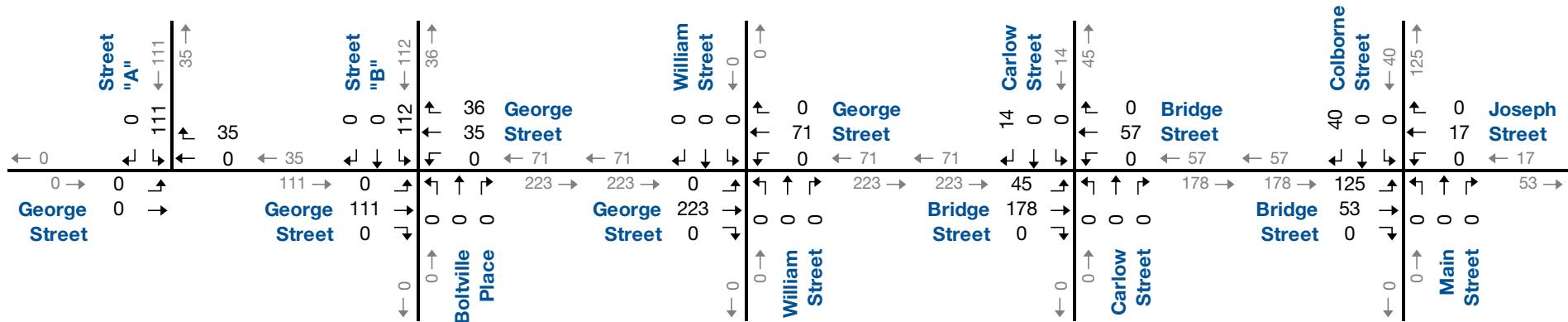
TABLE 3.3: TRIP DISTRIBUTION

Route	Direction	Peak Hour
William Street	South	0%
Carlow Street	North	20%
	South	0%
Bridge Street/Joseph Street	East	24%
George Street	West	0%
Colborne Street	North	56%
	South	0%
Total		100%

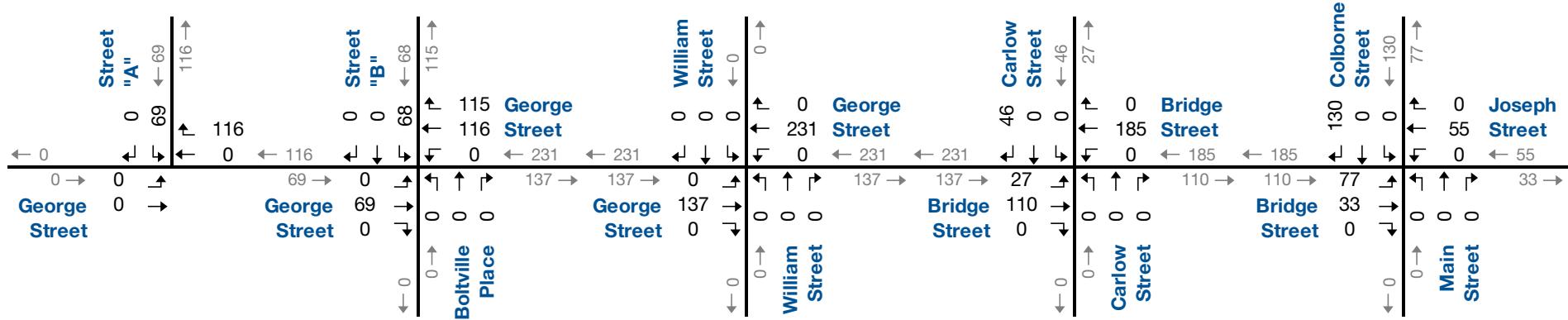
Figure 3.2 illustrates the trip assignment for the development traffic for the AM and PM peak hours.



AM Peak Hour



PM Peak Hour



Development Traffic Forecasts

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Figure 3.2

4 Evaluation of Future Traffic Conditions

The assessment of future traffic conditions contained in this section includes estimates of future background and total traffic and analyses for the 2026 horizons. The future traffic volumes in the vicinity of the development will likely consist of increased non-site traffic volumes (background traffic), and the traffic forecast to be generated by the proposed development.

4.1 2026 Background Traffic Growth

The non-site traffic increase represents generalized traffic growth in the Port Stanley area. A growth rate of 0.4% per year was used for traffic in the study area. Historical Ministry of Transportation³ AADT volume counts on Highway 4 at Highway 3 (Talbot Line) in Talbotville revealed this rate of change.

Figure 4.1 shows the 2026 background traffic for the AM and PM peak hours.

4.2 2026 Background Traffic Operations

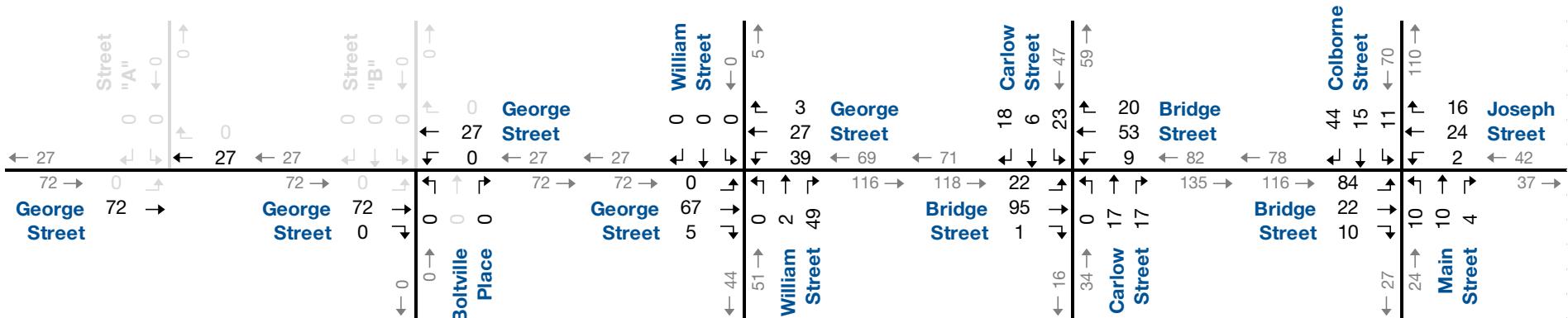
Based on the forecast 2026 background traffic volumes, operational analyses have been conducted using Synchro 9 to determine the peak hour conditions for the intersections within the study area. No changes to the existing signal timings were made in this analysis. **Table 4.1** summarizes the 2026 background traffic operations for the AM and PM peak hours. Based on the analyses, the 2026 background traffic operations are forecast to be similar to the existing traffic operations with all movements forecast to operate at acceptable levels of service.

Appendix B contains the supporting Synchro 9 reports.

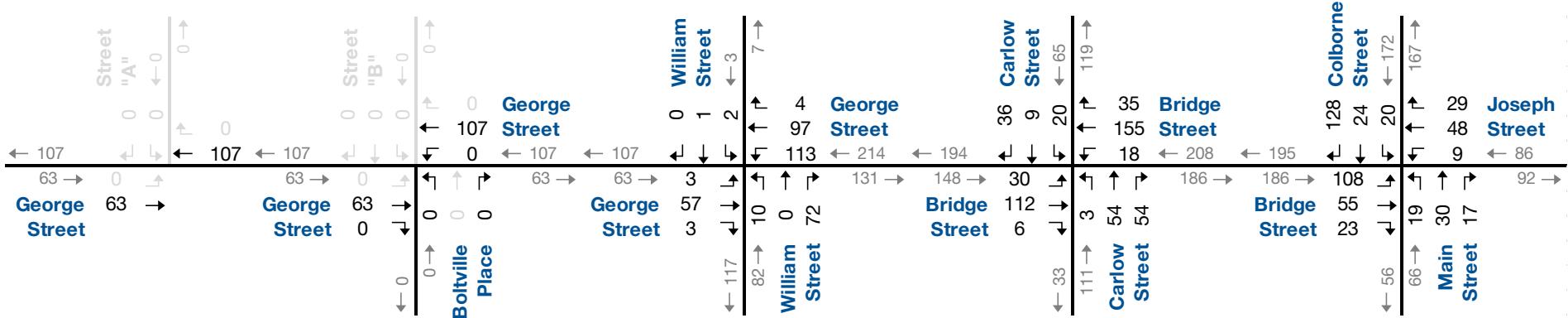
³ Provincial Highways Traffic Volumes 1988-2010, Ministry of Transportation Ontario, Queen's Printer for Ontario, 2011



AM Peak Hour



PM Peak Hour



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2026 Background Traffic Forecasts

Figure 4.1

TABLE 4.1: 2026 BACKGROUND 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	George Street & William Street	3WSC	LOS Delay V/C Q Ex Avail.	< < < < < <	A 8 0.10	> > > > > >	A 8	A 8 0.03	A 0 0.02	> > >	A 4	< < < < < <	A 9 0.06 2 -	> > >	A 9	< < < < < <	A 0 0.00 0 - -	> > >	A 0	A 4	
	Bridge Street & Carlow Road		LOS Delay V/C Q Ex Avail.	< < < < < <	A 2 0.02	> > >	A 2	< < <	A 1 0.01	> > >	A 1	< < < < < <	A 10 0.03 1 -	> > >	A 10	< < < < < <	B 10 0.08 2 -	> > >	B 10	A 4	
	Bridge Street/ Joseph Street & Colborne Street/ Main Street		TCS	LOS Delay V/C Q Ex Avail.	C 22 0.38	C 21 0.11	> >	C 22	C 24 0.02	C 26 0.27	> >	C 26	< < <	A 7 0.03 5 -	A 7 0.00 0	A 7	< < < < < <	A 7 0.03 6 - 25 21	> > >	A 7	B 17
PM Peak Hour	George Street & William Street	3WSC	LOS Delay V/C Q Ex Avail.	< < < < < <	A 8 0.08	> >	A 8	A 8 0.08	A 0 0.07	> >	A 4	< < < < < <	A 9 0.08 2 -	> > >	A 9	< < < < < <	B 13 0.01 0 - -	> > >	B 13	A 5	
	Bridge Street & Carlow Road		LOS Delay V/C Q Ex Avail.	< < < < < <	A 2 0.03	> >	A 2	< < <	A 1 0.02	> >	A 1	< < < < < <	B 10 0.10 3 -	> > >	B 10	< < < < < <	B 12 0.14 4 - -	> > >	B 12	A 4	
	Bridge Street/ Joseph Street & Colborne Street/ Main Street		TCS	LOS Delay V/C Q Ex Avail.	C 22 0.40	C 21 0.24	> >	C 22	C 22 0.04	C 23 0.28	> >	C 23	< < <	B 11 0.08 10 -	B 10 0.01 0	B 11	< < < < < <	B 11 0.07 10 - 25 16	> > >	B 11	B 17

MOE - Measure of Effectiveness

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Delay - Average Delay per Vehicle in Seconds

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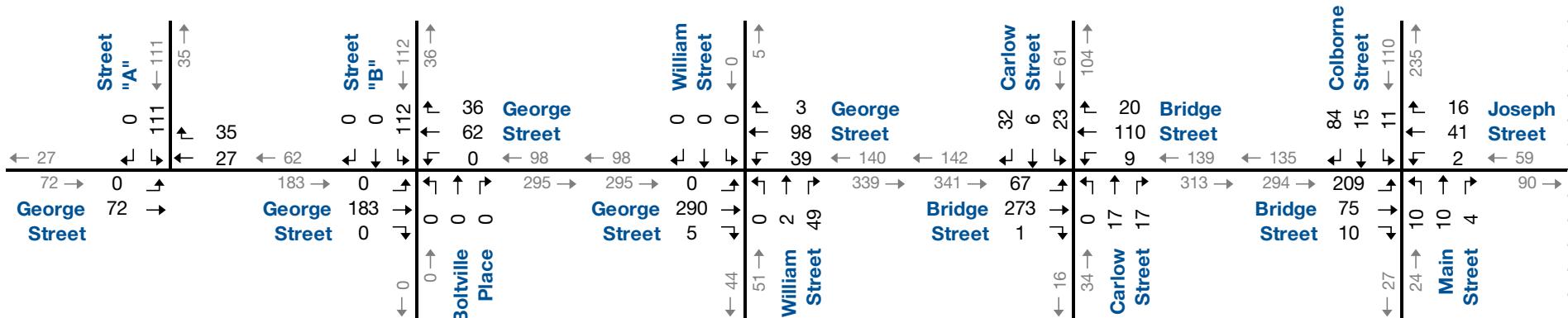
4.3 2026 Total Traffic Operations

Figure 4.2 illustrates the total trips (background + development) forecast for 2026 for the AM and PM peak hours. Based on the forecast 2026 total traffic volumes, operational analyses were conducted using Synchro 9 to determine the peak hour conditions for the intersections within the study area. No changes to the existing signal timings were made.

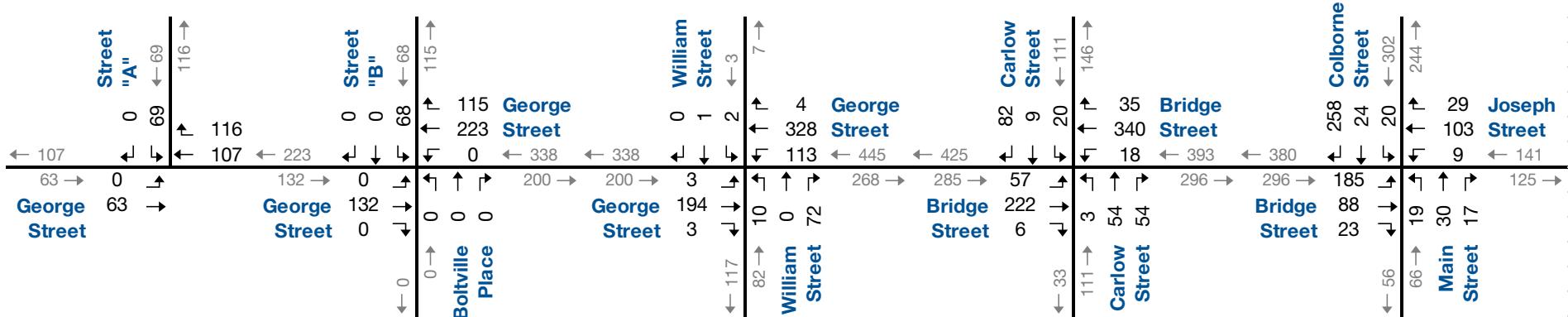
Table 4.2 summarizes the forecast LOS conditions for the AM and PM peak hours. **Appendix C** contains the supporting detailed Synchro reports. Based on the analyses it is concluded that the intersections are forecast to operate similar to the background conditions.



AM Peak Hour



PM Peak Hour



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2026 Total Traffic Forecasts

Figure 4.2

TABLE 4.2: 2026 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	George Street & William Street	3WSC	LOS Delay V/C Q Ex Avail.	< < < < < <	B 11 0.44	> > > > >	B 11	A 8 0.04	A 0 0.08	> > >	A 2	< < < <	B 11 0.09	> > >	B 11	< < < <	A 0 0.00	> > >	A 0	A 2		
	Bridge Street & Carlow Road	TWSC	LOS Delay V/C Q Ex Avail.	< < < < < <	A 2 0.06	> > > >	A 2	< < <	A 1 0.01	> > >	A 1	< < <	B 12 0.05	> > >	B 12	< < <	B 14 0.15	> > >	B 14	A 3		
	Bridge Street/ Joseph Street & Colborne Street/ Main Street	TCS	LOS Delay V/C Q Ex Avail.	C 21 0.58	B 18 0.21	> >	C 20	C 24 0.01	C 25 0.30	> >	C 25	< < <	B 11 0.03	B 11 0.00	B 11	< < <	B 11 0.04	B 11 0.07	B 11	B 18		
	George Street & Street "A"	TWSC	LOS Delay V/C Q Ex Avail.	< < < < < <	A 0 0.00	> >	A 0	< < <	A 0 0.04	> >	A 0							< < <	A 10 0.14	> > >	A 10	A 5
	George Street & Boltville Place/ Street "B"	TWSC	LOS Delay V/C Q Ex Avail.	< < < < < <	A 0 0.00	> >	A 0	< < <	A 0 0.00	> >	A 0	< < <	A 0 0.00	> >	A 0	< < <	B 12 0.18	> >	B 12	A 3		
	George Street & William Street	3WSC	LOS Delay V/C Q Ex Avail.	< < < < < <	A 9 0.28	> >	A 9	A 8 0.09	A 0 0.21	> >	A 2	< < <	B 11 0.10	> >	B 11	< < <	C 19 0.01	> >	C 19	A 3		
	Bridge Street & Carlow Road	TWSC	LOS Delay V/C Q Ex Avail.	< < < < < <	A 2 0.06	> >	A 2	< < <	A 1 0.02	> >	A 1	< < <	B 13 0.14	> >	B 13	< < <	C 18 0.33	> >	C 18	A 4		
	Bridge Street/ Joseph Street & Colborne Street/ Main Street	TCS	LOS Delay V/C Q Ex Avail.	C 24 0.57	C 21 0.32	> >	C 23	C 21 0.03	C 23 0.44	> >	C 23	< < <	B 14 0.10	B 13 0.01	B 14	< < <	B 14 0.09	B 15 0.20	B 15	B 19		
	George Street & Street "A"	TWSC	LOS Delay V/C Q Ex Avail.	< < < < < <	A 0 0.00	> >	A 0	< < <	A 0 0.14	> >	A 0							< < <	B 10 0.10	> >	B 10	A 2
	George Street & Boltville Place/ Street "B"	TWSC	LOS Delay V/C Q Ex Avail.	< < < < < <	A 0 0.00	> >	A 0	< < <	A 0 0.00	> >	A 0	< < <	A 0 0.00	> >	A 0	< < <	B 13 0.14	> >	B 13	A 2		

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length

Ex. - Existing Available Storage

Avail. - Available Storage

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

3WSC - Three-Way Stop Control

RBT - Roundabout

< - Shared Left-Turn Lane

> - Shared Right-Turn Lane



4.4 2026 Summer Total Traffic Operations

An influx of summer vacationers causes the traffic volumes in Port Stanley are considerably higher during the summer months. The County identified the need to analyze the traffic conditions for a typical summer day.

The September traffic counts were increased using the AADT and Summer Annual Daily Traffic (SADT) counts data. Counts available from MTO for Highway 4 at Highway 3 (Talbot Line) in Talbotville have an SADT increase of 6% traffic volumes compared to the AADT. Counts from the City of St.Thomas on Sunset Drive south of the city. The AADT counts on Sunset Drive during the year were 12,000 vehicles/day versus 15,000 vehicles/day during the summer months. The SADT displays a 20% increase in traffic volumes compared to the AADT. Therefore, for a conservative analysis, the base year traffic volumes were increased by 20% before applying the growth rate for the background traffic.

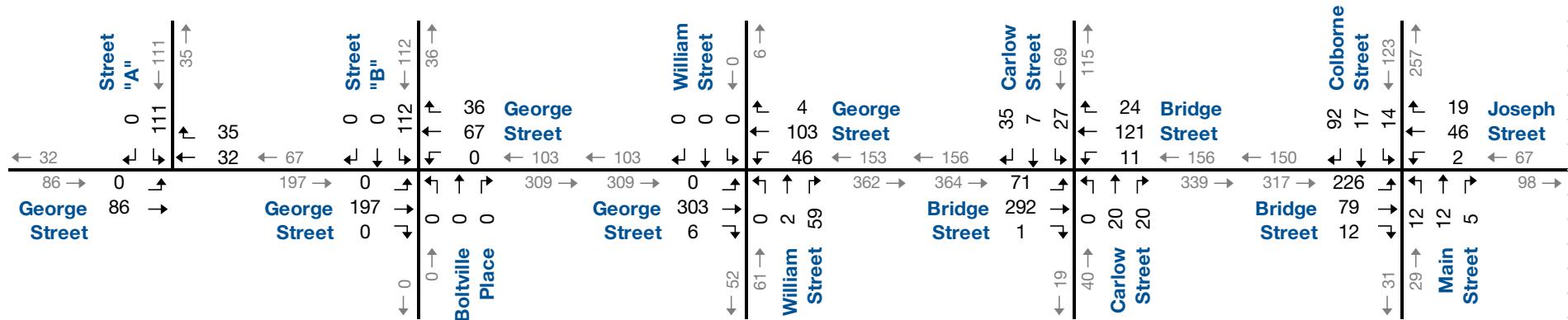
Figure 4.3 illustrates the total trips (background + development) forecast for 2026 for the AM and PM peak hours. Based on the forecast 2026 summer total traffic volumes, operations analyses were conducted using Synchro 9 to determine the peak hour conditions for the intersections within the study area. No changes to the existing signal timings were made.

Table 4.3 summarizes the forecast LOS conditions for the AM and PM peak hours. **Appendix D** contains the supporting detailed Synchro reports. Based on the analyses, it is concluded that the intersections are forecast to operate similar to the background conditions.

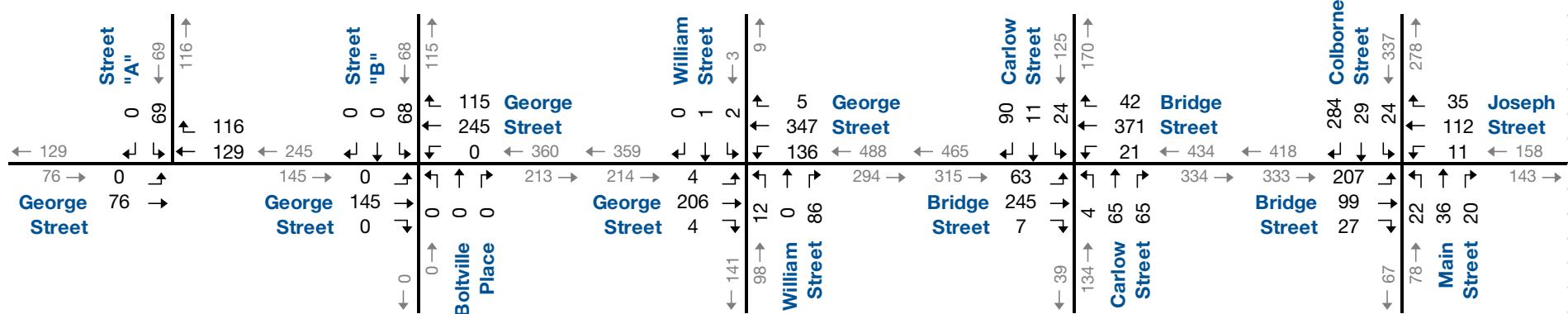
It is important to note that the severity of traffic congestion is based on the influx of vacationers on any given weekend during the summer. Major delays travelling through the main streets of Port Stanley occur mainly on weekends in July and August, specifically long weekends and represent a small fraction of peak times throughout the year. In addition, the lift bridge operates during the summer season and may exacerbate traffic congestion for short periods (5 minutes) while in operation. It is difficult to determine the number and frequency of boats requiring the operation of the swing bridge.



AM Peak Hour



PM Peak Hour



2026 Summer Total Traffic Forecasts

George Street Transportation Impact Study
161910

Figure 4.3

TABLE 4.3: 2026 SUMMER 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	George Street & William Street	3WSC	LOS Delay V/C Q Ex Avail.	< < < < < <	B 11 0.45	> > > > > >	B 11	A 8 0.05	A 0.08	> > >	A 3	< < < < < <	B 11 0.11 3 -	> > >	B 11	< < < < < <	A 0 0.00 0 -	> > >	A 0	A 2	
	Bridge Street & Carlow Road	TWSC	LOS Delay V/C Q Ex Avail.	< < < < < <	A 2 0.06	> > > > > >	A 2	< < < < < <	A 1 0.01	> > >	A 1	< < < < < <	B 12 0.06 2	> > >	B 12	< < < < < <	B 15 0.18 5	> >	B 15	A 4	
	Bridge Street/ Joseph Street & Colborne Street/ Main Street	TCS	LOS Delay V/C Q Ex Avail.	C 23 0.62	B 19 0.22	> > >	C 22	C 23 0.01	C 24 0.26	> > >	C 24	< < < < < <	B 12 0.04 7 0	B 12 0.00	B 12	< < < < < <	B 12 0.06 9 9 25 16	> >	B 13	B 20	
	George Street & Street "A"	TWSC	LOS Delay V/C Q Ex Avail.	< < < < < <	A 0 0.00	> > >	A 0	< < < < < <	A 0 0.04	> > >	A 0					< < < < < <	A 10 0.14 4	> >	A 10	A 4	
	George Street & Boltville Place/ Street "B"	TWSC	LOS Delay V/C Q Ex Avail.	< < < < < <	A 0 0.00	> > >	A 0	< < < < < <	A 0 0.00	> > >	A 0	< < < < < <	A 0 0.00	> > >	A 0	< < < < < <	B 12 0.19 6	> >	B 12	A 3	
	George Street & William Street	3WSC	LOS Delay V/C Q Ex Avail.	< < < < < <	A 9 0.28	> > >	A 9	A 8 0.11	A 0 0.23	> > >	A 2	< < < < < <	B 11 0.12 3 -	> > >	B 11	< < < < < <	C 22 0.01 0 -	> >	C 22	A 3	
	Bridge Street & Carlow Road	TWSC	LOS Delay V/C Q Ex Avail.	< < < < < <	A 2 0.07	> > >	A 2	< < < < < <	A 1 0.02	> > >	A 1	< < < < < <	B 14 0.20 6 -	> > >	B 14	< < < < < <	C 23 0.43 17 -	> >	C 23	A 5	
	Bridge Street/ Joseph Street & Colborne Street/ Main Street	TCS	LOS Delay V/C Q Ex Avail.	C 25 0.61	C 21 0.35	> > >	C 24	C 21 0.04	C 24 0.48	> > >	C 24	< < < < < <	B 15 0.12 16 -	B 14 0.01 0	B 15	< < < < < <	B 15 0.11 15 -	> >	B 16	B 20	
	George Street & Street "A"	TWSC	LOS Delay V/C Q Ex Avail.	< < < < < <	A 0 0.00	> > >	A 0	< < < < < <	A 0 0.16	> > >	A 0					< < < < < <	B 11 0.11 3 -	> >	B 11	A 2	
	George Street & Boltville Place/ Street "B"	TWSC	LOS Delay V/C Q Ex Avail.	< < < < < <	A 0 0.00	> > >	A 0	< < < < < <	A 0 0.00	> > >	A 0	< < < < < <	A 0 0.00	> > >	A 0	< < < < < <	B 14 0.15 4 -	> >	B 14	A 2	

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length

Ex. - Existing Available Storage

Avail. - Available Storage

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

3WSC - Three-Way Stop Control

RBT - Roundabout

< - Shared Left-Turn Lane

> - Shared Right-Turn Lane



5 Remedial Measures

The analyses indicate with the addition of the site traffic, the study area intersections are forecast to continue to operate at acceptable levels of service. The street connections operate well below maximum acceptable levels of service. George Street is able to accommodate the increase in traffic without auxiliary turning lanes. Within the study area, signalization and auxiliary turning lanes exist and are operating well in the field, therefore no remedial measures are required to accommodate the site traffic.



6 Conclusions and Recommendations

6.1 Conclusions

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

- ▶ currently, all intersections within the study area operate at acceptable levels of service during the AM and PM peak hours, with no individual problem movements;
- ▶ at full build-out, the development is forecast to generate 294 and 368 new trips during the AM and PM peak hours, respectively;
- ▶ under 2026 Background Traffic conditions all intersections within the study area are forecast to operate at acceptable levels of service, with no individual problem movements;
- ▶ under 2026 Total Traffic conditions, all intersections within the study area are forecast to operate at acceptable levels of service, with no individual problem movements;
- ▶ under 2026 Summer Total Traffic conditions, all intersections within the study area are forecast to operate at acceptable levels of service, with no individual problem movements; and
- ▶ no remedial measures warranted to mitigate the proposed traffic increases resulting from the site development.

6.2 Recommendations

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

It is further recommended that the Municipality review the intersection operation at George Street and William Street and consider a converting the intersection to two-way stop controlled, with right-of-way assigned to George Street.



Appendix A

Base Year Traffic Operations Reports



HCM Unsignalized Intersection Capacity Analysis
1: William Street & George Street

AM Base Year
George Street TIS

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	0	64	5	37	26	3	0	2	47	0	0	0
Future Volume (vph)	0	64	5	37	26	3	0	2	47	0	0	0
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	0	81	6	47	33	4	0	3	59	0	0	0
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	87	47	37	3	59	0						
Volume Left (vph)	0	47	0	0	0	0						
Volume Right (vph)	6	0	4	0	59	0						
Hadj (s)	0.04	0.72	-0.02	0.00	-0.57	0.00						
Departure Headway (s)	4.1	5.3	4.5	4.3	3.2	4.3						
Degree Utilization, x	0.10	0.07	0.05	0.00	0.05	0.00						
Capacity (veh/h)	862	668	778	799	1121	813						
Control Delay (s)	7.6	7.5	6.6	7.3	6.4	7.3						
Approach Delay (s)	7.6	7.1		6.4		0.0						
Approach LOS	A	A		A		A						
Intersection Summary												
Delay							7.1					
Level of Service							A					
Intersection Capacity Utilization	20.2%						ICU Level of Service					
Analysis Period (min)	15						A					

HCM Unsignalized Intersection Capacity Analysis
1: William Street & George Street

AM Base Year
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Volume (veh/h)	0	64	5	37	26	3	0	2	47	0	0	0				
Future Volume (Veh/h)	0	64	5	37	26	3	0	2	47	0	0	0				
Sign Control	Free			Free			Stop			Stop						
Grade	0%			0%			0%			0%						
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79				
Hourly flow rate (vph)	0	81	6	47	33	4	0	3	59	0	0	0				
Pedestrians	2			3			1			4						
Lane Width (m)	3.6			3.6			3.6			3.6						
Walking Speed (m/s)	1.2			1.2			1.2			1.2						
Percent Blockage	0			0			0			0						
Right turn flare (veh)							1									
Median type	None			None												
Median storage veh)																
Upstream signal (m)																
pX, platoon unblocked																
vC, conflicting volume	41			88			214	220	88	222	221	41				
vC1, stage 1 conf vol																
vC2, stage 2 conf vol																
vCu, unblocked vol	41			88			214	220	88	222	221	41				
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2				
tC, 2 stage (s)																
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3				
p0 queue free %	100			97			100	100	94	100	100	100				
cM capacity (veh/h)	1576			1440			724	657	967	668	656	1031				
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1											
Volume Total	87	47	37	62	0											
Volume Left	0	47	0	0	0											
Volume Right	6	0	4	59	0											
cSH	1576	1440	1700	1016	1700											
Volume to Capacity	0.00	0.03	0.02	0.06	0.00											
Queue Length 95th (m)	0.0	0.8	0.0	1.6	0.0											
Control Delay (s)	0.0	7.6	0.0	9.0	0.0											
Lane LOS	A			A												
Approach Delay (s)	0.0	4.2			9.0	0.0										
Approach LOS	A			A												
Intersection Summary																
Average Delay	3.9															
Intersection Capacity Utilization	20.2%	ICU Level of Service		A												
Analysis Period (min)	15															

HCM Unsignalized Intersection Capacity Analysis
2: Carlow Road & Bridge Street

AM Base Year
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Volume (veh/h)	21	91	1	9	51	19	0	6	16	22	6	17				
Future Volume (Veh/h)	21	91	1	9	51	19	0	6	16	22	6	17				
Sign Control	Free			Free			Stop			Stop						
Grade	0%			0%			0%			0%						
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83				
Hourly flow rate (vph)	25	110	1	11	61	23	0	7	19	27	7	20				
Pedestrians										5						
Lane Width (m)										3.6						
Walking Speed (m/s)										1.2						
Percent Blockage										0						
Right turn flare (veh)																
Median type	None			None												
Median storage veh)										320						
Upstream signal (m)																
pX, platoon unblocked																
vC, conflicting volume	87			116			284	274	116	280	264	76				
vC1, stage 1 conf vol																
vC2, stage 2 conf vol																
vCu, unblocked vol	87			116			284	274	116	280	264	76				
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.3				
tC, 2 stage (s)																
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.4				
p0 queue free %	98			99			100	99	98	96	99	98				
cM capacity (veh/h)	1487			1413			635	613	938	639	622	972				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1												
Volume Total	136	95	26	54												
Volume Left	25	11	0	27												
Volume Right	1	23	19	20												
cSH	1487			1413			821			729						
Volume to Capacity	0.02	0.01	0.03	0.07												
Queue Length 95th (m)	0.4	0.2	0.8	1.9												
Control Delay (s)	1.5	0.9	9.5	10.3												
Lane LOS	A			A			B									
Approach Delay (s)	1.5	0.9	9.5	10.3												
Approach LOS	A			B												
Intersection Summary																
Average Delay	3.5															
Intersection Capacity Utilization	26.0%	ICU Level of Service		A												
Analysis Period (min)	15															

Queues
3: Main Street/Colborne Street & Bridge Street/Joseph Street

AM Base Year
George Street TIS

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	91	35	2	43	22	4	28	47
v/c Ratio	0.26	0.10	0.01	0.12	0.02	0.00	0.03	0.06
Control Delay	21.4	15.5	19.0	14.8	10.7	0.0	10.5	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.4	15.5	19.0	14.8	10.7	0.0	10.5	2.6
Queue Length 50th (m)	6.2	1.6	0.2	1.7	0.7	0.0	0.9	0.0
Queue Length 95th (m)	19.6	8.5	1.7	9.5	5.2	0.0	6.1	3.6
Internal Link Dist (m)	88.9		133.7	266.2		469.2		
Turn Bay Length (m)	30.0		5.0		15.0		25.0	
Base Capacity (vph)	1338	1353	1405	1310	958	929	976	845
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	0.07	0.03	0.00	0.03	0.02	0.00	0.03	0.06

Intersection Summary

HCM Signalized Intersection Capacity Analysis
3: Main Street/Colborne Street & Bridge Street/Joseph Street

AM Base Year
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↓	↑	↑	↓	↑	↑	↓	↑	↑	↓	↑
Traffic Volume (vph)	81	21	10	2	23	15	10	10	4	11	14	42
Future Volume (vph)	81	21	10	2	23	15	10	10	4	11	14	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.2	5.2		5.2	5.2				5.5	5.5		5.5
Lane Util. Factor	1.00	1.00		1.00	1.00				1.00	1.00		1.00
Frbp, ped/bikes	1.00	0.99		1.00	0.99				1.00	0.97		1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00				1.00	1.00		1.00
Fr	1.00	0.95		1.00	0.94				1.00	0.85		1.00
Flt Protected	0.95	1.00		0.95	1.00				0.98	1.00		1.00
Satd. Flow (prot)	1719	1740		1805	1680				1758	1570		1778
Flt Permitted	0.95	1.00		0.95	1.00				0.92	1.00		0.93
Satd. Flow (perm)	1719	1740		1805	1680				1664	1570		1694
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	91	24	11	2	26	17	11	11	4	12	16	47
RTOR Reduction (vph)	0	9	0	0	16	0	0	0	2	0	0	23
Lane Group Flow (vph)	91	26	0	2	27	0	0	22	2	0	28	24
Confli. Peds. (#/hr)	2		6	6		2	7		6	6		7
Heavy Vehicles (%)	5%	0%	10%	0%	9%	0%	0%	10%	0%	10%	0%	10%
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	4	4		8	8				2	2	6	6
Permitted Phases												
Actuated Green, G (s)	7.8	7.8		3.6	3.6				28.1	28.1		28.1
Effective Green, g (s)	7.8	7.8		3.6	3.6				28.1	28.1		28.1
Actuated g/C Ratio	0.14	0.14		0.06	0.06				0.51	0.51		0.51
Clearance Time (s)	5.2	5.2		5.2	5.2				5.5	5.5		5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0				3.0	3.0		3.0
Lane Grp Cap (vph)	242	244		117	109				844	796		859
v/s Ratio Prot	c0.05	0.01		0.00	c0.02							
v/s Ratio Perm									0.01	0.00		0.02
v/c Ratio	0.38	0.10		0.02	0.25				0.03	0.00		0.03
Uniform Delay, d1	21.6	20.8		24.2	24.6				6.8	6.7		6.8
Progression Factor	1.00	1.00		1.00	1.00				1.00	1.00		1.00
Incremental Delay, d2	1.0	0.2		0.1	1.2				0.1	0.0		0.1
Delay (s)	22.6	20.9		24.3	25.8				6.9	6.7		6.9
Level of Service	C	C		C	C				A	A		A
Approach Delay (s)						25.7			6.9			6.9
Approach LOS						C			A			A

Intersection Summary

HCM 2000 Control Delay	17.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.12		
Actuated Cycle Length (s)	55.4	Sum of lost time (s)	15.9
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
1: William Street & George Street

PM Base Year
George Street TIS

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	3	55	3	109	93	4	10	0	69	2	1	0
Future Volume (vph)	3	55	3	109	93	4	10	0	69	2	1	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	3	60	3	120	102	4	11	0	76	2	1	0
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	66	120	106	11	76	3						
Volume Left (vph)	3	120	0	11	0	2						
Volume Right (vph)	3	0	4	0	76	0						
Hadj (s)	0.04	0.52	-0.01	0.23	-0.57	0.13						
Departure Headway (s)	4.3	5.1	4.6	4.8	3.2	4.7						
Degree Utilization, x	0.08	0.17	0.13	0.01	0.07	0.00						
Capacity (veh/h)	824	692	775	705	1121	717						
Control Delay (s)	7.7	7.9	7.1	7.9	6.4	7.7						
Approach Delay (s)	7.7	7.5		6.6		7.7						
Approach LOS	A	A		A		A						
Intersection Summary												
Delay							7.3					
Level of Service							A					
Intersection Capacity Utilization	24.0%						ICU Level of Service					
Analysis Period (min)	15						A					

HCM Unsignalized Intersection Capacity Analysis
1: William Street & George Street

PM Base Year
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR									
Lane Configurations																					
Traffic Volume (veh/h)	3	55	3	109	93	4	10	0	69	2	1	0									
Future Volume (Veh/h)	3	55	3	109	93	4	10	0	69	2	1	0									
Sign Control	Free			Free			Stop			Stop											
Grade	0%			0%			0%			0%											
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91									
Hourly flow rate (vph)	3	60	3	120	102	4	11	0	76	2	1	0									
Pedestrians	4																				
Lane Width (m)	3.6																				
Walking Speed (m/s)	1.2																				
Percent Blockage	0																				
Right turn flare (veh)	1																				
Median type	None			None																	
Median storage veh)																					
Upstream signal (m)																					
pX, platoon unblocked																					
vC, conflicting volume	107	63			414	414	62	412	414	109											
vC1, stage 1 conf vol																					
vC2, stage 2 conf vol																					
vCu, unblocked vol	107	63			414	414	62	412	414	109											
tC, single (s)	4.1	4.1			7.1	6.5	6.2	7.1	6.5	6.2											
tC, 2 stage (s)																					
tF (s)	2.2	2.2			3.5	4.0	3.3	3.5	4.0	3.3											
p0 queue free %	100	92			98	100	92	100	100	100											
cM capacity (veh/h)	1495	1546			512	489	1004	480	489	946											
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1																
Volume Total	66	120	106	87	3																
Volume Left	3	120	0	11	2																
Volume Right	3	0	4	76	0																
cSH	1495	1546	1700	1149	483																
Volume to Capacity	0.00	0.08	0.06	0.08	0.01																
Queue Length 95th (m)	0.0	2.0	0.0	2.0	0.2																
Control Delay (s)	0.4	7.5	0.0	9.3	12.5																
Lane LOS	A	A	A	B																	
Approach Delay (s)	0.4	4.0		9.3	12.5																
Approach LOS			A	B																	
Intersection Summary																					
Average Delay	4.6																				
Intersection Capacity Utilization	24.0%	ICU Level of Service			A																
Analysis Period (min)	15																				

HCM Unsignalized Intersection Capacity Analysis
2: Carlow Road & Bridge Street

PM Base Year
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR									
Lane Configurations																					
Traffic Volume (veh/h)	29	108	6	17	149	34	3	7	52	19	9	35									
Future Volume (Veh/h)	29	108	6	17	149	34	3	7	52	19	9	35									
Sign Control	Free			Free			Stop			Stop											
Grade	0%			0%			0%			0%											
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83									
Hourly flow rate (vph)	35	130	7	20	180	41	4	8	63	23	11	42									
Pedestrians	7																				
Lane Width (m)	3.6																				
Walking Speed (m/s)	1.2																				
Percent Blockage	1																				
Right turn flare (veh)																					
Median type	None			None																	
Median storage veh)																					
Upstream signal (m)	320																				
pX, platoon unblocked																					
vC, conflicting volume	222	144			498			472	140	512	456	202									
vC1, stage 1 conf vol																					
vC2, stage 2 conf vol																					
vCu, unblocked vol	222	144			498			472	140	512	456	202									
tC, single (s)	4.1	4.2			7.1	6.6	6.2	7.1	6.6	7.1	6.6	6.2									
tC, 2 stage (s)																					
tF (s)	2.2	2.3			3.5	4.1	3.3	3.5	4.1	3.3											
p0 queue free %	97	99			99	98	93	94	98	95											
cM capacity (veh/h)	1340	1406			434			456	902	415	465	836									
Direction, Lane #	EB 1	WB 1	NB 1	SB 1																	
Volume Total	172	241	75	76																	
Volume Left	35	20	4	23																	
Volume Right	7	41	63	42																	
cSH	1340	1406	777	588																	
Volume to Capacity	0.03	0.01	0.10	0.13																	
Queue Length 95th (m)	0.6	0.3	2.6	3.5																	
Control Delay (s)	1.8	0.7	10.1	12.0																	
Lane LOS	A	A	B	B																	
Approach Delay (s)	1.8	0.7	10.1	12.0																	
Approach LOS			B	B																	
Intersection Summary																					
Average Delay	3.8									A											
Intersection Capacity Utilization	31.2%	ICU Level of Service						A													
Analysis Period (min)	15																				

Queues
3: Main Street/Colborne Street & Bridge Street/Joseph Street

PM Base Year
George Street TIS

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	121	88	10	86	55	19	49	143
v/c Ratio	0.38	0.27	0.03	0.27	0.08	0.03	0.07	0.20
Control Delay	24.4	18.8	20.4	17.4	12.6	0.1	12.5	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.4	18.8	20.4	17.4	12.6	0.1	12.5	3.7
Queue Length 50th (m)	11.8	6.4	0.9	5.3	3.8	0.0	3.4	0.0
Queue Length 95th (m)	23.4	16.0	4.3	15.2	9.9	0.0	9.2	8.6
Internal Link Dist (m)	88.9		133.7	266.2		469.2		
Turn Bay Length (m)	30.0		5.0		15.0		25.0	
Base Capacity (vph)	1205	1176	1229	1169	720	674	703	710
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	0.10	0.07	0.01	0.07	0.08	0.03	0.07	0.20

Intersection Summary

HCM Signalized Intersection Capacity Analysis

3: Main Street/Colborne Street & Bridge Street/Joseph Street

PM Base Year
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↓	↑	↑	↓	↑	↑	↓	↑	↑	↓	↑
Traffic Volume (vph)	104	53	22	9	46	28	18	29	16	19	23	123
Future Volume (vph)	104	53	22	9	46	28	18	29	16	19	23	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.2	5.2		5.2	5.2				5.5	5.5		5.5
Lane Util. Factor	1.00	1.00		1.00	1.00				1.00	1.00		1.00
Frbp, ped/bikes	1.00	0.99		1.00	0.99				1.00	0.96		1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00				0.99	1.00		0.99
Fr	1.00	0.96		1.00	0.94				1.00	0.85		1.00
Flt Protected	0.95	1.00		0.95	1.00				0.98	1.00		0.98
Satd. Flow (prot)	1770	1725		1805	1706				1852	1545		1840
Flt Permitted	0.95	1.00		0.95	1.00				0.91	1.00		0.90
Satd. Flow (perm)	1770	1725		1805	1706				1727	1545		1691
Peak-hour factor, PHF	0.86	0.86		0.86	0.86				0.86	0.86		0.86
Adj. Flow (vph)	121	62	26	10	53	33	21	34	19	22	27	143
RTOR Reduction (vph)	0	16	0	0	26	0	0	0	11	0	0	84
Lane Group Flow (vph)	121	72	0	10	60	0	0	55	8	0	49	59
Confli. Peds. (#/hr)	3		9	9		3	13		17	17		13
Heavy Vehicles (%)	2%	6%	0%	0%	4%	4%	0%	0%	0%	0%	0%	2%
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	4	4		8	8				2	2	6	6
Permitted Phases												
Actuated Green, G (s)	10.4	10.4		8.0	8.0				24.0	24.0		24.0
Effective Green, g (s)	10.4	10.4		8.0	8.0				24.0	24.0		24.0
Actuated g/C Ratio	0.18	0.18		0.14	0.14				0.41	0.41		0.41
Clearance Time (s)	5.2	5.2		5.2	5.2				5.5	5.5		5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0				3.0	3.0		3.0
Lane Grp Cap (vph)	315	307		247	234				710	636		696
v/s Ratio Prot	c0.07	0.04		0.01	c0.04							627
v/s Ratio Perm									0.03	0.01		0.03
v/c Ratio	0.38	0.23		0.04	0.26				0.08	0.01		0.07
Uniform Delay, d1	21.1	20.5		21.8	22.5				10.4	10.1		10.4
Progression Factor	1.00	1.00		1.00	1.00				1.00	1.00		1.00
Incremental Delay, d2	0.8	0.4		0.1	0.6				0.2	0.0		0.2
Delay (s)	21.9	20.9		21.9	23.1				10.6	10.2		10.6
Level of Service	C	C		C	C				B	B		B
Approach Delay (s)						23.0			10.5			10.7
Approach LOS						C			B			B

Intersection Summary

HCM 2000 Control Delay	16.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.20		
Actuated Cycle Length (s)	58.3	Sum of lost time (s)	15.9
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Appendix B

2026 Background Traffic Operations Reports



HCM Unsignalized Intersection Capacity Analysis
1: William Street & George Street

2026 AM Background
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Stop		Stop			Stop
Traffic Volume (vph)	0	67	5	39	27	3	0	2	49	0	0	0
Future Volume (vph)	0	67	5	39	27	3	0	2	49	0	0	0
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	0	85	6	49	34	4	0	3	62	0	0	0
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	91	49	38	3	62	0						
Volume Left (vph)	0	49	0	0	0	0						
Volume Right (vph)	6	0	4	0	62	0						
Hadj (s)	0.04	0.72	-0.01	0.00	-0.57	0.00						
Departure Headway (s)	4.1	5.3	4.5	4.3	3.2	4.3						
Degree Utilization, x	0.10	0.07	0.05	0.00	0.06	0.00						
Capacity (veh/h)	861	667	778	795	1121	809						
Control Delay (s)	7.6	7.5	6.6	7.3	6.4	7.3						
Approach Delay (s)	7.6	7.1		6.4		0.0						
Approach LOS	A	A		A		A						
Intersection Summary												
Delay							7.1					
Level of Service							A					
Intersection Capacity Utilization	20.3%						ICU Level of Service					
Analysis Period (min)	15						A					

HCM Unsignalized Intersection Capacity Analysis
1: William Street & George Street

2026 AM Background
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	67	5	39	27	3	0	2	49	0	0	0
Future Volume (Veh/h)	0	67	5	39	27	3	0	2	49	0	0	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	0	85	6	49	34	4	0	3	62	0	0	0
Pedestrians	2			3			1			4		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			0			0			0		
Right turn flare (veh)								1				
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	42			92			223	229	92	230	230	42
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	42			92			223	229	92	230	230	42
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	94	100	100	100
cM capacity (veh/h)	1575			1435			714	648	962	656	648	1029
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total	91	49	38	65	0							
Volume Left	0	49	0	0	0							
Volume Right	6	0	4	62	0							
cSH	1575	1435	1700	1009	1700							
Volume to Capacity	0.00	0.03	0.02	0.06	0.00							
Queue Length 95th (m)	0.0	0.8	0.0	1.7	0.0							
Control Delay (s)	0.0	7.6	0.0	9.1	0.0							
Lane LOS	A		A	A								
Approach Delay (s)	0.0	4.3		9.1	0.0							
Approach LOS				A	A							
Intersection Summary												
Average Delay		4.0										
Intersection Capacity Utilization	20.3%		ICU Level of Service		A							
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
2: Carlow Road & Bridge Street

2026 AM Background
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	95	1	9	53	20	0	6	17	23	6	18
Future Volume (Veh/h)	22	95	1	9	53	20	0	6	17	23	6	18
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	27	114	1	11	64	24	0	7	20	28	7	22
Pedestrians										5	3	
Lane Width (m)										3.6	3.6	
Walking Speed (m/s)										1.2	1.2	
Percent Blockage										0	0	
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)								320				
pX, platoon unblocked												
vC, conflicting volume	91			120			297	286	120	293	275	79
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	91			120			297	286	120	293	275	79
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.4
p0 queue free %	98			99			100	99	98	96	99	98
cM capacity (veh/h)	1482			1408			620	603	934	626	612	968
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	142	99	27	57								
Volume Left	27	11	0	28								
Volume Right	1	24	20	22								
cSH	1482	1408	817	722								
Volume to Capacity	0.02	0.01	0.03	0.08								
Queue Length 95th (m)	0.4	0.2	0.8	2.0								
Control Delay (s)	1.5	0.9	9.6	10.4								
Lane LOS	A	A	A	B								
Approach Delay (s)	1.5	0.9	9.6	10.4								
Approach LOS			A	B								
Intersection Summary												
Average Delay		3.6										
Intersection Capacity Utilization	26.6%		ICU Level of Service		A							
Analysis Period (min)	15											

Queues
3: Main Street/Colborne Street & Bridge Street/Joseph Street

2026 AM Background
George Street TIS

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	94	36	2	45	22	4	29	49
v/c Ratio	0.27	0.10	0.01	0.13	0.02	0.00	0.03	0.06
Control Delay	21.4	15.5	19.0	14.7	10.8	0.0	10.6	2.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.4	15.5	19.0	14.7	10.8	0.0	10.6	2.8
Queue Length 50th (m)	6.3	1.6	0.2	1.7	0.7	0.0	1.0	0.0
Queue Length 95th (m)	20.1	8.7	1.7	9.7	5.3	0.0	6.3	3.9
Internal Link Dist (m)	88.9		133.7	266.2		469.2		
Turn Bay Length (m)	30.0		5.0		15.0		25.0	
Base Capacity (vph)	1345	1363	1412	1316	954	926	974	842
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	0.07	0.03	0.00	0.03	0.02	0.00	0.03	0.06

Intersection Summary

HCM Signalized Intersection Capacity Analysis
3: Main Street/Colborne Street & Bridge Street/Joseph Street

2026 AM Background
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↓	↑	↑	↓	↑	↑	↓	↑	↑	↓	↑
Traffic Volume (vph)	84	22	10	2	24	16	10	10	4	11	15	44
Future Volume (vph)	84	22	10	2	24	16	10	10	4	11	15	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.2	5.2		5.2	5.2				5.5	5.5		5.5
Lane Util. Factor	1.00	1.00		1.00	1.00				1.00	1.00		1.00
Frbp, ped/bikes	1.00	0.99		1.00	0.99				1.00	0.97		1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00				1.00	1.00		1.00
Fr	1.00	0.95		1.00	0.94				1.00	0.85		1.00
Flt Protected	0.95	1.00		0.95	1.00				0.98	1.00		0.98
Satd. Flow (prot)	1719	1744		1805	1679				1758	1570		1782
Flt Permitted	0.95	1.00		0.95	1.00				0.92	1.00		0.93
Satd. Flow (perm)	1719	1744		1805	1679				1664	1570		1700
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	94	25	11	2	27	18	11	11	4	12	17	49
RTOR Reduction (vph)	0	9	0	0	17	0	0	0	2	0	0	24
Lane Group Flow (vph)	94	27	0	2	28	0	0	0	22	2	0	29
Conf. Peds. (#/hr)	2		6	6		2	7		6	6		7
Heavy Vehicles (%)	5%	0%	10%	0%	9%	0%	0%	10%	0%	10%	0%	10%
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	4	4		8	8				2	2	6	6
Permitted Phases												
Actuated Green, G (s)	7.9	7.9		3.5	3.5				27.9	27.9		27.9
Effective Green, g (s)	7.9	7.9		3.5	3.5				27.9	27.9		27.9
Actuated g/C Ratio	0.14	0.14		0.06	0.06				0.51	0.51		0.51
Clearance Time (s)	5.2	5.2		5.2	5.2				5.5	5.5		5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0				3.0	3.0		3.0
Lane Grp Cap (vph)	246	249		114	106				841	793		859
v/s Ratio Prot	c0.05	0.02		0.00	c0.02							
v/s Ratio Perm									0.01	0.00		0.02
v/c Ratio	0.38	0.11		0.02	0.27				0.03	0.00		0.03
Uniform Delay, d1	21.4	20.6		24.2	24.6				6.8	6.8		6.9
Progression Factor	1.00	1.00		1.00	1.00				1.00	1.00		1.00
Incremental Delay, d2	1.0	0.2		0.1	1.3				0.1	0.0		0.1
Delay (s)	22.4	20.8		24.3	26.0				6.9	6.8		6.9
Level of Service	C	C		C	C				A	A		A
Approach Delay (s)						25.9			6.9			7.0
Approach LOS						C			A			A

Intersection Summary

HCM 2000 Control Delay	17.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.12		
Actuated Cycle Length (s)	55.2	Sum of lost time (s)	15.9
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
1: William Street & George Street

2026 PM Background
George Street TIS



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Stop		Stop			Stop
Traffic Volume (vph)	3	57	3	113	97	4	10	0	72	2	1	0
Future Volume (vph)	3	57	3	113	97	4	10	0	72	2	1	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	3	63	3	124	107	4	11	0	79	2	1	0
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	69	124	111	11	79	3						
Volume Left (vph)	3	124	0	11	0	2						
Volume Right (vph)	3	0	4	0	79	0						
Hadj (s)	0.04	0.52	-0.01	0.23	-0.57	0.13						
Departure Headway (s)	4.3	5.1	4.6	4.8	3.2	4.7						
Degree Utilization, x	0.08	0.18	0.14	0.01	0.07	0.00						
Capacity (veh/h)	822	692	774	701	1121	713						
Control Delay (s)	7.7	8.0	7.1	7.9	6.4	7.8						
Approach Delay (s)	7.7	7.6		6.6		7.8						
Approach LOS	A	A		A		A						
Intersection Summary												
Delay							7.4					
Level of Service							A					
Intersection Capacity Utilization	24.2%						ICU Level of Service					
Analysis Period (min)	15						A					

HCM Unsignalized Intersection Capacity Analysis
1: William Street & George Street

2026 PM Background
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	57	3	113	97	4	10	0	72	2	1	0
Future Volume (Veh/h)	3	57	3	113	97	4	10	0	72	2	1	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	3	63	3	124	107	4	11	0	79	2	1	0
Pedestrians												1
Lane Width (m)												3.6
Walking Speed (m/s)												1.2
Percent Blockage												0
Right turn flare (veh)												1
Median type	None			None								
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	112			66			430	430	64	428	430	114
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	112			66			430	430	64	428	430	114
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			92			98	100	92	100	100	100
cM capacity (veh/h)	1489			1542			499	477	1000	466	478	940
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total	69	124	111	90	3							
Volume Left	3	124	0	11	2							
Volume Right	3	0	4	79	0							
cSH	1489	1542	1700	1139	469							
Volume to Capacity	0.00	0.08	0.07	0.08	0.01							
Queue Length 95th (m)	0.0	2.1	0.0	2.1	0.2							
Control Delay (s)	0.3	7.5	0.0	9.3	12.7							
Lane LOS	A	A		A	B							
Approach Delay (s)	0.3	4.0		9.3	12.7							
Approach LOS				A	B							
Intersection Summary												
Average Delay					4.6							
Intersection Capacity Utilization	24.2%			ICU Level of Service	A							
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
2: Carlow Road & Bridge Street

2026 PM Background
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	112	6	18	155	35	3	7	54	20	9	36
Future Volume (Veh/h)	30	112	6	18	155	35	3	7	54	20	9	36
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	36	135	7	22	187	42	4	8	65	24	11	43
Pedestrians												7
Lane Width (m)												3.6
Walking Speed (m/s)												1.2
Percent Blockage												0
Right turn flare (veh)												
Median type	None			None								
Median storage veh)												
Upstream signal (m)												320
pX, platoon unblocked												
vC, conflicting volume	230			149			518	492	146	532	474	209
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	230			149			518	492	146	532	474	209
tC, single (s)	4.1			4.2			7.1	6.6	6.2	7.1	6.6	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.1	3.3	3.5	4.1	3.3
p0 queue free %	97			98			99	98	93	94	98	95
cM capacity (veh/h)	1331			1400			420	444	896	400	453	828
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	178	251	77	78								
Volume Left	36	22	4	24								
Volume Right	7	42	65	43								
cSH	1331	1400	769	573								
Volume to Capacity	0.03	0.02	0.10	0.14								
Queue Length 95th (m)	0.7	0.4	2.7	3.8								
Control Delay (s)	1.8	0.8	10.2	12.3								
Lane LOS	A	A	B	B								
Approach Delay (s)	1.8	0.8	10.2	12.3								
Approach LOS			B	B								
Intersection Summary												
Average Delay					3.9							
Intersection Capacity Utilization	31.7%			ICU Level of Service	A							
Analysis Period (min)	15											

Queues
3: Main Street/Colborne Street & Bridge Street/Joseph Street

2026 PM Background
George Street TIS

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	126	91	10	90	57	20	51	149
v/c Ratio	0.39	0.28	0.03	0.28	0.08	0.03	0.07	0.21
Control Delay	24.6	18.9	20.6	18.1	12.8	0.1	12.7	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.6	18.9	20.6	18.1	12.8	0.1	12.7	3.7
Queue Length 50th (m)	12.3	6.7	0.9	5.8	3.9	0.0	3.5	0.0
Queue Length 95th (m)	24.3	16.4	4.3	16.2	10.3	0.0	9.5	8.8
Internal Link Dist (m)	88.9		133.7	266.2		469.2		
Turn Bay Length (m)	30.0		5.0		15.0		25.0	
Base Capacity (vph)	1203	1173	1226	1167	716	672	699	713
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	0.10	0.08	0.01	0.08	0.08	0.03	0.07	0.21

Intersection Summary

HCM Signalized Intersection Capacity Analysis
3: Main Street/Colborne Street & Bridge Street/Joseph Street

2026 PM Background
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↓	↑	↑	↓	↑	↑	↓	↑	↑	↓	↑
Traffic Volume (vph)	108	55	23	9	48	29	19	30	17	20	24	128
Future Volume (vph)	108	55	23	9	48	29	19	30	17	20	24	128
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.2	5.2		5.2	5.2			5.5	5.5		5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Frbp, ped/bikes	1.00	0.99		1.00	0.99			1.00	0.96		1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00		0.99	1.00
Fr	1.00	0.96		1.00	0.94			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.98	1.00		0.98	1.00
Satd. Flow (prot)	1770	1725		1805	1707			1852	1545		1840	1524
Flt Permitted	0.95	1.00		0.95	1.00			0.91	1.00		0.90	1.00
Satd. Flow (perm)	1770	1725		1805	1707			1722	1545		1687	1524
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	126	64	27	10	56	34	22	35	20	23	28	149
RTOR Reduction (vph)	0	16	0	0	25	0	0	0	12	0	0	88
Lane Group Flow (vph)	126	75	0	10	65	0	0	57	8	0	51	61
Confli. Peds. (#/hr)	3		9	9		3	13		17	17		13
Heavy Vehicles (%)	2%	6%	0%	0%	4%	4%	0%	0%	0%	0%	0%	2%
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	4	4		8	8			2		2	6	6
Permitted Phases									2	2	6	6
Actuated Green, G (s)	10.5	10.5		8.0	8.0			24.0	24.0		24.0	24.0
Effective Green, g (s)	10.5	10.5		8.0	8.0			24.0	24.0		24.0	24.0
Actuated g/C Ratio	0.18	0.18		0.14	0.14			0.41	0.41		0.41	0.41
Clearance Time (s)	5.2	5.2		5.2	5.2			5.5	5.5		5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	318	310		247	233			707	634		693	626
v/s Ratio Prot	c0.07	0.04		0.01	c0.04							
v/s Ratio Perm								0.03	0.01		0.03	c0.04
v/c Ratio	0.40	0.24		0.04	0.28			0.08	0.01		0.07	0.10
Uniform Delay, d1	21.2	20.5		21.9	22.6			10.5	10.2		10.4	10.6
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.8	0.4		0.1	0.7			0.2	0.0		0.2	0.3
Delay (s)	22.0	20.9		21.9	23.3			10.7	10.2		10.7	10.9
Level of Service	C	C		C	C			B	B		B	B
Approach Delay (s)							23.1		10.6		10.8	
Approach LOS							C		B		B	
Intersection Summary												
HCM 2000 Control Delay					16.8		HCM 2000 Level of Service		B			
HCM 2000 Volume to Capacity ratio					0.21							
Actuated Cycle Length (s)					58.4		Sum of lost time (s)		15.9			
Intersection Capacity Utilization					58.8%		ICU Level of Service		B			
Analysis Period (min)					15							
c Critical Lane Group												

Appendix C

2026 Total Traffic Operations Reports



HCM Unsignalized Intersection Capacity Analysis
1: William Street & George Street

2026 AM Total
George Street TIS

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	0	290	5	39	98	3	0	2	49	0	0	0
Future Volume (vph)	0	290	5	39	98	3	0	2	49	0	0	0
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	0	367	6	49	124	4	0	3	62	0	0	0
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	373	49	128	3	62	0						
Volume Left (vph)	0	49	0	0	0	0						
Volume Right (vph)	6	0	4	0	62	0						
Hadj (s)	0.07	0.72	0.04	0.00	-0.57	0.00						
Departure Headway (s)	4.3	5.5	4.8	5.1	3.2	5.1						
Degree Utilization, x	0.44	0.07	0.17	0.00	0.06	0.00						
Capacity (veh/h)	837	644	737	632	1121	640						
Control Delay (s)	10.6	7.7	7.6	8.1	6.4	8.1						
Approach Delay (s)	10.6	7.6		6.5		0.0						
Approach LOS	B	A		A		A						
Intersection Summary												
Delay							9.3					
Level of Service							A					
Intersection Capacity Utilization	36.2%						ICU Level of Service					
Analysis Period (min)	15						A					

HCM Unsignalized Intersection Capacity Analysis
1: William Street & George Street

2026 AM Total
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	290	5	39	98	3	0	2	49	0	0	0
Future Volume (Veh/h)	0	290	5	39	98	3	0	2	49	0	0	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	0	367	6	49	124	4	0	3	62	0	0	0
Pedestrians	2			3			1			4		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			0			0			0		
Right turn flare (veh)								1				
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	132			374			595	601	374	602	602	132
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	132			374			595	601	374	602	602	132
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			100	99	91	100	100	100
cM capacity (veh/h)	1461			1126			403	397	670	358	396	918
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total	373	49	128	65	0							
Volume Left	0	49	0	0	0							
Volume Right	6	0	4	62	0							
cSH	1461	1126	1700	702	1700							
Volume to Capacity	0.00	0.04	0.08	0.09	0.00							
Queue Length 95th (m)	0.0	1.1	0.0	2.4	0.0							
Control Delay (s)	0.0	8.3	0.0	11.1	0.0							
Lane LOS		A		B	A							
Approach Delay (s)	0.0	2.3		11.1	0.0							
Approach LOS				B	A							
Intersection Summary												
Average Delay				1.8								
Intersection Capacity Utilization	36.2%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
2: Carlow Road & Bridge Street

2026 AM Total
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	67	273	1	9	110	20	0	6	17	23	6	32
Future Volume (Veh/h)	67	273	1	9	110	20	0	6	17	23	6	32
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	81	329	1	11	133	24	0	7	20	28	7	39
Pedestrians											5	3
Lane Width (m)											3.6	3.6
Walking Speed (m/s)											1.2	1.2
Percent Blockage											0	0
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)								320				
pX, platoon unblocked												
vC, conflicting volume	160			335			706	678	334	685	667	148
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	160			335			706	678	334	685	667	148
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.4
p0 queue free %	94			99			100	98	97	91	98	96
cM capacity (veh/h)	1398			1171			313	347	709	329	352	886
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	411	168	27	74								
Volume Left	81	11	0	28								
Volume Right	1	24	20	39								
cSH	1398	1171	558	496								
Volume to Capacity	0.06	0.01	0.05	0.15								
Queue Length 95th (m)	1.5	0.2	1.2	4.2								
Control Delay (s)	2.0	0.6	11.8	13.5								
Lane LOS	A	A	B	B								
Approach Delay (s)	2.0	0.6	11.8	13.5								
Approach LOS			B	B								
Intersection Summary												
Average Delay				3.3								
Intersection Capacity Utilization	46.5%			ICU Level of Service			A					
Analysis Period (min)	15											

Queues
3: Main Street/Colborne Street & Bridge Street/Joseph Street

2026 AM Total
George Street TIS

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	235	95	2	64	22	4	29	94
v/c Ratio	0.56	0.21	0.01	0.19	0.03	0.01	0.04	0.15
Control Delay	25.1	18.4	23.0	19.5	14.6	0.0	14.5	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.1	18.4	23.0	19.5	14.6	0.0	14.5	4.9
Queue Length 50th (m)	24.8	8.5	0.2	4.7	1.7	0.0	2.2	0.0
Queue Length 95th (m)	43.8	18.6	1.9	14.8	6.2	0.0	7.5	8.7
Internal Link Dist (m)	88.9		133.7	266.2		469.2		
Turn Bay Length (m)	30.0		5.0		15.0		25.0	
Base Capacity (vph)	1251	1339	1313	1240	668	676	685	631
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	0.07	0.00	0.05	0.03	0.01	0.04	0.15

Intersection Summary

HCM Signalized Intersection Capacity Analysis
3: Main Street/Colborne Street & Bridge Street/Joseph Street

2026 AM Total
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↓	↑	↑	↓	↑	↑	↓	↑	↑	↓	↑
Traffic Volume (vph)	209	75	10	2	41	16	10	10	4	11	15	84
Future Volume (vph)	209	75	10	2	41	16	10	10	4	11	15	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.2	5.2		5.2	5.2				5.5	5.5		5.5
Lane Util. Factor	1.00	1.00		1.00	1.00				1.00	1.00		1.00
Frbp, ped/bikes	1.00	1.00		1.00	0.99				1.00	0.97		1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00				1.00	1.00		1.00
Fr	1.00	0.98		1.00	0.96				1.00	0.85		1.00
Flt Protected	0.95	1.00		0.95	1.00				0.98	1.00		1.00
Satd. Flow (prot)	1719	1839		1805	1698				1757	1570		1782
Flt Permitted	0.95	1.00		0.95	1.00				0.91	1.00		0.93
Satd. Flow (perm)	1719	1839		1805	1698				1647	1570		1686
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	235	84	11	2	46	18	11	11	4	12	17	94
RTOR Reduction (vph)	0	5	0	0	16	0	0	0	2	0	0	57
Lane Group Flow (vph)	235	90	0	2	48	0	0	22	2	0	29	37
Conf. Peds. (#/hr)	2		6	6		2	7		6	6		7
Heavy Vehicles (%)	5%	0%	10%	0%	9%	0%	0%	10%	0%	10%	0%	10%
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	4	4		8	8				2	2	6	6
Permitted Phases												
Actuated Green, G (s)	13.6	13.6		5.3	5.3				22.5	22.5		22.5
Effective Green, g (s)	13.6	13.6		5.3	5.3				22.5	22.5		22.5
Actuated g/C Ratio	0.24	0.24		0.09	0.09				0.39	0.39		0.39
Clearance Time (s)	5.2	5.2		5.2	5.2				5.5	5.5		5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0				3.0	3.0		3.0
Lane Grp Cap (vph)	408	436		166	157				646	616		662
v/s Ratio Prot	c0.14	0.05		0.00	c0.03							
v/s Ratio Perm									0.01	0.00		0.02
v/c Ratio	0.58	0.21		0.01	0.30				0.03	0.00		0.04
Uniform Delay, d1	19.3	17.5		23.6	24.3				10.7	10.6		10.8
Progression Factor	1.00	1.00		1.00	1.00				1.00	1.00		1.00
Incremental Delay, d2	2.0	0.2		0.0	1.1				0.1	0.0		0.1
Delay (s)	21.3	17.8		23.7	25.4				10.8	10.6		10.9
Level of Service	C	B		C	C				B	B		B
Approach Delay (s)					25.3				10.8			11.0
Approach LOS					C				B			B
Intersection Summary												
HCM 2000 Control Delay					18.3							
HCM 2000 Volume to Capacity ratio					0.26							
Actuated Cycle Length (s)					57.3							
Intersection Capacity Utilization					58.2%							
Analysis Period (min)								15				
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
4: George Street & Street "A"

2026 AM Total
George Street TIS

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	72	27	35	111	0
Future Volume (Veh/h)	0	72	27	35	111	0
Sign Control	Free	Free		Stop		
Grade	0%	0%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	78	29	38	121	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None	None				
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	67		126	48		
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	67		126	48		
tC, single (s)	4.1		6.4	6.2		
tC, 2 stage (s)						
tF (s)	2.2		3.5	3.3		
p0 queue free %	100		86	100		
cM capacity (veh/h)	1535		869	1021		
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	78	67	121			
Volume Left	0	0	121			
Volume Right	0	38	0			
cSH	1535	1700	869			
Volume to Capacity	0.00	0.04	0.14			
Queue Length 95th (m)	0.0	0.0	3.9			
Control Delay (s)	0.0	0.0	9.8			
Lane LOS		A				
Approach Delay (s)	0.0	0.0	9.8			
Approach LOS		A				
Intersection Summary						
Average Delay		4.5				
Intersection Capacity Utilization	16.6%		ICU Level of Service	A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
5: Boltville Place/Street "B" & George Street

2026 AM Total
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	183	0	0	62	36	0	0	0	112	0	0
Future Volume (Veh/h)	0	183	0	0	62	36	0	0	0	112	0	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	199	0	0	67	39	0	0	0	122	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	106		199				286	305	199	286	286	86
vC1, stage 1 conf vol												
vC2, stage 2 conf vol							286	305	199	286	286	86
vCu, unblocked vol	106		199				7.1	6.5	6.2	7.1	6.5	6.2
tC, single (s)	4.1		4.1									
tC, 2 stage (s)												
tF (s)	2.2		2.2				3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100		100				100	100	100	82	100	100
cM capacity (veh/h)	1485		1373				667	608	842	667	624	972
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	199	106	0	122								
Volume Left	0	0	0	122								
Volume Right	0	39	0	0								
cSH	1485	1373	1700	667								
Volume to Capacity	0.00	0.00	0.00	0.18								
Queue Length 95th (m)	0.0	0.0	0.0	5.3								
Control Delay (s)	0.0	0.0	0.0	11.6								
Lane LOS		A	B									
Approach Delay (s)	0.0	0.0	0.0	11.6								
Approach LOS		A	B									
Intersection Summary												
Average Delay			3.3									
Intersection Capacity Utilization			22.5%				ICU Level of Service			A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
1: William Street & George Street

2026 Total PM
George Street TIS

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	3	194	3	113	328	4	10	0	72	2	1	0
Future Volume (vph)	3	194	3	113	328	4	10	0	72	2	1	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	3	213	3	124	360	4	11	0	79	2	1	0
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	219	124	364	11	79	3						
Volume Left (vph)	3	124	0	11	0	2						
Volume Right (vph)	3	0	4	0	79	0						
Hadj (s)	0.06	0.52	0.01	0.23	-0.57	0.13						
Departure Headway (s)	4.6	5.2	4.7	5.6	3.2	5.6						
Degree Utilization, x	0.28	0.18	0.48	0.02	0.07	0.00						
Capacity (veh/h)	778	678	757	576	1121	582						
Control Delay (s)	9.3	8.1	10.7	8.7	6.4	8.6						
Approach Delay (s)	9.3	10.0		6.7		8.6						
Approach LOS	A	B		A		A						
Intersection Summary												
Delay							9.5					
Level of Service							A					
Intersection Capacity Utilization	42.6%						ICU Level of Service					
Analysis Period (min)	15						A					

HCM Unsignalized Intersection Capacity Analysis
1: William Street & George Street

2026 Total PM
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	194	3	113	328	4	10	0	72	2	1	0
Future Volume (Veh/h)	3	194	3	113	328	4	10	0	72	2	1	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	3	213	3	124	360	4	11	0	79	2	1	0
Pedestrians	4									1		
Lane Width (m)	3.6									3.6		
Walking Speed (m/s)	1.2									1.2		
Percent Blockage	0									0		
Right turn flare (veh)										1		
Median type	None			None								
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	365			216			833	834	214	832	833	367
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	365			216			833	834	214	832	833	367
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			91			96	100	90	99	100	100
cM capacity (veh/h)	1204			1360			266	278	825	244	278	680
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total	219	124	364	90	3							
Volume Left	3	124	0	11	2							
Volume Right	3	0	4	79	0							
cSH	1204	1360	1700	940	254							
Volume to Capacity	0.00	0.09	0.21	0.10	0.01							
Queue Length 95th (m)	0.1	2.4	0.0	2.5	0.3							
Control Delay (s)	0.1	7.9	0.0	11.0	19.3							
Lane LOS	A	A		B	C							
Approach Delay (s)	0.1	2.0		11.0	19.3							
Approach LOS				B	C							
Intersection Summary												
Average Delay				2.6								
Intersection Capacity Utilization	42.6%			ICU Level of Service	A							
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
2: Carlow Road & Bridge Street

2026 Total PM
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	57	222	6	18	340	35	3	7	54	20	9	82
Future Volume (Veh/h)	57	222	6	18	340	35	3	7	54	20	9	82
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	69	267	7	22	410	42	4	8	65	24	11	99
Pedestrians										7	1	
Lane Width (m)										3.6	3.6	
Walking Speed (m/s)										1.2	1.2	
Percent Blockage										1	0	
Right turn flare (veh)												
Median type	None			None								
Median storage veh)												
Upstream signal (m)										320		
pX, platoon unblocked												
vC, conflicting volume	453			281			995	912	278	954	895	432
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	453			281			995	912	278	954	895	432
tC, single (s)	4.1			4.2			7.1	6.6	6.2	7.1	6.6	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.1	3.3	3.5	4.1	3.3
p0 queue free %	94			98			98	97	91	88	96	84
cM capacity (veh/h)	1101			1252			170	243	757	197	248	621
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	343	474	77	134								
Volume Left	69	22	4	24								
Volume Right	7	42	65	99								
cSH	1101	1252	541	411								
Volume to Capacity	0.06	0.02	0.14	0.33								
Queue Length 95th (m)	1.6	0.4	3.9	11.1								
Control Delay (s)	2.2	0.5	12.8	17.9								
Lane LOS	A	A	B	C								
Approach Delay (s)	2.2	0.5	12.8	17.9								
Approach LOS			B	C								
Intersection Summary												
Average Delay				4.3								
Intersection Capacity Utilization	55.1%			ICU Level of Service	B							
Analysis Period (min)	15											

Queues
3: Main Street/Colborne Street & Bridge Street/Joseph Street

2026 Total PM
George Street TIS

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	215	129	10	154	57	20	51	300
v/c Ratio	0.57	0.34	0.03	0.46	0.10	0.04	0.09	0.42
Control Delay	28.5	21.2	21.7	25.9	16.1	0.1	16.1	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.5	21.2	21.7	25.9	16.1	0.1	16.1	4.7
Queue Length 50th (m)	22.5	11.4	1.0	14.8	4.3	0.0	3.9	0.0
Queue Length 95th (m)	41.9	24.7	4.5	31.2	13.0	0.0	11.9	14.0
Internal Link Dist (m)	88.9		133.7	266.2		469.2		
Turn Bay Length (m)	30.0		5.0		15.0		25.0	
Base Capacity (vph)	1127	1113	1150	1122	582	563	568	710
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	0.12	0.01	0.14	0.10	0.04	0.09	0.42

Intersection Summary

HCM Signalized Intersection Capacity Analysis
3: Main Street/Colborne Street & Bridge Street/Joseph Street

2026 Total PM
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↓	↑	↑	↓	↑	↑	↓	↑	↑	↓	↑
Traffic Volume (vph)	185	88	23	9	103	29	19	30	17	20	24	258
Future Volume (vph)	185	88	23	9	103	29	19	30	17	20	24	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.2	5.2	5.2	5.2					5.5	5.5	5.5	5.5
Lane Util. Factor	1.00	1.00	1.00	1.00					1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	0.99	1.00	0.99					1.00	0.96	1.00	0.96
Flpb, ped/bikes	1.00	1.00	1.00	1.00					0.99	1.00	0.99	1.00
Fr	1.00	0.97	1.00	0.97					1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00					0.98	1.00	0.98	1.00
Satd. Flow (prot)	1770	1744		1805	1757			1851	1543		1839	1522
Flt Permitted	0.95	1.00	0.95	1.00					0.91	1.00	0.89	1.00
Satd. Flow (perm)	1770	1744		1805	1757			1710	1543		1673	1522
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	215	102	27	10	120	34	22	35	20	23	28	300
RTOR Reduction (vph)	0	10	0	0	11	0	0	0	13	0	0	197
Lane Group Flow (vph)	215	119	0	10	143	0	0	57	7	0	51	103
Confli. Peds. (#/hr)	3		9	9		3	13		17	17		13
Heavy Vehicles (%)	2%	6%	0%	0%	4%	4%	0%	0%	0%	0%	0%	2%
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	4	4		8	8			2		2	6	6
Permitted Phases												
Actuated Green, G (s)	13.1	13.1		11.4	11.4			21.1	21.1		21.1	21.1
Effective Green, g (s)	13.1	13.1		11.4	11.4			21.1	21.1		21.1	21.1
Actuated g/C Ratio	0.21	0.21		0.19	0.19			0.34	0.34		0.34	0.34
Clearance Time (s)	5.2	5.2		5.2	5.2			5.5	5.5		5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	377	371		334	325			586	529		573	522
v/s Ratio Prot	c0.12	0.07		0.01	c0.08							
v/s Ratio Perm								0.03	0.00		0.03	c0.07
v/c Ratio	0.57	0.32		0.03	0.44			0.10	0.01		0.09	0.20
Uniform Delay, d1	21.7	20.4		20.5	22.2			13.7	13.3		13.7	14.2
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	2.1	0.5		0.0	1.0			0.3	0.0		0.3	0.8
Delay (s)	23.8	20.9		20.6	23.2			14.1	13.4		14.0	15.1
Level of Service	C	C		C	C			B	B		B	B
Approach Delay (s)					23.0			13.9			14.9	
Approach LOS					C			B			B	

Intersection Summary

HCM 2000 Control Delay	19.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	61.5	Sum of lost time (s)	15.9
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
4: George Street & Street "A"

2026 Total PM
George Street TIS

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↑	→	←	↙	↘	↔
Traffic Volume (veh/h)	0	63	107	116	69	0
Future Volume (Veh/h)	0	63	107	116	69	0
Sign Control	Free	Free		Stop		
Grade	0%	0%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	68	116	126	75	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None	None				
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	242		247	179		
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	242		247	179		
tC, single (s)	4.1		6.4	6.2		
tC, 2 stage (s)						
tF (s)	2.2		3.5	3.3		
p0 queue free %	100		90	100		
cM capacity (veh/h)	1324		741	864		
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	68	242	75			
Volume Left	0	0	75			
Volume Right	0	126	0			
cSH	1324	1700	741			
Volume to Capacity	0.00	0.14	0.10			
Queue Length 95th (m)	0.0	0.0	2.7			
Control Delay (s)	0.0	0.0	10.4			
Lane LOS		B				
Approach Delay (s)	0.0	0.0	10.4			
Approach LOS		B				
Intersection Summary						
Average Delay		2.0				
Intersection Capacity Utilization	23.2%		ICU Level of Service	A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
5: Boltville Place/Street "B" & George Street

2026 Total PM
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑	←	↙	↘	↑	←	↙	↑	→	↑
Traffic Volume (veh/h)	0	132	0	0	223	115	0	0	0	68	0	0
Future Volume (Veh/h)	0	132	0	0	223	115	0	0	0	68	0	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	143	0	0	242	125	0	0	0	74	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None					None					
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	367		143				448	510	143	448	448	304
vC1, stage 1 conf vol												
vC2, stage 2 conf vol							448	510	143	448	448	304
vCu, unblocked vol	367		143				7.1	6.5	6.2	7.1	6.5	6.2
tC, single (s)	4.1		4.1									
tC, 2 stage (s)												
tF (s)	2.2		2.2				3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100		100				100	100	100	86	100	100
cM capacity (veh/h)	1192		1440				521	467	905	521	506	735
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	143	367	0	74								
Volume Left	0	0	0	74								
Volume Right	0	125	0	0								
cSH	1192	1440	1700	521								
Volume to Capacity	0.00	0.00	0.00	0.14								
Queue Length 95th (m)	0.0	0.0	0.0	3.9								
Control Delay (s)	0.0	0.0	0.0	13.0								
Lane LOS		A	B									
Approach Delay (s)	0.0	0.0	0.0	13.0								
Approach LOS		A	B									
Intersection Summary												
Average Delay			1.7									
Intersection Capacity Utilization	29.2%		ICU Level of Service	A								
Analysis Period (min)	15											

Appendix D

2026 Summer Total Traffic Operations Reports



HCM Unsignalized Intersection Capacity Analysis
1: William Street & George Street

2026 Summer AM Total
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Stop		Stop			Stop
Traffic Volume (vph)	0	303	6	46	103	4	0	2	59	0	0	0
Future Volume (vph)	0	303	6	46	103	4	0	2	59	0	0	0
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	0	384	8	58	130	5	0	3	75	0	0	0
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	392	58	135	3	75	0						
Volume Left (vph)	0	58	0	0	0	0						
Volume Right (vph)	8	0	5	0	75	0						
Hadj (s)	0.07	0.72	0.04	0.00	-0.57	0.00						
Departure Headway (s)	4.3	5.5	4.8	5.2	3.2	5.2						
Degree Utilization, x	0.47	0.09	0.18	0.00	0.07	0.00						
Capacity (veh/h)	834	642	736	621	1121	629						
Control Delay (s)	11.0	7.8	7.6	8.2	6.4	8.2						
Approach Delay (s)	11.0	7.7		6.5		0.0						
Approach LOS	B	A		A		A						
Intersection Summary												
Delay							9.5					
Level of Service							A					
Intersection Capacity Utilization	37.2%						ICU Level of Service					
Analysis Period (min)	15						A					

HCM Unsignalized Intersection Capacity Analysis
1: William Street & George Street

2026 Summer AM Total
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	303	6	46	103	4	0	2	59	0	0	0
Future Volume (Veh/h)	0	303	6	46	103	4	0	2	59	0	0	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	0	384	8	58	130	5	0	3	75	0	0	0
Pedestrians	2			3			1			4		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			0			0			0		
Right turn flare (veh)								1				
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	139			393			637	644	392	645	646	138
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	139			393			637	644	392	645	646	138
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			100	99	89	100	100	100
cM capacity (veh/h)	1452			1107			375	372	655	325	371	911
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total	392	58	135	78	0							
Volume Left	0	58	0	0	0							
Volume Right	8	0	5	75	0							
cSH	1452	1107	1700	681	1700							
Volume to Capacity	0.00	0.05	0.08	0.11	0.00							
Queue Length 95th (m)	0.0	1.3	0.0	3.1	0.0							
Control Delay (s)	0.0	8.4	0.0	11.3	0.0							
Lane LOS		A		B	A							
Approach Delay (s)	0.0	2.5		11.3	0.0							
Approach LOS			B	A								
Intersection Summary												
Average Delay		2.1										
Intersection Capacity Utilization	37.2%		ICU Level of Service		A							
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
2: Carlow Road & Bridge Street

2026 Summer AM Total
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	71	292	1	11	121	24	0	7	20	27	7	35
Future Volume (Veh/h)	71	292	1	11	121	24	0	7	20	27	7	35
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	86	352	1	13	146	29	0	8	24	33	8	42
Pedestrians										5	3	
Lane Width (m)										3.6	3.6	
Walking Speed (m/s)										1.2	1.2	
Percent Blockage										0	0	
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)								320				
pX, platoon unblocked												
vC, conflicting volume	178			358			762	734	358	742	720	164
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	178			358			762	734	358	742	720	164
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.4
p0 queue free %	94			99			100	98	97	89	98	95
cM capacity (veh/h)	1376			1148			283	320	688	297	326	869
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	439	188	32	83								
Volume Left	86	13	0	33								
Volume Right	1	29	24	42								
cSH	1376	1148	535	451								
Volume to Capacity	0.06	0.01	0.06	0.18								
Queue Length 95th (m)	1.6	0.3	1.5	5.3								
Control Delay (s)	2.0	0.7	12.2	14.8								
Lane LOS	A	A	B	B								
Approach Delay (s)	2.0	0.7	12.2	14.8								
Approach LOS		B	B									
Intersection Summary												
Average Delay		3.5										
Intersection Capacity Utilization	49.0%		ICU Level of Service		A							
Analysis Period (min)	15											

Queues
3: Main Street/Colborne Street & Bridge Street/Joseph Street

2026 Summer AM Total
George Street TIS

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	254	102	2	73	26	6	35	103
v/c Ratio	0.61	0.23	0.01	0.23	0.04	0.01	0.06	0.17
Control Delay	27.6	19.0	23.0	20.9	15.1	0.0	15.2	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.6	19.0	23.0	20.9	15.1	0.0	15.2	4.9
Queue Length 50th (m)	27.1	9.1	0.2	5.6	2.0	0.0	2.7	0.0
Queue Length 95th (m)	47.5	19.7	1.9	16.7	7.2	0.0	8.8	9.2
Internal Link Dist (m)	88.9		133.7	266.2		469.2		
Turn Bay Length (m)	30.0		5.0		15.0		25.0	
Base Capacity (vph)	1172	1252	1231	1162	608	626	614	592
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	0.08	0.00	0.06	0.04	0.01	0.06	0.17

Intersection Summary

HCM Signalized Intersection Capacity Analysis
3: Main Street/Colborne Street & Bridge Street/Joseph Street

2026 Summer AM Total
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↓	↑	↑	↓	↑	↑	↓	↑	↑	↓	↑
Traffic Volume (vph)	226	79	12	2	46	19	12	12	5	14	17	92
Future Volume (vph)	226	79	12	2	46	19	12	12	5	14	17	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.2	5.2		5.2	5.2				5.5	5.5		5.5
Lane Util. Factor	1.00	1.00		1.00	1.00				1.00	1.00		1.00
Frbp, ped/bikes	1.00	1.00		1.00	0.99				1.00	0.97		1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00				1.00	1.00		1.00
Fr	1.00	0.98		1.00	0.96				1.00	0.85		1.00
Flt Protected	0.95	1.00		0.95	1.00				0.98	1.00		1.00
Satd. Flow (prot)	1719	1833		1805	1697				1757	1569		1770
Flt Permitted	0.95	1.00		0.95	1.00				0.91	1.00		0.91
Satd. Flow (perm)	1719	1833		1805	1697				1633	1569		1648
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	254	89	13	2	52	21	13	13	6	16	19	103
RTOR Reduction (vph)	0	5	0	0	17	0	0	0	4	0	0	65
Lane Group Flow (vph)	254	97	0	2	56	0	0	26	2	0	35	38
Conf. Peds. (#/hr)	2		6	6	2	7		6	6		7	
Heavy Vehicles (%)	5%	0%	10%	0%	9%	0%	0%	10%	0%	10%	0%	10%
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	4	4		8	8			2		2	6	
Permitted Phases												6
Actuated Green, G (s)	14.2	14.2		7.6	7.6			21.9	21.9		21.9	21.9
Effective Green, g (s)	14.2	14.2		7.6	7.6			21.9	21.9		21.9	21.9
Actuated g/C Ratio	0.24	0.24		0.13	0.13			0.37	0.37		0.37	0.37
Clearance Time (s)	5.2	5.2		5.2	5.2			5.5	5.5		5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	409	436		230	216			600	576		605	523
v/s Ratio Prot	c0.15	0.05		0.00	c0.03							
v/s Ratio Perm									0.02	0.00		0.02 c0.03
v/c Ratio	0.62	0.22		0.01	0.26				0.04	0.00		0.06 0.07
Uniform Delay, d1	20.3	18.3		22.7	23.5			12.1	11.9		12.2	12.2
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	2.9	0.3		0.0	0.6			0.1	0.0		0.2	0.3
Delay (s)	23.2	18.5		22.7	24.1			12.3	12.0		12.4	12.5
Level of Service	C	B		C	C			B	B		B	B
Approach Delay (s)					24.1				12.2			12.5
Approach LOS					C				B			B

Intersection Summary

HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	59.6	Sum of lost time (s)	15.9
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
4: George Street & Street "A"

2026 Summer AM Total
George Street TIS

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	86	32	35	111	0
Future Volume (Veh/h)	0	86	32	35	111	0
Sign Control	Free	Free		Stop		
Grade	0%	0%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	93	35	38	121	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None	None				
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	73			147	54	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	73			147	54	
tC, single (s)	4.1			6.4	6.2	
tC, 2 stage (s)						
tF (s)	2.2			3.5	3.3	
p0 queue free %	100			86	100	
cM capacity (veh/h)	1527			845	1013	
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	93	73	121			
Volume Left	0	0	121			
Volume Right	0	38	0			
cSH	1527	1700	845			
Volume to Capacity	0.00	0.04	0.14			
Queue Length 95th (m)	0.0	0.0	4.0			
Control Delay (s)	0.0	0.0	10.0			
Lane LOS		A				
Approach Delay (s)	0.0	0.0	10.0			
Approach LOS		A				
Intersection Summary						
Average Delay		4.2				
Intersection Capacity Utilization	17.3%		ICU Level of Service	A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
5: Boltville Place/Street "B" & George Street

2026 Summer AM Total
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	197	0	0	67	36	0	0	0	112	0	0
Future Volume (Veh/h)	0	197	0	0	67	36	0	0	0	112	0	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	214	0	0	73	39	0	0	0	122	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	112			214			306	326	214	306	306	92
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	112			214			306	326	214	306	306	92
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	81	100	100
cM capacity (veh/h)	1478			1356			646	592	826	646	607	965
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	214	112	0	122								
Volume Left	0	0	0	122								
Volume Right	0	39	0	0								
cSH	1478	1356	1700	646								
Volume to Capacity	0.00	0.00	0.00	0.19								
Queue Length 95th (m)	0.0	0.0	0.0	5.5								
Control Delay (s)	0.0	0.0	0.0	11.9								
Lane LOS		A	B									
Approach Delay (s)	0.0	0.0	0.0	11.9								
Approach LOS		A	B									
Intersection Summary												
Average Delay		3.2										
Intersection Capacity Utilization	23.2%		ICU Level of Service	A								
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
1: William Street & George Street

2026 Summer Total PM
George Street TIS

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	4	206	4	136	347	5	12	0	86	2	1	0
Future Volume (vph)	4	206	4	136	347	5	12	0	86	2	1	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	4	226	4	149	381	5	13	0	95	2	1	0
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1						
Volume Total (vph)	234	149	386	13	95	3						
Volume Left (vph)	4	149	0	13	0	2						
Volume Right (vph)	4	0	5	0	95	0						
Hadj (s)	0.06	0.52	0.01	0.23	-0.57	0.13						
Departure Headway (s)	4.6	5.2	4.7	5.7	3.2	5.7						
Degree Utilization, x	0.30	0.22	0.51	0.02	0.08	0.00						
Capacity (veh/h)	771	676	754	564	1121	569						
Control Delay (s)	9.6	8.5	11.3	8.9	6.5	8.7						
Approach Delay (s)	9.6	10.5		6.8		8.7						
Approach LOS	A	B		A		A						
Intersection Summary												
Delay												9.8
Level of Service												A
Intersection Capacity Utilization	44.5%											ICU Level of Service
Analysis Period (min)	15											A

HCM Unsignalized Intersection Capacity Analysis
1: William Street & George Street

2026 Summer Total PM
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	206	4	136	347	5	12	0	86	2	1	0
Future Volume (Veh/h)	4	206	4	136	347	5	12	0	86	2	1	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	4	226	4	149	381	5	13	0	95	2	1	0
Pedestrians		4								1		
Lane Width (m)		3.6								3.6		
Walking Speed (m/s)		1.2								1.2		
Percent Blockage		0								0		
Right turn flare (veh)								1				
Median type	None			None								
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	387			230			920	921	228	918	920	388
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	387			230			920	921	228	918	920	388
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			89			94	100	88	99	100	100
cM capacity (veh/h)	1182			1344			228	241	811	205	241	661
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total	234	149	386	108	3							
Volume Left	4	149	0	13	2							
Volume Right	4	0	5	95	0							
cSH	1182	1344	1700	922	216							
Volume to Capacity	0.00	0.11	0.23	0.12	0.01							
Queue Length 95th (m)	0.1	3.0	0.0	3.2	0.3							
Control Delay (s)	0.2	8.0	0.0	11.4	21.9							
Lane LOS	A	A		B	C							
Approach Delay (s)	0.2	2.2		11.4	21.9							
Approach LOS				B	C							
Intersection Summary												
Average Delay		2.9										
Intersection Capacity Utilization	44.5%		ICU Level of Service		A							
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
2: Carlow Road & Bridge Street

2026 Summer Total PM
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	63	245	7	21	371	42	4	9	65	24	11	90
Future Volume (Veh/h)	63	245	7	21	371	42	4	9	65	24	11	90
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	76	295	8	25	447	51	5	11	78	29	13	108
Pedestrians									7		1	
Lane Width (m)									3.6		3.6	
Walking Speed (m/s)									1.2		1.2	
Percent Blockage									1		0	
Right turn flare (veh)												
Median type	None			None								
Median storage veh)												
Upstream signal (m)								320				
pX, platoon unblocked												
vC, conflicting volume	499			310			1095	1007	306	1058	986	474
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	499			310			1095	1007	306	1058	986	474
tC, single (s)	4.1			4.2			7.1	6.6	6.2	7.1	6.6	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.1	3.3	3.5	4.1	3.3
p0 queue free %	93			98			96	95	89	82	94	82
cM capacity (veh/h)	1059			1221			138	211	730	159	216	588
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	379	523	94	150								
Volume Left	76	25	5	29								
Volume Right	8	51	78	108								
cSH	1059	1221	481	352								
Volume to Capacity	0.07	0.02	0.20	0.43								
Queue Length 95th (m)	1.9	0.5	5.7	16.5								
Control Delay (s)	2.3	0.6	14.3	22.6								
Lane LOS	A	A	B	C								
Approach Delay (s)	2.3	0.6	14.3	22.6								
Approach LOS			B	C								
Intersection Summary												
Average Delay		5.2										
Intersection Capacity Utilization	58.9%		ICU Level of Service		B							
Analysis Period (min)	15											

Queues
3: Main Street/Colborne Street & Bridge Street/Joseph Street

2026 Summer Total PM
George Street TIS

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	241	146	13	171	68	23	62	330
v/c Ratio	0.61	0.37	0.04	0.50	0.12	0.04	0.11	0.46
Control Delay	29.6	21.9	22.2	27.0	17.5	0.1	17.5	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.6	21.9	22.2	27.0	17.5	0.1	17.5	5.0
Queue Length 50th (m)	26.1	13.5	1.3	17.0	5.5	0.0	5.0	0.0
Queue Length 95th (m)	47.6	28.1	5.5	35.0	15.7	0.0	14.7	15.1
Internal Link Dist (m)	88.9		133.7	266.2		469.2		
Turn Bay Length (m)	30.0		5.0		15.0		25.0	
Base Capacity (vph)	1100	1085	1122	1093	563	551	548	720
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	0.13	0.01	0.16	0.12	0.04	0.11	0.46

Intersection Summary

HCM Signalized Intersection Capacity Analysis
3: Main Street/Colborne Street & Bridge Street/Joseph Street

2026 Summer Total PM
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↓	↑	↑	↓	↑	↑	↓	↑	↑	↓	↑
Traffic Volume (vph)	207	99	27	11	112	35	22	36	20	24	29	284
Future Volume (vph)	207	99	27	11	112	35	22	36	20	24	29	284
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.2	5.2	5.2	5.2					5.5	5.5	5.5	5.5
Lane Util. Factor	1.00	1.00	1.00	1.00					1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	0.99	1.00	0.99					1.00	0.95	1.00	0.96
Flpb, ped/bikes	1.00	1.00	1.00	1.00					0.99	1.00	0.99	1.00
Fr	1.00	0.97	1.00	0.96					1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00					0.98	1.00	0.98	1.00
Satd. Flow (prot)	1770	1744		1805	1751				1852	1542	1839	1521
Flt Permitted	0.95	1.00	0.95	1.00					0.90	1.00	0.88	1.00
Satd. Flow (perm)	1770	1744		1805	1751				1695	1542	1652	1521
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	241	115	31	13	130	41	26	42	23	28	34	330
RTOR Reduction (vph)	0	10	0	0	12	0	0	0	15	0	0	219
Lane Group Flow (vph)	241	136	0	13	159	0	0	68	8	0	62	111
Confli. Peds. (#/hr)	3		9	9	3	13		17	17		13	
Heavy Vehicles (%)	2%	6%	0%	0%	4%	4%	0%	0%	0%	0%	0%	2%
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	4	4		8	8			2		2	6	6
Permitted Phases												
Actuated Green, G (s)	14.1	14.1		12.0	12.0				21.2	21.2	21.2	21.2
Effective Green, g (s)	14.1	14.1		12.0	12.0				21.2	21.2	21.2	21.2
Actuated g/C Ratio	0.22	0.22		0.19	0.19				0.34	0.34	0.34	0.34
Clearance Time (s)	5.2	5.2		5.2	5.2				5.5	5.5	5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0				3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	394	389		342	332				568	517	554	510
v/s Ratio Prot	c0.14	0.08		0.01	c0.09							
v/s Ratio Perm									0.04	0.01	0.04	c0.07
v/c Ratio	0.61	0.35		0.04	0.48				0.12	0.01	0.11	0.22
Uniform Delay, d1	22.1	20.7		20.9	22.8				14.5	14.0	14.5	15.1
Progression Factor	1.00	1.00		1.00	1.00				1.00	1.00	1.00	1.00
Incremental Delay, d2	2.8	0.5		0.0	1.1				0.4	0.1	0.4	1.0
Delay (s)	24.9	21.2		20.9	23.9				15.0	14.1	14.9	16.0
Level of Service	C	C		C	C				B	B	B	B
Approach Delay (s)									23.7	14.7		15.9
Approach LOS	C			C					B		B	

Intersection Summary

HCM 2000 Control Delay	19.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	63.2	Sum of lost time (s)	15.9
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
4: George Street & Street "A"

2026 Summer Total PM
George Street TIS

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	76	129	116	69	0
Future Volume (Veh/h)	0	76	129	116	69	0
Sign Control	Free	Free		Stop		
Grade	0%	0%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	83	140	126	75	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None	None				
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	266		286	203		
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	266		286	203		
tC, single (s)	4.1		6.4	6.2		
tC, 2 stage (s)						
tF (s)	2.2		3.5	3.3		
p0 queue free %	100		89	100		
cM capacity (veh/h)	1298		704	838		
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	83	266	75			
Volume Left	0	0	75			
Volume Right	0	126	0			
cSH	1298	1700	704			
Volume to Capacity	0.00	0.16	0.11			
Queue Length 95th (m)	0.0	0.0	2.8			
Control Delay (s)	0.0	0.0	10.7			
Lane LOS		B				
Approach Delay (s)	0.0	0.0	10.7			
Approach LOS		B				
Intersection Summary						
Average Delay		1.9				
Intersection Capacity Utilization	24.4%		ICU Level of Service	A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
5: Boltville Place/Street "B" & George Street

2026 Summer Total PM
George Street TIS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	145	0	0	245	115	0	0	0	68	0	0
Future Volume (Veh/h)	0	145	0	0	245	115	0	0	0	68	0	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	158	0	0	266	125	0	0	0	74	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	391		158				486	549	158	486	486	328
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	391		158				486	549	158	486	486	328
tC, single (s)	4.1		4.1				7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2		2.2				3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100		100				100	100	100	85	100	100
cM capacity (veh/h)	1168		1422				491	443	887	491	481	713
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	158	391	0	74								
Volume Left	0	0	0	74								
Volume Right	0	125	0	0								
cSH	1168	1422	1700	491								
Volume to Capacity	0.00	0.00	0.00	0.15								
Queue Length 95th (m)	0.0	0.0	0.0	4.2								
Control Delay (s)	0.0	0.0	0.0	13.6								
Lane LOS		A	B									
Approach Delay (s)	0.0	0.0	0.0	13.6								
Approach LOS		A	B									
Intersection Summary												
Average Delay			1.6									
Intersection Capacity Utilization			30.3%									
Analysis Period (min)			15									