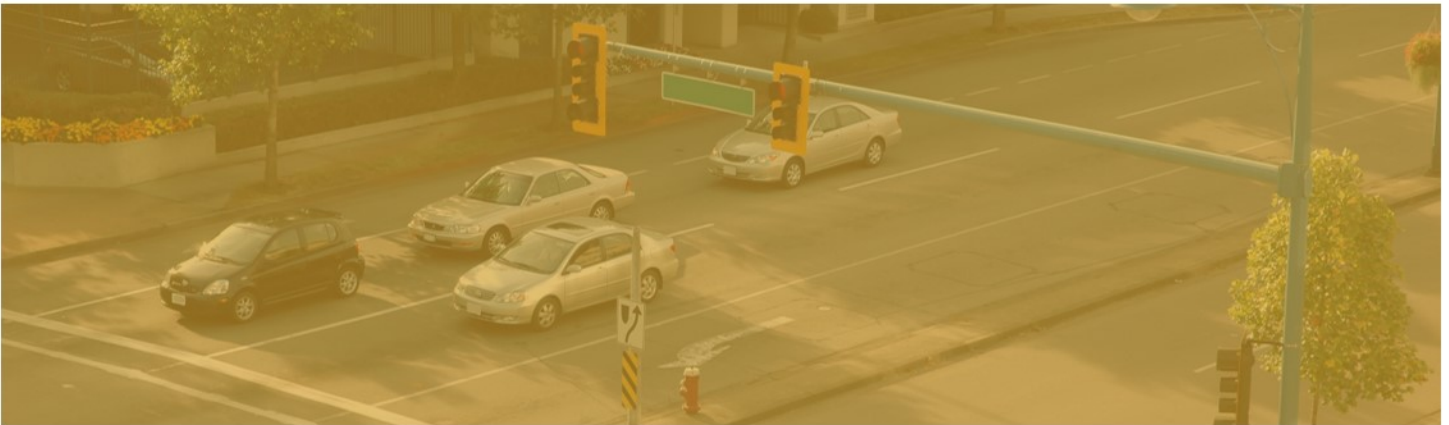




Enhancing our communities



150 & 160 King Street East, Thornbury

TRAFFIC IMPACT STUDY

2706499 Ontario Ltd. & Thornbury Hills Inc.

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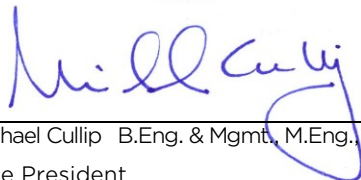
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Issue	Date	Description
1	June 13, 2022	Final Report

Document Contents

1	Introduction	1
1.1	Study Purpose	1
1.2	Study Structure.....	1
2	Existing Conditions.....	2
2.1	Road Network	2
2.2	Traffic Volumes.....	3
2.3	Traffic Operations.....	3
3	Future Background Conditions.....	5
3.1	Road Network	5
3.2	Traffic Volumes.....	5
3.3	Traffic Operations.....	7
4	Proposed Development	11
4.1	Site Location	11
4.2	Proposed Land Use.....	11
4.3	Site Parking	11
4.4	Site Access.....	13
4.5	On-Site Circulation	14
4.6	Site Traffic.....	14
5	Future Total Conditions.....	18
5.1	Traffic Volumes.....	18
5.2	Traffic Operations.....	18
5.3	Turn Lane Requirements	22
5.4	Sight Line Assessment.....	23
6	Summary.....	25



Tables

Table 1: Intersection Operations – 2022 Conditions	4
Table 2: Intersection Operations – 2026 Background Conditions	8
Table 3: Intersection Operations – 2031 Background Conditions	8
Table 4: Intersection Operations – 2036 Background Conditions	9
Table 5: Intersection Operations - King Street East & Elgin Street (with signals)	10
Table 6: Parking Supply - 150 King Street East	12
Table 7: Parking Supply – 160 King Street East	12
Table 8: Trip Rates	15
Table 9: Trip Generation	15
Table 10: Trip Types.....	16
Table 11: Intersection Operations – 2026 Total Conditions.....	19
Table 12: Intersection Operations – 2031 Total Conditions.....	20
Table 13: Intersection Operations – 2036 Total Conditions.....	21
Table 14: Sight Distance Requirements.....	23
Table 15: Sight Distance Availability	23

Figures

Figure 1: Site Location	27
Figure 2: Area Road Network	28
Figure 3: 2022 Traffic	30
Figure 4: Background Development Locations.....	31
Figure 5: Background Development Traffic – Manorwood.....	32
Figure 6: Background Development Traffic – Thornbury Village Cider & Brew House	33
Figure 7: Background Development Traffic – Thornbury Gateway.....	34
Figure 8: 2026 Background Traffic	35
Figure 9: 2031 Background Traffic	36
Figure 10: 2036 Background Traffic	37
Figure 11: Site Plan	38
Figure 12: Site-Generated Traffic – New	39
Figure 13: Site-Generated Traffic – Pass-by.....	40
Figure 14: Site-Generated Traffic – Total	41
Figure 15: 2026 Total Traffic.....	42
Figure 16: 2031 Total Traffic.....	43
Figure 17: 2036 Total Traffic.....	44
Figure 18: Sight Lines.....	45



Appendices

Appendix A: Traffic Counts

Appendix B: LOS Definitions

Appendix C: Existing Operations

Appendix D: Background Operations

Appendix E: ITE Land-Use Definitions

Appendix F: Total Operations



1 Introduction

Tatham Engineering Limited was retained by 2706499 Ontario Ltd. and Thornbury Hills Inc. to address the traffic impacts associated with the proposed multi-use development to be located at 150 and 160 King Street East within the community of Thornbury, Town of The Blue Mountains. The location of the development site is illustrated in Figure 1.

1.1 STUDY PURPOSE

The purpose of this study is to address the requirements of the Town of The Blue Mountains with respect to the potential transportation impacts of the development on the local road network. In particular, the following will be discussed:

- the operations of the road system through the study area prior to the proposed development;
- the growth in the traffic volumes not otherwise attributed to the development (i.e. from overall growth in the area and/or other developments);
- the number of new trips the proposed development is likely to generate;
- the operations of the study area road system upon completion of the development; and
- the resulting impacts and need for mitigating measures (if required) to ensure acceptable overall road operations.

1.2 STUDY STRUCTURE

The report is structured as follows:

- Chapter 1: introduction and study purpose;
- Chapter 2: existing conditions, detailing the road system and corresponding traffic operations;
- Chapter 3: future conditions, prior to the completion of the proposed development (referred to as future background conditions), and the expected growth in traffic levels and the resulting operating conditions;
- Chapter 4: proposed development and associated details including land use, access, traffic volumes and parking;
- Chapter 5: future conditions, with completion of the proposed development (referred to as future total conditions); and
- Chapter 6: summary of the report and key findings.



2 Existing Conditions

This chapter will describe the road network, traffic volumes, and operations for the existing conditions.

2.1 ROAD NETWORK

The road network to be addressed by this study consists of King Street East, Elgin Street and the intersections of King Street East with Elgin Street and Wellington Street South. Aerial imagery of the study area and photographs of the road network are provided in Figure 2.

2.1.1 Road Sections

King Street East

King Street East (Highway 26) is part of the provincial highway system; however, through the community of Thornbury the road falls under the jurisdiction of the Town as part of the MTO Connecting Links program. The road is oriented southeast-northwest (referenced hereafter as east-west) through the study area and has a 2-lane semi-urban cross-section, providing one lane of travel per direction with paved shoulders, curb and gutter on the south side and a gravel shoulder with open ditches on the north side. King Street East has a posted speed limit of 50km/h, thus a design speed of 60km/h has been assumed (posted speed limit + 10km/h for lower-speed roads). While a highway typically has a capacity of 900 to 1100 vehicles per hour per lane (vphpl), a reduced capacity of 700 vphpl is assumed in consideration of its location within a built-up area and the number of intersecting driveways and intersections that introduce friction to the traffic operations and hence reduce capacity.

Elgin Street

Elgin Street is a local road oriented northeast-southwest (referenced as north-south) through the study area. The road has a 2-lane rural cross-section (grass/gravel shoulders and open ditches) providing one lane of travel per direction. There is a sidewalk on the west side of the Elgin Street, north of its intersection with King Street East, extending from King Street East to Bay Street East. The road has a speed limit of 50km/h, thus a design speed of 60km/h has been assumed. As a local road, Elgin Street has an assumed planning capacity of 400 vphpl.



2.1.2 Key Intersections

King Street East & Elgin Street

The intersection of King Street East with Elgin Street is a 4-leg, unsignalized intersection with stop control on Elgin Street. Each approach consists of a single shared left-through-right turn lane.

King Street East & Wellington Street South

The intersection of King Street East with Wellington Street South is a 3-leg unsignalized T-intersection with stop control on Wellington Street South. The east approach (King Street East) consists of a single shared left-through lane, whereas the west approach consists of a shared through-right turn lane. The south approach (Wellington Street South) consists of a single shared left-right turn lane.

2.2 TRAFFIC VOLUMES

To determine existing traffic volumes, traffic counts were conducted at the intersection of King Street East with Elgin Street on June 2, 2022, from 07:00 to 10:00 and 15:00 to 18:00. Detailed count sheets are provided in Appendix A.

Traffic volumes for the intersection of King Street East with Wellington Street South were estimated based on the traffic volumes and patterns observed at the Elgin Street. Given the limited level of development served by Wellington Street South and recognizing its limited reach (a small residential subdivision which is also connected to Elgin Street via the local road network), turning volumes at its intersection with King Street East were assumed to be 50% of the volumes observed on Elgin Street, south of King Street East. The through volumes on King Street East as observed at Elgin Street were carried through the intersection with Wellington Street South.

The 2022 volumes are illustrated in Figure 3.

2.3 TRAFFIC OPERATIONS

The assessment of existing conditions provides the baseline from which the future traffic operations (both with and without the subject development) can be assessed from. The capacity, and hence operations, of a road system is effectively governed by its intersections. The analysis is based on the 2022 traffic volumes, the existing intersection configuration and control, and procedures outlined in the *2000 Highway Capacity Manual*¹ (using Synchro v.11 software). For unsignalized intersections, the analysis considers:

¹ *Highway Capacity Manual*. Transportation Research Board, Washington DC, 2000.



- the average delay (measured in seconds);
- level of service (LOS); and
- volume to capacity (v/c) for each critical movement, namely those operating under stop control

With respect to the noted metrics:

- level of service 'A' corresponds to the best operating condition with minimal delays whereas level of service 'F' corresponds to poor operations resulting from high intersection delays (additional details regarding Level of Service definitions are provided in Appendix B); and
- a v/c ratio of less than 1.0 indicates the intersection movement/approach is operating at less than capacity while v/c of 1.0 indicates capacity has been reached.

A summary of the analysis is provided in Table 1 with detailed worksheets available in Appendix C.

Table 1: Intersection Operations – 2022 Conditions

INTERSECTION, MOVEMENTS & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
King Street East & Elgin Street	EB L	free	1	A	0.02	1	A	0.02
	WB L	free	1	A	0.03	1	A	0.01
	NB LTR	stop	24	C	0.22	45	E	0.33
	SB LTR	stop	24	C	0.13	33	D	0.51
King Street East & Wellington Street South	WB L	free	1	A	0.01	1	A	0.01
	NB LR	stop	21	C	0.09	24	C	0.11

L: left T: thru R: right LT: left-thru TR: thru-right LTR: left-thru-right LR: left-right

As indicated, the key intersections currently provide good operations (LOS C or better) with minimal delays during the weekday AM peak hour, and acceptable operations (LOS E or better) with average delays during the weekday PM peak hour. All movements are operating well below capacity (i.e. v/c < 1.0). Therefore, no improvements are required to accommodate the existing conditions.



3 Future Background Conditions

This chapter will describe the road network and background traffic volumes expected for the years 2026, 2031, and 2036. The 2026 horizon has been adopted to reflect full build-out of the subject development, whereas the 2031 and 2036 horizons will address longer-term impacts of the (5 and 10 years beyond build-out).

3.1 ROAD NETWORK

No road or intersection improvements are currently proposed by MTO or the Town of The Blue Mountains within the study area road network. While there have been several studies completed with respect to improvements to Highway 26 (i.e. widening), there are no imminent plans for the study area roads. Therefore, the existing configuration has been maintained under future background conditions.

3.2 TRAFFIC VOLUMES

Background traffic volumes expected for the 2026, 2031 and 2036 horizon years have been determined based on the existing traffic volumes, historical and projected growth, and consideration for other development specific traffic volumes.

3.2.1 Background Growth

Historic & Future Population Growth

Based on census data from 2016 and 2021, the population of Thornbury increased from 2,363 persons in 2011 to 2,873 persons in 2016 and to 3,474 persons in 2021. This translates to fairly consistent growth of approximately 4% growth per annum from 2011 to 2021. Over the same period, the population of the Town of The Blue Mountains increased from 6,453 person in 2011 to 7,025 persons in 2016 and to 9,390 persons in 2021. This translates to a growth rate of approximately 1.7% per annum between 2011 and 2016 and 6% per annum between 2016 and 2021, or approximately 3.8% averaged between 2011 and 2021.

The *County of Grey Official Plan*², the 2038 forecast population for the Town of The Blue Mountains is 9,100. This translates to an annual growth rate of 1.3% when considering the 2016 census population of 7,025 persons. As noted above, the 2021 census data indicates that the Town's population has already surpassed the 2038 forecast population.

² *County of Grey Official Plan*. County of Grey. June 7, 2019.



As per the Town's *Development Charges Background Study*³, the Town is expected to see an overall growth of 3.5% per annum between 2019 and 2028. Most of this growth is to be concentrated in the Craighleith area (approximately 70% of all growth), with only a minimal amount of growth (approximately 4% of all growth) expected for the Thornbury area.

Historic Traffic Growth

The Annual Average Daily Traffic (AADT) volumes along Highway 26 immediately east of Thornbury (as published by MTO) indicate an annual growth of approximately 0.7% between 2011 and 2016 (the 2016 data is the most recent published data available).

Background Growth Rate

In consideration of the historic and projected growth in the area, a background growth rate of 2.0% has been applied to volumes along King Street East. For the remaining roads within the network (Wellington Street and Elgin Street), a background growth rate of 0.5% has been applied, recognizing that they are local roads not subject to considerable year-over-year growth.

3.2.2 Background Developments

Three other developments were identified within the study area which will contribute traffic volumes to the study area road network. The location of each development in relation to the subject site is illustrated in Figure 4

Additional development details are provided below.

Manorwood

The Manorwood development is a 42-unit townhouse development to be located on Huron Street, west of Elgin Street. The site is assumed to be fully built out by the 2026 horizon. Trip generation and assignment to the network is based on that contained within the *Applewood Development - Requirement for a Traffic Impact Study*⁴ letter. Upon full build-out, the site is expected to generate 22 trips during the weekday AM peak hour, and 27 trips during the weekday PM peak hour. Trip distribution through the study area network is illustrated in Figure 5 and is representative of full build-out volumes.

Thornbury Village Cider & Brew House

The Thornbury Village Cider & Brew House is planning an expansion to the brewery located at 90 King Street East. The proposed development consists of a 440 m² (4,763 ft²) addition to the

³ *Development Charges Background Study*. Hemson Consulting. June 12, 2019.

⁴ *Applewood Development - Requirement for a Traffic Impact Study*. Tatham Engineering. May 10, 2021.



existing building on the site. The expansion is assumed to be fully built out by the 2026 horizon. Trip generation and assignment to the network is based on that contained within the *171 King Street East Traffic Impact Study*⁵. Fully built out, the expansion is expected to generate an additional 10 trips during the weekday AM peak hour and 34 trips during the weekday PM peak hour. Trip distribution through the study area network is illustrated in Figure 6.

Thornbury Gateway

The Thornbury Gateway is a mixed-use development proposed for the former site of the Thornbury Foodland grocery store at 171 King Street East. The proposed development is to consist of a 118-unit affordable housing apartment building with 2,648 m² (28,500 ft²) of ground floor commercial/office space. The site is assumed to be fully built out by the 2026 horizon. Trip generation and assignment to the road network is based on that contained within the *171 King Street East Traffic Impact Study*. Upon full build-out, the site is expected to generate 98 trips during the weekday AM peak hour and 118 trips during the weekday PM peak hour. Trip distribution through the study area network is illustrated in Figure 7.

3.2.3 Background Traffic Volumes

The resulting 2026, 2031, and 2036 background traffic volumes are illustrated in Figure 8 through Figure 10. The background volumes are based on the 2022 traffic volumes, adjusted to reflect the noted background growth rate and additional volumes generated by the noted background developments.

3.3 TRAFFIC OPERATIONS

The key intersections were again analyzed for each horizon year under the projected background volumes. Results of the operational analyses are summarized in Table 2 through Table 4 with detailed worksheets provided in Appendix D.

As indicated, operations at the intersection of King Street East with Elgin Street begin to experience poor operations (LOS F) in 2026 during the PM peak hour, with operations further deteriorating through the 2036 horizon, at which point poor operations are also experienced during the AM peak hour. The intersection of King Street East and Wellington Street will provide acceptable operations (LOS E or better) through the 2036 horizon; although it is noted that the delays are nearing the LOS F threshold during the PM peak hour (LOS F $\geq$ 50 seconds).

⁵ *171 King Street East Traffic Impact Study*. Tatham Engineering. January 20, 2021.



Table 2: Intersection Operations – 2026 Background Conditions

INTERSECTION, MOVEMENTS & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
King Street East & Elgin Street	EB L	free	1	A	0.02	2	A	0.04
	WB L	free	1	A	0.03	1	A	0.01
	NB LTR	stop	33	D	0.29	87	F	0.52
	SB LTR	stop	39	E	0.35	88	F	0.86
King Street East & Wellington Street South	WB L	free	1	A	0.02	1	A	0.01
	NB LR	stop	26	D	0.11	33	D	0.15

Table 3: Intersection Operations – 2031 Background Conditions

INTERSECTION, MOVEMENTS & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
King Street East & Elgin Street	EB L	free	1	A	0.02	2	A	0.04
	WB L	free	1	A	0.03	1	A	0.02
	NB LTR	stop	42	E	0.37	142	F	0.70
	SB LTR	stop	51	F	0.42	150	F	1.05
King Street East & Wellington Street South	WB L	free	1	A	0.02	1	A	0.01
	NB LR	stop	30	D	0.13	40	E	0.18



Table 4: Intersection Operations – 2036 Background Conditions

INTERSECTION, MOVEMENTS & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
King Street East & Elgin Street	EB L	free	1	A	0.03	2	A	0.05
	WB L	free	1	A	0.03	1	A	0.02
	NB LTR	stop	58	F	0.46	238	F	0.93
	SB LTR	stop	72	F	0.54	271	F	1.34
King Street East & Wellington Street South	WB L	free	1	A	0.02	1	A	0.01
	NB LR	stop	38	E	0.18	49	E	0.24

Traffic signal warrants based on Ontario Traffic Manual (OTM) criteria were reviewed under the 2036 background conditions to determine if traffic signals at the intersection of King Street East with Elgin Street are warranted based on the projected volumes. Based on the OTM criteria, traffic signals are not warranted; however, they are nonetheless recommended from an operational perspective due to the long delays present on Elgin Street.

The operations of the intersection of King Street East with Elgin Street were re-assessed to consider the implementation of traffic signals. Given that the operations begin experiencing poor conditions in 2026, the implementation of traffic signals by 2026 has been considered. Aside from signalization, the existing lane configurations for each approach have been maintained. Results of the re-assessment are summarized in Table 5 with detailed worksheets available in Appendix D.

As indicated, with the implementation of traffic signals the intersection of King Street East with Elgin Street will provide good operations (LOS C or better) through the 2036 horizon year under background conditions. In consideration of this, it is recommended that traffic signals be installed at the intersection of King Street East with Elgin Street by the 2026 horizon to mitigate the operational concerns expected under the future background volumes.



Table 5: Intersection Operations - King Street East & Elgin Street (with signals)

HORIZON & MOVEMENTS		WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		Delay	LOS	v/c	Delay	LOS	v/c
2026	EB LTR	4	A	0.43	9	A	0.66
	WB LTR	5	A	0.49	7	A	0.53
	NB LTR	33	C	0.32	27	C	0.03
	SB LTR	34	C	0.40	30	C	0.36
	overall	7	A	0.48	10	A	0.62
2031	EB LTR	5	A	0.46	11	B	0.73
	WB LTR	5	A	0.54	7	A	0.58
	NB LTR	33	C	0.34	27	C	0.04
	SB LTR	34	C	0.40	30	C	0.36
	overall	7	A	0.53	11	B	0.67
2036	EB LTR	5	A	0.51	13	B	0.80
	WB LTR	6	A	0.59	8	A	0.63
	NB LTR	33	C	0.35	27	C	0.05
	SB LTR	34	C	0.42	30	C	0.37
	overall	8	A	0.57	13	A	0.73



4 Proposed Development

This chapter will provide additional details with respect to the proposed development, including its location, land-use, site access, trips generated by the development, and assignment of said trips to the adjacent road network.

4.1 SITE LOCATION

The subject site is located at 150 and 160 King Street East in the community of Thornbury, Town of The Blue Mountains (per Figure 1). The site is approximately 1.42 ha in size and is bounded by the Georgian Trail (an unpaved multi-use trail) to the north, King Street East to the south, a vacant lot to the east, and Elgin Street North to the west.

4.2 PROPOSED LAND USE

The proposed development will consist of the following:

150 King Street East

- two 3-storey mixed-use buildings each with 24 apartment units and 564 m² of ground floor commercial space

160 King Street East

- 69-unit hotel

A site plan is provided in Figure 11.

4.3 SITE PARKING

4.3.1 Standard Parking

Parking supply requirements based on the proposed land-uses and parking rates provided in *The Town of The Blue Mountains Comprehensive Zoning By-law*⁶ are summarized in Table 6 and Table 7 for 150 and 160 King Street East, respectively. It is noted that the parking requirements for the apartment use are based on the number of bedrooms per unit. The 48 apartment units proposed for 150 King Street East will consist of 36 1-bedroom units and 12 2-bedroom units.

⁶ *The Town of the Blue Mountains Comprehensive Zoning By-law 2018-65*. Town of the Blue Mountains. March 9, 2020.



Table 6: Parking Supply - 150 King Street East

LAND USE	PARKING RATE	SIZE	PARKING SUPPLY	
			Required	Provided
1-BR apartment	1.5 spaces/unit	36 units	54 spaces	54 spaces
2-BR apartment	2.0 spaces/unit	12 units	24 spaces	24 spaces
retail store	1 space/20 m ² floor area	1,128 m ²	58 spaces ¹	60 spaces
Total			136 spaces	138 spaces

¹ Each retail space (564 m²) is required to provide 29 spaces each

Table 7: Parking Supply - 160 King Street East

LAND USE	PARKING RATE	SIZE	PARKING SUPPLY	
			Required	Provided
hotel	1.3/per room	69 rooms	90 spaces	91 spaces

As indicated, the parking supply for both 150 and 160 King Street East will satisfy the Town's requirements.

4.3.2 Barrier-Free Parking

With regards to provision of barrier-free spaces, the Town's zoning by-law states the following:

- for developments requiring between 13 and 100 spaces, 4% of the total required spaces must be provided as barrier-free spaces;
- for 101 to 200 spaces, 1 parking space plus 3% of the required spaces are to be barrier free; and
- for 201 to 1000 spaces, 2 spaces plus 2% of the required spaces are to be barrier-free.

In all cases, the number of barrier spaces must be distributed between Type A and Type B spaces (equally if an even number of spaces, or one additional Type A or Type B if an odd number of spaces).

Based on the required parking provision (229 spaces), a total of 7 barrier-free spaces must be provided. Per the site plan, 6 barrier-free spaces are provided (3 Type A and 3 Type B).



4.3.3 Loading Areas

The Town's zoning by-law states that non-residential land-uses must provide designated loading spaces if the gross floor area exceeds 2,000 m². As per the site plan, none of the individual buildings satisfy the noted threshold. Regardless, one designated loading space is provided at each building.

4.4 SITE ACCESS

4.4.1 Location & Configuration

The site will be served by 3 new full-moves access points, with one access on Elgin Street (the west access) and two accesses on King Street East. The accesses on King Street East will be located opposite Wellington Street (the centre access) and opposite the existing access to 171 King Street East (the east access).

The Town's zoning by-law requires an access providing two-way operations to have a minimum width of 6.0 metres. As per the site plan, each access will meet or exceed the minimum width.

4.4.2 Corner Clearance – Elgin Street

Corner clearance is the minimum suggested distance between an intersection and an adjacent driveway along a road. The distance is typically measured from the near curb of a street intersection to the near edge of an access or driveway throat. Inadequate corner clearance can result in interrupted traffic flow, poor access operations and safety concerns. Appropriate corner clearance is of particular concern at intersections where stop or signal control is present (i.e. stop control and traffic signals can create queues that encroach on the operations of the adjacent driveway).

The Transportation Association of Canada's (TAC) *Geometric Design Guide for Canadian Roads*⁷, recommends a minimum corner clearance of 15 metres along a local road. With respect to the subject development, the available corner clearance along Elgin Street (a local road) between King Street East and the West Access is approximately 25 metres thus satisfying the TAC guideline of 15 metres.

⁷ *Geometric Design Guide for Canadian Roads, Chapter 8*. Transportation Association of Canada, June 2017.



4.5 ON-SITE CIRCULATION

4.5.1 Vehicular

The Town's zoning by-law requires that internal aisles providing access to parking spaces, and which are intended for two-way operations, must be a minimum of 6.0 metres in width. As per the site plan, this minimum width is maintained throughout the site.

A 12-metre centreline turn radius is also maintained, meeting the requirements for a fire route as set forth in the *Ontario Building Code*.

4.5.2 Pedestrian

Regarding pedestrian circulation, an internal sidewalk is provided throughout the site, connecting both development parcels with Elgin Street. Sidewalks are also provided adjacent to the centre access which provides pedestrian access to King Street East. As noted in Section 4.1, the Georgian Trail runs parallel to the site along the north limits. Access to this trail is available from Elgin Street.

4.6 SITE TRAFFIC

4.6.1 Trip Generation

The number of vehicle trips to be generated by the proposed development for the weekday AM and weekday PM peak hours has been determined based on type of use, development size, and trip generation rates per the *ITE Trip Generation Manual, 11th Edition*⁸. Based on the proposed development, trip rates for the *multifamily housing – low rise* (ITE land-use code 220), *business hotel* (ITE land-use code 312) and *strip retail plaza* (ITE land-use code 822) land-uses have been applied. While the *ITE Trip Generation Manual* provides rates for the *hotel* land-use (ITE land-use code 310), the ITE description for the *business hotel* land-use was determined to be most representative of the hotel proposed for the subject site. The *hotel* land-use includes larger hotels (100+ rooms) with various supporting facilities such as conference rooms, a banquet hall, full-service restaurant (open to the public) and recreational facilities (pool, fitness room, etc.). Land-use descriptions for both the *hotel* and *business hotel* are provided in Appendix E. The trip rates and trip generation for the site are summarized in Table 8 and Table 9.

⁸ *Trip Generation Manual, 11th Edition*. Institute of Transportation Engineers. September 2021.



Table 8: Trip Rates

LAND USE	ITE LAND USE CODE	VARIABLE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			In	Out	Total	In	Out	Total
multifamily housing – low-rise	220	units	0.10	0.30	0.40	0.32	0.19	0.51
business hotel	312	occupied rooms	0.27	0.24	0.51	0.23	0.18	0.41
strip retail plaza	822	1000 ft ² GLA	1.42	0.94	2.36	3.30	3.30	6.59

Table 9: Trip Generation

LAND USE	SIZE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		In	Out	Total	In	Out	Total
apartments	48 units	5	14	19	15	9	24
hotel	69 rooms	18	17	35	16	12	28
retail space	12,142 ft ²	17	12	29	40	40	80
Total		40	43	83	71	61	132

As indicated, the proposed development is expected to generate 83 trips during the weekday AM peak hour and 132 trips during the weekday PM peak hour.

It is noted that not all trips generated by the development will be new trips on the road network, with a portion of the trips expected to be internal trips and/or pass-by trips, as detailed below:

- Internal trips occur when there is interaction between the uses on a single site (i.e. patrons of one commercial unit may visit an adjacent unit or interaction between the residential/hotel uses and the commercial uses). For shared/internal trips, it is common practice to apply a reduction to the trip estimates to avoid double counting.
- Pass-by trips occur when a motorist is already on the adjacent road network for another purpose and chooses to stop at a different site as they pass by before continuing to their primary destination. In this case, a motorist on King Street East may choose to stop at a retail shop at the subject site before continuing to their intended destination.



To account for internal/shared trips, a 10% reduction has been applied to the trip estimates. For pass-by trips, a pass-by rate of 34% has been applied to the retail land use (ITE 822). The pass-by rate reflects data provided in the ITE *Trip Generation Handbook*⁹ and has only been applied to the weekday PM peak hour trip generation (pass-by rates are not available for the AM peak hour). A summary of the trip estimates by type and the resulting net new trip estimates is provided in Table 10. As indicated, the site is expected to generate 75 new trips during the weekday AM peak hour, and 91 new trips during the weekday PM peak hour.

Table 10: Trip Types

TRIP TYPE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
	In	Out	Total	In	Out	Total
Gross Trips	40	43	83	71	61	132
Internal Trips	4	4	8	7	6	13
Pass-by Trips	-	-	-	14	14	28
New Trips	36	39	75	50	41	91

4.6.2 Trip Distribution and Assignment

The distribution of site-generated trips was considered from two perspectives: pass-by trips and new trips.

As previously indicated, pass-by trips are those which are already on the road network which are expected to stop at the subject site as they travel past. The distribution of these pass-by trips is therefore proportional to the directional volumes present on King Street East during the weekday PM peak hour period. The greatest approach volume past the site will generate the greatest number of pass-by trips. The following distribution was realized:

- weekday PM peak – 45% from the east, 55% from the west.

The distribution of new trips generated by the proposed development has been established based on the observed traffic patterns on the adjacent road network and the proximity of the site to the built-up area of Thornbury. In considering the above, the following distribution has been applied:

⁹ *Trip Generation Handbook, 3rd Edition*. Institute of Transportation Engineers. September 2017.



- to/from the east – 40%; and
- to/from the west – 60%.

Trips were further assigned to each site access based on the site layout. The following access assignment was applied:

- residential/commercial buildings – 50% to west access, 50% to centre access; and
- hotel building – 50% to centre access, 50% to east access.

Assignment of the site trips generated by the development to the adjacent road network is based on the trip distribution noted above, the site layout, and expected travel routes. Site-generated traffic is illustrated in Figure 12 through Figure 14.



5 Future Total Conditions

This chapter will address the resulting impacts of the proposed development on the adjacent road network. The following areas are to be addressed:

- operations of the key intersections, including the site access points;
- available sight lines at the proposed site access points; and
- potential improvements to the study area road network, if necessary.

5.1 TRAFFIC VOLUMES

To assess the impacts of the increased traffic volumes resulting from the proposed development, the site-generated traffic volumes were added to the 2026, 2031, and 2036 background traffic volumes. The resulting total traffic volumes are illustrated in Figure 15 through Figure 17.

5.2 TRAFFIC OPERATIONS

The operations of the key intersections were re-assessed for each horizon in consideration of the total traffic volumes. Additionally, the operations of the site access points were analyzed under the noted total conditions. The results of the operational analyses are summarized in Table 11 through Table 13, with detailed worksheets provided in Appendix F.

Network improvements recommended under background conditions (namely the implementation of traffic signals at the intersection of King Street East with Elgin Street) have been considered in the assessment of the total conditions.



Table 11: Intersection Operations – 2026 Total Conditions

INTERSECTION, MOVEMENTS & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Elgin Street N & West Access	WB LR	stop	9	A	0.01	9	A	0.03
King Street East & Elgin Street	EB LTR	signal	6	A	0.47	12	B	0.75
	WB LTR	signal	6	A	0.52	8	A	0.56
	NB LTR	signal	31	C	0.24	26	C	0.04
	SB LTR	signal	32	C	0.38	30	C	0.48
	overall	signal	8	A	0.50	13	B	0.70
King Street East & Wellington Street South/ Centre Access	EB L	free	1	A	0.02	1	A	0.04
	WB L	free	1	A	0.02	1	A	0.01
	NB LTR	stop	31	D	0.13	62	F	0.27
	SB LTR	stop	24	C	0.10	42	E	0.39
King Street East & East Access/ Gateway Access	EB L	free	1	A	0.01	1	A	0.00
	WB L	free	1	A	0.01	1	A	0.01
	NB LTR	stop	28	D	0.18	53	F	0.43
	SB LTR	stop	19	C	0.03	24	C	0.03



Table 12: Intersection Operations – 2031 Total Conditions

INTERSECTION, MOVEMENTS & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Elgin Street N & West Access	WB LR	stop	9	A	0.01	9	A	0.03
King Street East & Elgin Street	EB LTR	signal	6	A	0.52	15	B	0.82
	WB LTR	signal	7	A	0.57	9	A	0.61
	NB LTR	signal	31	C	0.26	26	C	0.05
	SB LTR	signal	32	C	0.38	30	C	0.49
	overall	signal	8	A	0.55	14	B	0.76
King Street East & Wellington Street South/ Centre Access	EB L	free	1	A	0.03	1	A	0.04
	WB L	free	1	A	0.02	1	A	0.01
	NB LTR	stop	38	E	0.17	112	F	0.42
	SB LTR	stop	29	D	0.13	76	F	0.57
King Street East & East Access/ Gateway Access	EB L	free	1	A	0.01	1	A	0.00
	WB L	free	1	A	0.01	1	A	0.01
	NB LTR	stop	33	D	0.21	97	F	0.63
	SB LTR	stop	22	C	0.03	33	D	0.04



Table 13: Intersection Operations – 2036 Total Conditions

INTERSECTION, MOVEMENTS & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Elgin Street N & West Access	WB LR	stop	9	A	0.01	9	A	0.03
King Street East & Elgin Street	EB LTR	signal	7	A	0.56	19	B	0.89
	WB LTR	signal	7	A	0.62	9	A	0.67
	NB LTR	signal	31	C	0.26	26	C	0.05
	SB LTR	signal	32	C	0.38	30	C	0.48
	overall	signal	9	A	0.59	17	B	0.82
King Street East & Wellington Street South/ Centre Access	EB L	free	1	A	0.03	2	A	0.04
	WB L	free	1	A	0.02	1	A	0.01
	NB LTR	stop	55	F	0.25	302	F	0.83
	SB LTR	stop	37	E	0.16	248	F	1.05
King Street East & East Access/ Gateway Access	EB L	free	1	A	0.01	1	A	0.00
	WB L	free	1	A	0.01	1	A	0.02
	NB LTR	stop	41	E	0.25	352	F	1.23
	SB LTR	stop	24	C	0.04	59	F	0.07

As indicated, the intersection of King Street East and Elgin Street continues to provide good operations (LOS C or better) under traffic signal control with minimal delays through the 2036 horizon. As such, no further improvements are recommended at this intersection.

The operations at the west access on Elgin Street are expected to be excellent (LOS A) through the 2036 horizon; however, the centre and east access points on King Street East are expected to provide poor operations (LOS F) beginning in 2026 with conditions deteriorating by the 2036 horizon. Despite the poor operations, traffic signals are not recommended (nor are they warranted) at these locations due to their relatively close proximity to one another and the proposed signals at Elgin Street. It is noted that site traffic will have the option of travelling through the site to access King Street East via the traffic signals at Elgin Street which has reserve capacity to accommodate additional volumes. Similarly, northbound motorists on Wellington



Street have the option of diverting to Elgin Street to access King Street East via the proposed traffic signals.

5.3 TURN LANE REQUIREMENTS

The need for exclusive left and right turning lanes to serve turning volumes at each site access have been reviewed in the context of MTO warrants. The review is based on the following:

- MTO guidelines¹⁰ for auxiliary turn lanes at unsignalized intersections;
- a design speed of 60 km/h (reflective of the 50 km/h posted speed limit within the study area); and
- the projected 2036 future total traffic volumes (considered the worst-case scenario).

5.3.1 Left Turn Lanes

For two-lane undivided highways, MTO warrants for left turn lanes at unsignalized intersections are based on design speed, advancing volume (i.e. traffic travelling in the same direction as left turning traffic), opposing volume (i.e. traffic travelling in the opposite direction that would impede left turning vehicles), and the percentage of left turns in the advancing volume. At each access, the volume of inbound left turns are below the 5% minimum threshold of the advancing volumes as identified in the MTO warrants. As such, left turn lanes are not warranted at the site access points (left turning volumes are projected at 4 to 19 vehicles per hour, which translates to 1 left turn every 3 to 15 minutes which is not considered significant).

While it is recognized that there is an existing westbound left turn lane serving the access to Thornbury Gateway (opposite the east access), MTO design standards do not require an opposing left turn lane be constructed where volumes do not warrant such (as per the *Geometric Design Standards for Ontario Highways*).

5.3.2 Right Turn Lanes

MTO guidelines suggest that an exclusive right turn lane be considered where right turn volumes exceed 60 vehicles per hour (vph) and/or impede the operations of through traffic.

At each site access, right turning volumes are less than the 60 vph threshold (right-turning volumes in the order of 3 to 25 vph). Therefore, right turn lanes are not required to accommodate the inbound right turn movements.

¹⁰ *Geometric Design Standards for Ontario Highways*. Ontario Ministry of Transportation. Undated.



5.4 SIGHT LINE ASSESSMENT

A sight line assessment was conducted to establish the available sight lines at each of the site access points. The sight line assessment has considered both minimum stopping sight distance and intersection sight distance requirements as per the TAC *Geometric Design Guide for Canadian Roads*¹¹:

- the minimum stopping sight distance provides sufficient distance for an approaching motorist to observe a stationary hazard in the road and bring their vehicle to a complete stop prior to the hazard; and
- the intersection sight distance allows a vehicle to enter a main road from a side street (or site access) and attain the appropriate operating speed without substantially impacting the operating speed of an approaching vehicle.

The minimum stopping sight and intersection sight distance requirements for a design speed of 60km/h (reflective of the 50km/h posted speed limit within the study area) are summarized in Table 14. The available sight distances at each access (as determined through field measurements) are summarized in Table 15 and illustrated in Figure 18.

Table 14: Sight Distance Requirements

DESIGN SPEED	STOPPING SIGHT DISTANCE	INTERSECTION SIGHT DISTANCE	
		Left Turn	Right Turn
60km/h	85m	130m	110m

Table 15: Sight Distance Availability

LOCATION	DESIGN SPEED	AVAILABLE SIGHT DISTANCE TO/FROM			
		North	South	West	East
West Access	60 km/h	130m	25m	-	-
Centre Access	60 km/h	-	-	>200m	>200m
East Access	60 km/h	-	-	>200m	>200m

¹¹ *Geometric Design Guide for Canadian Roads, Chapter 9.* Transportation Association of Canada, June 2017



As indicated, sight lines at the west access satisfy the noted sight distance requirements to the north, but do not satisfy either requirement to the south. This is not considered problematic however, recognizing that the sight line is limited by the intersection of Elgin Street North with King Street East. In this respect, any vehicles entering Elgin Street North from the south will be operating at a reduced speed having just completed a turning movement from King Street East or crossing movement (from stop) from Elgin Street South. With the site access readily visible from King Street and Elgin Street South, there will be sufficient time and distance for motorists to identify vehicles at the access point and make the necessary adjustments. Similarly, motorists at the site access will have an unobstructed view of vehicles turning from King Street East or crossing from Elgin Street and thus will be able to complete the necessary turning movements without issue. It is further noted that the sight lines to/from the south do extend beyond King Street East, with the intersection of Elgin Street with Arthur Street visible at approximately 160 metres. In consideration of the above, the available sight lines along Elgin Street are considered sufficient.

With respect to the access points on King Street East, the sight lines to/from the east and west at access points satisfy TAC recommended minimum stopping and intersection sight distances.



6 Summary

Proposed Development

This study has addressed the transportation impacts associated with the proposed mixed-use development located at 150 and 160 King Street East within the community of Thornbury, Town of The Blue Mountains. The proposed development consists of 48 apartment units, 1,128 m² of commercial space, and a 69-room hotel. Upon completion, the site is expected to generate 75 new trips during the weekday AM peak hour and 91 new trips during the weekday PM peak hour.

Transportation Impacts

In addressing the study area traffic operations, the key intersections of King Street East with Elgin Street and Wellington Street were analyzed under existing (2022) and future (2026, 2031, and 2036) horizon periods. The three site access points (one on Elgin Street and two on King Street East) were also assessed under the future horizon periods.

Results of the operational analyses indicate that the key intersections provide acceptable operations (LOS E or better) under existing conditions; however, the intersection of King Street East with Elgin Street is expected experience poor (LOS F) operations in 2026 under background conditions, with operations further deteriorating through the 2036 horizon. To address the poor operations, it is recommended that traffic signals be installed at the intersection of King Street East and Elgin Street by 2026. With the implementation of traffic signals, the intersection will provide good operations (LOS C or better) under future background and future total conditions through the 2036 horizon.

The site access points were analyzed under future total conditions and were found to provide excellent (LOS A at the west access, on Elgin Street) to poor (LOS F at the centre and east access points on King Street East) operations. Despite the poor operations, traffic signals are not recommended (nor are they warranted) at these locations due to their relatively close proximity to one another and the proposed signals at Elgin Street. It is noted that site traffic will have the option of travelling through the site to access King Street East via the traffic signals at Elgin Street which has reserve capacity to accommodate additional volumes. Similarly, northbound motorists on Wellington Street have the option of diverting to Elgin Street to access King Street East via the proposed traffic signals.



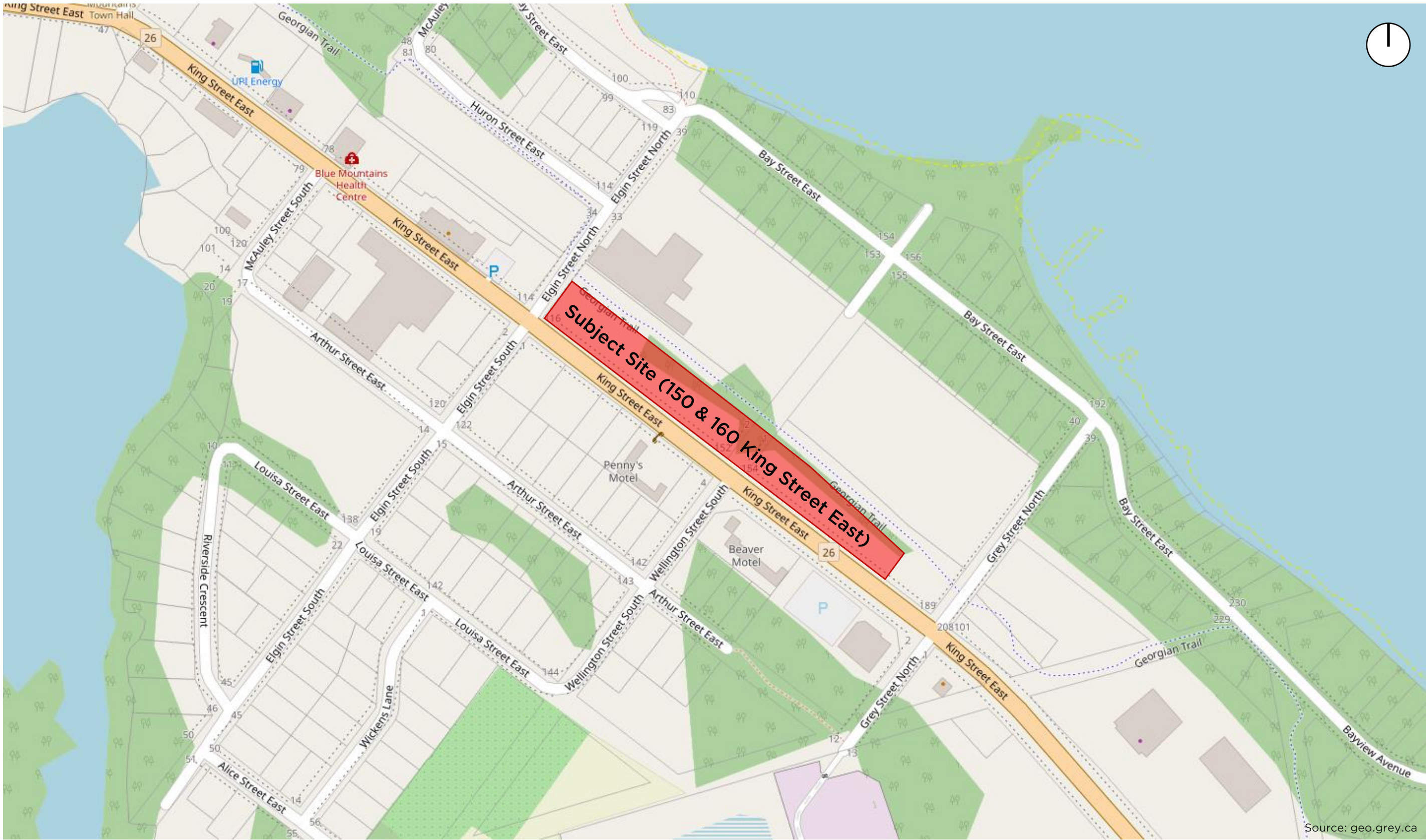
Turn Lane Requirements

The need for exclusive turn lanes to serve the site were reviewed in context of MTO warrants and future traffic volumes. Based on the review, exclusive left and right turn lanes the site access points are not warranted.

Sight Line Assessment

Sight lines along King Street East and Elgin Street North at the proposed site access points were reviewed in context of TAC requirements for stopping and intersection sight distances. Based on this review, the sight lines at each access point are considered acceptable.





150 & 160 KING STREET EAST, THORNBURY
Figure 1: Site Location





150 & 160 KING STREET EAST, THORNBURY

Figure 2A: Area Road Network





Intersection of King Street East & Elgin Street – north and east legs



Intersection of King Street East & Wellington Street – south and east legs



Intersection of King Street East & Elgin Street – south and west legs

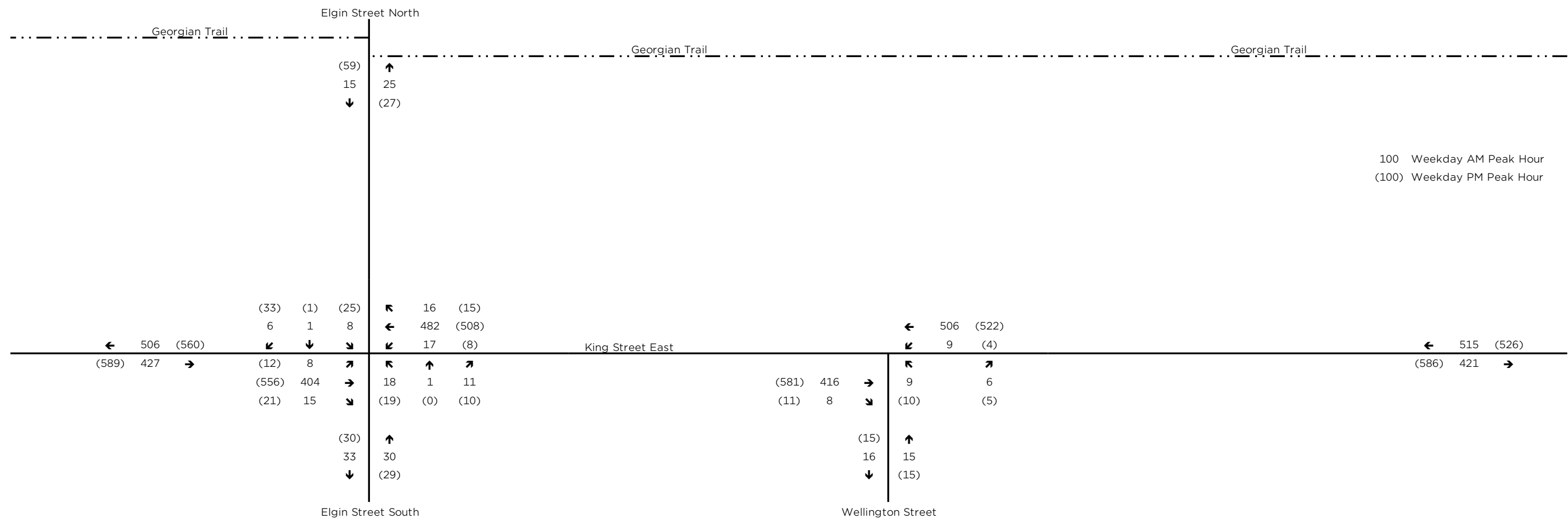
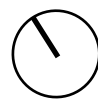


Intersection of King Street East & Wellington Street – west leg

150 & 160 KING STREET EAST, THORNBURY

Figure 2B: Area Road Network





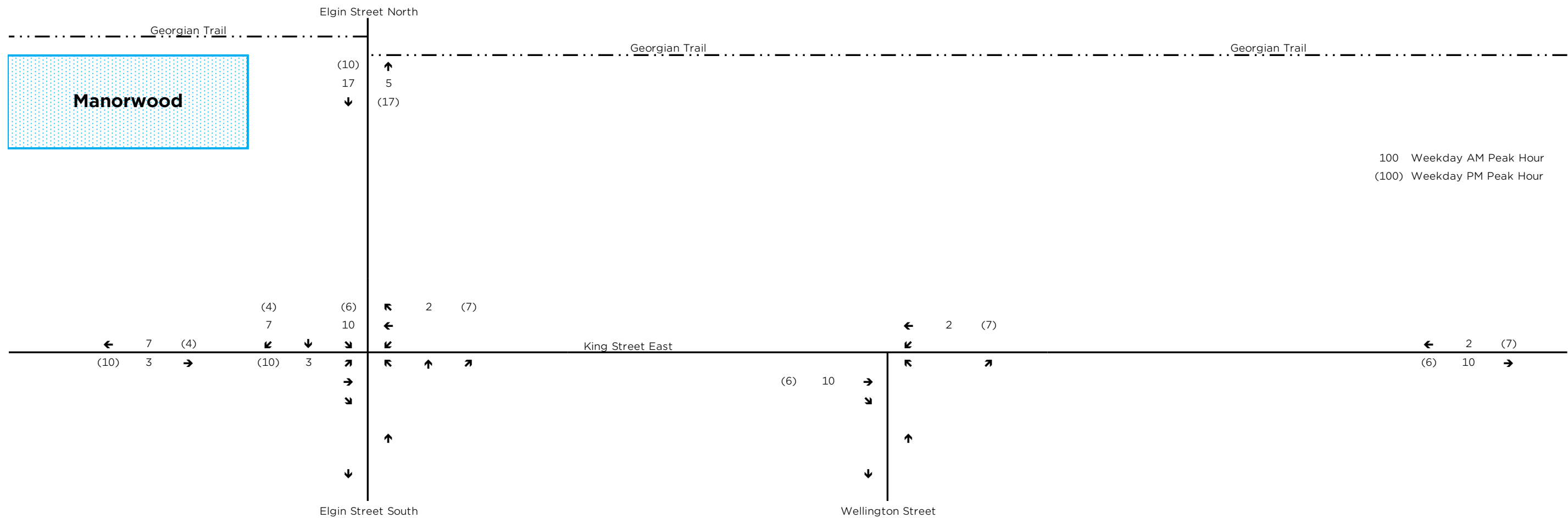
150 & 160 KING STREET EAST, THORNBURY
Figure 3: 2022 Traffic





150 & 160 KING STREET EAST, THORNBURY
Figure 4: Background Development Locations

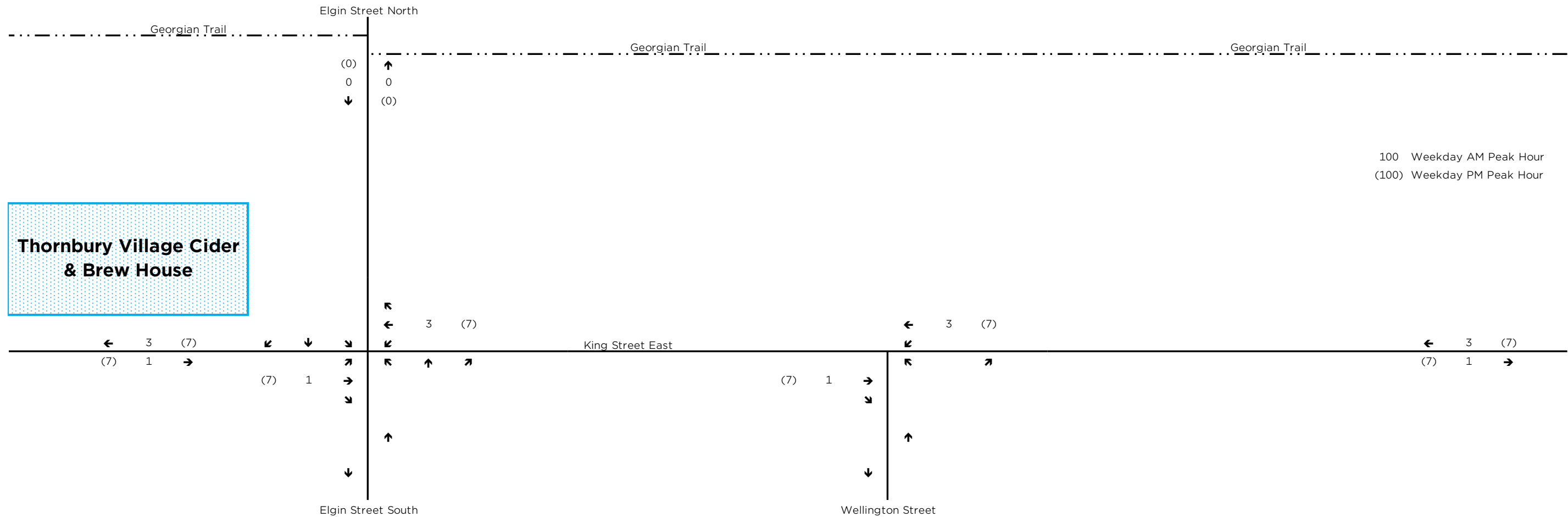




150 & 160 KING STREET EAST, THORNBURY

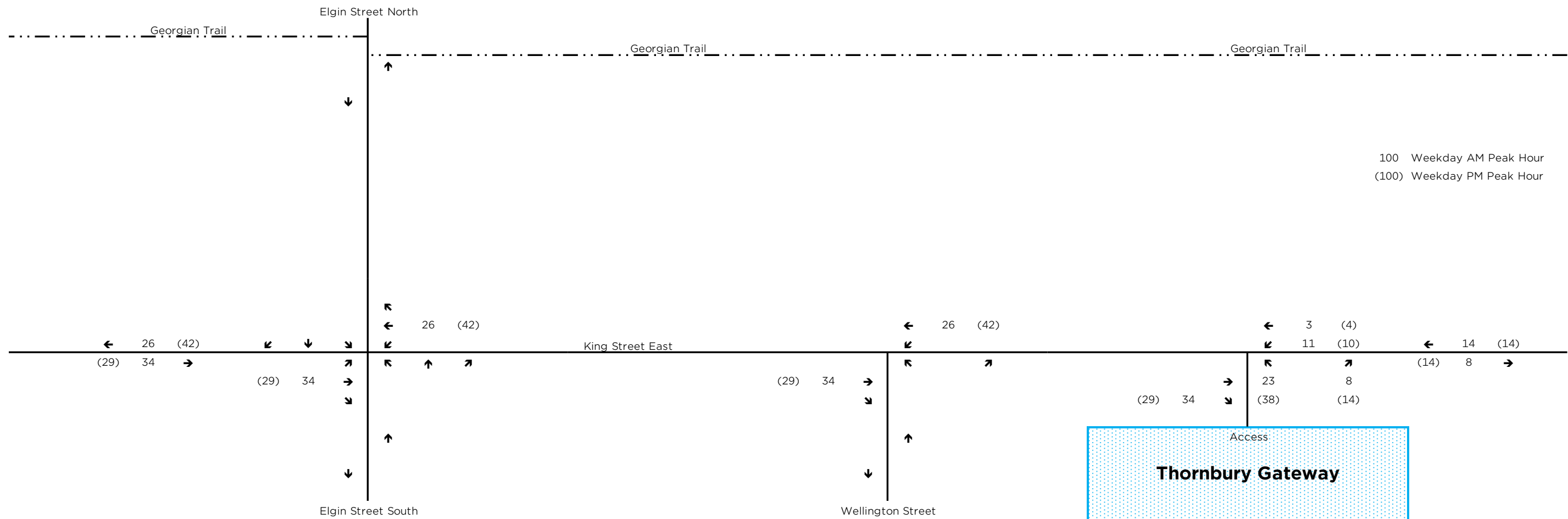
Figure 5: Background Development Traffic – Manorwood





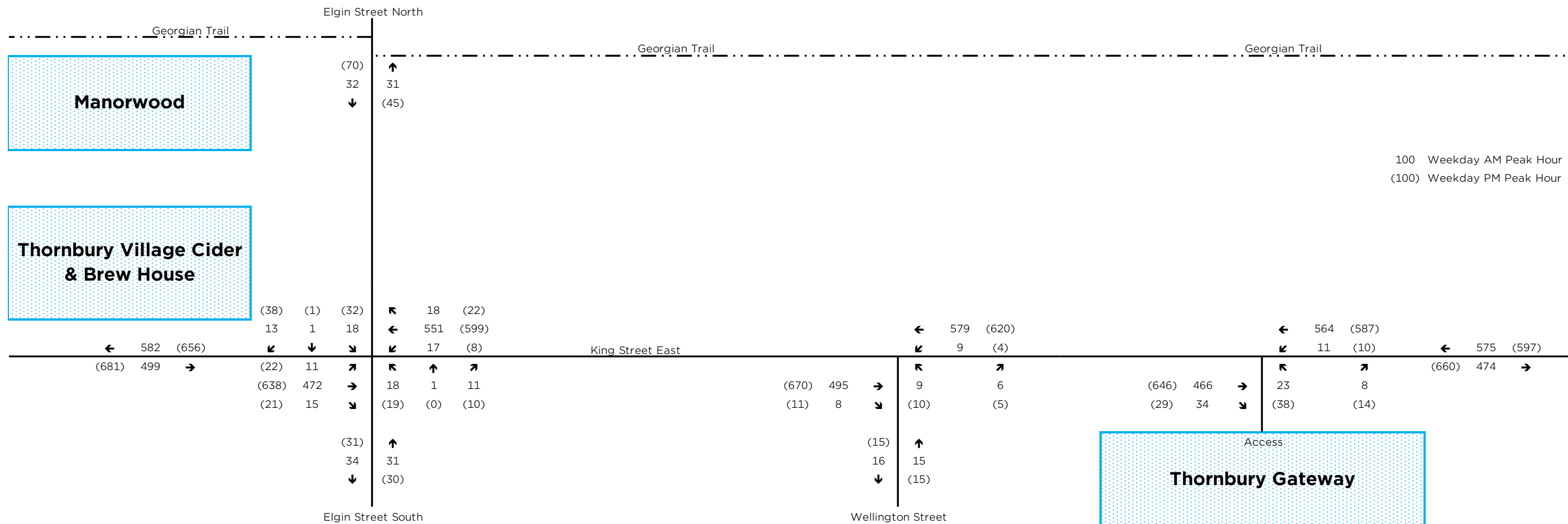
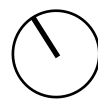
150 & 160 KING STREET EAST, THORNBURY
Figure 6: Background Development Traffic – Thornbury Village Cider & Brew House





150 & 160 KING STREET EAST, THORNBURY
Figure 7: Background Development Traffic – Thornbury Gateway

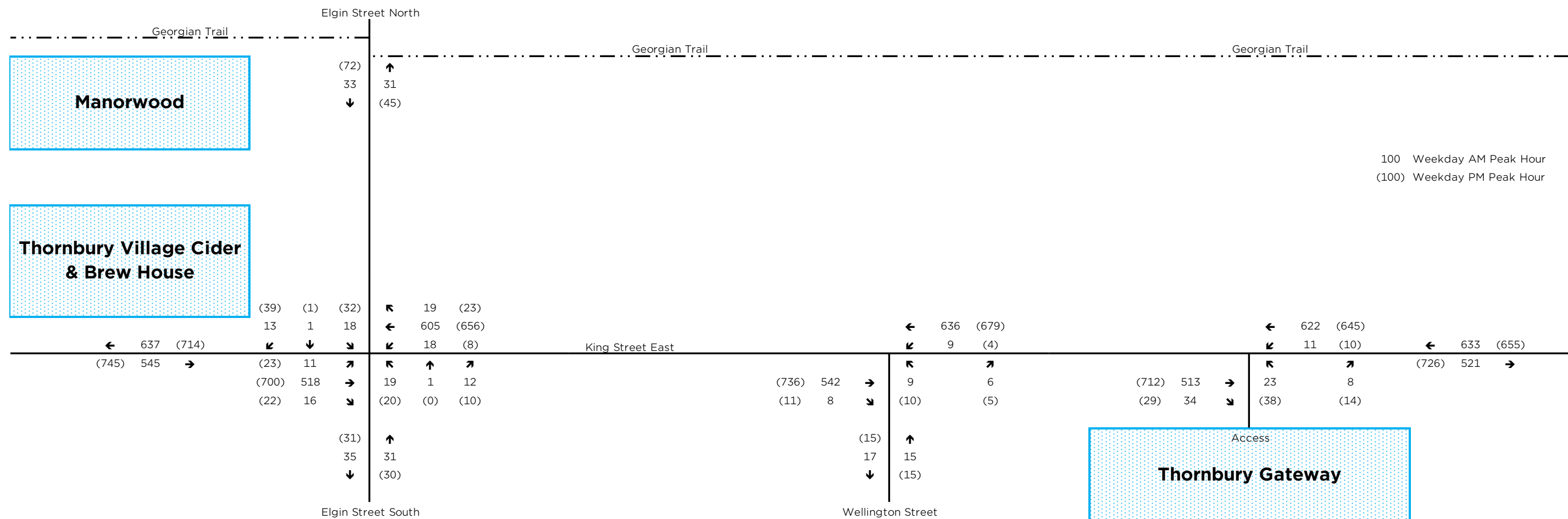
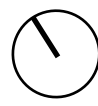




150 & 160 KING STREET EAST, THORNBURY

Figure 8: 2026 Background Traffic

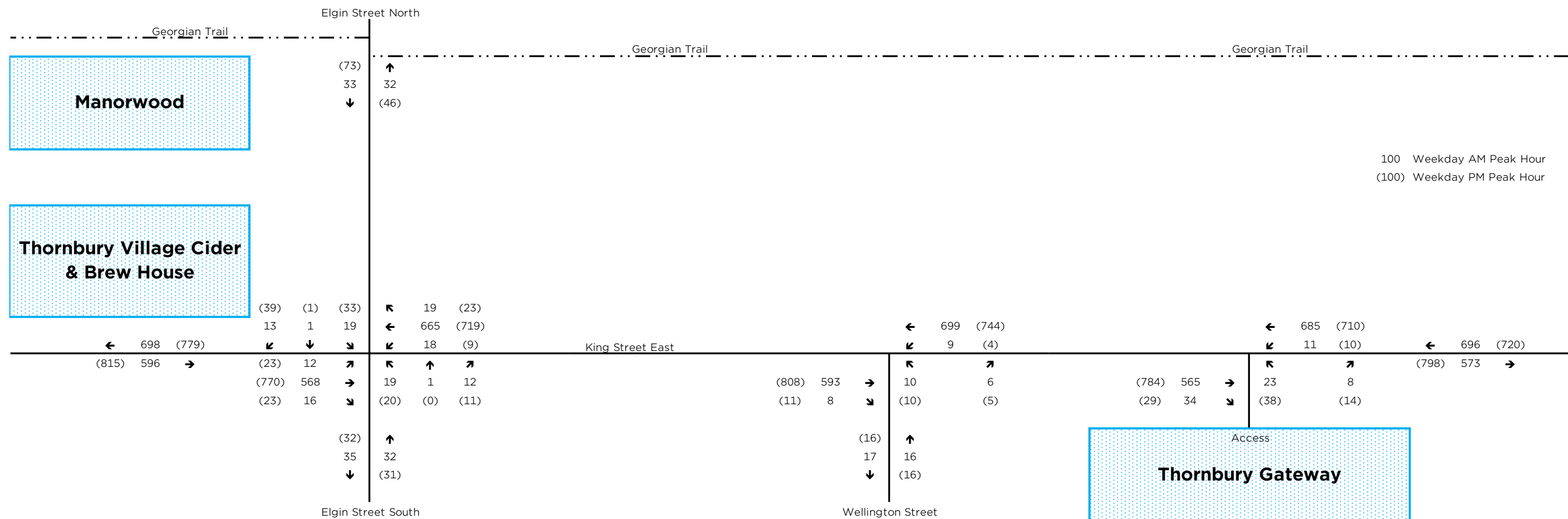
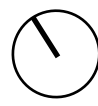




150 & 160 KING STREET EAST, THORNBURY

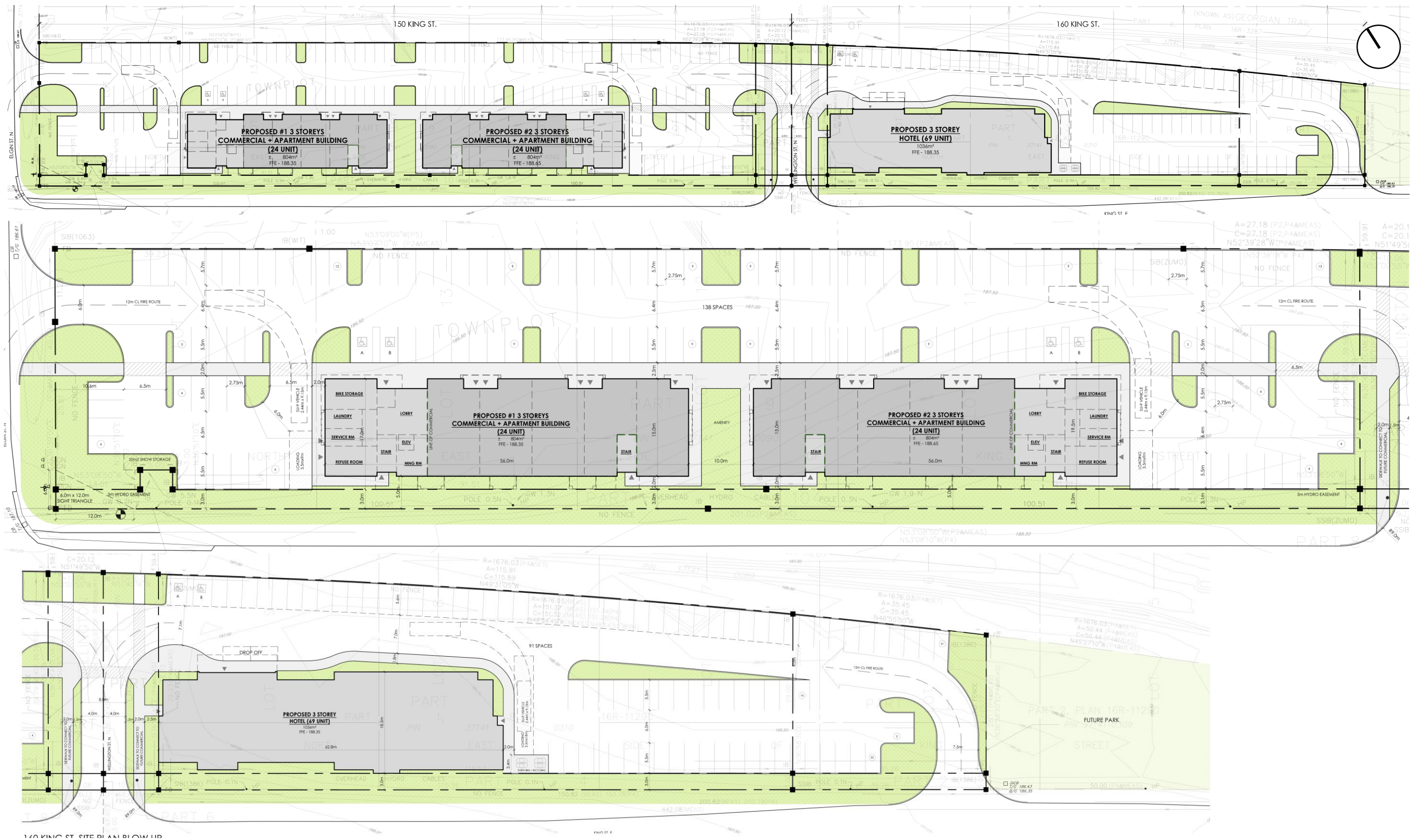
Figure 9: 2031 Background Traffic





150 & 160 KING STREET EAST, THORNBURY
Figure 10: 2036 Background Traffic

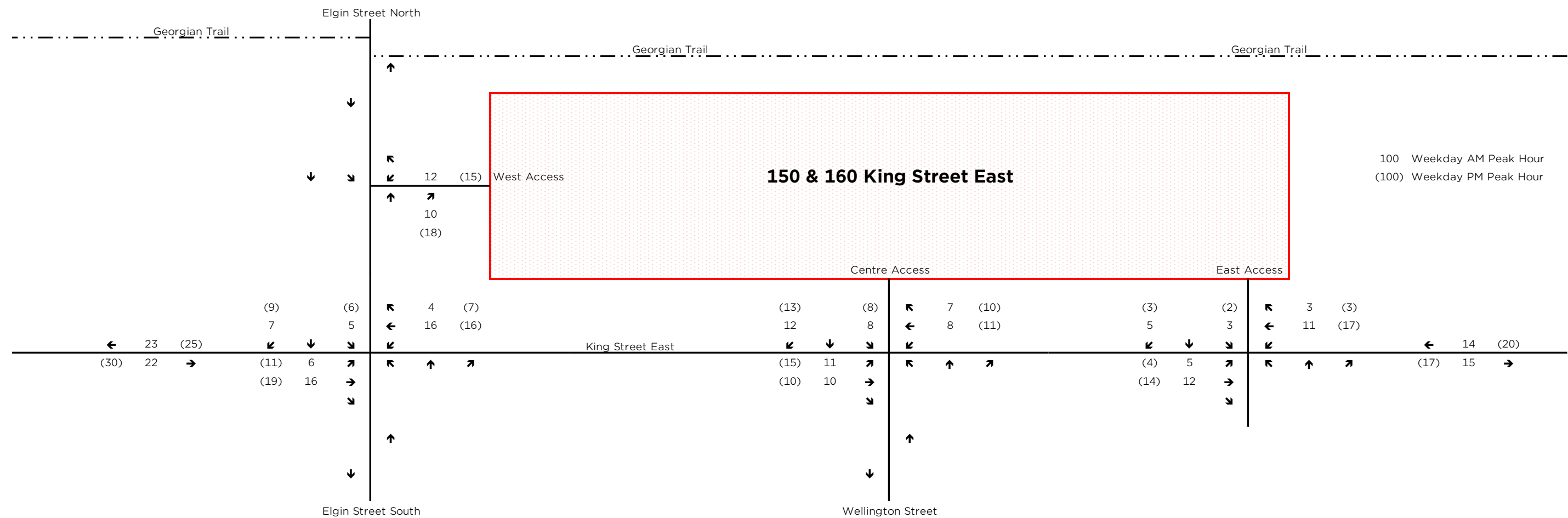




150 & 160 KING STREET EAST, THORNBURY

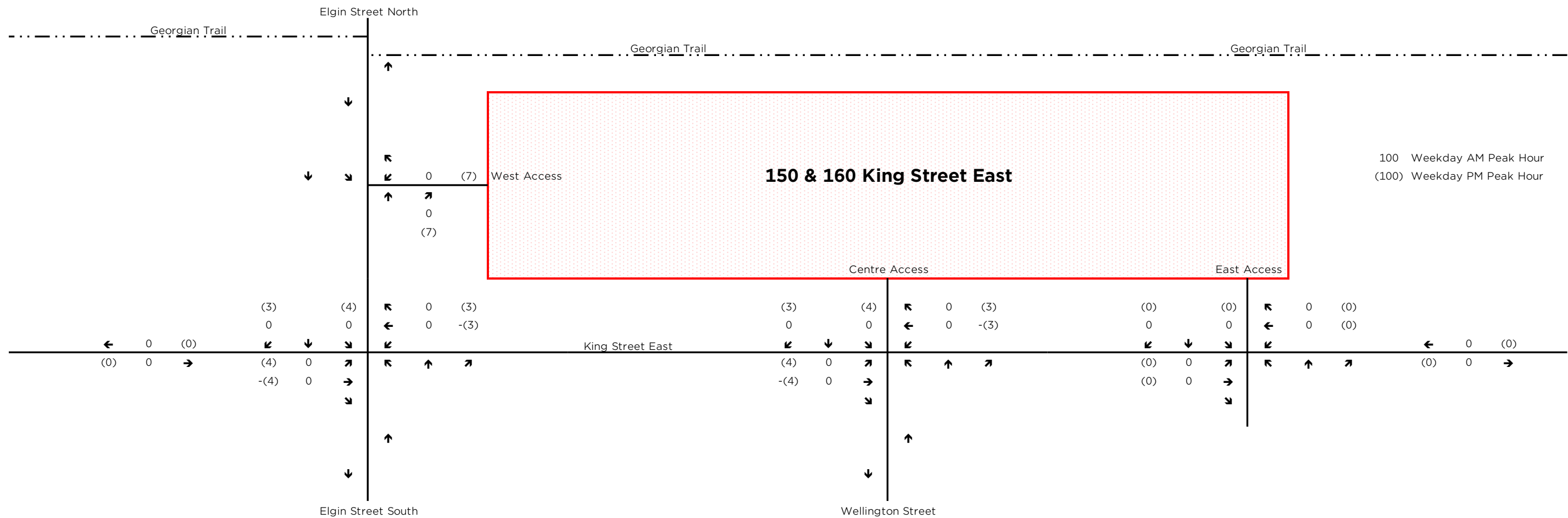
Figure 11: Site Plan





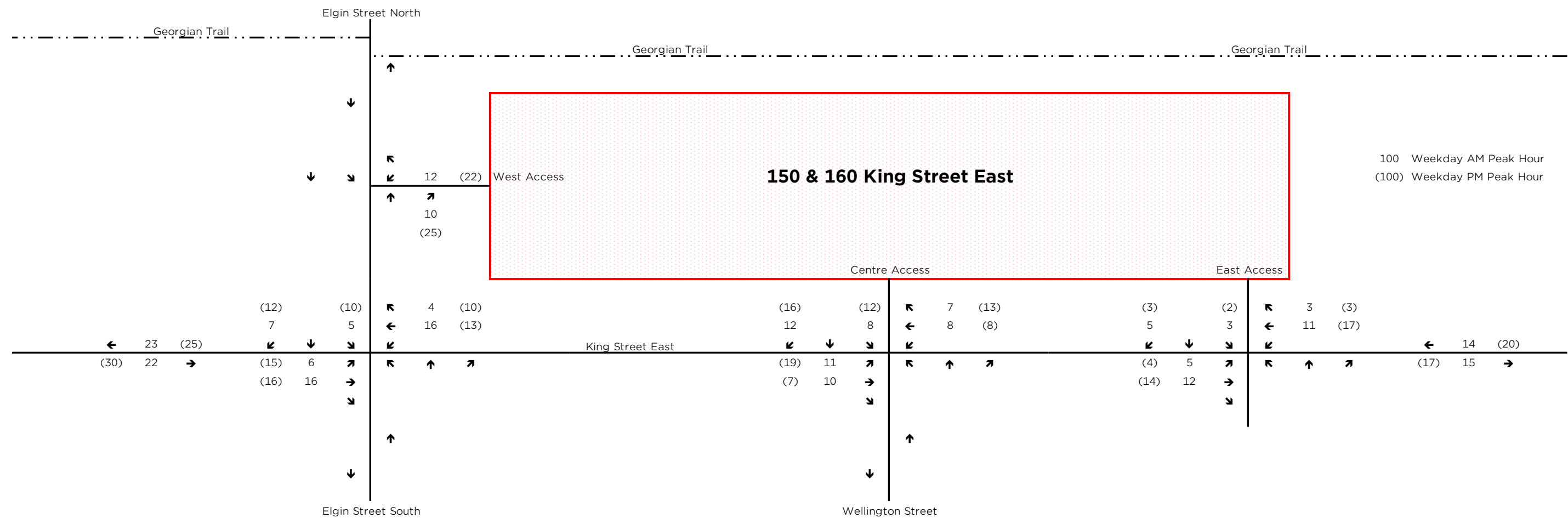
150 & 160 KING STREET EAST, THORNBURY
Figure 12: Site-Generated Traffic – New





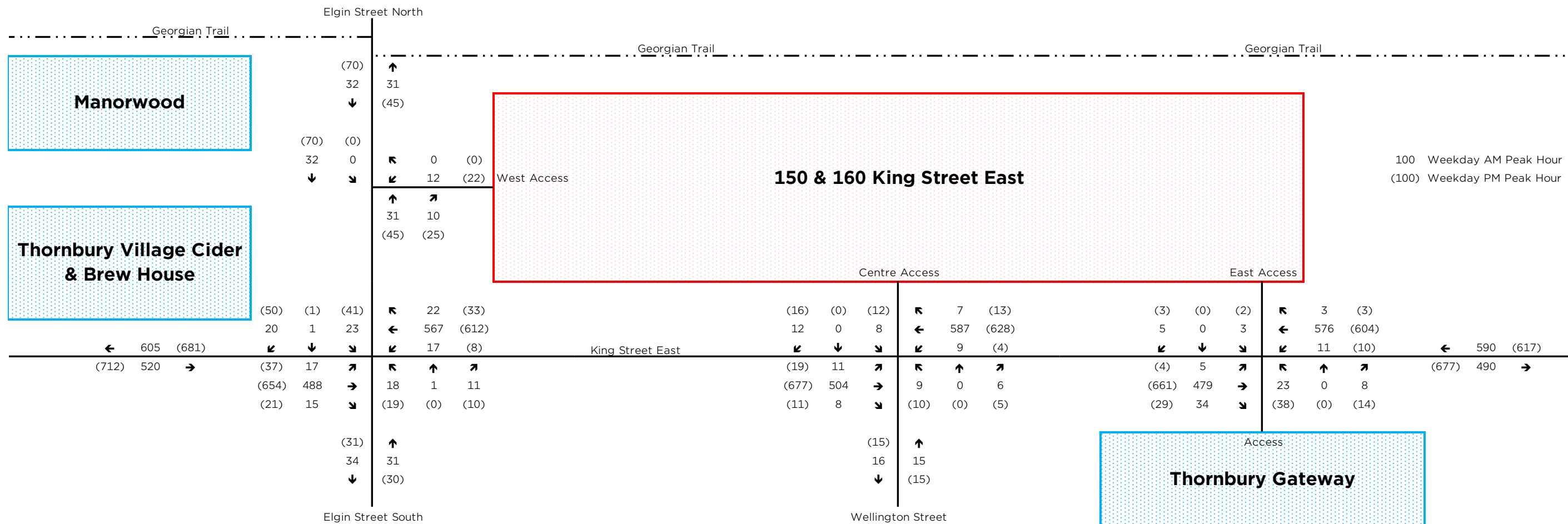
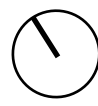
150 & 160 KING STREET EAST, THORNBURY
Figure 13: Site-Generated Traffic – Pass-by





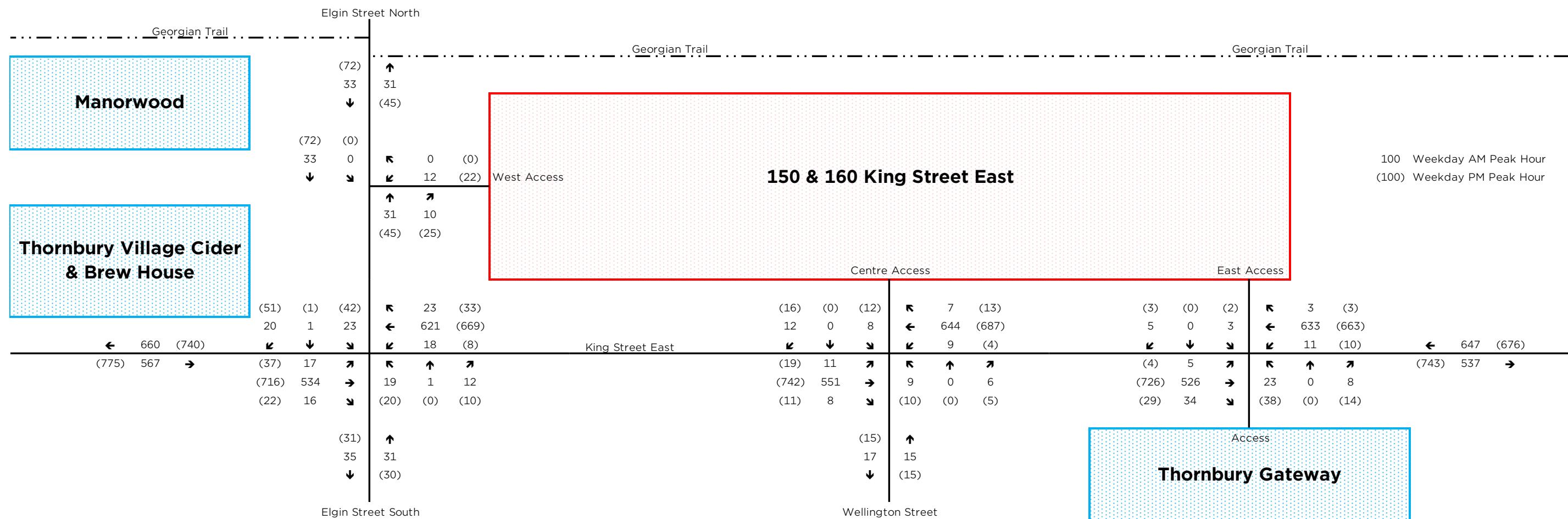
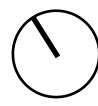
150 & 160 KING STREET EAST, THORNBURY
Figure 14: Site-Generated Traffic – Total





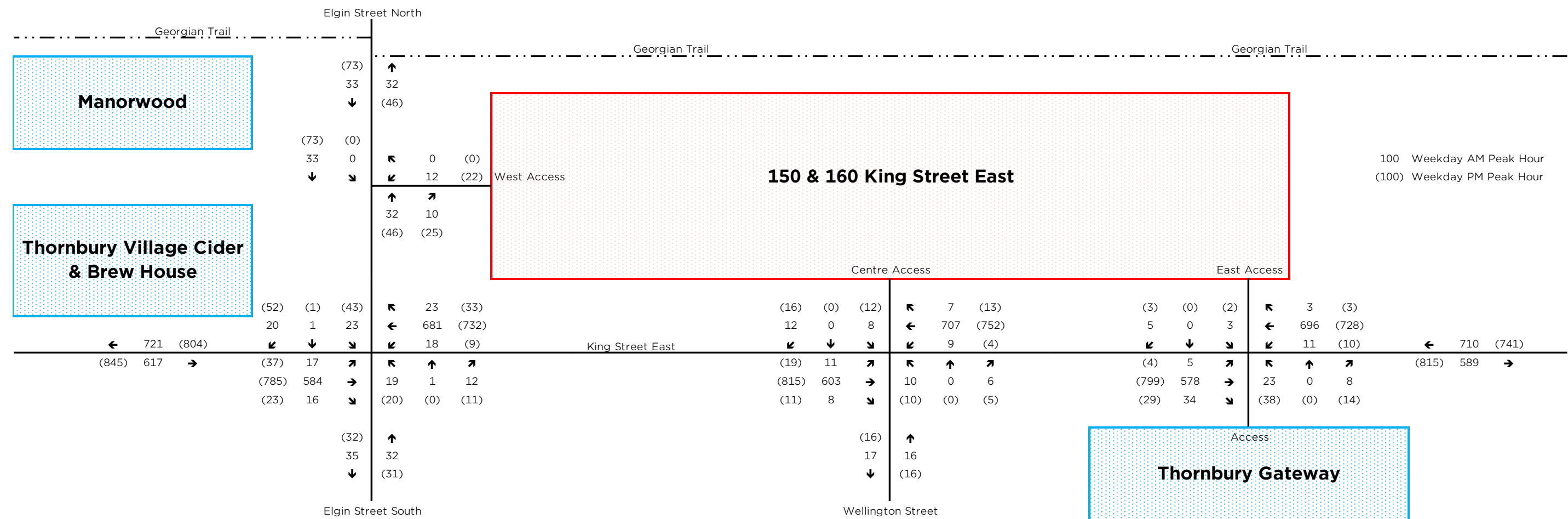
150 & 160 KING STREET EAST, THORNBURY
Figure 15: 2026 Total Traffic





150 & 160 KING STREET EAST, THORNBURY
Figure 16: 2031 Total Traffic





150 & 160 KING STREET EAST, THORNBURY
Figure 17: 2036 Total Traffic





150 & 160 KING STREET EAST, THORNBURY
Figure 18A: Sight Lines





Sight lines along King Street East towards the east from the east access



Sight lines along King Street East from the east towards the east access



Sight lines along King Street East towards the west from the east access



Sight lines along King Street East from the west towards the east access

150 & 160 KING STREET EAST, THORNBURY

Figure 18B: Sight Lines





Sight lines along King Street East towards the east from the centre access



Sight lines along King Street East from the east towards the centre access



Sight lines along King Street East towards the west from the centre access



Sight lines along King Street East from the west towards the centre access

150 & 160 KING STREET EAST, THORNBURY

Figure 18C: Sight Lines





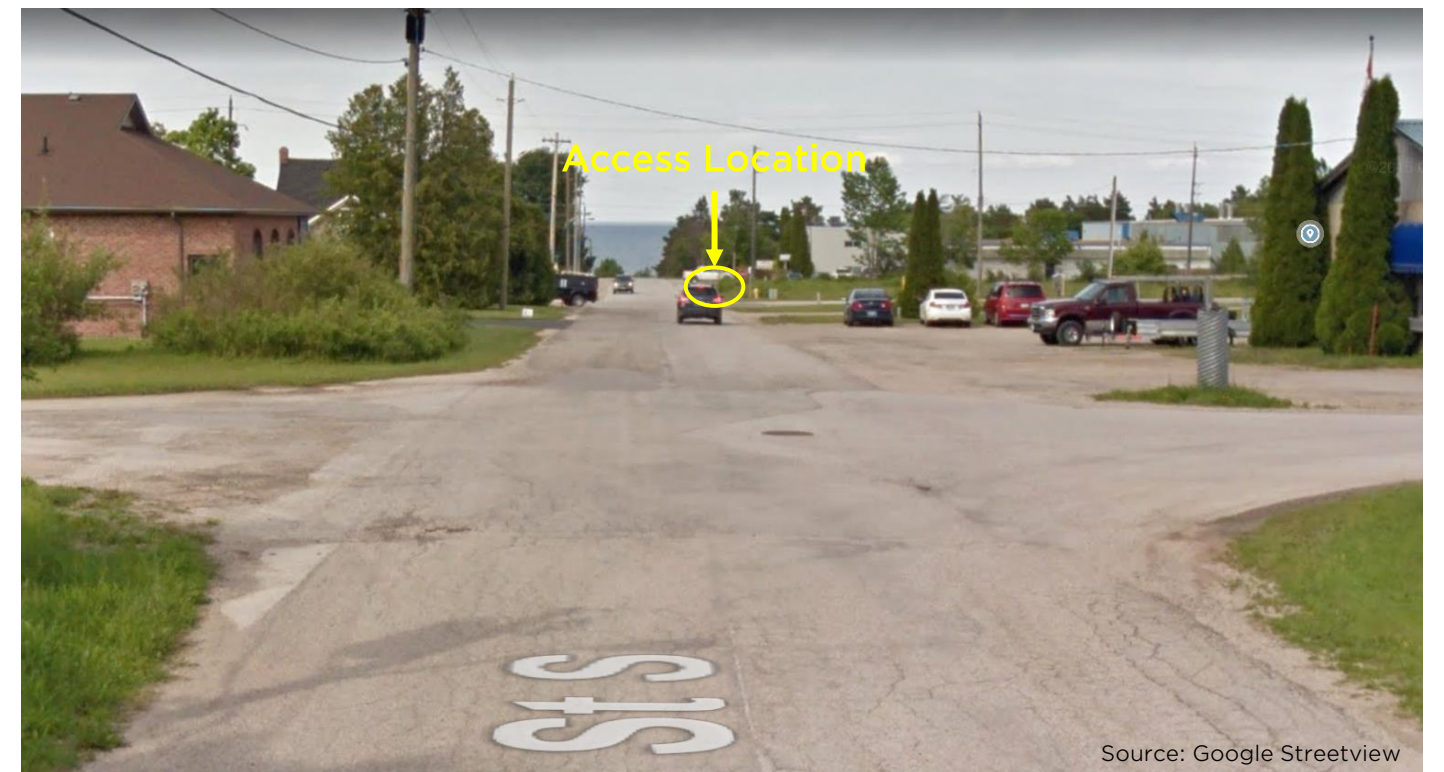
Sight lines along Elgin Street towards the north from the west access



Sight lines along Elgin Street from the north towards the west access



Sight lines along Elgin Street towards the south from the west access



Sight lines along Elgin Street from the south towards the west access

Source: Google Streetview

150 & 160 KING STREET EAST, THORNBURY

Figure 18D: Sight Lines



Appendix A: Traffic Counts

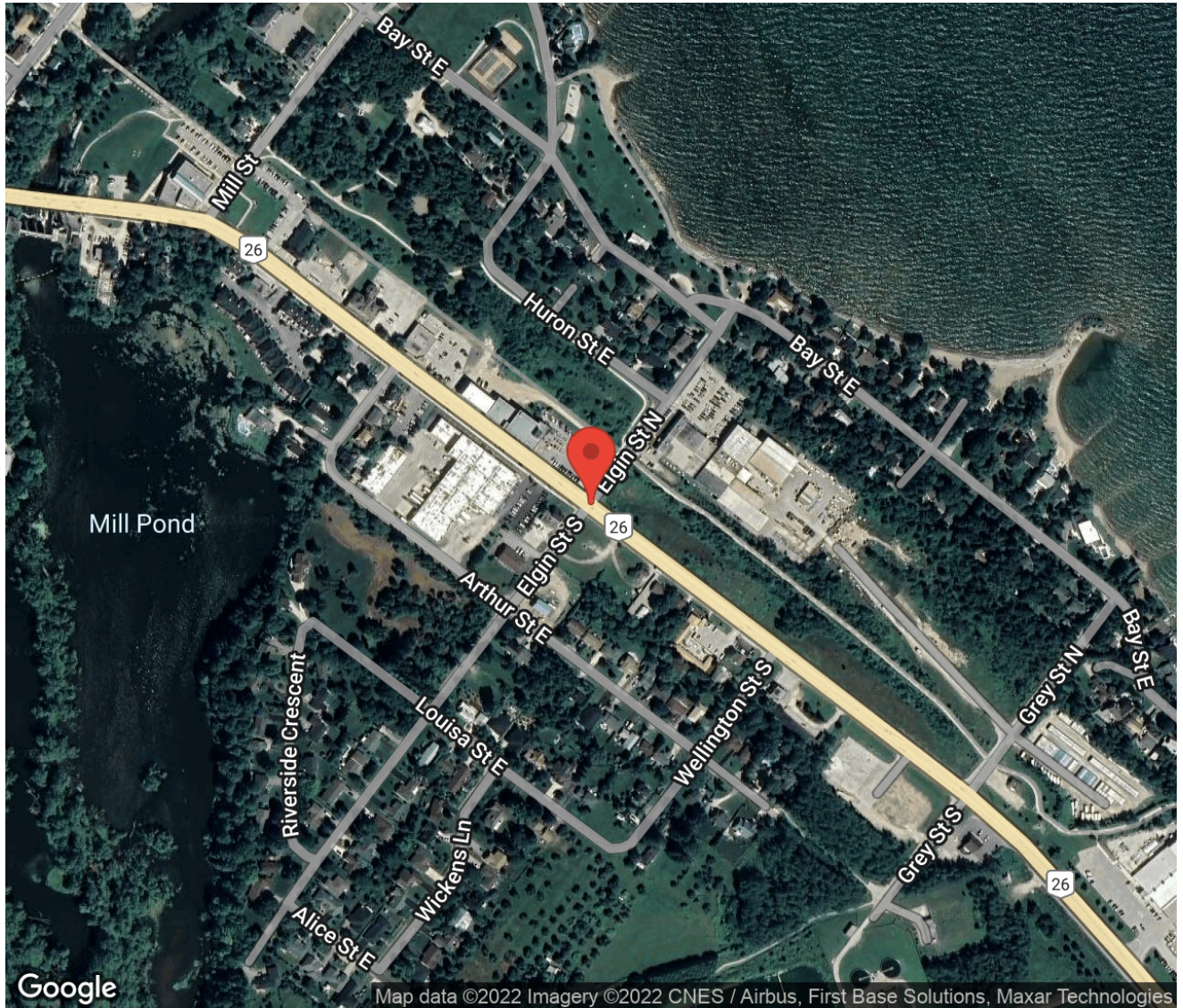
Project #22-178 - Tatham Engineering Ltd

Intersection Count Report

Intersection: Hwy 26 (King St E) & Elgin St
Municipality: Thornbury
Count Date: Thursday, Jun 02, 2022
Site Code: 2217800001
Count Categories: Cars, Trucks, Bicycles, Pedestrians
Count Period: 07:00-10:00, 15:00-18:00
Weather: Clear
Comments:

Traffic Count Map

Intersection:	Hwy 26 (King St E) & Elgin St
Site Code:	2217800001
Municipality:	Thornbury
Count Date:	Jun 02, 2022



Traffic Count Summary

Intersection: Hwy 26 (King St E) & Elgin St
Site Code: 2217800001
Municipality: Thornbury
Count Date: Jun 02, 2022

Elgin St N - Traffic Summary

Hour	North Approach Totals						South Approach Totals						Total
	Includes Cars, Trucks, Bicycles						Includes Cars, Trucks, Bicycles						
	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	
07:00 - 08:00	1	1	3	0	5	0	8	1	4	0	13	0	18
08:00 - 09:00	8	1	6	0	15	0	18	1	11	0	30	2	45
09:00 - 10:00	8	0	6	0	14	0	22	1	9	0	32	0	46
BREAK													
15:00 - 16:00	15	3	34	0	52	0	25	1	10	0	36	2	88
16:00 - 17:00	24	0	15	0	39	0	20	0	8	0	28	0	67
17:00 - 18:00	11	1	11	0	23	0	12	1	5	0	18	0	41
GRAND TOTAL	67	6	75	0	148	0	105	5	47	0	157	4	305

Traffic Count Summary

Intersection: Hwy 26 (King St E) & Elgin St
 Site Code: 2217800001
 Municipality: Thornbury
 Count Date: Jun 02, 2022

Hwy 26 (King St E) - Traffic Summary

East Approach Totals							West Approach Totals						
Hour	Includes Cars, Trucks, Bicycles						Includes Cars, Trucks, Bicycles						Total
	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	
07:00 - 08:00	5	322	19	0	346	0	8	371	8	0	387	0	733
08:00 - 09:00	17	482	16	0	515	0	8	404	15	0	427	3	942
09:00 - 10:00	7	395	6	0	408	1	8	404	19	0	431	0	839
BREAK													
15:00 - 16:00	10	500	13	0	523	1	9	534	23	0	566	4	1089
16:00 - 17:00	6	474	16	0	496	0	8	525	16	0	549	1	1045
17:00 - 18:00	7	481	12	0	500	0	3	466	17	0	486	1	986
GRAND TOTAL	52	2654	82	0	2788	2	44	2704	98	0	2846	9	5634

Traffic Count Data

Intersection: Hwy 26 (King St E) & Elgin St
Site Code: 2217800001
Municipality: Thornbury
Count Date: Jun 02, 2022

North Approach - Elgin St N

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	←	↑	→	↺	Total	
07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	1	0	1	0	2	0	0	0	0	0	0	1	0	0	1	0
08:00	4	0	2	0	6	0	1	0	0	1	0	0	0	0	0	0
08:15	3	0	2	0	5	0	0	0	0	0	0	0	0	0	0	0
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45	1	0	2	0	3	0	0	0	0	0	0	0	0	0	0	0
09:00	2	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0
09:15	3	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0
09:30	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0
09:45	2	0	1	0	3	1	0	0	0	1	0	0	0	0	0	0
SUBTOTAL	16	0	15	0	31	1	1	0	0	2	0	1	0	0	1	0

Traffic Count Data

Intersection: Hwy 26 (King St E) & Elgin St
Site Code: 2217800001
Municipality: Thornbury
Count Date: Jun 02, 2022

North Approach - Elgin St N

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
15:00	1	1	5	0	7	0	0	0	0	0	0	0	0	0	0	0
15:15	0	1	2	0	3	0	0	0	0	0	0	0	0	0	0	0
15:30	10	1	21	0	32	0	0	0	0	0	0	0	0	0	0	0
15:45	4	0	6	0	10	0	0	0	0	0	0	0	0	0	0	0
16:00	9	0	1	0	10	0	0	0	0	0	0	0	0	0	0	0
16:15	2	0	5	0	7	0	0	0	0	0	0	0	0	0	0	0
16:30	10	0	7	0	17	0	0	0	0	0	0	0	0	0	0	0
16:45	3	0	2	0	5	0	0	0	0	0	0	0	0	0	0	0
17:00	4	0	4	0	8	0	0	0	0	0	0	0	0	0	0	0
17:15	3	0	3	0	6	0	0	0	0	0	0	0	0	0	0	0
17:30	3	1	2	0	6	0	0	0	0	0	0	0	0	0	0	0
17:45	1	0	2	0	3	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	50	4	60	0	114	0	0	0	0	0	0	0	0	0	0	0
GRAND TOTAL	66	4	75	0	145	1	1	0	0	2	0	1	0	0	1	0

Traffic Count Data

Intersection: Hwy 26 (King St E) & Elgin St
Site Code: 2217800001
Municipality: Thornbury
Count Date: Jun 02, 2022

South Approach - Elgin St S

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	←	↑	→	↺	Total	
07:00	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
07:15	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0
07:30	3	1	0	0	4	0	0	0	0	0	0	0	0	0	0	0
07:45	2	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0
08:00	2	0	1	0	3	1	0	0	0	1	1	0	0	0	1	0
08:15	2	0	4	0	6	0	0	1	0	1	0	0	0	0	0	0
08:30	5	1	1	0	7	0	0	0	0	0	0	0	0	0	0	1
08:45	7	0	3	0	10	0	0	1	0	1	0	0	0	0	0	1
09:00	3	0	2	0	5	1	0	0	0	1	0	0	0	0	0	0
09:15	6	1	2	0	9	0	0	1	0	1	0	0	0	0	0	0
09:30	4	0	2	0	6	1	0	0	0	1	0	0	0	0	0	0
09:45	7	0	2	0	9	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	44	3	21	0	68	3	0	3	0	6	1	0	0	0	1	2

Traffic Count Data

Intersection: Hwy 26 (King St E) & Elgin St
Site Code: 2217800001
Municipality: Thornbury
Count Date: Jun 02, 2022

South Approach - Elgin St S

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	←	↑	→	↺	Total	
15:00	5	1	1	0	7	0	0	0	0	0	0	0	0	0	0	1
15:15	7	0	2	0	9	0	0	0	0	0	0	0	0	0	0	0
15:30	6	0	3	0	9	0	0	0	0	0	0	0	0	0	0	0
15:45	7	0	4	0	11	0	0	0	0	0	0	0	0	0	0	1
16:00	2	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0
16:15	4	0	2	0	6	0	0	0	0	0	0	0	0	0	0	0
16:30	11	0	3	0	14	0	0	1	0	1	0	0	0	0	0	0
16:45	3	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0
17:00	5	0	1	0	6	1	0	0	0	1	0	0	0	0	0	0
17:15	3	1	1	0	5	0	0	0	0	0	0	0	0	0	0	0
17:30	2	0	2	0	4	0	0	0	0	0	0	0	0	0	0	0
17:45	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	56	2	22	0	80	1	0	1	0	2	0	0	0	0	0	2
GRAND TOTAL	100	5	43	0	148	4	0	4	0	8	1	0	0	0	1	4

Traffic Count Data

Intersection: Hwy 26 (King St E) & Elgin St
Site Code: 2217800001
Municipality: Thornbury
Count Date: Jun 02, 2022

East Approach - Hwy 26 (King St E)

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	←	↑	→	↺	Total	
07:00	2	53	4	0	59	0	4	0	0	4	0	0	0	0	0	0
07:15	0	59	2	0	61	0	11	0	0	11	0	0	0	0	0	0
07:30	1	84	9	0	94	0	7	0	0	7	0	0	0	0	0	0
07:45	0	98	4	0	102	2	6	0	0	8	0	0	0	0	0	0
08:00	2	91	5	0	98	0	9	0	0	9	0	0	0	0	0	0
08:15	7	115	4	0	126	0	11	1	0	12	0	0	0	0	0	0
08:30	5	109	1	0	115	0	11	0	0	11	0	0	0	0	0	0
08:45	3	126	5	0	134	0	10	0	0	10	0	0	0	0	0	0
09:00	3	69	1	0	73	0	6	0	0	6	0	0	0	0	0	0
09:15	1	104	0	0	105	0	3	0	0	3	0	0	0	0	0	0
09:30	3	94	1	0	98	0	8	0	0	8	0	0	0	0	0	1
09:45	0	99	1	0	100	0	12	3	0	15	0	0	0	0	0	0
SUBTOTAL	27	1101	37	0	1165	2	98	4	0	104	0	0	0	0	0	1

Traffic Count Data

Intersection: Hwy 26 (King St E) & Elgin St
Site Code: 2217800001
Municipality: Thornbury
Count Date: Jun 02, 2022

East Approach - Hwy 26 (King St E)

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	←	↑	→	↺	Total	
15:00	0	117	2	0	119	0	5	0	0	5	0	0	0	0	0	0
15:15	5	104	2	0	111	0	13	1	0	14	0	0	0	0	0	1
15:30	2	118	5	0	125	0	6	0	0	6	0	0	0	0	0	0
15:45	3	130	3	0	136	0	7	0	0	7	0	0	0	0	0	0
16:00	1	111	2	0	114	0	12	0	0	12	0	0	0	0	0	0
16:15	2	117	5	0	124	0	7	0	0	7	0	0	0	0	0	0
16:30	3	110	6	0	119	0	5	0	0	5	0	0	0	0	0	0
16:45	0	105	3	0	108	0	7	0	0	7	0	0	0	0	0	0
17:00	0	130	3	0	133	0	6	0	0	6	0	0	0	0	0	0
17:15	2	119	3	0	124	0	5	0	0	5	0	0	0	0	0	0
17:30	3	107	4	0	114	0	4	0	0	4	0	0	0	0	0	0
17:45	2	108	2	0	112	0	2	0	0	2	0	0	0	0	0	0
SUBTOTAL	23	1376	40	0	1439	0	79	1	0	80	0	0	0	0	0	1
GRAND TOTAL	50	2477	77	0	2604	2	177	5	0	184	0	0	0	0	0	2

Traffic Count Data

Intersection: Hwy 26 (King St E) & Elgin St
Site Code: 2217800001
Municipality: Thornbury
Count Date: Jun 02, 2022

West Approach - Hwy 26 (King St E)

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	←	↑	→	↺	Total	
07:00	0	73	0	0	73	0	2	0	0	2	0	0	0	0	0	0
07:15	3	82	1	0	86	0	6	0	0	6	0	0	0	0	0	0
07:30	1	94	5	0	100	0	9	0	0	9	0	0	0	0	0	0
07:45	4	97	2	0	103	0	8	0	0	8	0	0	0	0	0	0
08:00	4	77	3	0	84	0	9	0	0	9	0	0	0	0	0	0
08:15	2	106	3	0	111	0	5	0	0	5	0	0	0	0	0	0
08:30	0	110	4	0	114	0	6	0	0	6	0	0	0	0	0	0
08:45	2	86	5	0	93	0	5	0	0	5	0	0	0	0	0	3
09:00	2	102	5	0	109	0	8	0	0	8	0	0	0	0	0	0
09:15	0	99	4	0	103	0	6	1	0	7	0	0	0	0	0	0
09:30	1	91	5	0	97	0	9	0	0	9	0	0	0	0	0	0
09:45	5	83	4	0	92	0	6	0	0	6	0	0	0	0	0	0
SUBTOTAL	24	1100	41	0	1165	0	79	1	0	80	0	0	0	0	0	3

Traffic Count Data

Intersection: Hwy 26 (King St E) & Elgin St
Site Code: 2217800001
Municipality: Thornbury
Count Date: Jun 02, 2022

West Approach - Hwy 26 (King St E)

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	←	↑	→	↺	Total	
15:00	2	99	7	0	108	0	10	0	0	10	0	0	0	0	0	1
15:15	2	119	5	0	126	0	6	0	0	6	0	0	0	0	0	1
15:30	3	140	5	0	148	0	9	1	0	10	0	0	0	0	0	0
15:45	2	147	5	0	154	0	4	0	0	4	0	0	0	0	0	2
16:00	4	115	6	0	125	1	11	0	0	12	0	0	0	0	0	0
16:15	2	122	4	0	128	0	8	0	0	8	0	0	0	0	0	1
16:30	1	130	3	0	134	0	9	0	0	9	0	0	0	0	0	0
16:45	0	124	3	0	127	0	6	0	0	6	0	0	0	0	0	0
17:00	1	119	5	0	125	0	5	0	0	5	0	0	0	0	0	0
17:15	0	114	5	0	119	0	3	0	0	3	0	0	0	0	0	1
17:30	1	118	4	0	123	0	5	1	0	6	0	0	0	0	0	0
17:45	1	97	2	0	100	0	5	0	0	5	0	0	0	0	0	0
SUBTOTAL	19	1444	54	0	1517	1	81	2	0	84	0	0	0	0	0	6
GRAND TOTAL	43	2544	95	0	2682	1	160	3	0	164	0	0	0	0	0	9

Peak Hour Diagram

Specified Period

From: 07:00:00
To: 10:00:00

One Hour Peak

From: 08:00:00
To: 09:00:00

Intersection: Hwy 26 (King St E) & Elgin St
Site Code: 2217800001
Count Date: Jun 02, 2022

Weather conditions: Clear

** Unsignalized Intersection **

Major Road: Hwy 26 (King St E) runs E/W

North Approach

	Out	In	Total
	14	24	38
	1	1	2
	0	0	0
Totals	15	25	40

Elgin St N

	0	0	0	0
	0	1	0	0
	6	0	8	0
Totals	6	1	8	0






East Approach

	Out	In	Total
	473	396	869
	42	27	69
	0	0	0
Totals	515	423	938

Hwy 26 (King St E)

				Totals
	0	0	0	0
	0	0	8	8
	0	25	379	404
	0	0	15	15

Peds: 3

Peds: 0



Peds: 2

Peds: 0

Hwy 26 (King St E)

Totals			
	0	0	0
	16	15	1
	482	441	41
	17	17	0

West Approach

	Out	In	Total
	402	463	865
	25	42	67
	0	1	1
Totals	427	506	933

Totals				
	18	1	11	0
	1	0	2	0
	1	0	0	0

Elgin St S

South Approach

	Out	In	Total
	26	32	58
	3	1	4
	1	0	1
Totals	30	33	63

 - Cars

 - Trucks

 - Bicycles

Comments

Peak Hour Summary

Intersection: Hwy 26 (King St E) & Elgin St
Site Code: 2217800001
Count Date: Jun 02, 2022
Period: 07:00 - 10:00

Peak Hour Data (08:00 - 09:00)

Start Time	North Approach Elgin St N						South Approach Elgin St S						East Approach Hwy 26 (King St E)						West Approach Hwy 26 (King St E)						Total Vehicles
	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	
08:00	4	1	2	0	0	7	4	0	1	0	0	5	2	100	5	0	0	107	4	86	3	0	0	93	212
08:15	3	0	2	0	0	5	2	0	5	0	0	7	7	126	5	0	0	138	2	111	3	0	0	116	266
08:30	0	0	0	0	0	0	5	1	1	0	1	7	5	120	1	0	0	126	0	116	4	0	0	120	253
08:45	1	0	2	0	0	3	7	0	4	0	1	11	3	136	5	0	0	144	2	91	5	0	3	98	256
Grand Total	8	1	6	0	0	15	18	1	11	0	2	30	17	482	16	0	0	515	8	404	15	0	3	427	987
Approach %	53.3	6.7	40	0	-	-	60	3.3	36.7	0	-	-	3.3	93.6	3.1	0	-	-	1.9	94.6	3.5	0	-	-	-
Totals %	0.8	0.1	0.6	0	-	1.5	1.8	0.1	1.1	0	-	3	1.7	48.8	1.6	0	-	52.2	0.8	40.9	1.5	0	-	43.3	-
PHF	0.5	0.25	0.75	0	-	0.54	0.64	0.25	0.55	0	-	0.68	0.61	0.89	0.8	0	-	0.89	0.5	0.87	0.75	0	-	0.89	0.93
Cars	8	0	6	0	-	14	16	1	9	0	-	26	17	441	15	0	-	473	8	379	15	0	-	402	915
% Cars	100	0	100	0	-	93.3	88.9	100	81.8	0	-	86.7	100	91.5	93.8	0	-	91.8	100	93.8	100	0	-	94.1	92.7
Trucks	0	1	0	0	-	1	1	0	2	0	-	3	0	41	1	0	-	42	0	25	0	0	-	25	71
% Trucks	0	100	0	0	-	6.7	5.6	0	18.2	0	-	10	0	8.5	6.3	0	-	8.2	0	6.2	0	0	-	5.9	7.2
Bicycles	0	0	0	0	-	0	1	0	0	0	-	1	0	0	0	0	-	0	0	0	0	0	-	0	1
% Bicycles	0	0	0	0	-	0	5.6	0	0	0	-	3.3	0	0	0	0	-	0	0	0	0	0	-	0	0.1
Peds	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	3	-	5
% Peds	-	-	-	-	0	-	-	-	-	-	40	-	-	-	-	-	0	-	-	-	-	-	60	-	-

Peak Hour Diagram

Specified Period

From: 15:00:00
To: 18:00:00

One Hour Peak

From: 15:30:00
To: 16:30:00

Intersection: Hwy 26 (King St E) & Elgin St
Site Code: 2217800001
Count Date: Jun 02, 2022

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: Hwy 26 (King St E) runs E/W

North Approach

	Out	In	Total
	59	26	85
	0	1	1
	0	0	0
Totals	59	27	86

Elgin St N

	0	0	0	0
	0	0	0	0
	33	1	25	0
Totals	33	1	25	0






East Approach

	Out	In	Total
	499	559	1058
	32	32	64
	0	0	0
Totals	531	591	1122

Hwy 26 (King St E)

				Totals	
0	0	0	0	0	
0	1	11	12	12	
0	32	524	556	556	
0	1	20	21	21	

Peds: 3

Peds: 0



Peds: 1

Peds: 0

Hwy 26 (King St E)

Totals			
0	0	0	0
15	15	0	0
508	476	32	0
8	8	0	0

West Approach

	Out	In	Total
	555	528	1083
	34	32	66
	0	0	0
Totals	589	560	1149

Totals				
	19	0	10	0
	0	0	0	0
	0	0	0	0

Elgin St S

South Approach

	Out	In	Total
	29	29	58
	0	1	1
	0	0	0
Totals	29	30	59

 - Cars

 - Trucks

 - Bicycles

Comments

Peak Hour Summary

Intersection: Hwy 26 (King St E) & Elgin St
Site Code: 2217800001
Count Date: Jun 02, 2022
Period: 15:00 - 18:00

Peak Hour Data (15:30 - 16:30)

	North Approach Elgin St N						South Approach Elgin St S						East Approach Hwy 26 (King St E)						West Approach Hwy 26 (King St E)						Total Vehicl es
Start Time	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	
15:30	10	1	21	0	0	32	6	0	3	0	0	9	2	124	5	0	0	131	3	149	6	0	0	158	330
15:45	4	0	6	0	0	10	7	0	4	0	1	11	3	137	3	0	0	143	2	151	5	0	2	158	322
16:00	9	0	1	0	0	10	2	0	1	0	0	3	1	123	2	0	0	126	5	126	6	0	0	137	276
16:15	2	0	5	0	0	7	4	0	2	0	0	6	2	124	5	0	0	131	2	130	4	0	1	136	280
Grand Total	25	1	33	0	0	59	19	0	10	0	1	29	8	508	15	0	0	531	12	556	21	0	3	589	1208
Approach %	42.4	1.7	55.9	0		-	65.5	0	34.5	0		-	1.5	95.7	2.8	0		-	2	94.4	3.6	0		-	
Totals %	2.1	0.1	2.7	0		4.9	1.6	0	0.8	0		2.4	0.7	42.1	1.2	0		44	1	46	1.7	0		48.8	
PHF	0.63	0.25	0.39	0		0.46	0.68	0	0.63	0		0.66	0.67	0.93	0.75	0		0.93	0.6	0.92	0.88	0		0.93	0.92
Cars	25	1	33	0		59	19	0	10	0		29	8	476	15	0		499	11	524	20	0		555	1142
% Cars	100	100	100	0		100	100	0	100	0		100	100	93.7	100	0		94	91.7	94.2	95.2	0		94.2	94.5
Trucks	0	0	0	0		0	0	0	0	0		0	0	32	0	0		32	1	32	1	0		34	66
% Trucks	0	0	0	0		0	0	0	0	0		0	0	6.3	0	0		6	8.3	5.8	4.8	0		5.8	5.5
Bicycles	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0
% Bicycles	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0
Peds	0					-	1					-	0					-	3					-	4
% Peds	0					-	25					-	0					-	75					-	

Appendix B: LOS Definitions

CAPACITY ANALYSIS AT UNSIGNALIZED INTERSECTIONS

Highway Capacity Manual Methodology

The level of service at an unsignalized intersection is determined on the basis of control delay for each critical lane. This method of analysis is taken from the Highway Capacity Manual, Special Report 209, by the Transportation Research Board, 1997.

The average control delay for any particular critical movement (control delay includes initial deceleration, queue move-up time, stopped delay, and final acceleration delay) is a function of the service rate or capacity of the approach and degree of saturation. The level of service criteria for unsignalized intersections is outlined below and is related to ranges in vehicle delay.

Level of Service	Expected Delay to Minor Street Traffic	Average Control Delay 'd' (sec/veh)
A	Little or no delays	$0 < d \leq 10$
B	Short traffic delays	$10 \leq d \leq 15$
C	Average traffic delays	$15 \leq d \leq 25$
D	Long traffic delays	$25 \leq d \leq 35$
E	Very long traffic delays	$35 \leq d \leq 50$
F	Extreme delays with queuing which may cause congestion affecting other traffic movements in the intersection	$d > 50$

CAPACITY ANALYSIS AT SIGNALIZED INTERSECTIONS

Highway Capacity Manual Methodology

The capacity of signalized intersections has been determined in terms of delay taken from Chapter 9 of the Highway Capacity Manual, Special Report 209, by the Transportation Research Board, 2000.

To assist in clarifying the arithmetic analysis associated with traffic engineering, it is often useful to refer to "Level of Service". Level of Service (LOS) for signalized intersections is defined in terms of delay, which is made up of a number of factors that relate to control, geometrics, traffic, and incidents. Only the portion of total delay attributed to the control facility is quantified. This control delay includes initial deceleration, queue move-up time, stopped delay, and final acceleration delay. The following table describes in detail the characteristics of each level:

Level of Service	Expected Delay to Minor Street Traffic	Average Control Delay 'd' (sec/veh)
A	Describes operations with very low control delay, up to 10 seconds/vehicle. This level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all at this LOS. Short cycle lengths may also contribute to low delay.	$d \leq 10$
B	Describes operations with control delay greater than 10 seconds and up to 20 seconds/vehicle. This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop at this level than at LOS A, causing longer average delays.	$10 \leq d \leq 20$
C	Describes operations with control delay greater than 20 seconds and up to 35 seconds/vehicle. These higher delays may result from fair progression, longer cycle length, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, though many still pass through the intersection without stopping.	$20 \leq d \leq 35$
D	Describes operations with control delay greater than 35 seconds and up to 55 seconds/vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavourable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures become noticeable.	$35 \leq d \leq 55$
E	Describes operations with control delay greater than 55 seconds and up to 80 seconds/vehicle. This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.	$55 \leq d \leq 80$
F	LOS F describes operations with control delay in excess of 80 seconds/vehicle. This <i>oversaturation</i> , considered to be unacceptable to most drivers, occurs when arrival flow rates exceed the design capacity of the intersection. It may also occur at high v/c ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing factors to such high delay levels.	$d > 80$

Appendix C: Existing Operations

HCM Unsignalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2022 Existing Conditions

Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	404	15	17	482	16	18	1	11	8	1	6
Future Volume (Veh/h)	8	404	15	17	482	16	18	1	11	8	1	6
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.55	0.50	0.25	0.75
Hourly flow rate (vph)	16	464	20	28	542	20	28	4	20	16	4	8
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	562			484			1124	1124	474	1136	1124	552
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	562			484			1124	1124	474	1136	1124	552
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 %	98			97			84	98	97	90	98	99
cM capacity (veh/h)	1009			1079			171	197	590	165	197	533
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	500	590	52	28								
Volume Left	16	28	28	16								
Volume Right	20	20	20	8								
cSH	1009	1079	239	212								
Volume to Capacity	0.02	0.03	0.22	0.13								
Queue Length 95th (m)	0.4	0.6	6.1	3.4								
Control Delay (s)	0.5	0.7	24.2	24.6								
Lane LOS	A	A	C	C								
Approach Delay (s)	0.5	0.7	24.2	24.6								
Approach LOS			C	C								
Intersection Summary												
Average Delay			2.2									
Intersection Capacity Utilization			45.3%	ICU Level of Service					A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

3: Wellington St/Centre Access & King St E

2022 Existing Conditions
Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	416	8	9	506	0	9	0	6	0	0	0
Future Volume (Veh/h)	0	416	8	9	506	0	9	0	6	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.75	0.92	0.92	0.92
Hourly flow rate (vph)	0	478	11	15	569	0	14	0	8	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	569			489			1082	1082	484	1090	1088	569
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	569			489			1082	1082	484	1090	1088	569
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			93	100	99	100	100	100
cM capacity (veh/h)	1003			1074			193	214	583	188	213	522
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	489	584	22	0								
Volume Left	0	15	14	0								
Volume Right	11	0	8	0								
cSH	1003	1074	255	1700								
Volume to Capacity	0.00	0.01	0.09	0.00								
Queue Length 95th (m)	0.0	0.3	2.1	0.0								
Control Delay (s)	0.0	0.4	20.5	0.0								
Lane LOS		A	C	A								
Approach Delay (s)	0.0	0.4	20.5	0.0								
Approach LOS			C	A								
Intersection Summary												
Average Delay			0.6									
Intersection Capacity Utilization			43.8%	ICU Level of Service					A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2022 Existing Conditions
Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	556	21	8	508	15	19	0	10	25	1	33
Future Volume (Veh/h)	12	556	21	8	508	15	19	0	10	25	1	33
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.82	0.88	0.67	0.93	0.75	0.68	0.25	0.63	0.63	0.25	0.39
Hourly flow rate (vph)	20	678	24	12	546	20	28	0	16	40	4	85
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	566			702			1397	1320	690	1326	1322	556
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	566			702			1397	1320	690	1326	1322	556
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 %	98			99			71	100	96	68	97	84
cM capacity (veh/h)	1006			895			95	152	445	125	151	531
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	722	578	44	129								
Volume Left	20	12	28	40								
Volume Right	24	20	16	85								
cSH	1006	895	133	254								
Volume to Capacity	0.02	0.01	0.33	0.51								
Queue Length 95th (m)	0.5	0.3	10.1	20.1								
Control Delay (s)	0.5	0.4	44.9	32.9								
Lane LOS	A	A	E	D								
Approach Delay (s)	0.5	0.4	44.9	32.9								
Approach LOS			E	D								
Intersection Summary												
Average Delay			4.6									
Intersection Capacity Utilization			47.5%	ICU Level of Service					A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

3: Wellington St/Centre Access & King St E

2022 Existing Conditions
Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	581	11	4	522	0	10	0	5	0	0	0
Future Volume (Veh/h)	0	581	11	4	522	0	10	0	5	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.92	0.88	0.67	0.93	0.75	0.68	0.92	0.63	0.63	0.25	0.39
Hourly flow rate (vph)	0	632	12	6	561	0	15	0	8	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	561			644			1211	1211	638	1219	1217	561
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	561			644			1211	1211	638	1219	1217	561
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			91	100	98	100	100	100
cM capacity (veh/h)	1010			941			158	181	477	154	180	527
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	644	567	23	0								
Volume Left	0	6	15	0								
Volume Right	12	0	8	0								
cSH	1010	941	206	1700								
Volume to Capacity	0.00	0.01	0.11	0.00								
Queue Length 95th (m)	0.0	0.1	2.8	0.0								
Control Delay (s)	0.0	0.2	24.6	0.0								
Lane LOS		A	C	A								
Approach Delay (s)	0.0	0.2	24.6	0.0								
Approach LOS			C	A								
Intersection Summary												
Average Delay			0.5									
Intersection Capacity Utilization			41.2%		ICU Level of Service				A			
Analysis Period (min)			15									

Appendix D: Background Operations

HCM Unsignalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2026 Background Conditions
Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	472	15	17	551	18	18	1	11	18	1	13
Future Volume (Veh/h)	11	472	15	17	551	18	18	1	11	18	1	13
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.55	0.50	0.25	0.75
Hourly flow rate (vph)	22	543	20	28	619	22	28	4	20	36	4	17
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	641			563			1302	1294	553	1305	1293	630
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	641			563			1302	1294	553	1305	1293	630
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 %	98			97			78	97	96	71	97	96
cM capacity (veh/h)	943			1008			125	154	533	124	155	482
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	585	669	52	57								
Volume Left	22	28	28	36								
Volume Right	20	22	20	17								
cSH	943	1008	181	163								
Volume to Capacity	0.02	0.03	0.29	0.35								
Queue Length 95th (m)	0.5	0.7	8.6	11.1								
Control Delay (s)	0.6	0.7	32.7	38.7								
Lane LOS	A	A	D	E								
Approach Delay (s)	0.6	0.7	32.7	38.7								
Approach LOS			D	E								
Intersection Summary												
Average Delay			3.5									
Intersection Capacity Utilization			48.5%	ICU Level of Service					A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

3: Wellington St/Centre Access & King St E

2026 Background Conditions
Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	495	8	9	579	0	9	0	6	0	0	0
Future Volume (Veh/h)	0	495	8	9	579	0	9	0	6	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.75	0.92	0.92	0.92
Hourly flow rate (vph)	0	569	11	15	651	0	14	0	8	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	651			580			1256	1256	574	1264	1261	651
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	651			580			1256	1256	574	1264	1261	651
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			98			90	100	98	100	100	100
cM capacity (veh/h)	935			994			147	169	518	143	168	469
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	580	666	22	0								
Volume Left	0	15	14	0								
Volume Right	11	0	8	0								
cSH	935	994	198	1700								
Volume to Capacity	0.00	0.02	0.11	0.00								
Queue Length 95th (m)	0.0	0.3	2.8	0.0								
Control Delay (s)	0.0	0.4	25.4	0.0								
Lane LOS		A	D	A								
Approach Delay (s)	0.0	0.4	25.4	0.0								
Approach LOS			D	A								
Intersection Summary												
Average Delay			0.7									
Intersection Capacity Utilization			47.7%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2026 Background Conditions
Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	638	21	8	599	22	19	0	10	32	1	38
Future Volume (Veh/h)	22	638	21	8	599	22	19	0	10	32	1	38
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.82	0.88	0.67	0.93	0.75	0.68	0.25	0.63	0.63	0.25	0.39
Hourly flow rate (vph)	37	778	24	12	644	29	28	0	16	51	4	97
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	673			802			1646	1561	790	1562	1558	658
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	673			802			1646	1561	790	1562	1558	658
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 %	96			99			52	100	96	39	96	79
cM capacity (veh/h)	918			822			58	106	390	83	106	464
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	839	685	44	152								
Volume Left	37	12	28	51								
Volume Right	24	29	16	97								
cSH	918	822	85	177								
Volume to Capacity	0.04	0.01	0.52	0.86								
Queue Length 95th (m)	1.0	0.3	17.1	46.6								
Control Delay (s)	1.1	0.4	86.5	87.5								
Lane LOS	A	A	F	F								
Approach Delay (s)	1.1	0.4	86.5	87.5								
Approach LOS			F	F								
Intersection Summary												
Average Delay			10.6									
Intersection Capacity Utilization			59.0%		ICU Level of Service				B			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

3: Wellington St/Centre Access & King St E

2026 Background Conditions
Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	670	11	4	620	0	10	0	5	0	0	0
Future Volume (Veh/h)	0	670	11	4	620	0	10	0	5	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.92	0.88	0.67	0.93	0.75	0.68	0.92	0.63	0.63	0.25	0.39
Hourly flow rate (vph)	0	728	12	6	667	0	15	0	8	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	667			740			1413	1413	734	1421	1419	667
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	667			740			1413	1413	734	1421	1419	667
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			87	100	98	100	100	100
cM capacity (veh/h)	923			867			115	137	420	111	136	459
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	740	673	23	0								
Volume Left	0	6	15	0								
Volume Right	12	0	8	0								
cSH	923	867	154	1700								
Volume to Capacity	0.00	0.01	0.15	0.00								
Queue Length 95th (m)	0.0	0.2	3.9	0.0								
Control Delay (s)	0.0	0.2	32.5	0.0								
Lane LOS		A	D	A								
Approach Delay (s)	0.0	0.2	32.5	0.0								
Approach LOS			D	A								
Intersection Summary												
Average Delay	0.6											
Intersection Capacity Utilization	45.9%			ICU Level of Service					A			
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2031 Background Conditions
Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	518	16	18	605	19	19	1	12	18	1	13
Future Volume (Veh/h)	11	518	16	18	605	19	19	1	12	18	1	13
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.55	0.50	0.25	0.75
Hourly flow rate (vph)	22	595	21	30	680	24	30	4	22	36	4	17
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	704			616			1420	1414	606	1426	1412	692
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	704			616			1420	1414	606	1426	1412	692
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 %	98			97			71	97	96	64	97	96
cM capacity (veh/h)	894			964			103	130	497	101	130	444
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	638	734	56	57								
Volume Left	22	30	30	36								
Volume Right	21	24	22	17								
cSH	894	964	152	134								
Volume to Capacity	0.02	0.03	0.37	0.42								
Queue Length 95th (m)	0.6	0.7	11.7	14.1								
Control Delay (s)	0.7	0.8	41.7	50.3								
Lane LOS	A	A	E	F								
Approach Delay (s)	0.7	0.8	41.7	50.3								
Approach LOS			E	F								
Intersection Summary												
Average Delay			4.2									
Intersection Capacity Utilization			52.2%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

3: Wellington St/Centre Access & King St E

2031 Background Conditions
Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	542	8	9	636	0	9	0	6	0	0	0
Future Volume (Veh/h)	0	542	8	9	636	0	9	0	6	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.75	0.92	0.92	0.92
Hourly flow rate (vph)	0	623	11	15	715	0	14	0	8	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	715			634			1374	1374	628	1382	1379	715
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	715			634			1374	1374	628	1382	1379	715
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			98			88	100	98	100	100	100
cM capacity (veh/h)	885			949			121	143	483	118	142	431
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	634	730	22	0								
Volume Left	0	15	14	0								
Volume Right	11	0	8	0								
cSH	885	949	167	1700								
Volume to Capacity	0.00	0.02	0.13	0.00								
Queue Length 95th (m)	0.0	0.4	3.4	0.0								
Control Delay (s)	0.0	0.4	29.8	0.0								
Lane LOS		A	D	A								
Approach Delay (s)	0.0	0.4	29.8	0.0								
Approach LOS			D	A								
Intersection Summary												
Average Delay	0.7											
Intersection Capacity Utilization	50.7%			ICU Level of Service					A			
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2031 Background Conditions
Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	700	22	8	656	23	20	0	10	32	1	39
Future Volume (Veh/h)	23	700	22	8	656	23	20	0	10	32	1	39
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.82	0.88	0.67	0.93	0.75	0.68	0.25	0.63	0.63	0.25	0.39
Hourly flow rate (vph)	38	854	25	12	705	31	29	0	16	51	4	100
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	736			879			1789	1702	866	1703	1700	720
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	736			879			1789	1702	866	1703	1700	720
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 %	96			98			35	100	95	23	95	77
cM capacity (veh/h)	870			769			44	86	353	66	87	428
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	917	748	45	155								
Volume Left	38	12	29	51								
Volume Right	25	31	16	100								
cSH	870	769	65	147								
Volume to Capacity	0.04	0.02	0.70	1.05								
Queue Length 95th (m)	1.0	0.4	23.3	61.8								
Control Delay (s)	1.2	0.4	141.6	149.6								
Lane LOS	A	A	F	F								
Approach Delay (s)	1.2	0.4	141.6	149.6								
Approach LOS			F	F								
Intersection Summary												
Average Delay			16.6									
Intersection Capacity Utilization			63.2%	ICU Level of Service					B			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

3: Wellington St/Centre Access & King St E

2031 Background Conditions
Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	736	11	4	679	0	10	0	5	0	0	0
Future Volume (Veh/h)	0	736	11	4	679	0	10	0	5	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.92	0.88	0.67	0.93	0.75	0.68	0.92	0.63	0.63	0.25	0.39
Hourly flow rate (vph)	0	800	12	6	730	0	15	0	8	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	730			812			1548	1548	806	1556	1554	730
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	730			812			1548	1548	806	1556	1554	730
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			84	100	98	100	100	100
cM capacity (veh/h)	874			814			92	113	382	89	112	422
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	812	736	23	0								
Volume Left	0	6	15	0								
Volume Right	12	0	8	0								
cSH	874	814	126	1700								
Volume to Capacity	0.00	0.01	0.18	0.00								
Queue Length 95th (m)	0.0	0.2	4.9	0.0								
Control Delay (s)	0.0	0.2	40.0	0.0								
Lane LOS		A	E	A								
Approach Delay (s)	0.0	0.2	40.0	0.0								
Approach LOS			E	A								
Intersection Summary												
Average Delay			0.7									
Intersection Capacity Utilization			49.4%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2036 Background Conditions
Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	568	16	18	665	19	20	1	11	19	1	13
Future Volume (Veh/h)	12	568	16	18	665	19	20	1	11	19	1	13
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.55	0.50	0.25	0.75
Hourly flow rate (vph)	24	653	21	30	747	24	31	4	20	38	4	17
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	771			674			1550	1542	664	1552	1541	759
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	771			674			1550	1542	664	1552	1541	759
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 %	97			97			62	96	96	54	96	96
cM capacity (veh/h)	844			917			82	108	461	82	108	406
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	698	801	55	59								
Volume Left	24	30	31	38								
Volume Right	21	24	20	17								
cSH	844	917	120	109								
Volume to Capacity	0.03	0.03	0.46	0.54								
Queue Length 95th (m)	0.7	0.8	15.4	19.2								
Control Delay (s)	0.8	0.9	57.9	72.0								
Lane LOS	A	A	F	F								
Approach Delay (s)	0.8	0.9	57.9	72.0								
Approach LOS			F	F								
Intersection Summary												
Average Delay			5.4									
Intersection Capacity Utilization			55.3%		ICU Level of Service				B			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

3: Wellington St/Centre Access & King St E

2036 Background Conditions
Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	593	8	9	699	0	10	0	6	0	0	0
Future Volume (Veh/h)	0	593	8	9	699	0	10	0	6	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.75	0.92	0.92	0.92
Hourly flow rate (vph)	0	682	11	15	785	0	16	0	8	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	785			693			1502	1502	688	1510	1508	785
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	785			693			1502	1502	688	1510	1508	785
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			98			84	100	98	100	100	100
cM capacity (veh/h)	834			902			99	120	447	96	119	393
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	693	800	24	0								
Volume Left	0	15	16	0								
Volume Right	11	0	8	0								
cSH	834	902	133	1700								
Volume to Capacity	0.00	0.02	0.18	0.00								
Queue Length 95th (m)	0.0	0.4	4.8	0.0								
Control Delay (s)	0.0	0.4	37.8	0.0								
Lane LOS		A	E	A								
Approach Delay (s)	0.0	0.4	37.8	0.0								
Approach LOS			E	A								
Intersection Summary												
Average Delay			0.8									
Intersection Capacity Utilization			54.0%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2036 Background Conditions
Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	770	23	9	719	23	20	0	11	33	1	39
Future Volume (Veh/h)	23	770	23	9	719	23	20	0	11	33	1	39
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.82	0.88	0.67	0.93	0.75	0.68	0.25	0.63	0.63	0.25	0.39
Hourly flow rate (vph)	38	939	26	13	773	31	29	0	17	52	4	100
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	804			965			1944	1858	952	1860	1856	788
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	804			965			1944	1858	952	1860	1856	788
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 %	95			98			12	100	95	0	94	74
cM capacity (veh/h)	820			714			33	69	315	51	69	391
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1003	817	46	156								
Volume Left	38	13	29	52								
Volume Right	26	31	17	100								
cSH	820	714	49	116								
Volume to Capacity	0.05	0.02	0.93	1.34								
Queue Length 95th (m)	1.1	0.4	30.0	80.1								
Control Delay (s)	1.4	0.5	237.7	270.4								
Lane LOS	A	A	F	F								
Approach Delay (s)	1.4	0.5	237.7	270.4								
Approach LOS			F	F								
Intersection Summary												
Average Delay			27.1									
Intersection Capacity Utilization			67.0%		ICU Level of Service				C			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

3: Wellington St/Centre Access & King St E

2036 Background Conditions
Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	808	11	4	744	0	10	0	6	0	0	0
Future Volume (Veh/h)	0	808	11	4	744	0	10	0	6	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.92	0.88	0.67	0.93	0.75	0.68	0.92	0.63	0.63	0.25	0.39
Hourly flow rate (vph)	0	878	12	6	800	0	15	0	10	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	800			890			1696	1696	884	1706	1702	800
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	800			890			1696	1696	884	1706	1702	800
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			79	100	97	100	100	100
cM capacity (veh/h)	823			761			73	92	344	70	91	385
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	890	806	25	0								
Volume Left	0	6	15	0								
Volume Right	12	0	10	0								
cSH	823	761	106	1700								
Volume to Capacity	0.00	0.01	0.24	0.00								
Queue Length 95th (m)	0.0	0.2	6.5	0.0								
Control Delay (s)	0.0	0.2	49.0	0.0								
Lane LOS		A	E	A								
Approach Delay (s)	0.0	0.2	49.0	0.0								
Approach LOS			E	A								
Intersection Summary												
Average Delay			0.8									
Intersection Capacity Utilization			53.2%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2026 Background Conditions
Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	472	15	17	551	18	18	1	11	18	1	13
Future Volume (vph)	11	472	15	17	551	18	18	1	11	18	1	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			1.00			0.95			0.96	
Flt Protected		1.00			1.00			0.97			0.97	
Satd. Flow (prot)		1871			1871			1739			1752	
Flt Permitted		0.97			0.97			0.80			0.78	
Satd. Flow (perm)		1817			1813			1430			1405	
Peak-hour factor, PHF	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.55	0.50	0.25	0.75
Adj. Flow (vph)	22	543	20	28	619	22	28	4	20	36	4	17
RTOR Reduction (vph)	0	1	0	0	1	0	0	19	0	0	16	0
Lane Group Flow (vph)	0	584	0	0	669	0	0	33	0	0	41	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		53.0			53.0			5.1			5.1	
Effective Green, g (s)		53.0			53.0			5.1			5.1	
Actuated g/C Ratio		0.76			0.76			0.07			0.07	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1373			1370			104			102	
v/s Ratio Prot												
v/s Ratio Perm		0.32			0.37			0.02			0.03	
v/c Ratio		0.43			0.49			0.32			0.40	
Uniform Delay, d1		3.1			3.3			30.9			31.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.0			1.2			1.8			2.6	
Delay (s)		4.0			4.6			32.7			33.7	
Level of Service		A			A			C			C	
Approach Delay (s)		4.0			4.6			32.7			33.7	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay		6.6			HCM 2000 Level of Service			A				
HCM 2000 Volume to Capacity ratio		0.48										
Actuated Cycle Length (s)		70.1			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		52.6%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2026 Background Conditions
Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	638	21	8	599	22	19	0	10	32	1	38
Future Volume (vph)	22	638	21	8	599	22	19	0	10	32	1	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.95			0.91	
Flt Protected		1.00			1.00			0.97			0.98	
Satd. Flow (prot)		1872			1871			1736			1693	
Flt Permitted		0.96			0.98			0.72			0.87	
Satd. Flow (perm)		1792			1844			1291			1499	
Peak-hour factor, PHF	0.60	0.82	0.88	0.67	0.93	0.75	0.68	0.25	0.63	0.63	0.25	0.39
Adj. Flow (vph)	37	778	24	12	644	29	28	0	16	51	4	97
RTOR Reduction (vph)	0	1	0	0	1	0	0	39	0	0	85	0
Lane Group Flow (vph)	0	838	0	0	684	0	0	5	0	0	67	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		48.9			48.9			8.6			8.6	
Effective Green, g (s)		48.9			48.9			8.6			8.6	
Actuated g/C Ratio		0.70			0.70			0.12			0.12	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1260			1297			159			185	
v/s Ratio Prot												
v/s Ratio Perm		c0.47			0.37			0.00			c0.04	
v/c Ratio		0.66			0.53			0.03			0.36	
Uniform Delay, d1		5.7			4.9			26.8			27.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.8			1.5			0.1			1.2	
Delay (s)		8.5			6.4			26.9			29.1	
Level of Service		A			A			C			C	
Approach Delay (s)		8.5			6.4			26.9			29.1	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay		10.0			HCM 2000 Level of Service			A				
HCM 2000 Volume to Capacity ratio		0.62										
Actuated Cycle Length (s)		69.5			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		62.3%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2031 Background Conditions
Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	518	16	18	605	19	19	1	12	18	1	13
Future Volume (vph)	11	518	16	18	605	19	19	1	12	18	1	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			1.00			0.95			0.96	
Flt Protected		1.00			1.00			0.97			0.97	
Satd. Flow (prot)		1872			1871			1737			1752	
Flt Permitted		0.97			0.96			0.80			0.77	
Satd. Flow (perm)		1817			1808			1430			1401	
Peak-hour factor, PHF	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.55	0.50	0.25	0.75
Adj. Flow (vph)	22	595	21	30	680	24	30	4	22	36	4	17
RTOR Reduction (vph)	0	1	0	0	1	0	0	20	0	0	16	0
Lane Group Flow (vph)	0	637	0	0	733	0	0	36	0	0	41	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		52.7			52.7			5.1			5.1	
Effective Green, g (s)		52.7			52.7			5.1			5.1	
Actuated g/C Ratio		0.76			0.76			0.07			0.07	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1371			1365			104			102	
v/s Ratio Prot												
v/s Ratio Perm		0.35			0.41			0.02			0.03	
v/c Ratio		0.46			0.54			0.34			0.40	
Uniform Delay, d1		3.2			3.5			30.8			30.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.1			1.5			2.0			2.6	
Delay (s)		4.4			5.0			32.7			33.5	
Level of Service		A			A			C			C	
Approach Delay (s)		4.4			5.0			32.7			33.5	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay		6.9			HCM 2000 Level of Service			A				
HCM 2000 Volume to Capacity ratio		0.53										
Actuated Cycle Length (s)		69.8			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		56.3%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2031 Background Conditions
Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	700	22	8	656	23	20	0	10	32	1	39
Future Volume (vph)	23	700	22	8	656	23	20	0	10	32	1	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.95			0.91	
Flt Protected		1.00			1.00			0.97			0.98	
Satd. Flow (prot)		1873			1871			1737			1692	
Flt Permitted		0.95			0.98			0.71			0.87	
Satd. Flow (perm)		1789			1844			1275			1501	
Peak-hour factor, PHF	0.60	0.82	0.88	0.67	0.93	0.75	0.68	0.25	0.63	0.63	0.25	0.39
Adj. Flow (vph)	38	854	25	12	705	31	29	0	16	51	4	100
RTOR Reduction (vph)	0	1	0	0	1	0	0	39	0	0	88	0
Lane Group Flow (vph)	0	916	0	0	747	0	0	6	0	0	67	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		48.8			48.8			8.6			8.6	
Effective Green, g (s)		48.8			48.8			8.6			8.6	
Actuated g/C Ratio		0.70			0.70			0.12			0.12	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1257			1296			157			186	
v/s Ratio Prot												
v/s Ratio Perm		c0.51			0.40			0.01			c0.04	
v/c Ratio		0.73			0.58			0.04			0.36	
Uniform Delay, d1		6.3			5.1			26.8			27.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		3.7			1.9			0.1			1.2	
Delay (s)		10.0			7.0			26.9			29.1	
Level of Service		B			A			C			C	
Approach Delay (s)		10.0			7.0			26.9			29.1	
Approach LOS		B			A			C			C	
Intersection Summary												
HCM 2000 Control Delay		10.8			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.67										
Actuated Cycle Length (s)		69.4			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		66.5%			ICU Level of Service			C				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2036 Background Conditions
Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	568	16	18	665	19	20	1	11	19	1	13
Future Volume (vph)	12	568	16	18	665	19	20	1	11	19	1	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			1.00			0.95			0.96	
Flt Protected		1.00			1.00			0.97			0.97	
Satd. Flow (prot)		1873			1872			1742			1754	
Flt Permitted		0.96			0.96			0.79			0.77	
Satd. Flow (perm)		1810			1808			1419			1397	
Peak-hour factor, PHF	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.55	0.50	0.25	0.75
Adj. Flow (vph)	24	653	21	30	747	24	31	4	20	38	4	17
RTOR Reduction (vph)	0	1	0	0	1	0	0	19	0	0	16	0
Lane Group Flow (vph)	0	697	0	0	800	0	0	36	0	0	43	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		52.7			52.7			5.2			5.2	
Effective Green, g (s)		52.7			52.7			5.2			5.2	
Actuated g/C Ratio		0.75			0.75			0.07			0.07	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1364			1363			105			103	
v/s Ratio Prot												
v/s Ratio Perm		0.39			0.44			0.03			0.03	
v/c Ratio		0.51			0.59			0.35			0.42	
Uniform Delay, d1		3.4			3.8			30.7			30.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.4			1.9			2.0			2.8	
Delay (s)		4.8			5.7			32.7			33.7	
Level of Service		A			A			C			C	
Approach Delay (s)		4.8			5.7			32.7			33.7	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay		7.2			HCM 2000 Level of Service			A				
HCM 2000 Volume to Capacity ratio		0.57										
Actuated Cycle Length (s)		69.9			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		59.5%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2036 Background Conditions
Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	770	23	9	719	23	20	0	11	33	1	39
Future Volume (vph)	23	770	23	9	719	23	20	0	11	33	1	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.95			0.91	
Flt Protected		1.00			1.00			0.97			0.98	
Satd. Flow (prot)		1873			1872			1735			1692	
Flt Permitted		0.95			0.98			0.71			0.87	
Satd. Flow (perm)		1788			1840			1277			1498	
Peak-hour factor, PHF	0.60	0.82	0.88	0.67	0.93	0.75	0.68	0.25	0.63	0.63	0.25	0.39
Adj. Flow (vph)	38	939	26	13	773	31	29	0	17	52	4	100
RTOR Reduction (vph)	0	1	0	0	1	0	0	39	0	0	88	0
Lane Group Flow (vph)	0	1002	0	0	816	0	0	7	0	0	68	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		48.9			48.9			8.6			8.6	
Effective Green, g (s)		48.9			48.9			8.6			8.6	
Actuated g/C Ratio		0.70			0.70			0.12			0.12	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1258			1294			158			185	
v/s Ratio Prot												
v/s Ratio Perm		c0.56			0.44			0.01			c0.05	
v/c Ratio		0.80			0.63			0.05			0.37	
Uniform Delay, d1		6.9			5.5			26.8			28.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		5.3			2.3			0.1			1.2	
Delay (s)		12.2			7.8			27.0			29.2	
Level of Service		B			A			C			C	
Approach Delay (s)		12.2			7.8			27.0			29.2	
Approach LOS		B			A			C			C	
Intersection Summary												
HCM 2000 Control Delay		12.1			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.73										
Actuated Cycle Length (s)		69.5			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		70.3%			ICU Level of Service			C				
Analysis Period (min)		15										
c Critical Lane Group												

Appendix E: ITE Land-Use Definitions

Land Use: 310

Hotel

Description

A hotel is a place of lodging that provides sleeping accommodations and supporting facilities such as a full-service restaurant, cocktail lounge, meeting rooms, banquet room, and convention facilities. A hotel typically provides a swimming pool or another recreational facility such as a fitness room. All suites hotel (Land Use 311), business hotel (Land Use 312), motel (Land Use 320), and resort hotel (Land Use 330) are related uses.

Additional Data

Twenty-five studies provided information on occupancy rates at the time the studies were conducted. The average occupancy rate for these studies was approximately 82 percent.

Some properties in this land use provide guest transportation services (e.g., airport shuttle, limousine service, golf course shuttle service) which may have an impact on the overall trip generation rates.

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip generation resource page on the ITE website (<https://www.ite.org/technical-resources/topics/trip-and-parking-generation/>).

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in California, District of Columbia, Florida, Georgia, Indiana, Minnesota, New York, Ontario (CAN), Pennsylvania, South Dakota, Texas, Vermont, Virginia, and Washington.

For all lodging uses, it is important to collect data on occupied rooms as well as total rooms in order to accurately predict trip generation characteristics for the site.

Trip generation at a hotel may be related to the presence of supporting facilities such as convention facilities, restaurants, meeting/banquet space, and retail facilities. Future data submissions should specify the presence of these amenities. Reporting the level of activity at the supporting facilities such as full, empty, partially active, number of people attending a meeting/banquet during observation may also be useful in further analysis of this land use.

Source Numbers

170, 260, 262, 277, 280, 301, 306, 357, 422, 507, 577, 728, 867, 872, 925, 951, 1009, 1021, 1026, 1046

Land Use: 312

Business Hotel

Description

A business hotel is a place of lodging aimed toward the business traveler but also accommodates a growing number of recreational travelers. These hotels provide sleeping accommodations and other limited facilities, such as a breakfast buffet bar and afternoon beverage bar. Some provide a full-service restaurant geared toward hotel guests. Some provide a swimming pool; most provide fitness facilities. Limited space for meeting facilities may be provided. Each unit is a large single room. Hotel (Land Use 310), all suites hotel (Land Use 311), motel (Land Use 320), and resort hotel (Land Use 330) are related uses.

Additional Data

Ten studies provided information on room occupancy at the time of data collection. The average occupancy rate for these sites was approximately 86 percent.

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip generation resource page on the ITE website (<https://www.ite.org/technical-resources/topics/trip-and-parking-generation/>).

The average numbers of person trips per vehicle trip at the three general urban/suburban sites at which both person trip and vehicle trip data were collected, were as follows:

- 1.3 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.3 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.

The sites were surveyed in the 1980s, the 1990s, and the 2010s in the District of Columbia, Florida, Georgia, Indiana, Minnesota, Texas, Vermont, Washington, and Wisconsin.

For all lodging uses, it is important to collect data on occupied rooms as well as total rooms in order to accurately predict trip generation characteristics for the site.

Source Numbers

216, 301, 306, 436, 507, 867, 870, 872, 877, 925, 945, 951, 959, 1017

Appendix F: Total Operations

HCM Unsignalized Intersection Capacity Analysis

1: Elgin St N & West Access

2026 Total Conditions

Weekday AM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	12	0	31	10	0	32
Future Volume (Veh/h)	12	0	31	10	0	32
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	0	34	11	0	35
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			44			
pX, platoon unblocked						
vC, conflicting volume	74	40			45	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	74	40			45	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	929	1032			1563	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	13	45	35			
Volume Left	13	0	0			
Volume Right	0	11	0			
cSH	929	1700	1563			
Volume to Capacity	0.01	0.03	0.00			
Queue Length 95th (m)	0.3	0.0	0.0			
Control Delay (s)	8.9	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	8.9	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		1.2				
Intersection Capacity Utilization		13.3%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2026 Total Conditions
Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	488	15	17	567	22	18	1	11	23	1	20
Future Volume (vph)	17	488	15	17	567	22	18	1	11	23	1	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.95			0.95	
Flt Protected		1.00			1.00			0.97			0.97	
Satd. Flow (prot)		1870			1869			1739			1742	
Flt Permitted		0.95			0.97			0.81			0.79	
Satd. Flow (perm)		1774			1810			1439			1412	
Peak-hour factor, PHF	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.55	0.50	0.25	0.75
Adj. Flow (vph)	34	561	20	28	637	28	28	4	20	46	4	27
RTOR Reduction (vph)	0	1	0	0	1	0	0	18	0	0	24	0
Lane Group Flow (vph)	0	614	0	0	692	0	0	34	0	0	53	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		52.0			52.0			6.9			6.9	
Effective Green, g (s)		52.0			52.0			6.9			6.9	
Actuated g/C Ratio		0.73			0.73			0.10			0.10	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1301			1327			140			137	
v/s Ratio Prot												
v/s Ratio Perm		0.35			c0.38			0.02			c0.04	
v/c Ratio		0.47			0.52			0.24			0.38	
Uniform Delay, d1		3.9			4.1			29.6			30.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.2			1.5			0.9			1.8	
Delay (s)		5.1			5.5			30.5			31.8	
Level of Service		A			A			C			C	
Approach Delay (s)		5.1			5.5			30.5			31.8	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay		7.7			HCM 2000 Level of Service			A				
HCM 2000 Volume to Capacity ratio		0.50										
Actuated Cycle Length (s)		70.9			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		52.4%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

3: Wellington St/Centre Access & King St E

2026 Total Conditions
Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	505	8	9	587	7	9	0	6	8	0	12
Future Volume (Veh/h)	11	505	8	9	587	7	9	0	6	8	0	12
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.75	0.92	0.92	0.92
Hourly flow rate (vph)	22	580	11	15	660	9	14	0	8	9	0	13
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)	221											
pX, platoon unblocked				0.94				0.94	0.94	0.94	0.94	0.94
vC, conflicting volume	669			591				1337	1328	586	1332	1330
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	669			536				1327	1318	530	1322	1319
tC, single (s)	4.1			4.1				7.1	6.5	6.2	7.1	6.5
tC, 2 stage (s)												
tF (s)	2.2			2.2				3.5	4.0	3.3	3.5	4.0
p0 queue free %	98			98				88	100	98	93	100
cM capacity (veh/h)	921			973				118	142	517	120	142
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	613	684	22	22								
Volume Left	22	15	14	9								
Volume Right	11	9	8	13								
cSH	921	973	164	213								
Volume to Capacity	0.02	0.02	0.13	0.10								
Queue Length 95th (m)	0.6	0.4	3.5	2.6								
Control Delay (s)	0.6	0.4	30.4	23.8								
Lane LOS	A	A	D	C								
Approach Delay (s)	0.6	0.4	30.4	23.8								
Approach LOS				D	C							
Intersection Summary												
Average Delay				1.4								
Intersection Capacity Utilization				45.8%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

4: Gateway Access/East Access & King St E

2026 Total Conditions

Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	479	34	11	576	3	23	0	8	3	0	5
Future Volume (Veh/h)	5	479	34	11	576	3	23	0	8	3	0	5
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)	5	521	37	12	626	3	25	0	9	3	0	5
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)	371											
pX, platoon unblocked												
vC, conflicting volume	629			558			1206	1202	540	1210	1220	628
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	629			558			1206	1202	540	1210	1220	628
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 %	99			99			84	100	98	98	100	99
cM capacity (veh/h)	953			1013			157	181	542	155	177	483
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	563	641	34	8								
Volume Left	5	12	25	3								
Volume Right	37	3	9	5								
cSH	953	1013	193	269								
Volume to Capacity	0.01	0.01	0.18	0.03								
Queue Length 95th (m)	0.1	0.3	4.7	0.7								
Control Delay (s)	0.1	0.3	27.6	18.8								
Lane LOS	A	A	D	C								
Approach Delay (s)	0.1	0.3	27.6	18.8								
Approach LOS			D	C								
Intersection Summary												
Average Delay			1.1									
Intersection Capacity Utilization			47.4%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

1: Elgin St N & West Access

2026 Total Conditions

Weekday PM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	23	0	45	26	0	70
Future Volume (Veh/h)	23	0	45	26	0	70
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	0	49	28	0	76
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)			44			
pX, platoon unblocked						
vC, conflicting volume	139	63			77	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	139	63			77	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	100			100	
cM capacity (veh/h)	854	1002			1522	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	25	77	76			
Volume Left	25	0	0			
Volume Right	0	28	0			
cSH	854	1700	1522			
Volume to Capacity	0.03	0.05	0.00			
Queue Length 95th (m)	0.7	0.0	0.0			
Control Delay (s)	9.3	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	9.3	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			14.0%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2026 Total Conditions

Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	654	21	8	612	33	19	0	10	42	1	51
Future Volume (vph)	38	654	21	8	612	33	19	0	10	42	1	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.95			0.91	
Flt Protected		1.00			1.00			0.97			0.98	
Satd. Flow (prot)		1870			1866			1736			1691	
Flt Permitted		0.91			0.98			0.63			0.87	
Satd. Flow (perm)		1714			1838			1130			1499	
Peak-hour factor, PHF	0.60	0.82	0.88	0.67	0.93	0.75	0.68	0.25	0.63	0.63	0.25	0.39
Adj. Flow (vph)	63	798	24	12	658	44	28	0	16	67	4	131
RTOR Reduction (vph)	0	1	0	0	3	0	0	38	0	0	100	0
Lane Group Flow (vph)	0	884	0	0	711	0	0	6	0	0	102	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		48.0			48.0			10.0			10.0	
Effective Green, g (s)		48.0			48.0			10.0			10.0	
Actuated g/C Ratio		0.69			0.69			0.14			0.14	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1175			1260			161			214	
v/s Ratio Prot												
v/s Ratio Perm		c0.52			0.39			0.01			c0.07	
v/c Ratio		0.75			0.56			0.04			0.48	
Uniform Delay, d1		7.1			5.6			25.9			27.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		4.5			1.8			0.1			1.7	
Delay (s)		11.6			7.5			26.0			29.3	
Level of Service		B			A			C			C	
Approach Delay (s)		11.6			7.5			26.0			29.3	
Approach LOS		B			A			C			C	
Intersection Summary												
HCM 2000 Control Delay		12.3			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.70										
Actuated Cycle Length (s)		70.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		74.7%			ICU Level of Service			D				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

3: Wellington St/Centre Access & King St E

2026 Total Conditions
Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	677	11	4	628	14	10	0	5	13	0	16
Future Volume (Veh/h)	20	677	11	4	628	14	10	0	5	13	0	16
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.92	0.88	0.67	0.93	0.75	0.68	0.92	0.63	0.63	0.25	0.39
Hourly flow rate (vph)	33	736	12	6	675	19	15	0	8	21	0	41
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		221										
pX, platoon unblocked				0.75			0.75	0.75	0.75	0.75	0.75	
vC, conflicting volume	694			748			1546	1514	742	1512	1510	684
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	694			498			1561	1519	490	1517	1514	684
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 %	96			99			75	100	98	70	100	91
cM capacity (veh/h)	901			800			60	85	434	70	86	448
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	781	700	23	62								
Volume Left	33	6	15	21								
Volume Right	12	19	8	41								
cSH	901	800	86	158								
Volume to Capacity	0.04	0.01	0.27	0.39								
Queue Length 95th (m)	0.9	0.2	7.4	12.9								
Control Delay (s)	1.0	0.2	61.7	41.9								
Lane LOS	A	A	F	E								
Approach Delay (s)	1.0	0.2	61.7	41.9								
Approach LOS			F	E								
Intersection Summary												
Average Delay			3.1									
Intersection Capacity Utilization			60.0%		ICU Level of Service				B			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Gateway Access/East Access & King St E

2026 Total Conditions

Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	661	29	10	605	3	38	0	14	2	0	3
Future Volume (Veh/h)	4	661	29	10	605	3	38	0	14	2	0	3
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)	4	718	32	11	658	3	41	0	15	2	0	3
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)		371										
pX, platoon unblocked				0.92			0.92	0.92	0.92	0.92	0.92	
vC, conflicting volume	661			750			1426	1425	734	1438	1440	660
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	661			684			1420	1418	667	1433	1434	660
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			60	100	96	98	100	99
cM capacity (veh/h)	927			836			103	124	422	98	121	463
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	754	672	56	5								
Volume Left	4	11	41	2								
Volume Right	32	3	15	3								
cSH	927	836	129	186								
Volume to Capacity	0.00	0.01	0.43	0.03								
Queue Length 95th (m)	0.1	0.3	14.5	0.6								
Control Delay (s)	0.1	0.4	52.8	24.9								
Lane LOS	A	A	F	C								
Approach Delay (s)	0.1	0.4	52.8	24.9								
Approach LOS			F	C								
Intersection Summary												
Average Delay			2.3									
Intersection Capacity Utilization			50.7%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

1: Elgin St N & West Access

2031 Total Conditions

Weekday AM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	12	0	31	10	0	33
Future Volume (Veh/h)	12	0	31	10	0	33
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	0	34	11	0	36
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)			44			
pX, platoon unblocked						
vC, conflicting volume	76	40			45	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	76	40			45	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	928	1032			1563	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	13	45	36			
Volume Left	13	0	0			
Volume Right	0	11	0			
cSH	928	1700	1563			
Volume to Capacity	0.01	0.03	0.00			
Queue Length 95th (m)	0.3	0.0	0.0			
Control Delay (s)	8.9	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	8.9	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			13.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2031 Total Conditions

Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	534	16	18	621	23	19	1	12	23	1	21
Future Volume (vph)	18	534	16	18	621	23	19	1	12	23	1	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.95			0.95	
Flt Protected		1.00			1.00			0.97			0.97	
Satd. Flow (prot)		1870			1870			1737			1741	
Flt Permitted		0.94			0.96			0.81			0.79	
Satd. Flow (perm)		1766			1805			1452			1410	
Peak-hour factor, PHF	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.55	0.50	0.25	0.75
Adj. Flow (vph)	36	614	21	30	698	29	30	4	22	46	4	28
RTOR Reduction (vph)	0	1	0	0	1	0	0	20	0	0	25	0
Lane Group Flow (vph)	0	670	0	0	756	0	0	36	0	0	53	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		51.9			51.9			6.9			6.9	
Effective Green, g (s)		51.9			51.9			6.9			6.9	
Actuated g/C Ratio		0.73			0.73			0.10			0.10	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1294			1323			141			137	
v/s Ratio Prot												
v/s Ratio Perm		0.38			0.42			0.02			0.04	
v/c Ratio		0.52			0.57			0.26			0.38	
Uniform Delay, d1		4.1			4.3			29.6			30.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.5			1.8			1.0			1.8	
Delay (s)		5.5			6.1			30.5			31.8	
Level of Service		A			A			C			C	
Approach Delay (s)		5.5			6.1			30.5			31.8	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay		8.0			HCM 2000 Level of Service			A				
HCM 2000 Volume to Capacity ratio		0.55										
Actuated Cycle Length (s)		70.8			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		55.8%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

3: Wellington St/Centre Access & King St E

2031 Total Conditions
Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	551	8	9	644	7	9	0	6	8	0	12
Future Volume (Veh/h)	11	551	8	9	644	7	9	0	6	8	0	12
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.75	0.92	0.92	0.92
Hourly flow rate (vph)	22	633	11	15	724	9	14	0	8	9	0	13
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)		221										
pX, platoon unblocked				0.90			0.90	0.90	0.90	0.90	0.90	
vC, conflicting volume	733			644			1454	1446	638	1449	1446	728
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	733			554			1449	1440	547	1444	1441	728
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 %	97			98			85	100	98	90	100	97
cM capacity (veh/h)	872			919			92	115	485	95	115	423
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	666	748	22	22								
Volume Left	22	15	14	9								
Volume Right	11	9	8	13								
cSH	872	919	131	175								
Volume to Capacity	0.03	0.02	0.17	0.13								
Queue Length 95th (m)	0.6	0.4	4.4	3.2								
Control Delay (s)	0.7	0.4	37.9	28.5								
Lane LOS	A	A	E	D								
Approach Delay (s)	0.7	0.4	37.9	28.5								
Approach LOS			E	D								
Intersection Summary												
Average Delay			1.5									
Intersection Capacity Utilization			48.9%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Gateway Access/East Access & King St E

2031 Total Conditions
Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	526	34	11	633	3	23	0	8	3	0	5
Future Volume (Veh/h)	5	526	34	11	633	3	23	0	8	3	0	5
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)	5	572	37	12	688	3	25	0	9	3	0	5
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		371										
pX, platoon unblocked												
vC, conflicting volume	691			609			1319	1316	590	1323	1332	690
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	691			609			1319	1316	590	1323	1332	690
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 %	99			99			81	100	98	98	100	99
cM capacity (veh/h)	904			970			131	155	507	129	151	445
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	614	703	34	8								
Volume Left	5	12	25	3								
Volume Right	37	3	9	5								
cSH	904	970	163	232								
Volume to Capacity	0.01	0.01	0.21	0.03								
Queue Length 95th (m)	0.1	0.3	5.8	0.8								
Control Delay (s)	0.2	0.3	32.9	21.1								
Lane LOS	A	A	D	C								
Approach Delay (s)	0.2	0.3	32.9	21.1								
Approach LOS			D	C								
Intersection Summary												
Average Delay			1.2									
Intersection Capacity Utilization			50.5%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

1: Elgin St N & West Access

2031 Total Conditions

Weekday PM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	23	0	45	26	0	72
Future Volume (Veh/h)	23	0	45	26	0	72
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	0	49	28	0	78
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)			44			
pX, platoon unblocked						
vC, conflicting volume	141	63			77	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	141	63			77	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	100			100	
cM capacity (veh/h)	852	1002			1522	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	25	77	78			
Volume Left	25	0	0			
Volume Right	0	28	0			
cSH	852	1700	1522			
Volume to Capacity	0.03	0.05	0.00			
Queue Length 95th (m)	0.7	0.0	0.0			
Control Delay (s)	9.4	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	9.4	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		1.3				
Intersection Capacity Utilization		14.0%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2031 Total Conditions
Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	716	22	8	669	33	20	0	10	43	1	51
Future Volume (vph)	38	716	22	8	669	33	20	0	10	43	1	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.95			0.91	
Flt Protected		1.00			1.00			0.97			0.98	
Satd. Flow (prot)		1871			1868			1737			1691	
Flt Permitted		0.91			0.98			0.63			0.87	
Satd. Flow (perm)		1713			1839			1126			1497	
Peak-hour factor, PHF	0.60	0.82	0.88	0.67	0.93	0.75	0.68	0.25	0.63	0.63	0.25	0.39
Adj. Flow (vph)	63	873	25	12	719	44	29	0	16	68	4	131
RTOR Reduction (vph)	0	1	0	0	2	0	0	38	0	0	98	0
Lane Group Flow (vph)	0	960	0	0	773	0	0	7	0	0	105	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		48.0			48.0			10.1			10.1	
Effective Green, g (s)		48.0			48.0			10.1			10.1	
Actuated g/C Ratio		0.68			0.68			0.14			0.14	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1172			1259			162			215	
v/s Ratio Prot												
v/s Ratio Perm		c0.56			0.42			0.01			c0.07	
v/c Ratio		0.82			0.61			0.05			0.49	
Uniform Delay, d1		7.9			6.0			25.8			27.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		6.4			2.2			0.1			1.7	
Delay (s)		14.4			8.3			26.0			29.3	
Level of Service		B			A			C			C	
Approach Delay (s)		14.4			8.3			26.0			29.3	
Approach LOS		B			A			C			C	
Intersection Summary												
HCM 2000 Control Delay		13.8			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.76										
Actuated Cycle Length (s)		70.1			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		78.4%			ICU Level of Service			D				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

3: Wellington St/Centre Access & King St E

2031 Total Conditions
Weekday PM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	20	742	11	4	687	14	10	0	5	13	0	16	
Future Volume (Veh/h)	20	742	11	4	687	14	10	0	5	13	0	16	
Sign Control		Free			Free			Stop			Stop		
Grade		0%			0%			0%			0%		
Peak Hour Factor	0.60	0.92	0.88	0.67	0.93	0.75	0.68	0.92	0.63	0.63	0.25	0.39	
Hourly flow rate (vph)	33	807	12	6	739	19	15	0	8	21	0	41	
Pedestrians													
Lane Width (m)													
Walking Speed (m/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	None			None									
Median storage (veh)													
Upstream signal (m)	221												
pX, platoon unblocked				0.67				0.67	0.67	0.67	0.67	0.67	
vC, conflicting volume	758			819				1680	1649	813	1648	1646	748
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	758			479				1771	1723	470	1721	1718	748
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 %	96			99				60	100	98	53	100	90
cM capacity (veh/h)	853			723				38	57	396	44	57	412
Direction, Lane #	EB 1	WB 1	NB 1	SB 1									
Volume Total	852	764	23	62									
Volume Left	33	6	15	21									
Volume Right	12	19	8	41									
cSH	853	723	55	108									
Volume to Capacity	0.04	0.01	0.42	0.57									
Queue Length 95th (m)	0.9	0.2	11.8	20.8									
Control Delay (s)	1.0	0.2	111.7	75.8									
Lane LOS	A	A	F	F									
Approach Delay (s)	1.0	0.2	111.7	75.8									
Approach LOS				F	F								
Intersection Summary													
Average Delay				4.9									
Intersection Capacity Utilization				63.6%	ICU Level of Service				B				
Analysis Period (min)				15									

HCM Unsignalized Intersection Capacity Analysis

4: Gateway Access/East Access & King St E

2031 Total Conditions
Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	727	29	10	663	3	38	0	14	2	0	3
Future Volume (Veh/h)	4	727	29	10	663	3	38	0	14	2	0	3
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)	4	790	32	11	721	3	41	0	15	2	0	3
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage veh												
Upstream signal (m)	371											
pX, platoon unblocked				0.80			0.80	0.80	0.80	0.80	0.80	
vC, conflicting volume	724			822			1562	1560	806	1574	1574	722
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	724			657			1576	1575	638	1591	1593	722
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			41	100	96	97	100	99
cM capacity (veh/h)	879			749			70	87	384	66	85	426
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	826	735	56	5								
Volume Left	4	11	41	2								
Volume Right	32	3	15	3								
cSH	879	749	90	134								
Volume to Capacity	0.00	0.01	0.63	0.04								
Queue Length 95th (m)	0.1	0.3	22.4	0.9								
Control Delay (s)	0.1	0.4	96.7	32.9								
Lane LOS	A	A	F	D								
Approach Delay (s)	0.1	0.4	96.7	32.9								
Approach LOS			F	D								
Intersection Summary												
Average Delay			3.7									
Intersection Capacity Utilization			54.1%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

1: Elgin St N & West Access

2036 Total Conditions

Weekday AM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	12	0	32	10	0	33
Future Volume (Veh/h)	12	0	32	10	0	33
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	0	35	11	0	36
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)			44			
pX, platoon unblocked						
vC, conflicting volume	76	40			46	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	76	40			46	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	927	1031			1562	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	13	46	36			
Volume Left	13	0	0			
Volume Right	0	11	0			
cSH	927	1700	1562			
Volume to Capacity	0.01	0.03	0.00			
Queue Length 95th (m)	0.3	0.0	0.0			
Control Delay (s)	8.9	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	8.9	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			13.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2036 Total Conditions

Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	584	16	18	681	23	20	1	11	23	1	21
Future Volume (vph)	18	584	16	18	681	23	20	1	11	23	1	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			1.00			0.95			0.95	
Flt Protected		1.00			1.00			0.97			0.97	
Satd. Flow (prot)		1871			1871			1742			1741	
Flt Permitted		0.94			0.96			0.81			0.79	
Satd. Flow (perm)		1765			1806			1446			1411	
Peak-hour factor, PHF	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.55	0.50	0.25	0.75
Adj. Flow (vph)	36	671	21	30	765	29	31	4	20	46	4	28
RTOR Reduction (vph)	0	1	0	0	1	0	0	18	0	0	25	0
Lane Group Flow (vph)	0	727	0	0	823	0	0	37	0	0	53	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		51.9			51.9			6.9			6.9	
Effective Green, g (s)		51.9			51.9			6.9			6.9	
Actuated g/C Ratio		0.73			0.73			0.10			0.10	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1293			1323			140			137	
v/s Ratio Prot												
v/s Ratio Perm		0.41			0.46			0.03			0.04	
v/c Ratio		0.56			0.62			0.26			0.38	
Uniform Delay, d1		4.3			4.6			29.6			30.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.8			2.2			1.0			1.8	
Delay (s)		6.1			6.8			30.6			31.8	
Level of Service		A			A			C			C	
Approach Delay (s)		6.1			6.8			30.6			31.8	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay		8.4			HCM 2000 Level of Service			A				
HCM 2000 Volume to Capacity ratio		0.59										
Actuated Cycle Length (s)		70.8			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		59.3%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

3: Wellington St/Centre Access & King St E

2036 Total Conditions
Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	603	8	9	707	7	10	0	6	8	0	12
Future Volume (Veh/h)	11	603	8	9	707	7	10	0	6	8	0	12
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.50	0.87	0.75	0.61	0.89	0.80	0.64	0.25	0.75	0.92	0.92	0.92
Hourly flow rate (vph)	22	693	11	15	794	9	16	0	8	9	0	13
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (m)	221											
pX, platoon unblocked				0.86				0.86	0.86	0.86	0.86	0.86
vC, conflicting volume	803			704				1584	1576	698	1579	1576
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	803			570				1598	1588	564	1592	1589
tC, single (s)	4.1			4.1				7.1	6.5	6.2	7.1	6.5
tC, 2 stage (s)												
tF (s)	2.2			2.2				3.5	4.0	3.3	3.5	4.0
p0 queue free %	97			98				77	100	98	87	100
cM capacity (veh/h)	821			858				69	88	450	70	88
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	726	818	24	22								
Volume Left	22	15	16	9								
Volume Right	11	9	8	13								
cSH	821	858	96	136								
Volume to Capacity	0.03	0.02	0.25	0.16								
Queue Length 95th (m)	0.6	0.4	6.9	4.2								
Control Delay (s)	0.7	0.5	54.9	36.5								
Lane LOS	A	A	F	E								
Approach Delay (s)	0.7	0.5	54.9	36.5								
Approach LOS				F	E							
Intersection Summary												
Average Delay				1.9								
Intersection Capacity Utilization				52.4%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

4: Gateway Access/East Access & King St E

2036 Total Conditions

Weekday AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	578	34	11	696	3	23	0	8	3	0	5
Future Volume (Veh/h)	5	578	34	11	696	3	23	0	8	3	0	5
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)	5	628	37	12	757	3	25	0	9	3	0	5
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage (veh)												
Upstream signal (m)	371											
pX, platoon unblocked												
vC, conflicting volume	760			665			1444	1440	646	1448	1458	758
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	760			665			1444	1440	646	1448	1458	758
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 %	99			99			77	100	98	97	100	99
cM capacity (veh/h)	852			924			107	130	471	105	127	407
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	670	772	34	8								
Volume Left	5	12	25	3								
Volume Right	37	3	9	5								
cSH	852	924	134	196								
Volume to Capacity	0.01	0.01	0.25	0.04								
Queue Length 95th (m)	0.1	0.3	7.2	1.0								
Control Delay (s)	0.2	0.3	40.6	24.1								
Lane LOS	A	A	E	C								
Approach Delay (s)	0.2	0.3	40.6	24.1								
Approach LOS			E	C								
Intersection Summary												
Average Delay			1.3									
Intersection Capacity Utilization			53.9%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

1: Elgin St N & West Access

2036 Total Conditions

Weekday PM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	23	0	46	26	0	73
Future Volume (Veh/h)	23	0	46	26	0	73
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	0	50	28	0	79
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)			44			
pX, platoon unblocked						
vC, conflicting volume	143	64			78	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	143	64			78	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	100			100	
cM capacity (veh/h)	850	1000			1520	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	25	78	79			
Volume Left	25	0	0			
Volume Right	0	28	0			
cSH	850	1700	1520			
Volume to Capacity	0.03	0.05	0.00			
Queue Length 95th (m)	0.7	0.0	0.0			
Control Delay (s)	9.4	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	9.4	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		1.3				
Intersection Capacity Utilization		14.0%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

2: Elgin St S/Elgin St N & King St E

2036 Total Conditions
Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	786	23	9	732	34	20	0	11	43	1	52
Future Volume (vph)	38	786	23	9	732	34	20	0	11	43	1	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.95			0.91	
Flt Protected		1.00			1.00			0.97			0.98	
Satd. Flow (prot)		1872			1868			1735			1690	
Flt Permitted		0.91			0.98			0.63			0.87	
Satd. Flow (perm)		1712			1836			1126			1498	
Peak-hour factor, PHF	0.60	0.82	0.88	0.67	0.93	0.75	0.68	0.25	0.63	0.63	0.25	0.39
Adj. Flow (vph)	63	959	26	13	787	45	29	0	17	68	4	133
RTOR Reduction (vph)	0	1	0	0	2	0	0	38	0	0	100	0
Lane Group Flow (vph)	0	1047	0	0	843	0	0	8	0	0	105	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		48.0			48.0			10.2			10.2	
Effective Green, g (s)		48.0			48.0			10.2			10.2	
Actuated g/C Ratio		0.68			0.68			0.15			0.15	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1170			1255			163			217	
v/s Ratio Prot												
v/s Ratio Perm		c0.61			0.46			0.01			c0.07	
v/c Ratio		0.89			0.67			0.05			0.48	
Uniform Delay, d1		9.0			6.5			25.8			27.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		10.7			2.9			0.1			1.7	
Delay (s)		19.7			9.4			26.0			29.3	
Level of Service		B			A			C			C	
Approach Delay (s)		19.7			9.4			26.0			29.3	
Approach LOS		B			A			C			C	
Intersection Summary												
HCM 2000 Control Delay		16.7			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.82										
Actuated Cycle Length (s)		70.2			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		82.1%			ICU Level of Service			E				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

3: Wellington St/Centre Access & King St E

2036 Total Conditions
Weekday PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	815	11	4	752	14	10	0	6	13	0	16
Future Volume (Veh/h)	20	815	11	4	752	14	10	0	6	13	0	16
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.92	0.88	0.67	0.93	0.75	0.68	0.92	0.63	0.63	0.25	0.39
Hourly flow rate (vph)	33	886	12	6	809	19	15	0	10	21	0	41
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		221										
pX, platoon unblocked				0.56			0.56	0.56	0.56	0.56	0.56	
vC, conflicting volume	828			898			1830	1798	892	1798	1794	818
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	828			430			2086	2030	419	2031	2023	818
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 %	96			99			20	100	97	6	100	89
cM capacity (veh/h)	803			635			19	31	357	22	31	376
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	931	834	25	62								
Volume Left	33	6	15	21								
Volume Right	12	19	10	41								
cSH	803	635	30	59								
Volume to Capacity	0.04	0.01	0.83	1.05								
Queue Length 95th (m)	1.0	0.2	21.0	38.1								
Control Delay (s)	1.2	0.3	301.4	247.3								
Lane LOS	A	A	F	F								
Approach Delay (s)	1.2	0.3	301.4	247.3								
Approach LOS			F	F								
Intersection Summary												
Average Delay			13.1									
Intersection Capacity Utilization			67.5%		ICU Level of Service				C			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Gateway Access/East Access & King St E

2036 Total Conditions
Weekday PM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	4	799	29	10	728	3	38	0	14	2	0	3	
Future Volume (Veh/h)	4	799	29	10	728	3	38	0	14	2	0	3	
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)	4	868	32	11	791	3	41	0	15	2	0	3	
Pedestrians													
Lane Width (m)													
Walking Speed (m/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	None			None									
Median storage (veh)													
Upstream signal (m)	371												
pX, platoon unblocked				0.61				0.61	0.61	0.61	0.61	0.61	
vC, conflicting volume	794			900				1710	1708	884	1722	1722	792
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	794			520				1842	1840	494	1862	1863	792
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			98				0	100	96	94	100	99
cM capacity (veh/h)	827			641				34	45	352	32	44	389
Direction, Lane #	EB 1	WB 1	NB 1	SB 1									
Volume Total	904	805	56	5									
Volume Left	4	11	41	2									
Volume Right	32	3	15	3									
cSH	827	641	45	72									
Volume to Capacity	0.00	0.02	1.23	0.07									
Queue Length 95th (m)	0.1	0.4	40.2	1.7									
Control Delay (s)	0.1	0.5	351.9	59.0									
Lane LOS	A	A	F	F									
Approach Delay (s)	0.1	0.5	351.9	59.0									
Approach LOS				F	F								
Intersection Summary													
Average Delay				11.6									
Intersection Capacity Utilization				57.9%	ICU Level of Service				B				
Analysis Period (min)				15									