

Valery Homes

1354 Bronte Road



**Transportation
Impact
Study**



Valery Homes 1354 Bronte Road Transportation Impact Study

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1 Introduction

This Transportation Impact Study (TIS) has been prepared to support the properties for Valery Homes located at 1354 Bronte Road. Next to this development is the Bronte River development with townhouse and single-detached units. Across from these properties is the Bronte Green development, which is currently under construction east of Bronte Road. The proposed 1354 Bronte development includes 71 townhouses within a 4-storey building. Figure 1 illustrates the site context. Figure 2 illustrates the proposed development concept plan.

Figure 1: Site Context



The site currently resides within a Parkway Belt Complementary Use (PB2) zone. It is located next to an Existing Development (ED) zone and a Natural Area (N) zone. The subject property is bordered by Bronte Road and will have a primary access on Saw Whet Boulevard. The scope of this TIS has been confirmed with transportation staff from the Town of Oakville and Halton Region. Email correspondence has been included in Appendix A.

2 Existing Conditions

2.1 Area Road Network

Bronte Road

Bronte Road is a Region of Halton arterial road with a four-lane and divided urban cross-section. The Halton Region Transportation Master Plan (TMP) protects a 47-metre right-of-way for class C4 arterial roads, which includes Bronte Road. Boulevard-separated sidewalks are provided on both sides of the road. Left turn lanes are included at major intersections. A 60 km/h posted speed limit applies. The Region's TMP includes the widening of Bronte Road to six lanes in the future from Speers Road to Highway 407 starting in 2025. Bronte Road will be designated as a transit corridor with two of the lanes implemented as HOV lanes.

Upper Middle Road

Upper Middle Road is a Region of Halton arterial road with a four-lane and divided urban cross-section. The Halton Region Transportation Master Plan protects a 47-metre right-of-way for class C4 arterial roads, which includes Upper Middle Road. Boulevard-separated sidewalks are provided on both sides of the road east of the intersection at Bronte Road and only on the north side west of the intersection. West of the intersection at Bronte Road, the road transitions to two lanes. Left turn lanes are included at major intersections. A 60 km/h posted speed limit applies. The Region's TMP includes the widening of Upper Middle Road to six lanes in the future from Bronte Road to Neyagawa Boulevard starting in 2027.

Charles Cornwall Road

Charles Cornwall Road is a Town of Oakville local road with a two-lane cross section. It provides access to the Woodlands Operations Centre. The right-of-way is measured to be 22 metres. A 20 km/h posted speed limit applies.

2.2 Existing Intersections

Upper Middle Road at Bronte Road

The intersection of Upper Middle Road at Bronte Road is a signalized intersection with two auxiliary left turn lanes on the westbound approach and one auxiliary left turn lane on all other approaches. Right turn lanes are provided on all approaches. Crosswalks and associated pedestrian signal heads and call buttons are provided on the west, north, and east legs of the intersection. There is a multi-use pathway on the west side of Bronte Road and the north side of Upper Middle Road, alongside the sidewalks. Figure 3 illustrates the intersection of Upper Middle Road at Bronte Road.

Figure 3: Upper Middle Road at Bronte Road



Charles Cornwall Road at Bronte Road

The signalized intersection to the Halton Regional Centre at Bronte Road includes auxiliary left turn lanes on the north and south approaches. The west approach is a driveway to a few residential properties adjacent to Bronte Road. An exclusive right turn lane and exclusive left turn lane are provided on the east approach. An exclusive right turn lane is provided on the south approach into the Halton Regional Centre Access. The only east-west crosswalk that is provided is present on the north leg of the intersection. Pedestrian signal heads and call buttons are present on the north, west, and east legs of the intersection. Figure 4 illustrates the signalized intersection at Charles Cornwall Road at Bronte Road.

Figure 4: Charles Cornwall Road at Bronte Road

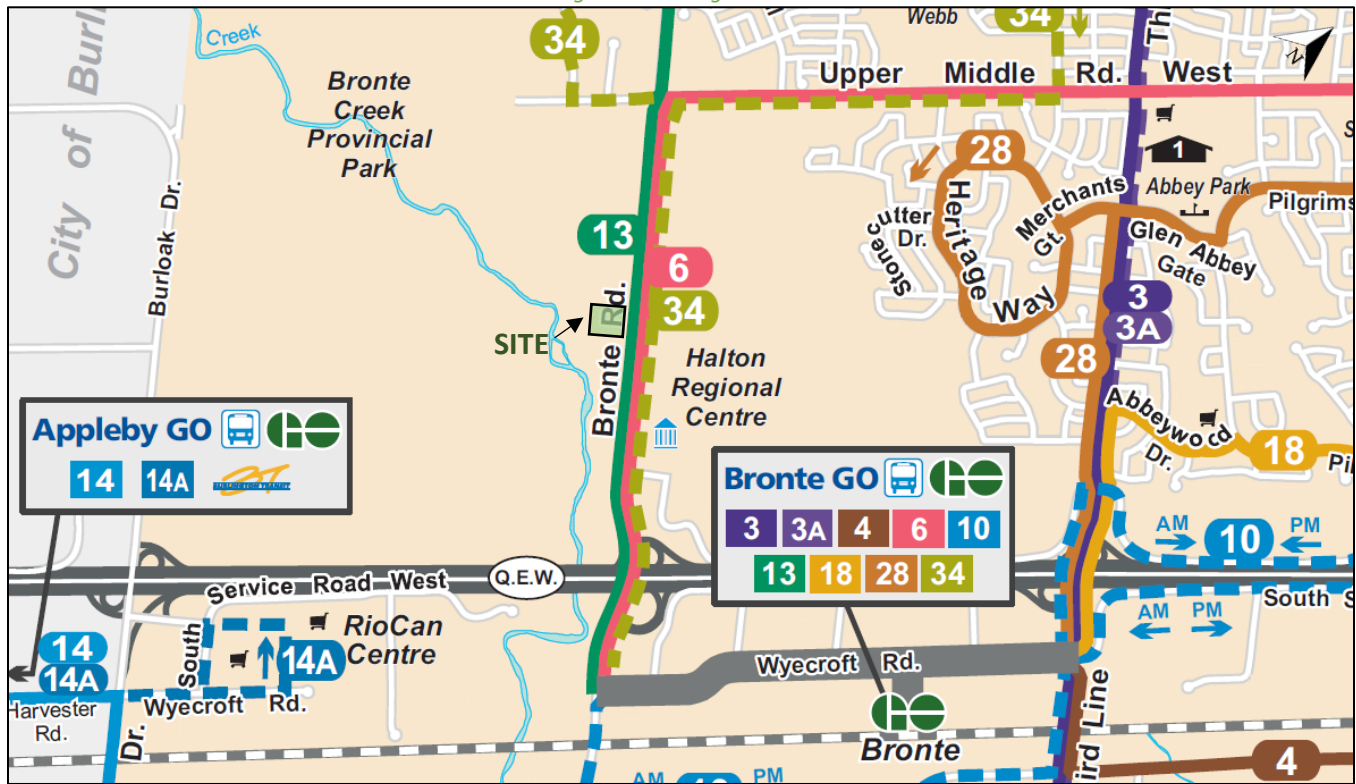
2.3 Cycling and Pedestrian Facilities

Cycling facilities in the Study Area are currently provided via a boulevard multi-use trail adjacent to the sidewalk along the west side of Bronte Road. Crosswalks are present at all the Study Area intersections with sidewalks along both sides of Bronte Road within the Study Area. The sidewalk is boulevard-separated for these extents. The Technical Appendix K in the Town of Oakville Active Transportation Master Plan (ATMP) refers to the Halton Region Active Transportation Network and Road Capital Projects. This document outlines proposed bike lanes along Bronte Road and Upper Middle Road. The Halton Region Transportation Development and Non-Development Capital Implementation plan as part of this Appendix notes that these infrastructure changes will have a start year of construction of 2025. For more information on cycling and pedestrian facilities, the Town of Oakville and Halton Region Active Transportation Maps are attached in Appendix B.

2.4 Existing Transit

As of September of 2021, Oakville Transit Route #13 runs along Bronte Road with eastbound destination of Oakville GO station and westbound destination of Bronte GO station. Routes #6 and #34 also run along Bronte Road as well as Upper Middle Road. The existing Study Area Oakville Transit service is presented in Figure 5.

Figure 5: Existing Transit



Source: www.oakvilletransit.ca

2.5 Existing Peak Hour Travel Demand

To understand the existing AM and PM peak hour traffic volumes turning movement counts for the Study Area intersections have been acquired from Halton Region. Table 1 summarizes the date of the most recent turning movement count at each Study Area intersection.

Table 1: TMC Data Dates

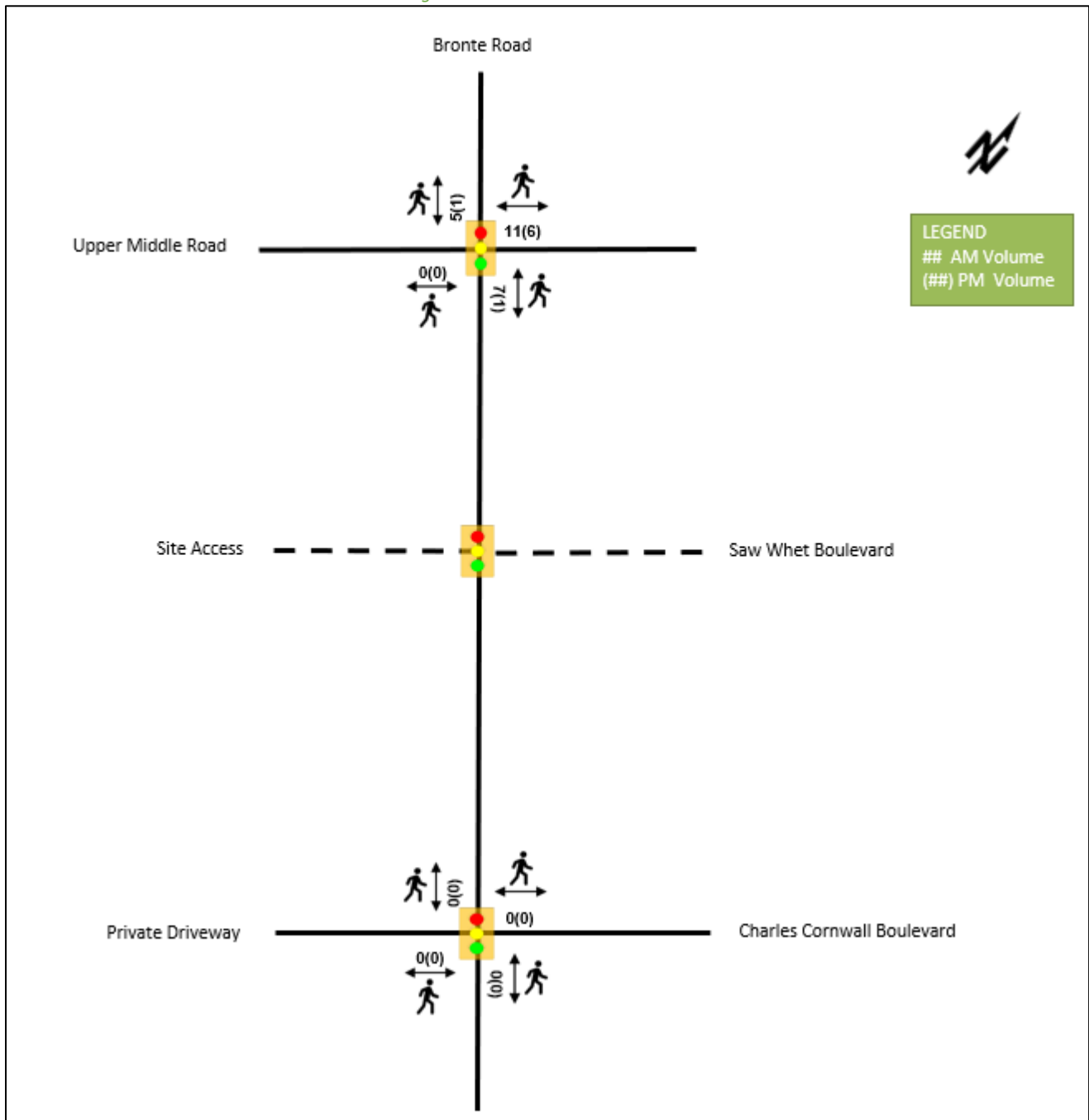
Data Type	Location	Count Date
Turning Movement Counts (TMC)	Charles Cornwall Road at Bronte Road	December 4, 2019
	Upper Middle Road at Bronte Road	October 29, 2019

The turning movement counts were undertaken in 2019, just less than two years prior to the study horizon of 2021. To reflect a 2021 horizon a compound annual growth rate (CAGR) has been applied to reflect growth outside of the Study Area. The Region proposes a 2% compound annual growth rate for Bronte Road to be applied to the Study Area Traffic Volumes. Turning movement count data is included in Appendix C. Figure 6 illustrates the existing 2021 traffic volumes. Figure 7 illustrates the existing pedestrian volumes. Cyclists are assumed to utilize the multi-use pathway along Bronte Road.

Figure 6: 2021 Existing Traffic Volumes



Figure 7: 2021 Pedestrian Volumes



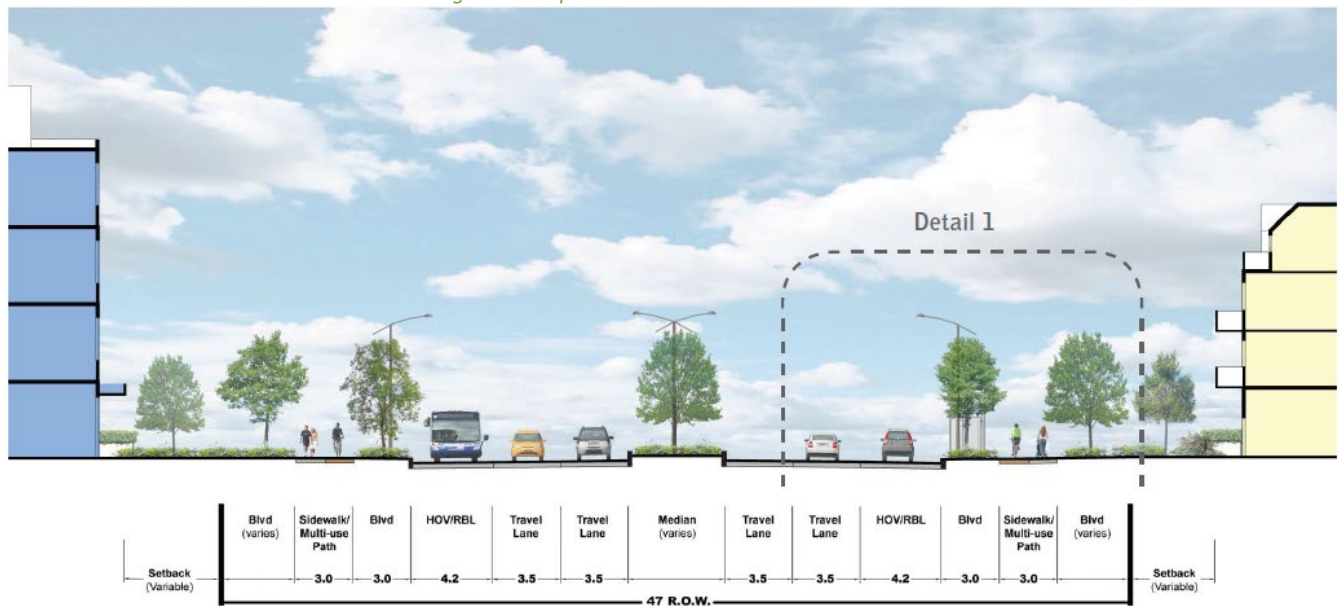
3 Future Background Conditions

3.1 Planned Conditions

3.1.1 Bronte Street HOV / RBL Lanes

Bronte Road is currently a two-lane road in each direction, with all lanes operating as general-purpose traffic lanes with no vehicle restrictions. The widening of Bronte Road from four to six lanes between Speers Road and Highway 407 is planned for 2025. Once widened, the two outer lanes of Bronte Road will be dedicated to high occupancy vehicles including transit as Bronte Road has been identified as a priority bus corridor as part of the Preliminary 2031 Halton Region Transit Priority Network. Additionally, Transit Signal Priority will be implemented throughout the entirety of Bronte Road within the Study Area. The cross-section for 47-metre-wide roadways, proposed as part of the Halton Region Transportation Master Plan, can be seen in Figure 8.

Figure 8: Proposed Bronte Road Cross Section



Source: Halton Region Transportation Master Plan (2011)

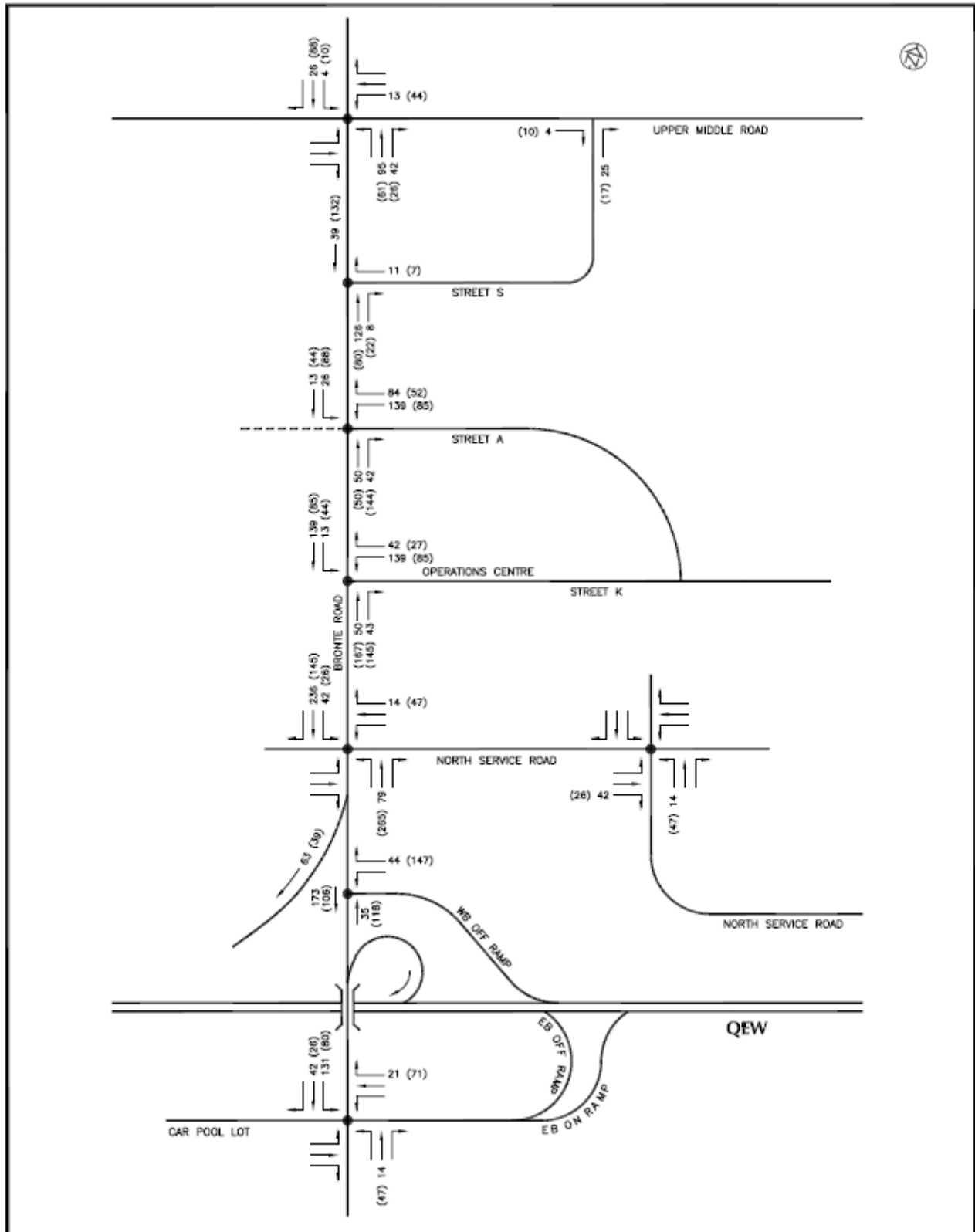
3.1.2 Other Study Area Developments

Adjacent to the 1354 Bronte Road development are the Bronte Green development and the Bronte River development. These developments will share a full-movement access with the subject property via future signalized intersection along Bronte Road at Saw Whet Boulevard.

3.1.2.1 Bronte Green Development

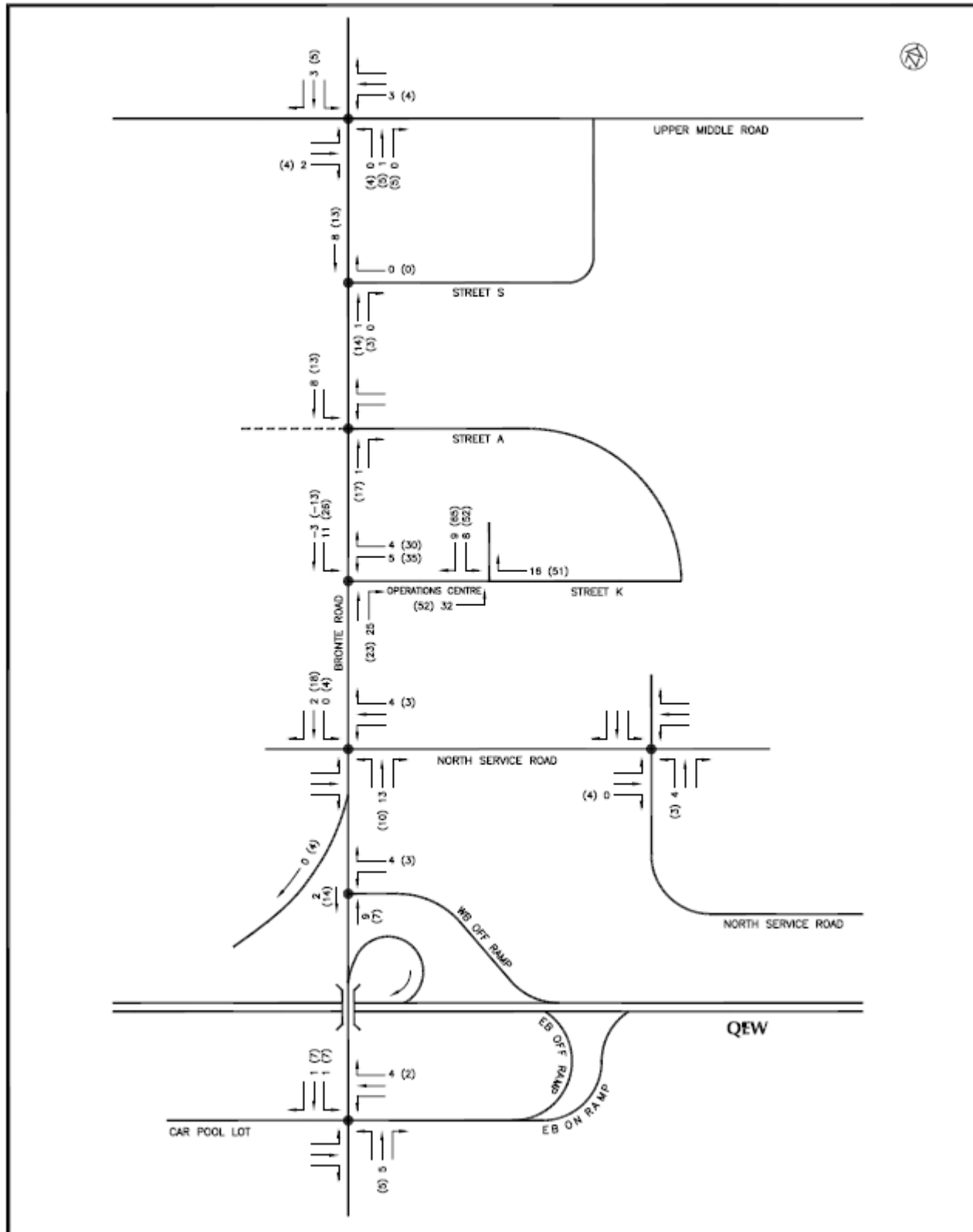
The Bronte Green subdivision is located on the former Saw Whet golf course lands, east of the proposed development. This development includes 164 freehold townhouse units, 443 detached units, 498 units in a residential condominium block, 76 units in a common elements condominium block, and some future commercial lands at the south end of the property. Adjacent to the central access at Saw Whet Boulevard are two mid-rise residential condominiums. The 2017 TIS update for Bronte Green assumes 270 units between the two developments. One of these developments has since been updated with a new unit count, and as a result, 335 units have been considered for this block. Figure 9 and Figure 10 illustrate the residential and commercial components of traffic generation of the Bronte Green Development in the 2017 update. Figure 11 and Figure 12 illustrate the site trips generated in addition due to the updated unit count in 2026 and 2031, respectively. That study is ongoing and the volumes below have not yet been approved by the Town of Oakville or Halton Region.

Figure 9: Bronte Green TIA Residential Traffic Generation



Source: Bronte Green Subdivision Traffic Impact Study; Read, Voorhees & Associates; April 2017

Figure 10: Bronte Green TIA Commercial Traffic Generation



Source: Bronte Green Subdivision Traffic Impact Study; Read, Voorhees & Associates; April 2017

Figure 11: Bronte Green Mid-Rise 2026 Traffic Generation

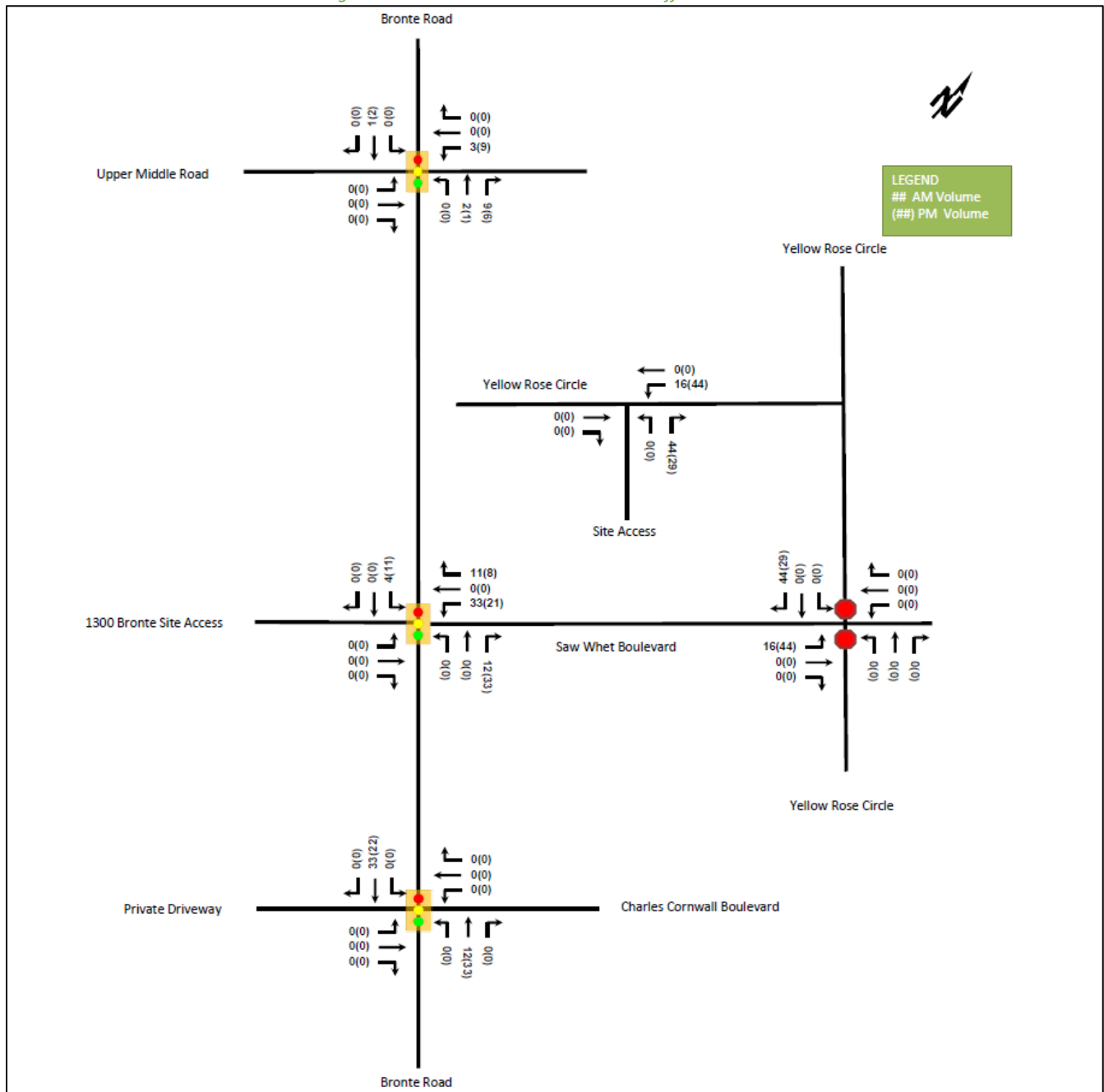
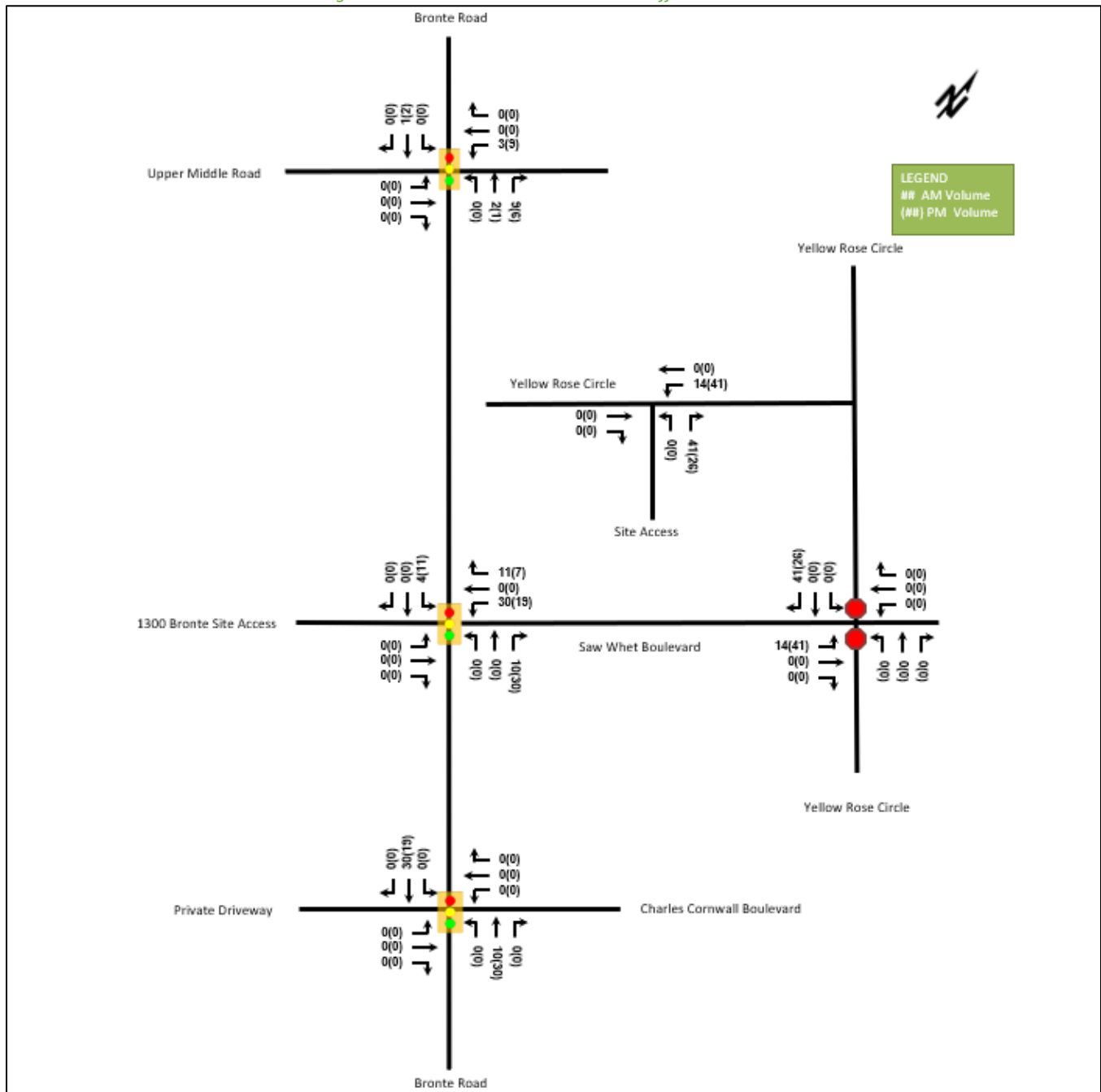


Figure 12: Bronte Green Mid-Rise 2031 Traffic Generation



3.1.2.2 Bronte River Development

South of the proposed development is ARGO's Bronte River development. This residential development is located at 1300-1350 Bronte Road. It will consist of 40 single detached units (including two existing houses) and 102 townhouses. It will utilize the Saw Whet Boulevard intersection with Bronte Road to access the arterial road network. Figure 13 and Figure 14 illustrate the traffic generation figures for the Bronte River development for 2026 and 2031, respectively. That study is ongoing, and the volumes below have not yet been approved by the Town of Oakville or Halton Region.

Figure 13: Bronte River 2026 Site Trip Generation

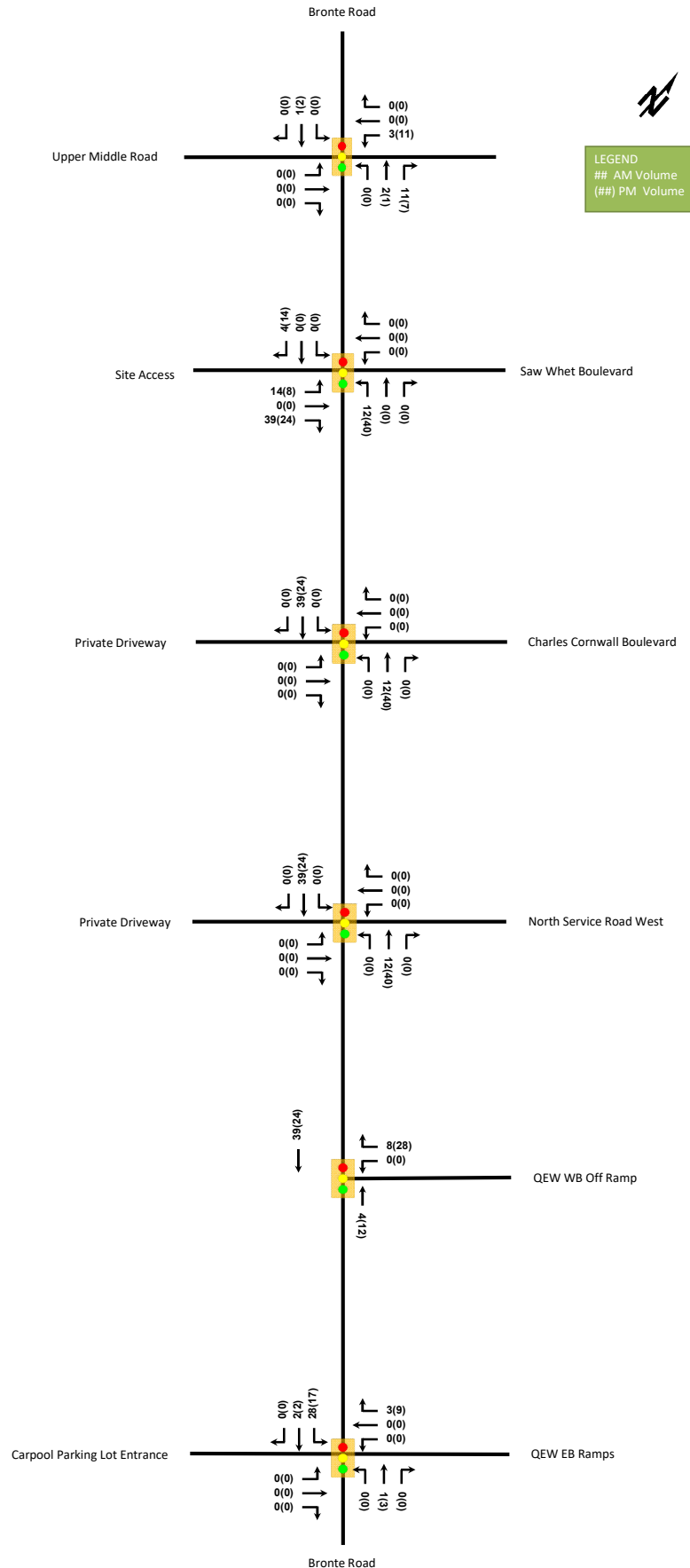
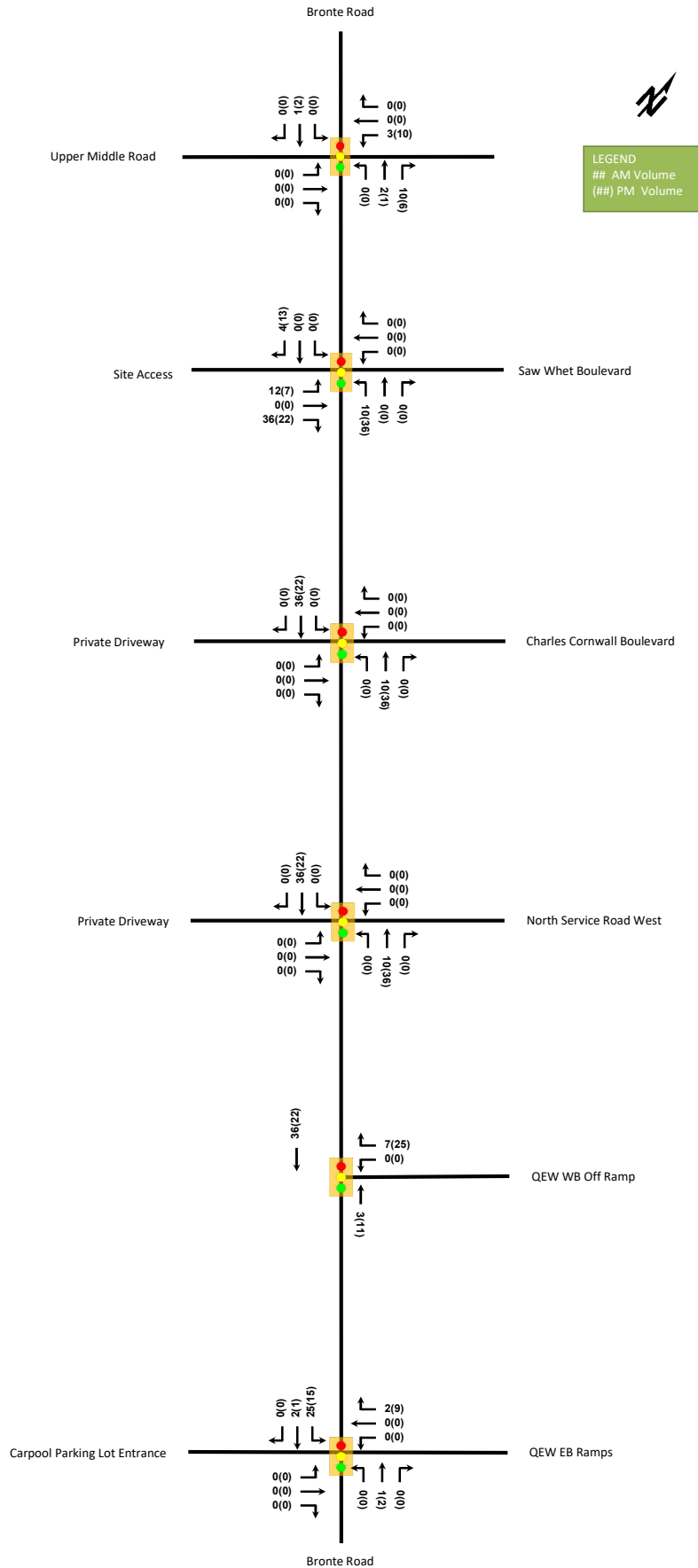


Figure 14: Bronte River 2031 Site Trip Generation



3.1.3 Background Growth

As discussed in Section 2.5, historical traffic counts have been reviewed to determine the historical growth rate. A 2% compound annual growth rate was selected.

3.1.4 Future Background Traffic Volumes

Combining the background development traffic, the background growth rate, and the existing traffic volumes, the Future Background traffic volumes were projected. Figure 15 illustrates the 2026 Future Background traffic volumes and Figure 16 illustrates the 2031 Future Background traffic volumes.

Figure 15: 2026 Future Background Traffic Volumes

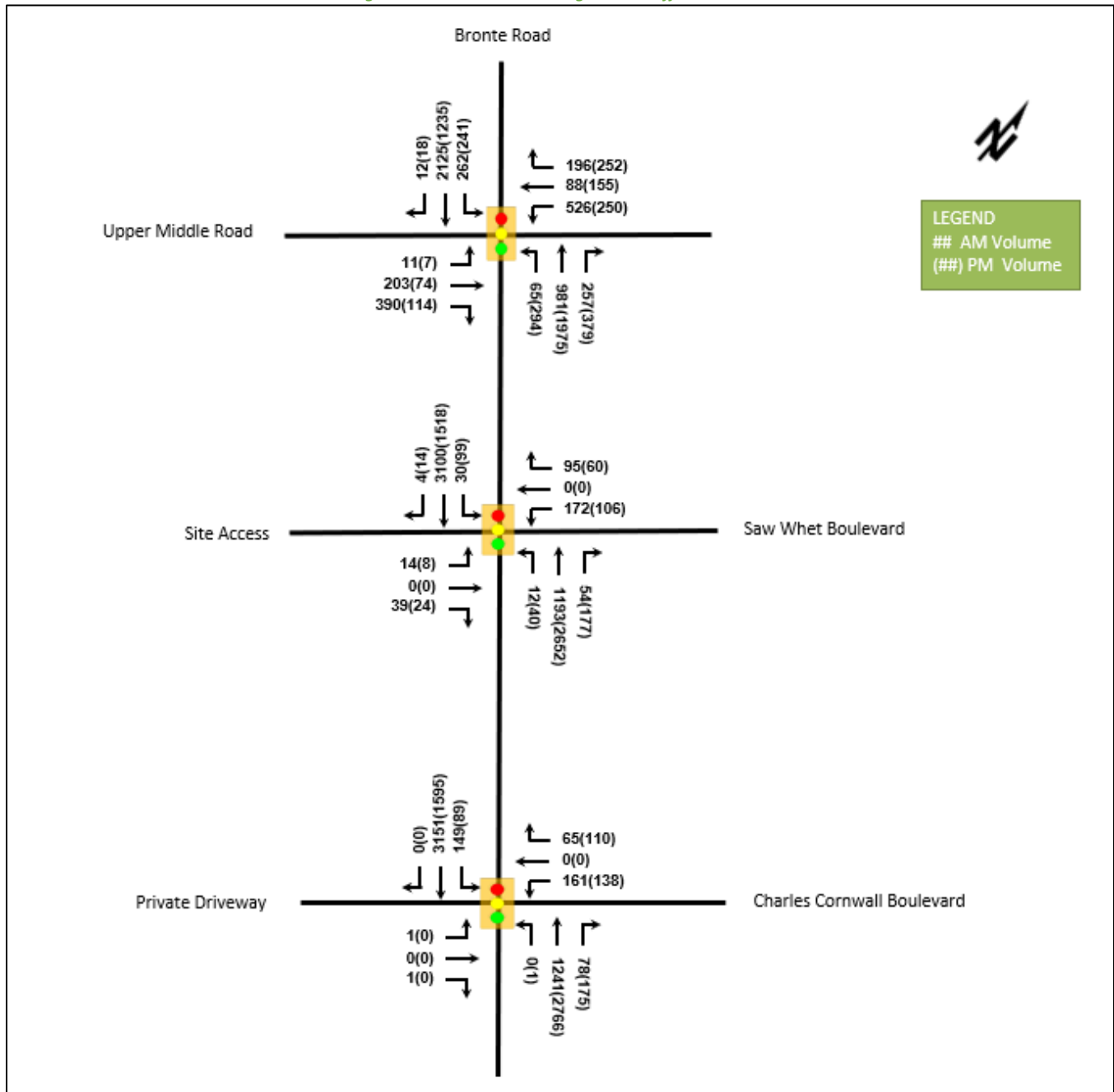
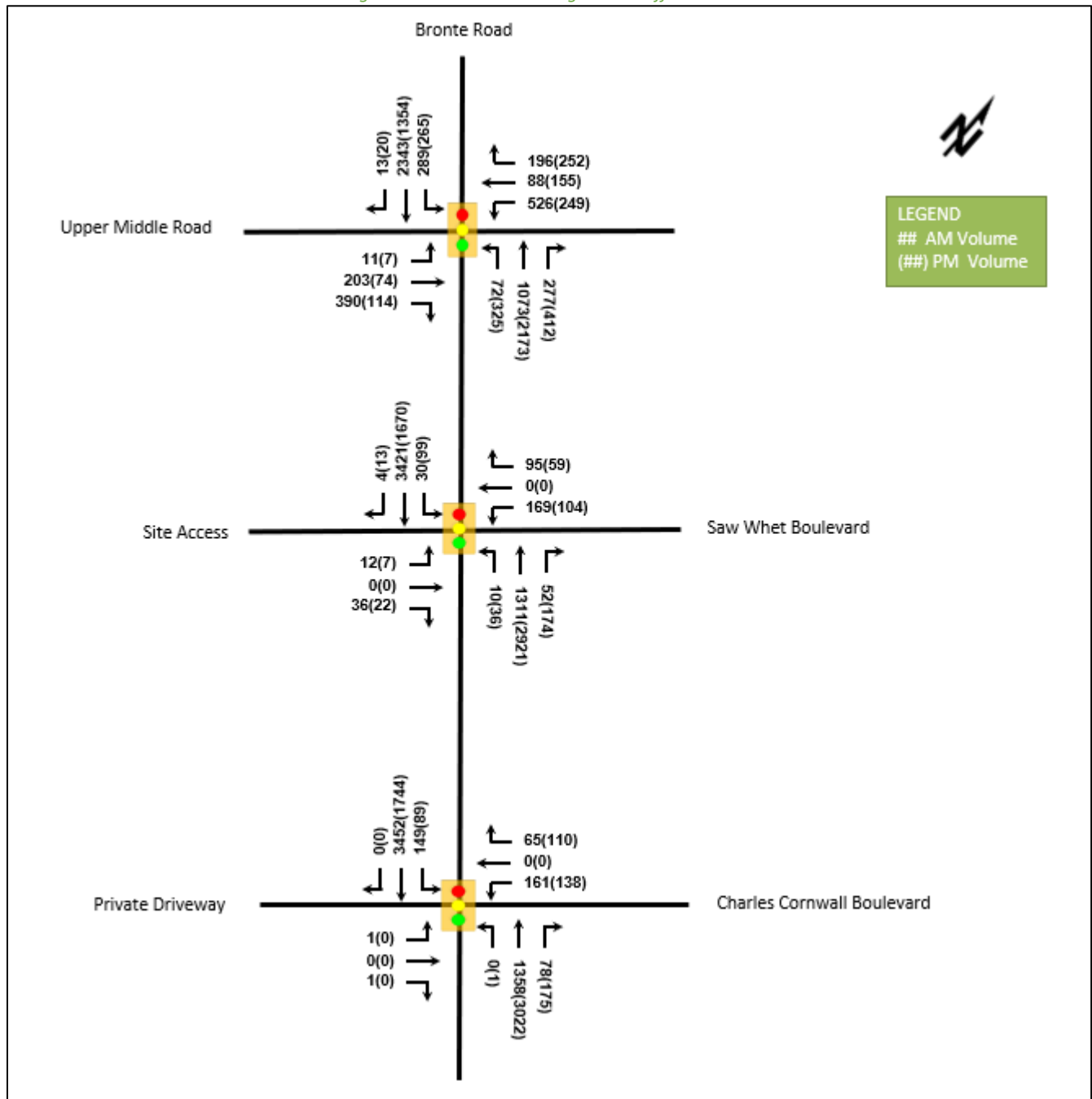


Figure 16: 2031 Future Background Traffic Volumes



4 Forecasting

4.1 Development-Generated Travel Demand

4.1.1 Trip Generation and Mode Shares

The ITE Trip Generation Manual 10th Edition has been reviewed to determine the appropriate trip generation rate equations for the proposed land uses. The rate equations were used to determine appropriate vehicle trip generation rates. The Multifamily Housing (Mid-Rise) land use category is used to estimate trips for townhouses and the Single Family Detached Housing land use category is used to estimate trips for the detached houses. To estimate person trip generation, the calculated vehicle trip generation rates were multiplied by a factor of 1.28. Table 2 summarizes the person trip rates for the proposed land uses.

Table 2: ITE Trip Generation Person Trip Rates

Dwelling Type	ITE Land Use Code	Unit Count	Peak Hour	Vehicle Trip Rate	Person Trip Rates	Method
Multifamily Housing (Mid-Rise)	221	71	AM	0.34	0.44	Fitted Curve
			PM	0.45	0.58	Fitted Curve

Using the above person trip rates, the total person trip generation for the Valery Homes development is summarized in Table 3. No synergy or pass-by trip reduction factors have been applied to the trip generation.

Table 3: Total Person Trip Generation

Land Use	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Total Person Trips	8	23	31	25	16	41

Mode share information for transit and active trips has been provided by Halton Region staff for 2026 and 2031. The total sum of auto and auto passenger mode shares has been calculated using these mode shares and split into two categories with slight distribution emphasis towards the auto passenger mode. The single occupant mode share in the Study Area indicates that the projected future auto mode is reasonable and errs on a conservative side. The increase in transit mode share from 11% in 2016 to 20% in 2031 is also expected as a result of the road widening along Bronte Road that will prioritize transit along the corridor and improve travel via the HOV lanes. An increase of transit mode from 11% to 15% in 2026 supports the mode shift towards transit in the future horizons. The existing active mode share of 13% indicates that the Regional active mode share projections of 5% are underestimated, especially considering higher density developments proposed along Bronte Road. However, to accommodate the inherent uncertainty in future travel patterns, and remain conservative, active mode share of 5% specified by Halton Region staff has been carried forward in the analysis. The existing and projected mode shares are summarized in Table 4.

Table 4: Mode Share Assumptions

Travel Mode	2016 TTS Mode Share	2026 Mode Share	2031 Mode Share
Auto Driver	66%	65%	60%
Auto Passenger	10%	15%	15%
Transit	11%	15%	20%
Active Modes	13%	5%	5%
Total	100%	100%	100%

Using the above mode shares and person trip rates, the person trips by mode have been projected. Table 5 summarizes the 2026 trip generation by mode.

Table 5: 2026 Trip Generation by Mode

Travel Mode	Mode Share	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Auto Driver	65%	5	15	20	16	10	27
Auto Passenger	15%	1	3	5	4	2	6
Transit	15%	1	3	5	4	2	6
Non-Auto Modes	5%	0	1	2	1	1	2
Total	100%	8	23	31	25	16	41

Table 6 summarizes the 2031 trip generation by mode.

Table 6: 2031 Trip Generation by Mode

Travel Mode	Mode Share	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Auto Driver	60%	5	14	19	15	10	25
Auto Passenger	15%	1	3	5	4	2	6
Transit	20%	2	5	6	5	3	8
Non-Auto Modes	5%	0	1	2	1	1	2
Total	100%	8	23	31	25	16	41

As shown above, the site is projected to generate 20 AM and 27 PM peak hour two-way auto trips during the 2026 horizon. With the shift in mode share, it will generate 19 AM and 25 PM peak hour two-way vehicle trips in 2031.

4.1.2 Trip Distribution

To understand the travel patterns of the subject development the Transportation Tomorrow Survey (TTS) has been reviewed to determine the existing travel patterns for Oakville. Table 7 below summarizes the distribution.

Table 7: 2016 TTS Trip Distribution

To/From	Percent of Trips
North	34%
South	14%
East	47%
West	5%
Total	100%

4.1.3 Trip Assignment

Using the distribution outlined above, turning movement splits, and access to major transportation infrastructure, the trips generated by the site have been assigned to the Study Area road network. The intersection at Saw Whet Boulevard and Bronte Road has been assumed to be actuated on the minor approach and coordinated along the Bronte Road corridor. The 2026 and 2031 trip generation are illustrated in Figure 17 and Figure 18, respectively.

4.1.4 Future Total Travel Demands

The site generated traffic has been combined with the 2026 and 2031 Future Background traffic volumes to estimate the Future Total traffic volumes. Figure 19 illustrates the 2026 Total Future traffic volumes and Figure 20 illustrates the 2031 Total Future traffic volumes.

Figure 17: 2026 Site Trip Generation

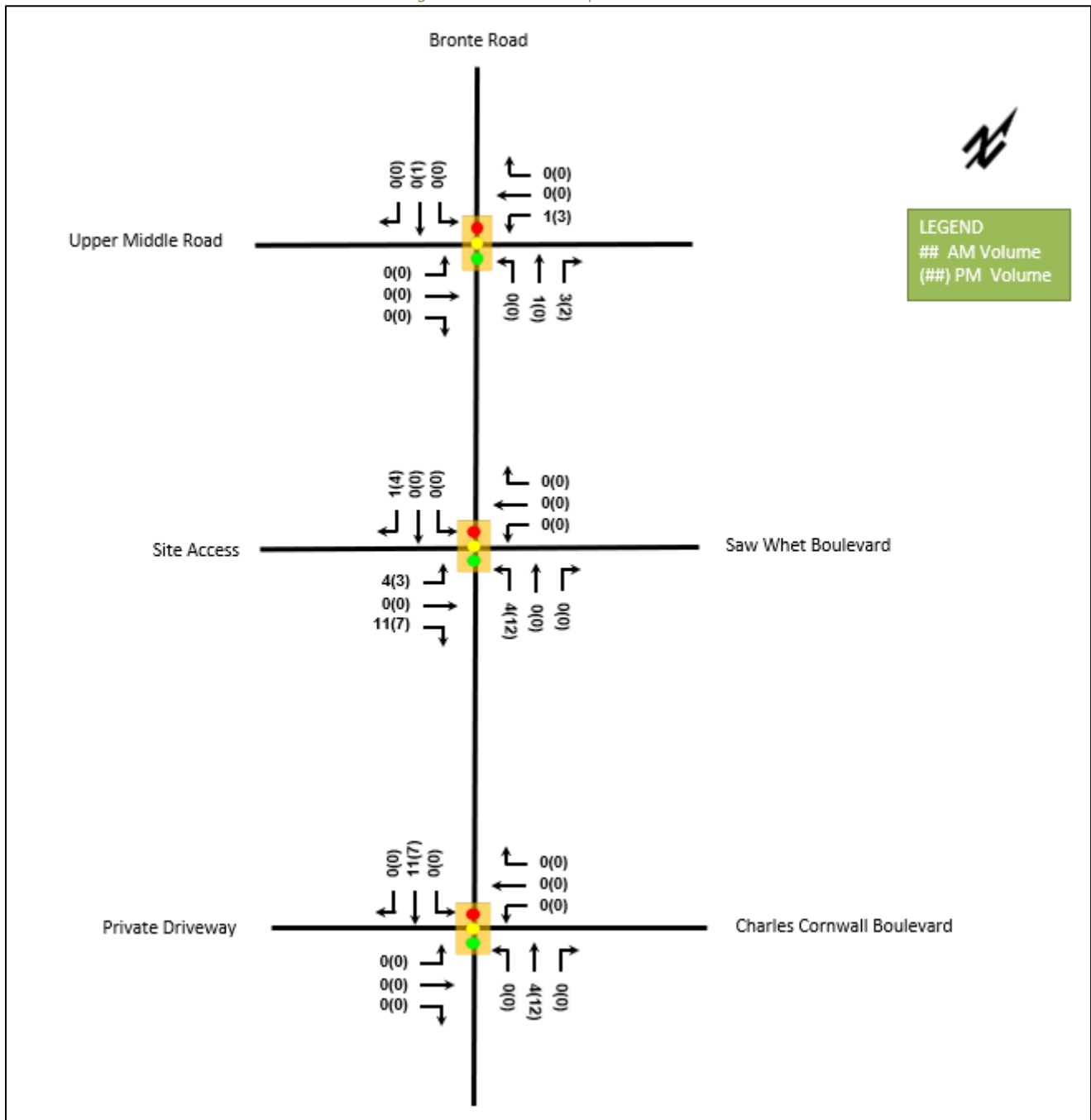


Figure 18: 2031 Site Trip Generation



Figure 19: 2026 Total Future Traffic Volumes

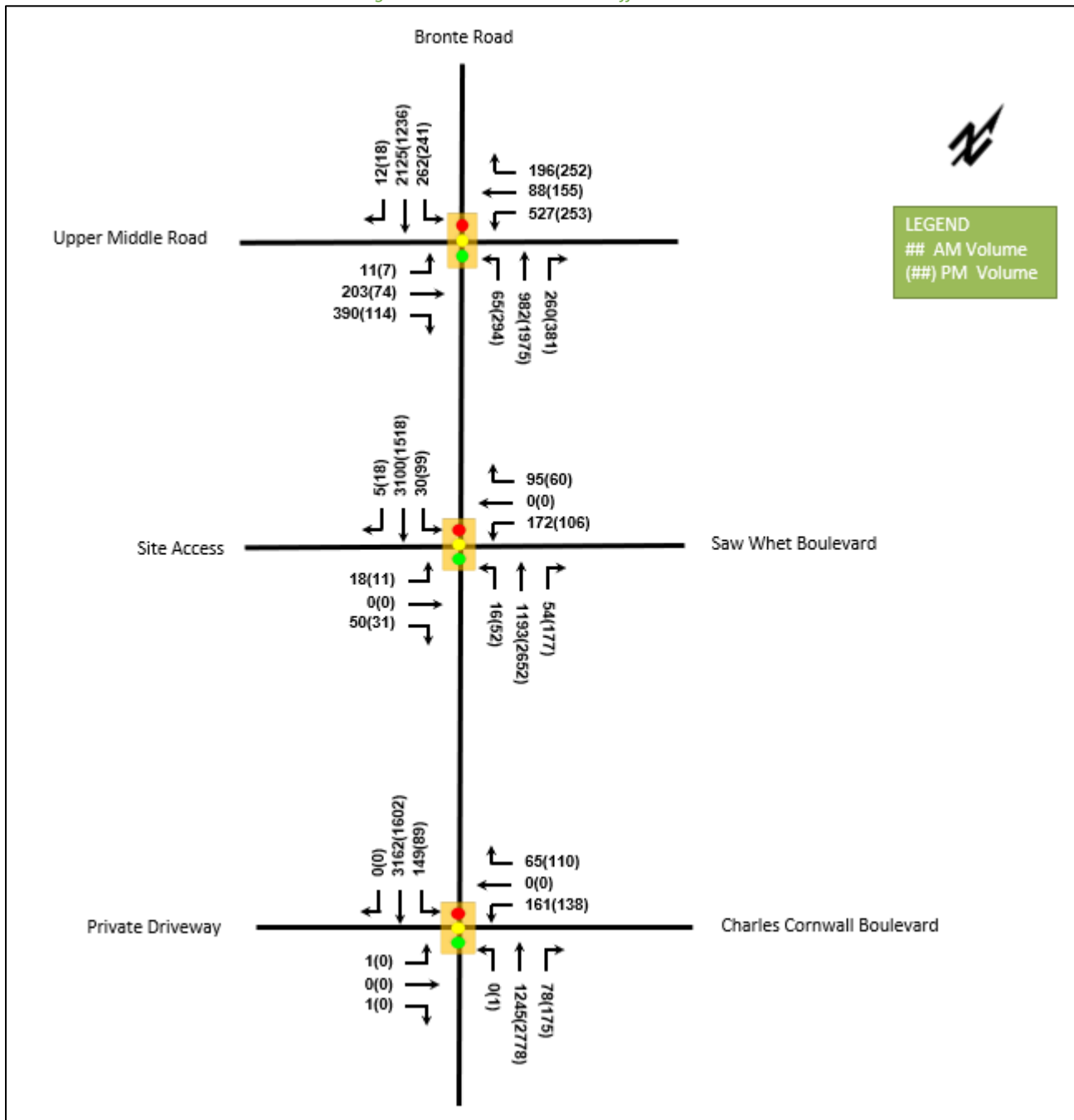
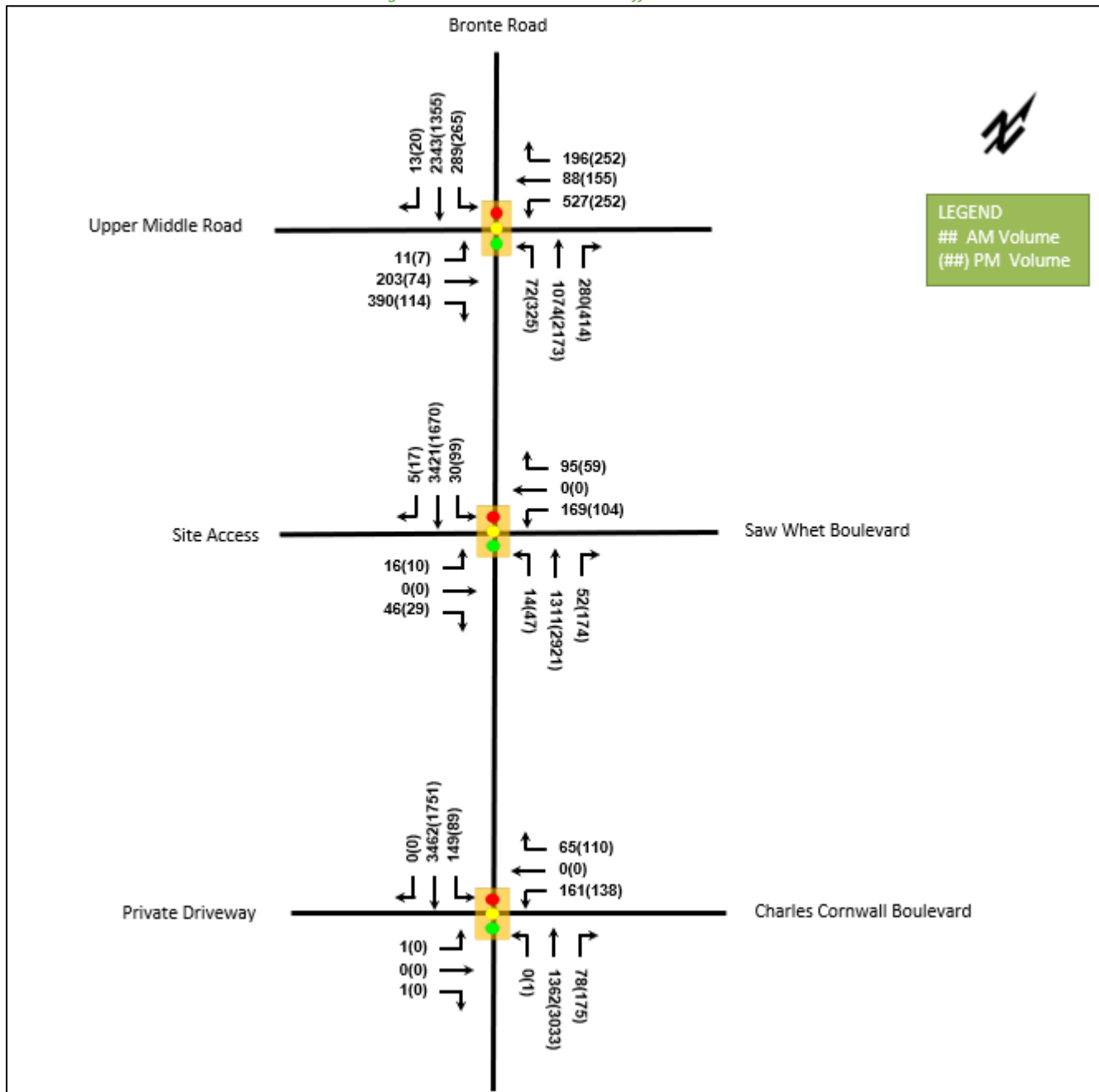


Figure 20: 2031 Total Future Traffic Volumes



5 Development Design

5.1.1 Transportation Demand Management

The proposed development includes mid-rise residential units. In these types of development, one of the most effective Transportation Demand Management (TDM) measures address access and usability of transit, cycling, and pedestrian facilities. To this end, the following plans have been created to illustrate the appropriate cycling (Figure 21), transit (Figure 22), and pedestrian (Figure 23) facilities. Transit stops have been assumed at the intersection of Saw Whet Boulevard and Bronte Road for transit along Bronte Road. As a result, the entire development is within a 400-metre walking distance to transit facilities. In addition, a multi-use pathway on the west side of Bronte Road provides residents with a cycling facility near the proposed development. Sidewalks are provided for site circulation and a direct connection to the Bronte Road corridor.

The following TDM Measures are anticipated to be provided, but the details will be confirmed through the final design and implementation of the site:

- Provide a multimodal travel option information package to new residents
- Offer PRESTO cards preloaded with one monthly transit pass on initial residence purchase/move-in, to encourage residents to use transit (Note: As these would be purchased in bulk it is requested that Town of Oakville provide a bulk purchase rate if this is agreed to)
- Provide visitor and resident bicycle parking in accordance with the Town of Oakville By-law 2014-014

Figure 21: Cycling Concept Plan

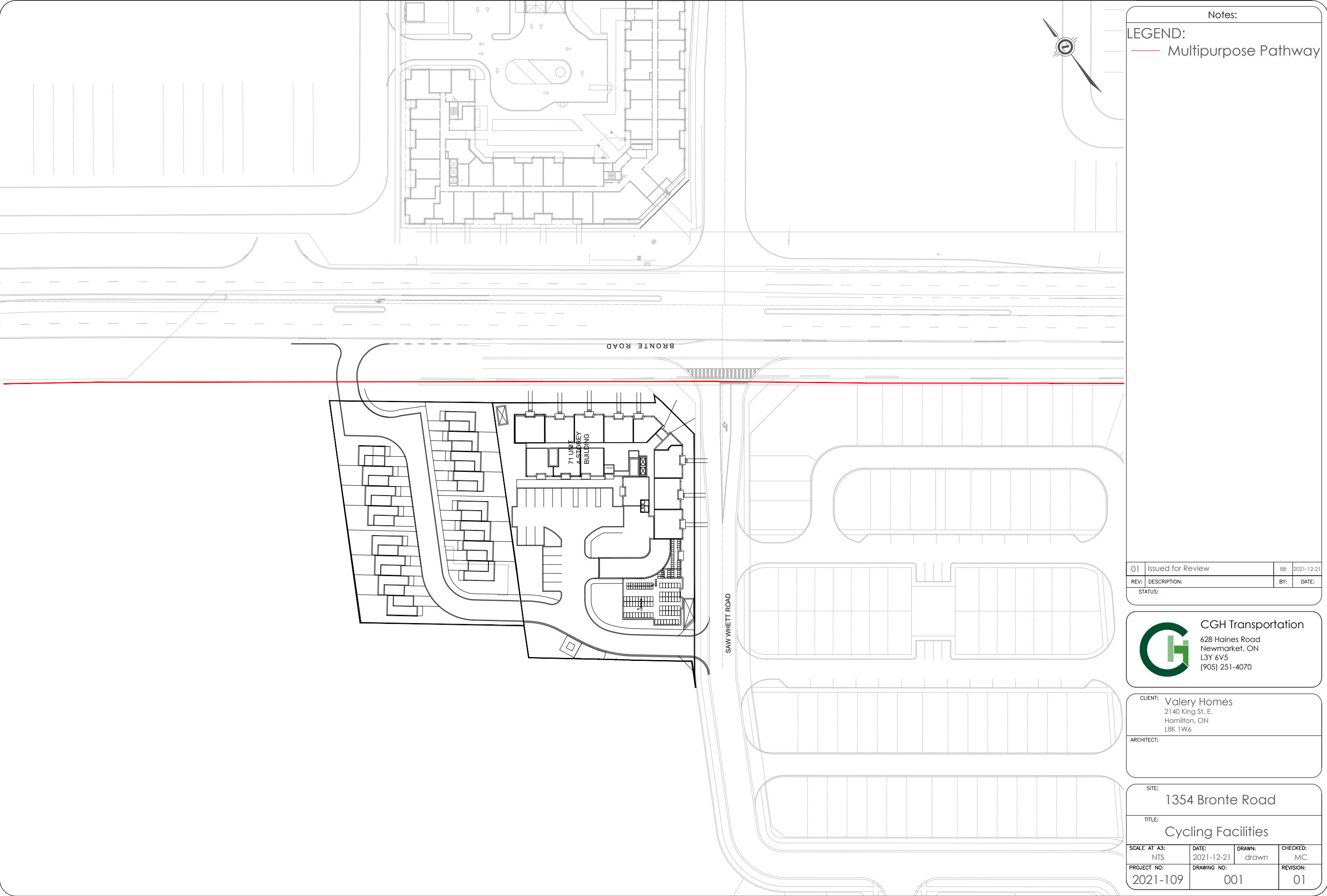


Figure 22: Transit Concept Plan

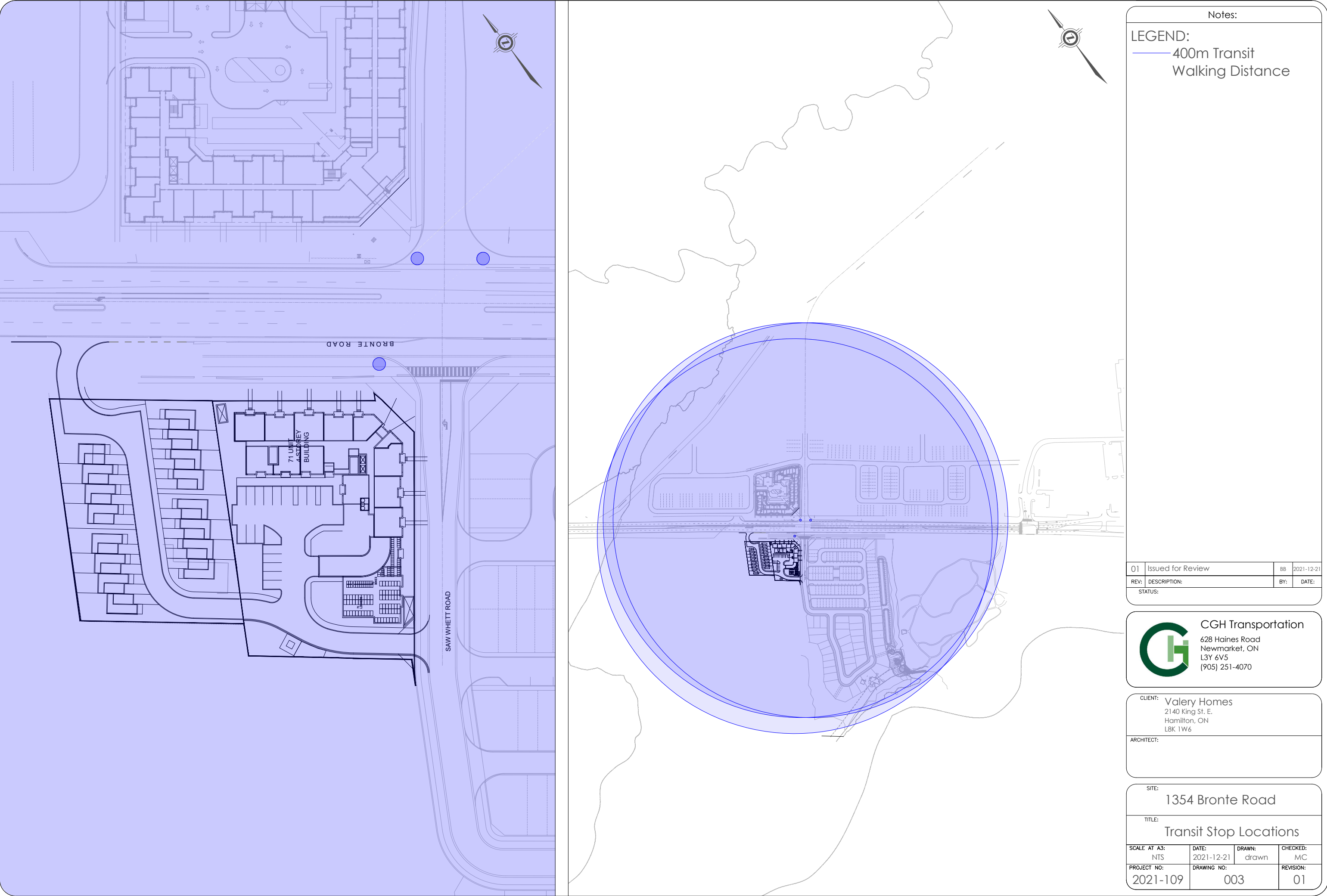
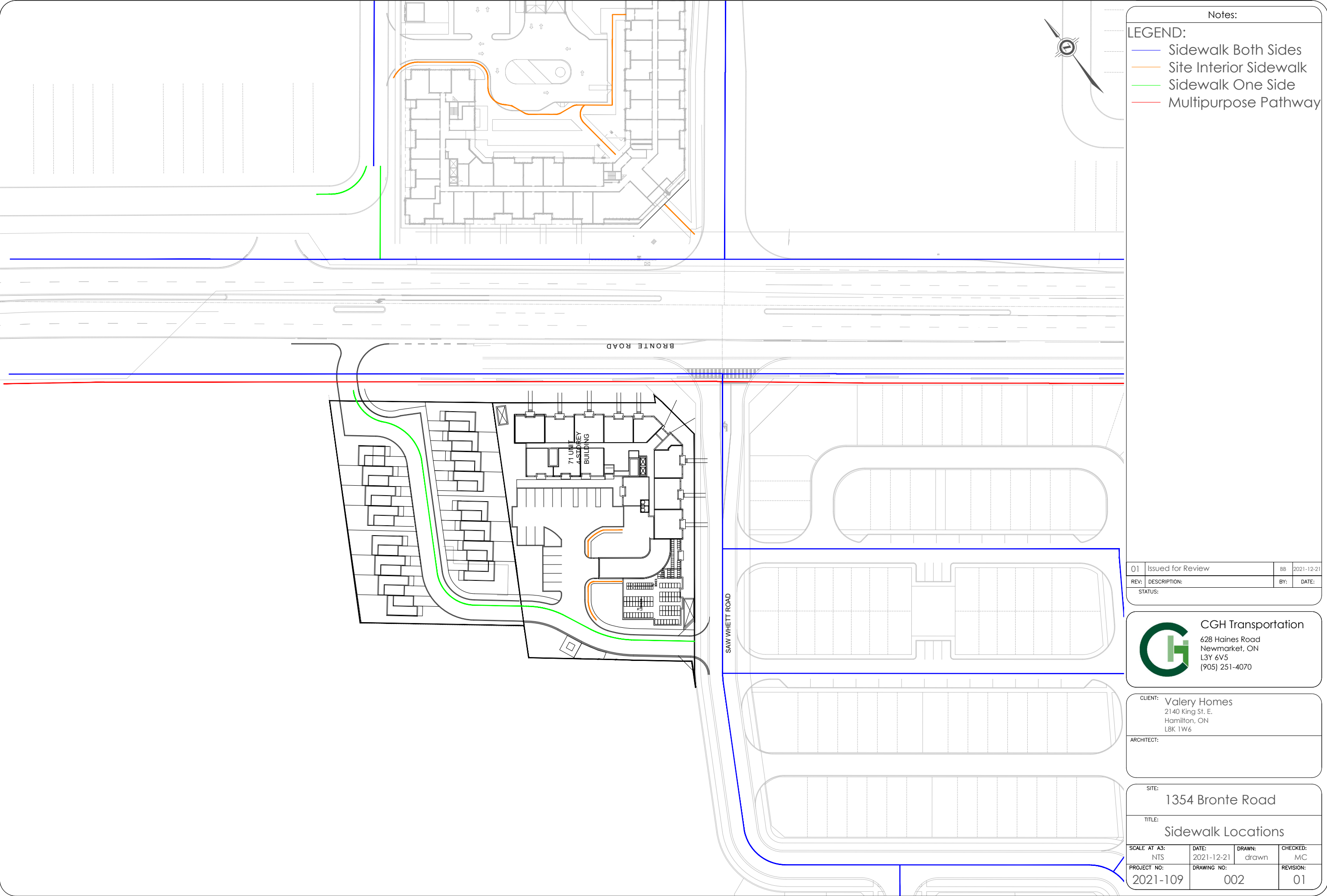


Figure 23: Pedestrian Concept Plan



5.1.2 Parking

The parking provisions for the proposed development have been reviewed using the Town of Oakville By-law 2014-014. Table 8 documents the required parking along with the parking provisions.

Table 8: Vehicle Parking Requirements

Type	GFA (s.m.)/ Units	Parking Rate	Parking Spaces Required	Parking Spaces Provided
Mid-rise	71	1.5 spaces/unit	107	111
Visitor	71	<i>Of the total number of parking spaces required, 0.25 of the parking spaces required per dwelling shall be designated as visitors parking spaces.</i>	$71 \times 0.25 = 18$	17
Total			107 minimum	111

As shown in the table above based on the by-law requirements, a total of 107 parking stalls are required. Eighteen of the total parking spaces must be dedicated to visitor parking. However, space is limited at-grade given the location of the garage door access to underground parking. Additionally, given the need to secure resident parking at the proposed development, accommodating visitor parking spaces underground is not feasible. Furthermore, the proposed development is constrained on surface parking spaces due to the need to provide road access to the potential future development to the north from Saw Whet Boulevard. As a result, 17 visitor parking spaces can be accommodated at the proposed development.

The bicycle parking provisions for the proposed development have been reviewed using the Town of Oakville By-law 2014-014. Table 9 documents the required parking along with the parking provisions.

Table 9: Bicycle Parking Requirements

Type	GFA (s.m.)/ Units	Parking Rate	Parking Spaces Required	Parking Spaces Provided
Mid-rise	71	1.0 space/unit	71	71
Visitor (included in total)	71	<i>0.25 of total spaces for visitor parking</i>	$71 \times 0.25 = 18$	18
Total			71	71

Based on the by-law requirements, a total of 71 bicycle parking spaces are required. Eighteen of the total parking spaces must be dedicated to visitor parking. Given that 71 parking spaces in total, including 18 visitor parking spaces, will be provided, the by-law requirements for bicycle parking are satisfied at the proposed development.

5.1.3 Development Access

Access to the proposed development will be accommodated via a signalized intersection at Saw Whet Boulevard and Bronte Road. Given that access is also required to the Bronte River development as well as the Bronte Green development on the opposing side of Bronte Road, and that these developments will generate considerable traffic, a full movement access is proposed.

Using OTM Book 12 Justification 7, and the volume projections herein, the traffic control signal warrant for this intersection has been assessed in Appendix D for the 2031 Future Total horizon. Although a signal is not warranted for this intersection using Justification 7, it has been proposed to address high V/C ratios and delays. A Left Turn Lane warrant has also been assessed for the access, which can be found in Appendix E. It has been found that a left turn lane is warranted for this access.

The proposed site plan and access configuration have been reviewed using a heavy single unit truck (HSU). The truck will enter through the site access at Saw Whet Boulevard and Bronte Road. Appendix F includes drawings illustrating the turning paths for the design vehicle. All turning paths are accommodated by the proposed curbs and driveways.

6 Operational Analysis

To understand the operational characteristics of the Study Area intersections, a Synchro model has been created using Trafficware's Synchro (Version 11). The Synchro model has been coded using the existing traffic signal timing, provided by Halton Region. The Heavy Vehicle percentage (HV %) has been calculated for each turning movement at the Study Area intersections. All Heavy Vehicle percentages calculated to be less than 2% were entered into the Synchro model as 2% in order to produce a conservative analysis. These calculations are shown in Appendix G. All other parameters have been coded using accepted best practices and default parameters where applicable.

6.1 2021 Existing Conditions

The existing intersection volumes have been analyzed to establish a baseline condition and determine the impact of the subject development as well as the surrounding background developments on the Study Area road network. Table 10 summarizes the operational analysis of the 2021 existing conditions. Appendix H contains the 2021 Existing Conditions Synchro Sheets.

Table 10: 2021 Existing Conditions Operational Analysis

Intersection	Mvmnt	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Del (s)	Q (95 th)	LOS	V/C	Del. (s)	Q (95 th)
Upper Middle Road and Bronte Road (Signalized)	EBL	D	0.06	50	8	D	0.05	54	6
	EBT	E	0.81	75	#111	E	0.38	59	38
	EBR	F	1.25	204	#171	E	0.08	56	18
	WBL	E	0.95	71	#86	D	0.34	45	33
	WBT	D	0.22	44	41	D	0.47	52	68
	WBR	D	0.13	43	23	D	0.40	51	52
	NBL	D	0.51	50	25	C	0.78	33	m#29
	NBT	C	0.48	23	91	C	0.98	25	#277
	NBR	E	0.13	61	35	A	0.28	5	m13
	SBL	B	0.59	16	38	E	0.84	67	#123
	SBT	E	1.03	60	#361	C	0.57	22	127
	SBR	B	0.01	14	0	B	0.01	14	0.0
	Overall	E	1.04	64	-	C	0.84	30	-
	Mitigation Measure: AM Peak Hour Signal Optimization								
	EBL	D	0.04	40	7	-	-	-	-
	EBT	D	0.50	49	82	-	-	-	-
	EBR	E	0.88	75	#150	-	-	-	-
	WBL	E	0.89	63	#93	-	-	-	-
	WBT	D	0.19	40	39	-	-	-	-
	WBR	D	0.13	40	21	-	-	-	-
	NBL	D	0.53	42	23	-	-	-	-
	NBT	C	0.53	21	92	-	-	-	-
	NBR	D	0.13	53	35	-	-	-	-
	SBL	B	0.61	19	43	-	-	-	-
	SBT	F	1.08	81	#379	-	-	-	-
	SBR	B	0.01	16	0	-	-	-	-
	Overall	E	1.03	59	-	-	-	-	-
Charles Cornwall Road and Bronte Road (Signalized)	EBL/T/R	E	0.00	64	0	-	-	-	-
	WBL	E	0.34	69	14	E	0.24	65	14
	WBR	E	0.02	64	0	E	0.04	63	14
	NBL	-	-	-	-	A	0.00	0	m0
	NBT	A	0.40	7	116	A	0.84	7	m26
	NBR	A	0.01	3	m0	A	0.01	3	m0
	SBL	A	0.29	2	m5	E	0.20	80	m1
	SBT/R	A	0.91	6	m189	A	0.46	2	33
	Overall	A	0.91	7	-	A	0.79	7	-
Notes:	# - 95% percentile exceeds capacity m - volume for the 95 th percentile queue is metered by an upstream signal								

The above table summarizes the intersection operational analysis of the 2021 projected volumes. Generally, the Study Area intersections are operating with good overall LOS and low delays. The exception to this is the eastbound right movement at Upper Middle Road and Bronte Road during the AM peak period. Signal optimization was explored as a mitigation measure for this movement, and as a result, conditions for this movement have been improved. However, this mitigation measure was not sufficient to reduce the V/C ratio below one and decrease delays at all movements at this intersection. Given the fact that both Upper Middle Road and Bronte Road are busy arterial roads with high traffic volumes in competing north-south and east-west directions, high delays during the peak hours may be expected at this intersection.

6.2 2026 Future Background Conditions

The 2026 Future Background conditions have been examined to determine the future traffic conditions without the addition of the proposed development. This will isolate the impact of the subject development on the traffic network. Table 11 summarizes the operational analysis of 2026 Future Background conditions. Synchro worksheets have been included in Appendix I.

Table 11: 2026 Future Background Conditions Operational Analysis

Intersection	Mvmnt	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Del (s)	Q (95 th)	LOS	V/C	Del. (s)	Q (95 th)
Upper Middle Road and Bronte Road (Signalized)	EBL	D	0.04	40	7	D	0.05	55	6
	EBT	D	0.50	48	82	E	0.38	59	39
	EBR	E	0.89	75	#151	E	0.08	56	19
	WBL	F	0.99	87	#112	D	0.43	45	44
	WBT	D	0.20	42	39	D	0.44	50	68
	WBR	D	0.13	41	22	D	0.39	49	54
	NBL	D	0.58	55	22	F	1.04	92	m#52
	NBT	C	0.66	28	153	E	1.12	80	m#344
	NBR	D	0.21	41	43	B	0.37	14	M19
	SBL	C	0.76	28	58	F	1.06	123	#145
	SBT	F	1.19	123	#446	C	0.71	27	165
	SBR	B	0.01	15	0	B	0.01	16	0
	Overall	E	1.14	80	-	E	0.95	59	-
Saw Whet Boulevard and Bronte Road (Signalized)	EBL	D	0.07	49	10	D	0.06	55	8
	EBT/R	D	0.10	49	16	D	0.02	54	4
	WBL	E	0.81	75	78	E	0.69	70	52
	WBT/R	D	0.09	49	18	E	0.25	56	26
	NBL	B	0.25	18	m4	A	0.24	1	m0
	NBT	A	0.49	20	127	C	1.02	27	m399
	NBR	A	0.04	7	m11	A	0.15	0	m0
	SBL	A	0.13	3	m2	F	2.04	551	m#80
	SBT	F	1.27	130	m#591	B	0.58	11	197
	SBR	A	0.00	4	m0	A	0.01	9	m2
	Overall	F	1.18	92	-	C	1.84	59	-
	Mitigation Measure: Protected and Permissive SBL Phase in PM Peak Hour								
	EBL	-	-	-	-	D	0.06	55	8
	EBT/R	-	-	-	-	D	0.02	54	2
	WBL	-	-	-	-	E	0.69	70	52
	WBT/R	-	-	-	-	D	0.06	55	15
	NBL	-	-	-	-	A	0.24	5	m2
	NBT	-	-	-	-	F	1.18	88	m#427
	NBR	-	-	-	-	A	0.16	4	m3
	SBL	-	-	-	-	D	0.57	42	m26
	SBT	-	-	-	-	B	0.58	17	256
	SBR	-	-	-	-	A	0.01	6	m1
	Overall	-	-	-	-	E	1.07	59	-
Charles Cornwall Road and Bronte Road (Signalized)	EBL/T/R	D	0.00	49	0	-	-	-	-
	WBL	E	0.82	79	72	E	0.73	71	61
	WBR	D	0.05	49	13	D	0.17	54	24
	NBL	-	-	-	-	A	0.01	7	1
	NBT	B	0.57	14	144	F	1.19	113	#610
	NBR	A	0.07	9	10	A	0.18	8	28
	SBL	A	0.50	5	m3	E	0.56	59	34
	SBT/R	F	1.25	119	m#439	A	0.61	8	144
	Overall	F	1.21	85	-	E	1.08	71	-
Notes:		# - 95% percentile exceeds capacity; m - volume for the 95 th percentile queue is metered by an upstream signal							

With the addition of background traffic growth as well as the nearby background development traffic, the Study Area intersections are experiencing operational constraints. At the Upper Middle Road and Bronte Road intersection, the southbound through movement experiences a V/C ratio of 1.19. Given that the opposing westbound left phase is at capacity, providing more green time to the southbound through movement would increase the westbound left movement's V/C ratio, which would exceed 1. As previously mentioned, given the nature of the two arterial roads at Upper Middle Road and Bronte Road, this high V/C can be expected. Conditions are expected to improve in future analysis horizons given additional lanes on Bronte Road.

At Saw Whet Boulevard and Bronte Road, the southbound through movement in the AM peak period experiences a V/C ratio of 1.27 with a high delay and a 95th percentile queue that exceeds capacity. At Charles Cornwall Road and Bronte Road, the southbound shared through/right movement in the AM peak period experiences a V/C ratio of 1.25 with a high delay and a 95th percentile queue that exceeds capacity. In the PM period at this intersection, the northbound through movement experiences a V/C ratio of 1.19 with a high delay and a 95th percentile queue that exceeds capacity. Although these movements are experiencing constraints, providing more green time to these movements will reduce the splits for opposing movements below the minimum splits. However, these conditions are expected to improve in future horizons of analysis given the additional lanes on Bronte Road.

At the Saw Whet Boulevard and Bronte Road intersection In the PM peak period, the southbound left movement experiences a V/C ratio of 2.04. To improve conditions, a permissive and protected southbound left turn phase has been proposed. The V/C ratio of this movement reduces to 0.57 with this implementation, but the northbound through movement experiences an increase in V/C ratio from 1.02 to 1.18. This trade-off is acceptable as through traffic conditions are expected to improve in future horizons of analysis given the additional lanes on Bronte Road.

6.3 2026 Future Total Conditions

The analysis parameters used to analyze the 2026 Future Background conditions have been carried forward as part of the analysis of 2026 Total Future conditions. The 2026 site-generated volumes have been added. Table 12 summarizes the results of the Synchro Analysis. Synchro worksheets have been included in Appendix J.

Table 12: 2026 Total Future Conditions Operational Analysis

Intersection	Mvmnt	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Del (s)	Q (95 th)	LOS	V/C	Del. (s)	Q (95 th)
Upper Middle Road and Bronte Road (Signalized)	EBL	D	0.04	40	7	D	0.05	55	6
	EBT	D	0.50	48	82	E	0.38	59	39
	EBR	E	0.89	75	#151	E	0.08	56	19
	WBL	F	1.00	88	#113	D	0.43	45	44
	WBT	D	0.20	42	39	D	0.44	50	68
	WBR	D	0.13	41	22	D	0.39	49	54
	NBL	D	0.58	54	22	F	1.05	92	m#60
	NBT	C	0.66	28	154	E	1.12	75	m111
	NBR	D	0.21	41	43	B	0.37	11	m13
	SBL	C	0.76	28	58	F	1.06	123	#145
	SBT	F	1.19	123	#446	C	0.72	27	166
	SBR	B	0.01	15	0	B	0.01	16	0
	Overall	E	1.14	80	-	E	0.95	57	-
Saw Whet Boulevard and Bronte Road (Signalized)	EBL	D	0.10	49	12	D	0.07	55	9
	EBT/R	D	0.14	50	21	D	0.02	54	5
	WBL	E	0.82	76	79	E	0.69	70	52
	WBT/R	D	0.09	49	18	D	0.06	55	15
	NBL	C	0.32	24	m5	A	0.32	3	m2
	NBT	A	0.49	10	127	F	1.18	97	#434
	NBR	A	0.05	7	m11	A	0.16	1	m3
	SBL	A	0.13	3	m2	C	0.57	35	m32
	SBT	F	1.27	131	m#591	B	0.58	15	220
	SBR	A	0.00	2	m0	A	0.01	8	m3
	Overall	F	1.18	93	-	E	1.07	63	-
Charles Cornwall Road and Bronte Road (Signalized)	EBL/T/R	D	0.00	49	0	-	-	-	-
	WBL	E	0.82	79	72	E	0.73	71	61
	WBR	D	0.05	49	13	D	0.17	54	24
	NBL	-	-	-	-	A	0.01	7	1
	NBT	B	0.58	15	145	F	1.20	115	#613
	NBR	A	0.07	9	10	A	0.18	8	28
	SBL	A	0.50	5	m3	E	0.56	55	34
	SBT/R	F	1.26	121	m#442	A	0.61	8	138
	Overall	F	1.22	86	-	E	1.09	72	-
Notes:	# - 95% percentile exceeds capacity m - volume for the 95 th percentile queue is metered by an upstream signal								

The projected 2026 Total Future conditions are similar to those projected for the 2026 Future Background conditions, with the north-south through volumes on Bronte Road projected to operate over capacity. At Upper Middle Road and Bronte Road in the AM peak period, the westbound left and southbound through movements are constrained, and given that they are in opposing directions, providing more green time to one movement to reduce its V/C ratio will increase the other movement's V/C ratio. These constraints are expected given the nature of the two arterial roads at this intersection. Applying signal timing adjustments at Saw Whet Boulevard and Charles Cornwall will reduce splits below minimum splits for movements opposing those that are constrained. However, conditions are expected to improve in future horizons.

6.4 2031 Future Background Traffic Conditions

The 2031 Future Background horizon has been examined to determine the future traffic conditions without the addition of the proposed development. This will isolate the impact of the subject development on the traffic network. By 2031, it is anticipated that the outer lanes of Bronte Road will be converted to HOV / Transit lanes. To reflect this, as instructed by Region Staff, a lane utilization factor of 0.80 has been used to estimate the impact of this reduction in north-south vehicle capacity along Bronte Road. Table 13 summarizes the operational analysis of 2031 Future Background conditions. Synchro worksheets are included as Appendix K.

Table 13: 2031 Future Background Conditions Operational Analysis

Intersection	Mvmnt	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Del (s)	Q (95 th)	LOS	V/C	Del. (s)	Q (95 th)
Upper Middle Road and Bronte Road (Signalized)	EBL	D	0.04	40	7	D	0.04	52	5
	EBT	D	0.50	48	82	E	0.33	56	35
	EBR	E	0.89	75	#151	D	0.08	54	17
	WBL	E	0.92	68	#100	D	0.55	51	42
	WBT	D	0.19	40	38	E	0.53	55	65
	WBR	D	0.13	39	21	D	0.17	50	25
	NBL	E	0.64	62	#27	E	0.86	57	m85
	NBT	C	0.62	29	129	E	1.08	65	m#294
	NBR	E	0.21	60	36	C	0.43	20	m29
	SBL	D	0.82	42	82	D	0.71	48	#147
	SBT	E	1.06	71	#354	C	0.68	29	184
	SBR	B	0.01	16	0	B	0.01	19	0
	Overall	E	1.04	58	-	D	0.93	49	-
Saw Whet Boulevard and Bronte Road (Signalized)	EBL	D	0.06	49	9	D	0.05	55	7
	EBT/R	D	0.09	49	15	D	0.02	54	1
	WBL	E	0.81	75	77	E	0.68	70	51
	WBT/R	D	0.16	50	24	D	0.06	55	15
	NBL	B	0.21	18	m4	A	0.34	5	m1
	NBT	A	0.42	9	113	C	1.03	20	m#422
	NBR	A	0.04	7	12	A	0.16	1	m1
	SBL	A	0.19	4	m3	D	0.57	37	m30
	SBT	E	1.10	58	m#535	B	0.51	13	238
	SBR	A	0.00	4	m0	B	0.01	11	m2
	Overall	D	1.05	45	-	B	0.94	19	-
Charles Cornwall Road and Bronte Road (Signalized)	EBL/T/R	D	0.00	49	0	-	-	-	-
	WBL	E	0.82	79	72	E	0.73	71	61
	WBR	D	0.05	49	13	D	0.27	55	31
	NBL	-	-	-	-	A	0.01	7	1
	NBT	B	0.50	13	118	D	1.02	44	#456
	NBR	A	0.07	9	11	A	0.17	8	25
	SBL	B	0.59	13	m0	E	0.59	69	#38
	SBT/R	D	1.09	47	m#439	A	0.53	2	40
	Overall	D	1.07	38	-	C	0.95	30	-
Notes:	# - 95% percentile exceeds capacity m - volume for the 95 th percentile queue is metered by an upstream signal								

With the addition of background growth to the 2026 Future Background horizon as well as additional lanes along Bronte Road to project the 2031 Future Background traffic volumes, the operational performance of the Study Area intersections increased, with lower delays and V/C ratios at movements that were previously constrained. Further, the LOS of all intersections either improved or stayed the same. Several movements exceeded capacity constraints and could not be improved using signal timing adjustments.

6.5 2031 Future Total Conditions

The analysis parameters used to analyze the 2031 Future Background conditions have been carried forward as part of the analysis of 2031 Total Future conditions. The 2031 site-generated volumes were added. Table 14 summarizes the results of the Synchro analysis. Synchro worksheets have been included in Appendix L.

Table 14: 2031 Total Future Conditions Operational Analysis

Intersection	Mvmnt	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Del (s)	Q (95 th)	LOS	V/C	Del. (s)	Q (95 th)
Upper Middle Road and Bronte Road (Signalized)	EBL	D	0.04	40	7	D	0.04	52	5
	EBT	D	0.50	48	82	E	0.33	56	35
	EBR	E	0.89	75	#151	D	0.08	54	17
	WBL	E	0.92	67	#99	D	0.55	51	43
	WBT	D	0.19	40	38	E	0.53	55	65
	WBR	D	0.13	39	21	D	0.17	50	25
	NBL	E	0.64	64	#27	D	0.86	49	m90
	NBT	C	0.63	33	145	E	1.08	70	m#294
	NBR	E	0.21	66	47	C	0.43	33	m41
	SBL	D	0.82	43	82	D	0.71	48	#147
	SBT	E	1.06	72	#354	C	0.68	29	184
	SBR	B	0.01	16	0	B	0.01	19	0
	Overall	E	1.04	59	-	D	0.93	52	-
Saw Whet Boulevard and Bronte Road (Signalized)	EBL	D	0.08	49	11	D	0.07	55	9
	EBT/R	D	0.13	50	19	D	0.02	54	4
	WBL	E	0.81	75	77	E	0.68	70	51
	WBT/R	D	0.16	50	24	D	0.06	55	15
	NBL	C	0.28	22	m5	A	0.45	7	m2
	NBT	A	0.42	8	95	C	1.03	27	m#433
	NBR	A	0.04	6	10	A	0.16	1	m2
	SBL	A	0.19	5	m3	D	0.57	39	m35
	SBT	E	1.10	62	m#549	A	0.51	10	201
	SBR	A	0.00	0	m0	A	0.01	9	m3
	Overall	D	1.05	47	-	C	0.94	22	-
Charles Cornwall Road and Bronte Road (Signalized)	EBL/T/R	D	0.00	49	0	-	-	-	-
	WBL	E	0.82	79	72	E	0.73	71	61
	WBR	D	0.05	49	13	D	0.27	55	31
	NBL	-	-	-	-	A	0.01	7	1
	NBT	B	0.50	13	119	D	1.03	45	#459
	NBR	A	0.07	9	11	A	0.17	8	25
	SBL	B	0.59	14	m3	E	0.59	68	#35
	SBT/R	D	1.09	46	m#427	A	0.53	2	50
	Overall	D	1.07	37	-	C	0.95	31	-
Notes:	# - 95% percentile exceeds capacity m - volume for the 95 th percentile queue is metered by an upstream signal								

The addition of the site generated traffic to the 2031 Future Background volumes at the Study Area intersections along Bronte Road resulted in lower level of service at Upper Middle Road and Saw Whet Boulevard during the PM peak period. This is expected given the 2021 Existing and 2031 Future Background operational performances along the Bronte Road corridor. It should be noted, however, that the proposed development only contributes to slight increases in V/C ratio to previously constrained intersections throughout the corridor. This horizon includes existing traffic volumes, background development trips, and growth.

With the addition of the HOV lanes northbound and southbound on Bronte Road, the southbound and northbound movements continue to operate at or above a V/C ratio of 1.0 in the AM and PM peak periods, respectively.

However, the active mode share used in this study is a projection of average expected travel behaviour in Oakville. Within the Study Area, the active mode share in 2016 was 13%, where the Regional projection for future horizons is 5%. As the lands along Bronte Road develop, walking and cycling trips are expected to increase further, as more destinations will be available within one-to-five-kilometer radius. Considering the foregoing, it is likely that the number of active mode trips generated by future phases of the proposed development has been underestimated, resulting in a conservative analysis.

It is important to note that although conservative assumptions were used throughout this report, it is evident from existing conditions operational analysis, and the trips generated by the background developments, that the Study Area will experience capacity constraints northbound and southbound along Bronte Road. In locations with low transit accessibility and where surplus of right-of-way exists, the capacity can be increased to allow the continued growth in single occupant vehicles. However, given the lack of ROW along Bronte Road, as well as the planned intensification, and the Town's initiative to increase high occupancy vehicle trips along this corridor, the two inner lanes are expected to operate at capacity. Any additional auto trips resulting in a V/C ratio above one will be further incentivized to transfer to alternative routes or modes. As policy around transportation planning transformed in the recent decade, with key performance indicator shifting from vehicle to person trips per hour per kilometer, this trade-off is considered acceptable.

7 Recommendations

The proposed development will fit into the existing road network. The Saw Whet Boulevard access will support the proposed development as well as the surrounding background developments. However, it is noted that, due to the large existing volume northbound in the PM peak hour and southbound in the AM peak hour, the north and south movements through along Bronte Road are projected to operate with capacity constraints. This will be partially alleviated by the proposed widening of Bronte Road that will accommodate HOV lanes. This will also provide additional transit capacity, promoting further transit usage along this corridor as commuters may choose transit or seek out carpooling opportunities to avoid congestion. The proposed intersection of Saw Whet Boulevard at Bronte Road will be a signalized intersection, with auxiliary turn lanes on all approaches, and with a southbound protected/permissive left turn phase.

8 Conclusions

This Transportation Impact Study has examined the trip generation, access requirements, and Study Area road network impact of the proposed 1354 Bronte Road residential development. The TIS has shown the following:

- a) The proposed development analyzed herein will include 71 townhouse units.
- b) The proposed development will have one access via signalized intersection at Saw Whet Boulevard and Bronte Road. Additionally, the adjacent developments will be connected by internal local and collector streets.
- c) It was found that the adjacent developments of Bronte Green, Bronte Green Mid-Rise, and Bronte River, with direct connections between the developments, should be included in the background traffic projections.
- d) The proposed development includes 111 vehicle parking spaces, including 17 visitor parking spaces. Visitor parking constraints include garage door location, the need to secure resident parking, and the need to provide access to a potential future development north of the site from Saw Whet Boulevard. With regards to bicycle parking, 71 parking spaces are provided, including 18 visitor parking spaces, which satisfies by-law requirements.
- e) The Region of Halton proposed a compound annual growth rate of 2% along Bronte Road. This conservative estimate of traffic growth was applied to the Study Area turning movement counts and traffic volumes.
- f) To estimate the impact of the subject development on the Study Area, a person trip generation exercise has been undertaken. The subject development is anticipated to generate 20 AM and 27 PM peak hour two-way auto trips during the 2026 horizon. With the shift in mode share projected to occur by 2031, the development will generate 19 AM and 25 PM peak hour two-way auto trips in 2031.
- g) Using the existing traffic volumes, projected to 2021, an operational analysis of existing conditions was undertaken. Through this analysis, it was determined that the Study Area intersections generally operate with acceptable overall LOS. All intersections operate at level of service E or better. Several movements experienced V/C ratios above one. Signal optimization was explored as a mitigation measure, which improved conditions for one critical movement at the Upper Middle Road and Bronte Road intersection. One movement at this intersection still experienced capacity constraints and considerable delays after this implementation, but this is expected at an intersection of two arterial roads with high traffic volumes.
- h) The 2026 Future Background traffic volumes, including background growth and the nearby background developments, were analysed. It was found that traffic volumes exceeded theoretical capacity for many movements, especially for through movements along Bronte Road. A protective and permissive phase was assigned to the southbound left-turn movement at Saw Whet Boulevard and Bronte Road during the PM peak period, which resulted in a significant operational improvement for this movement while constraining the northbound through movement. Where volumes exceeded capacity, improvements were expected in the future horizon given additional lanes on Bronte Road.
- i) The 2026 Future Total horizon operates similarly to the 2026 Future Background horizon. Some intersections could not be improved through signal timing adjustments due to opposing movements being constrained while already operating at minimum splits. The future road widening at Bronte Road is anticipated to provide extra capacity to relieve the experienced congestion along this corridor.
- j) The traffic operations within the Study Area improve in the 2031 Future Background horizon with the additional capacity along Bronte Road provided by the two additional lanes in the urban cross-section despite an additional five years of 2% compounding annual growth. The level of service of all intersections either improved or stayed the same compared to the 2026 Future Background scenario. Some movements

still experienced capacity constraints that could not be improved by implementing signal timing adjustments.

- k) In the 2031 Future Total horizon, several study intersections experienced lower level of services in the PM peak period. The proposed development only contributed to slight increases in V/C ratio to previously constrained intersection movements. With the addition of the HOV lanes in this horizon northbound and southbound on Bronte Road, the northbound and southbound movements continue to operate at or above a V/C ratio of one. Despite this, walking and cycling trips are expected to increase in the future, and it is likely that the number of active mode trips generated by future phases of the proposed development has been underestimated, resulting in a conservative analysis.
- l) Given the lack of ROW along Bronte Road, planned intensification, and the Town's initiative to increase high occupancy vehicle trips along this corridor, the two inner lanes of Bronte Road are expected to operate at capacity. Any additional auto trips resulting in a V/C ratio above one will be further incentivized to transfer to alternative routes or modes. As policy around transportation planning transformed in the recent decade, with key performance indicators shifting from vehicle to person trips per hour per kilometer, this trade-off is considered favourable.
- m) TDM measures are proposed to further encourage commuters to shift away from single occupant vehicle trips. For this development, which primarily consists of mid-rise residential units, the most effective measures involve access and usability of transit, cycling and pedestrian facilities. To ensure that the transit, cycling, and pedestrian modes are served appropriately by the proposed development, concept plans have been prepared.

The 1354 Bronte Road development will have a minor impact on the Study Area road network. The proposed accesses will operate with reasonable LOS and delays on the turning movements into and out of the site. The concept plan prepared will provide a good pedestrian and cycling network along with good access to transit throughout the development. It is recommended that, from a transportation perspective, the proposed development application proceed.

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Appendix A

Scope Confirmation

From: [Pasquini-Smith, Alexandria](#)
To: [Nasteha Abdullahi](#)
Subject: RE: Valery Homes 1354 Bronte Road TIS - Terms of Reference
Date: November 10, 2021 10:49:12 AM
Attachments: [image001.png](#)

Hello Nasteha,

Regional staff have reviewed the provided TIS Terms of Reference and offer the following comments:

The Study must be in accordance to Halton Region's Transportation Impact Study Guidelines (2015), Halton's Access By-Law 32-17 and Halton's Access Management Guidelines (2015). Any proposed development access to a Regional road will only be reviewed as part of the Transportation Impact Study.

As noted in the terms of references, the following intersections will be analyzed:

- Upper Middle Road at Bronte Road
- Charles Cornwall Road at Bronte Road (signalized access to Woodlands Operations Centre)
- Saw Whet Boulevard at Bronte Road
- Site Access on Saw Whet Boulevard

As noted in the terms of references, the Analysis Assumptions will be:

- Horizon years: 2021, 2026 (Buildout), and 2031 (+ 5 years).
- Bronte Road will be analyzed as four general purpose lanes for years 2021 (based on existing conditions) and 2026, and as four lanes plus HOV lane (with assumption that 20% of the lane capacity is assigned to HOV usage by using a 0.8 lane utilization factor) for year 2031.

Note: Currently Bronte Road is scheduled for start of construction for the widening from 4 to 6 lanes in 2025 (Speers Road to Highway 407). As the Municipal Class Environmental Assessment (MCEA) Study has not started to date, the Year 2026 analysis must assume Bronte Road at the existing 4 lanes (as noted in the terms of reference).

For the traffic volume counts and traffic signal timing (from Halton Region), information can be requested from our Road Operations group at trafficdatarequests@halton.ca

The Background Developments must be confirmed and approved by the Town of Oakville.

As noted in the terms of reference, a Halton Region growth rate of 2% for Bronte Road will be utilized.

Transit Mode Splits:

As noted in the term of reference, Halton's Transportation Master Plan 2011 utilizes a transit mode

split of 10% for 2021, 15% for 2026 and 20% for 2031. Assumption of travel via other modes (active transportation i.e.: walk, cycle) should utilize a 5% mode split for 2031. Transportation Demand Management (TDM) assumptions of 3% for 2031 would also be acceptable. Transit mode splits will need to be adjusted from the 2011 TMP assumptions to reasonable percentages based on current year (2021), 2026 and 2031 planned and proposed mode splits (based on existing facilities and service in the area to date (planned &/or proposed). Reasonable assumptions and rationale must be clearly outlined in the Study.

All other items in the terms of references appear acceptable.

Thank you.

Alex

Alexsandria Pasquini-Smith, MCIP, RPP

Intermediate Planner

Planning Services

Legislative & Planning Services

Halton Region

905-825-6000, ext. 7185 | 1-866-442-5866



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From: Nasteha Abdullahi <nasteha.abdullahi@cghtransportation.com>

Sent: Thursday, November 4, 2021 4:58 PM

To: Pasquini-Smith, Alexsandria <Alex.Pasquini-Smith@halton.ca>

Subject: Valery Homes 1354 Bronte Road TIS - Terms of Reference

CAUTION: This email originated from outside the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe. If you are unsure or need assistance please contact the IT Service Desk.

Good afternoon Alex,

CGH Transportation has been retained by Valery Homes to undertake a Transportation Impact Study for their 1354 Bronte Road development at Saw Whet Boulevard at Bronte Road in Oakville. We have drafted the attached terms of reference for this development for your review. Please let us know if you have any comments or questions.

Thank you,
Nasteha



Nasteha Abdullahi

CGH Transportation Inc.

P: 647-965-2835

E: nasteha.abdullahi@CGHTransportation.com

From: [Syed Rizvi](#)
To: [Nasteha Abdullahi](#)
Cc: [Mark Crockford](#)
Subject: RE: Valery Homes 1354 Bronte Road TIS - Terms of Reference
Date: November 16, 2021 11:29:16 AM
Attachments: [image001.png](#)

Hi Nasteha,

Sorry for delay in response. Transportation staff agree with the proposed study terms of reference. Please add site traffic circulation plan with the surface parking plan showing access to the underground parking levels and all dimensions should be submitted for review and comments by the Transportation staff.

Thanks,
Syed

Syed Rizvi, M.Sc., P. Eng
Transportation Engineer
Transportation and Engineering
Town of Oakville | 905-845-6601, ext.3981 | www.oakville.ca

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From: Nasteha Abdullahi <nasteha.abdullahi@cghtransportation.com>
Sent: November 4, 2021 4:52 PM
To: Syed Rizvi <syed.rizvi@oakville.ca>
Cc: Mark Crockford <mark.crockford@cghtransportation.com>
Subject: Valery Homes 1354 Bronte Road TIS - Terms of Reference

SECURITY CAUTION: This email originated from outside of The Town of Oakville. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good afternoon Syed,

CGH Transportation has been retained by Valery Homes to undertake a Transportation Impact Study for their 1354 Bronte Road development at Saw Whet Boulevard at Bronte Road in Oakville. We have drafted the attached terms of reference for this development for your review. Please let us know if you have any comments or questions.

Thank you,

Nasteha



Nasteha Abdullahi

CGH Transportation Inc.

P: 647-965-2835

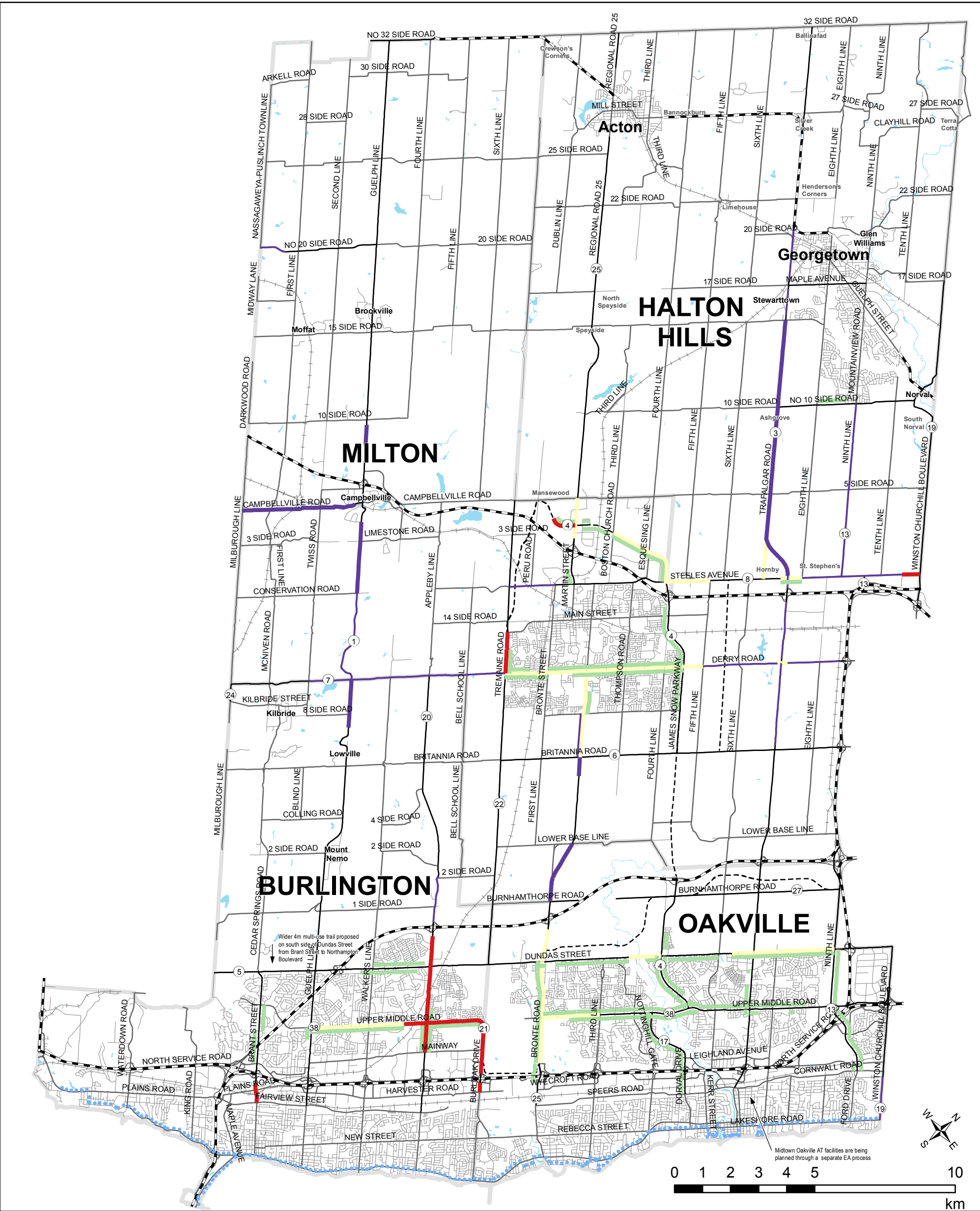
E: nasteha.abdullahi@CGHTransportation.com

Appendix B

Town of Oakville and Halton Region Active Transportation Maps

Appendix H

Existing and Proposed Regional Cycling & Walking Network Maps



Legend

Existing Regional Cycling Network*

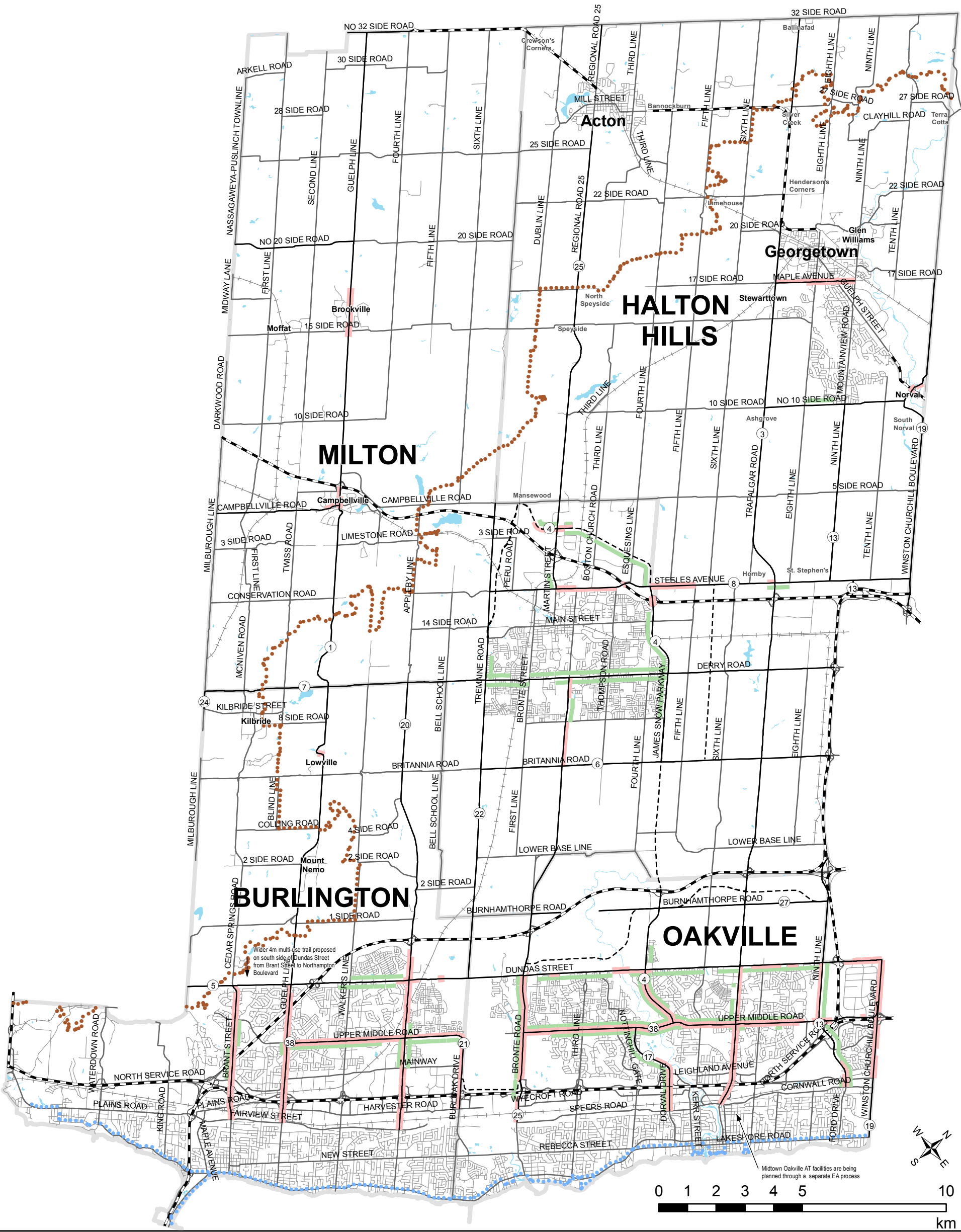
- Bike Lanes
- Boulevard Multi-Use Trail
- Wide Shared Use Lane
- Paved Shoulders
- Partially Paved Shoulders
- Waterfront Trail

Regional Road Network*

- Existing Regional Road
- Proposed Regional Road

Active Transportation Master Plan
MAP 1
Existing Regional Cycling Network

*Note: Existing cycling facilities are shown only for Regional Roads, which are shown in black on the map



Legend

Existing Regional Walk Network

- Sidewalk
- Boulevard Multi-Use Trail
- Bruce Trail
- Waterfront Trail

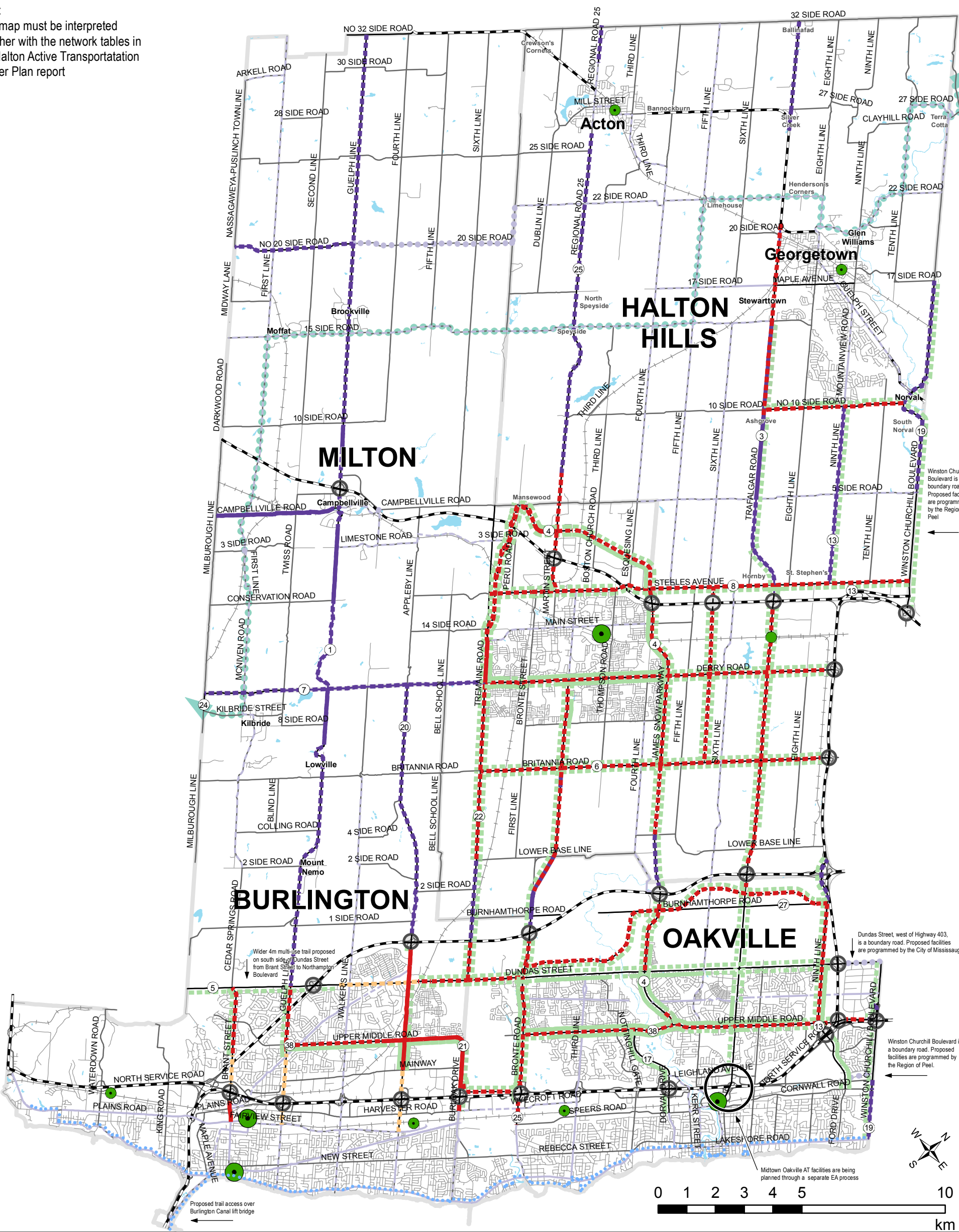
Regional Road Network

- Existing Regional Road
- Proposed Regional Road

Active Transportation Master Plan
MAP 2
Existing Regional Walking Network

Note: Existing walking facilities are shown only for Regional Roads, which are shown in black on the map.

Note:
This map must be interpreted together with the network tables in the Halton Active Transportation Master Plan report



Legend

Proposed Regional Bike Network

- Buffered Bike Lanes
- Bike Lanes
- Boulevard Multi-Use Trail
- Paved Shoulders
- Interchange Improvement*

Routes not on Regional Roads

- Existing Routes that are Regionally Significant
- Planned Routes that are Regionally Significant
- Proposed Routes that are Regionally Significant
- Greenbelt Cycling Route

Existing Regional Bike Network

- Bike Lane
- Boulevard Trail
- Waterfront Trail

Existing and Proposed Major Transit Stations**

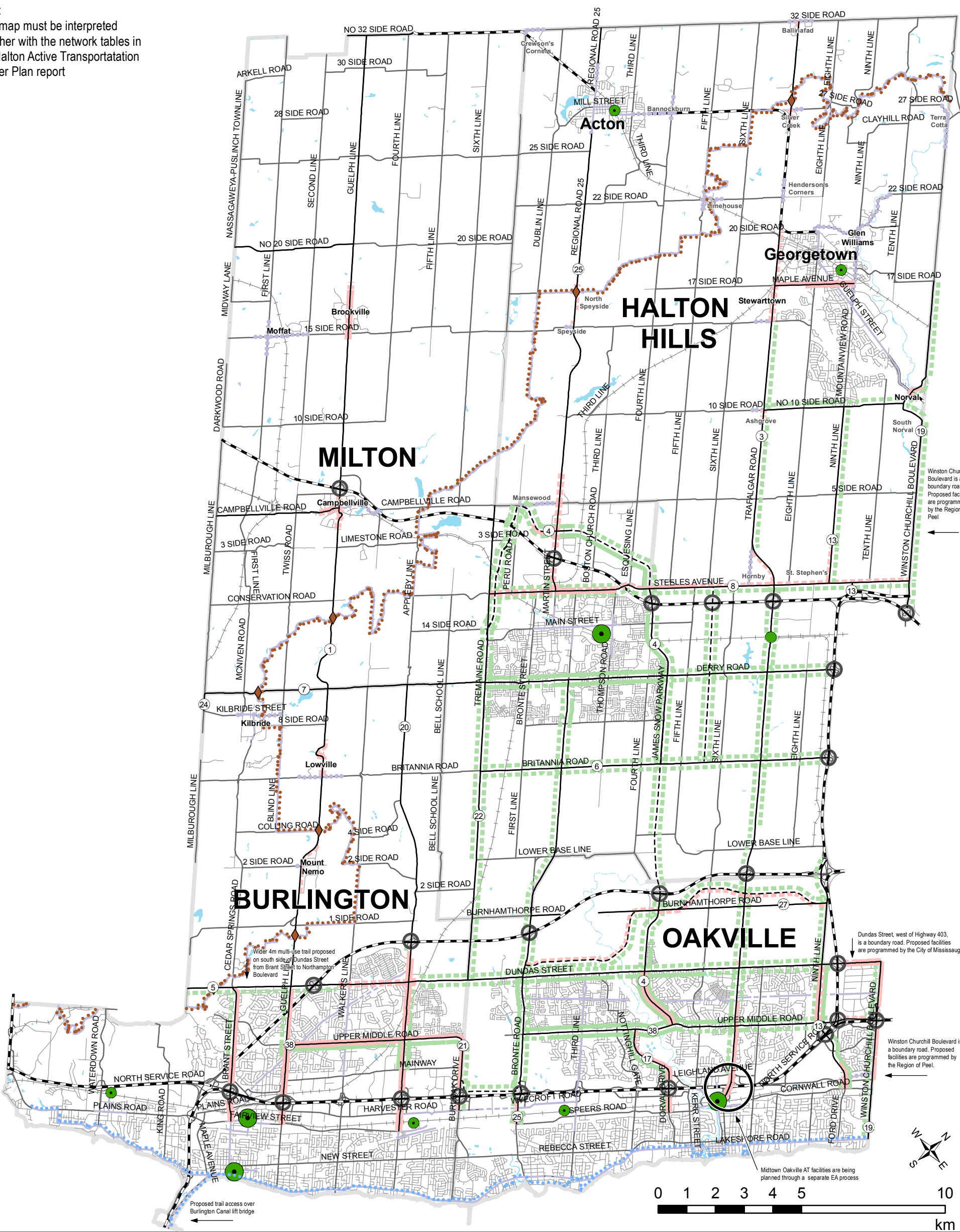
- Mobility Hub
- Major Transit Stations
- Proposed GO Stations

Active Transportation Master Plan

MAP 3
Proposed Regional Cycling Network

*Note active transportation facilities at interchanges to be determined in consultation with the MTO.
**Note that some Routes that are Regionally Significant are located near transit stations. Connections to transit are an important part of the Regional Cycling and Walking Network. Transit stations are shown on the map to provide contextual information.

Note:
This map must be interpreted
together with the network tables in
the Halton Active Transportation
Master Plan report



Legend

Proposed Regional Walk Network

- Sidewalk
- Boulevard Multi-Use Trail
- Interchange Improvement*
- Bruce Trail Crossing

Routes not on Regional Roads

- Existing Routes that are Regionally Significant
- Planned Routes that are Regionally Significant
- Proposed Routes that are Regionally Significant

Existing Regional Walk Network

- Sidewalk
- Boulevard Multi-Use Trail
- Bruce Trail
- Waterfront Trail

Existing and Proposed Major Transit Stations**

- Mobility Hub
- Existing GO Stations
- Proposed GO Stations

Active Transportation Master Plan
MAP 4
Proposed Regional Walking Network

*Note active transportation facilities at interchanges to be determined in consultation with the MTO.
**Note that some Routes that are Regionally Significant are located near transit stations. Connections to transit are an important part of the Regional Cycling and Walking Network. Transit stations are shown on the map to provide contextual information.

Appendix C

Turning Movement Count Data

Upper Middle Rd W @ Bronte Rd

Morning Peak Diagram

Specified Period

From: 7:00:00

To: 9:00:00

One Hour Peak

From: 7:45:00

To: 8:45:00

Municipality: Halton Region

Site #: 0000003289

Intersection: Bronte Rd & Upper Middle Rd W

TFR File #: 11

Count date: 29-Oct-2019

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

** Signalized Intersection **

Major Road: Bronte Rd runs N/S

North Leg Total: 3033

North Entering: 2059

North Peds: 11

Peds Cross: $\times$

Heavys	2	88	2	92
Trucks	0	19	1	20
Cars	9	1716	222	1947
Totals	11	1823	225	

Heavys 44

Trucks 26

Cars 904

Totals 974

East Leg Total: 1386

East Entering: 788

East Peds: 7

Peds Cross: $\times$

Heavys	Trucks	Cars	Totals
9	1	146	156



Upper Middle Rd W

Heavys	Trucks	Cars	Totals
1	0	10	11
0	2	201	203
0	0	388	388
1	2	599	

Peds Cross: $\times$

West Peds: 5

West Entering: 602

West Leg Total: 758

Cars 2598

Trucks 22

Heavys 95

Totals 2715

Cars	54	706	158	918
Trucks	1	25	5	31
Heavys	2	36	7	45
Totals	57	767	170	

Peds Cross: $\times$

South Peds: 0

South Entering: 994

South Leg Total: 3709

Comments

Upper Middle Rd W @ Bronte Rd

Mid-day Peak Diagram

Specified Period

From: 11:00:00

To: 14:00:00

One Hour Peak

From: 12:30:00

To: 13:30:00

Municipality: Halton Region

Site #: 0000003289

Intersection: Bronte Rd & Upper Middle Rd W

TFR File #: 11

Count date: 29-Oct-2019

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

** Signalized Intersection **

Major Road: Bronte Rd runs N/S

North Leg Total: 1932

North Entering: 968

North Peds: 2

Peds Cross: $\times$

Heavys	0	71	1	72
Trucks	1	19	3	23
Cars	7	745	121	873
Totals	8	835	125	

Heavys 73

Trucks 17

Cars 874

Totals 964

East Leg Total: 651

East Entering: 349

East Peds: 0

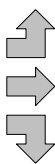
Peds Cross: $\times$

Heavys	Trucks	Cars	Totals
0	4	134	138

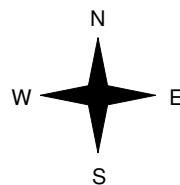


Upper Middle Rd W

Heavys	Trucks	Cars	Totals
0	1	5	6
1	2	33	36
1	1	86	88
2	4	124	



Bronte Rd



Bronte Rd

Cars	Trucks	Heavys	Totals
154	4	4	162
43	1	0	44
141	0	2	143
338	5	6	

Upper Middle Rd W



Cars	Trucks	Heavys	Totals
282	8	12	302

Peds Cross: $\times$

West Peds: 2

West Entering: 130

West Leg Total: 268

Cars	972
Trucks	20
Heavys	74
Totals	1066



Cars	84	715	128	927
Trucks	2	12	3	17
Heavys	0	69	10	79
Totals	86	796	141	

Peds Cross: $\times$

South Peds: 0

South Entering: 1023

South Leg Total: 2089

Comments

Upper Middle Rd W @ Bronte Rd

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 18:00:00

One Hour Peak

From: 16:45:00

To: 17:45:00

Municipality: Halton Region

Site #: 0000003289

Intersection: Bronte Rd & Upper Middle Rd W

TFR File #: 11

Count date: 29-Oct-2019

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

** Signalized Intersection **

Major Road: Bronte Rd runs N/S

North Leg Total: 3126

North Entering: 1207

North Peds: 6

Peds Cross: $\times$

	Heavys	Trucks	Cars	Totals
0	31	1	32	
1	8	0	9	
14	952	200	1166	
Totals	15	991	201	

Heavys 30

Trucks 9

Cars 1880

Totals 1919

East Leg Total: 1155

East Entering: 589

East Peds: 1

Peds Cross: $\times$

Heavys	Trucks	Cars	Totals
3	1	419	423



Upper Middle Rd W

Heavys	Trucks	Cars	Totals
0	0	7	7
0	1	73	74
1	0	109	110
1	1	189	

Peds Cross: $\times$

West Peds: 1

West Entering: 191

West Leg Total: 614

Cars	Trucks	Heavys	Totals
1237	8	38	1283

Cars	Trucks	Heavys	Totals
251	0	2	253
1624	7	29	1660
287	0	4	291
2162	7	35	

Peds Cross: $\times$

South Peds: 0

South Entering: 2204

South Leg Total: 3487

Comments

Upper Middle Rd W @ Bronte Rd

Total Count Diagram

Municipality: Halton Region

Site #: 0000003289

Intersection: Bronte Rd & Upper Middle Rd W

TFR File #: 11

Count date: 29-Oct-2019

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

**** Signalized Intersection ****

Major Road: Bronte Rd runs N/S

North Leg Total: 19991

North Entering: 10291

North Peds: 36

Peds Cross: $\times$

Heavys	6	511	32	549
Trucks	4	148	13	165
Cars	74	8178	1325	9577
Totals	84	8837	1370	



Heavys 450

Trucks 140

Cars 9110

Totals 9700

East Leg Total: 7615

East Entering: 4183

East Peds: 14

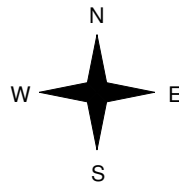
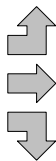
Peds Cross: $\times$

Heavys	Trucks	Cars	Totals
43	12	1609	1664



Upper Middle Rd W

Heavys	Trucks	Cars	Totals
2	3	61	66
9	5	600	614
10	5	1206	1221
21	13	1867	



Bronte Rd

Cars	Trucks	Heavys	Totals
1567	15	44	1626
622	3	19	644
1837	17	59	1913
4026	35	122	

Upper Middle Rd W



Cars	Trucks	Heavys	Totals
3317	35	80	3432

Peds Cross: $\times$

West Peds: 23

West Entering: 1901

West Leg Total: 3565

Cars	11221
Trucks	170
Heavys	580
Totals	11971



Cars	913	7482	1392	9787
Trucks	5	122	17	144
Heavys	18	404	39	461
Totals	936	8008	1448	

Peds Cross: $\times$

South Peds: 3

South Entering: 10392

South Leg Total: 22363

Comments

Bronte Rd @ Woodlands Entrance

Morning Peak Diagram

Specified Period

From: 7:00:00

To: 9:00:00

One Hour Peak

From: 7:45:00

To: 8:45:00

Municipality: Halton Region

Site #: 0000003340

Intersection: Bronte Rd & Woodlands Entrance

TFR File #: 16

Count date: 4-Dec-2019

Weather conditions:

Overcast/Wet

Person(s) who counted:

Cam

** Signalized Intersection **

Major Road: Bronte Rd runs N/S

North Leg Total: 3723

North Entering: 2687

North Peds: 0

Peds Cross: $\nless$

Heavys	0	72	0	72
Trucks	0	29	0	29
Cars	0	2461	125	2586
Totals	0	2562	125	



Heavys 49

Trucks 15

Cars 972

Totals 1036

East Leg Total: 171

East Entering: 36

East Peds: 0

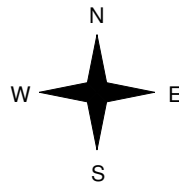
Peds Cross: $\nless$

Heavys	Trucks	Cars	Totals
0	0	0	0



Driveway

Heavys	Trucks	Cars	Totals
0	0	1	1
0	0	0	0
0	0	1	1
0	0	2	



Bronte Rd



Cars	Trucks	Heavys	Totals
16	2	1	19
0	0	0	0
14	2	1	17
30	4	2	

Woodlands Entrance



Cars	Trucks	Heavys	Totals
134	1	0	135

Peds Cross: $\nless$

West Peds: 0

West Entering: 2

West Leg Total: 2

Cars 2476

Trucks 31

Heavys 73

Totals 2580



Cars 0

Trucks 0

Heavys 0

Totals 0

955

13

48

10

9

1

0

Peds Cross: $\nless$

South Peds: 0

South Entering: 1026

South Leg Total: 3606

Comments

Bronte Rd @ Woodlands Entrance

Mid-day Peak Diagram

Specified Period

From: 11:00:00

To: 14:00:00

One Hour Peak

From: 11:45:00

To: 12:45:00

Municipality: Halton Region

Site #: 0000003340

Intersection: Bronte Rd & Woodlands Entrance

TFR File #: 16

Count date: 4-Dec-2019

Weather conditions:

Overcast/Wet

Person(s) who counted:

Cam

** Signalized Intersection **

Major Road: Bronte Rd runs N/S

North Leg Total: 2106

North Entering: 1137

North Peds: 0

Peds Cross: $\nlessgtr$

Heavys	0	101	0	101
Trucks	0	26	0	26
Cars	1	990	19	1010
Totals	1	1117	19	

Heavys 74

Trucks 27

Cars 868

Totals 969

East Leg Total: 73

East Entering: 44

East Peds: 8

Peds Cross: $\nlessgtr$

Heavys	Trucks	Cars	Totals
0	0	2	2

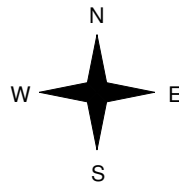


Driveway

Heavys	Trucks	Cars	Totals
0	0	1	1
0	0	0	0
0	0	0	0
0	0	1	



Bronte Rd



Bronte Rd



Cars	Trucks	Heavys	Totals
25	0	0	25
0	0	0	0
16	2	1	19
41	2	1	

Woodlands Entrance



Cars	Trucks	Heavys	Totals
29	0	0	29

Peds Cross: $\nlessgtr$

West Peds: 1

West Entering: 1

West Leg Total: 3

Cars	1006
Trucks	28
Heavys	102
Totals	1136



Cars	1	842	10	853
Trucks	0	27	0	27
Heavys	0	74	0	74
Totals	1	943	10	

Peds Cross: $\nlessgtr$

South Peds: 0

South Entering: 954

South Leg Total: 2090

Comments

Bronte Rd @ Woodlands Entrance

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 18:00:00

One Hour Peak

From: 16:45:00

To: 17:45:00

Municipality: Halton Region

Site #: 0000003340

Intersection: Bronte Rd & Woodlands Entrance

TFR File #: 16

Count date: 4-Dec-2019

Weather conditions:

Overcast/Wet

Person(s) who counted:

Cam

** Signalized Intersection **

Major Road: Bronte Rd runs N/S

North Leg Total: 3557

North Entering: 1305

North Peds: 0

Peds Cross: $\nlessgtr$

Heavys	0	44	0	44
Trucks	0	7	0	7
Cars	0	1235	19	1254
Totals	0	1286	19	

Heavys 52

Trucks 5

Cars 2195

Totals 2252

East Leg Total: 97

East Entering: 71

East Peds: 0

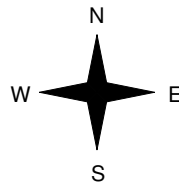
Peds Cross: $\nlessgtr$

Heavys	Trucks	Cars	Totals
0	0	1	1



Driveway

Heavys	Trucks	Cars	Totals
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0



Bronte Rd

Cars	Trucks	Heavys	Totals
53	0	0	53
0	0	0	0
18	0	0	18
71	0	0	

Woodlands Entrance



Cars	Trucks	Heavys	Totals
25	1	0	26

Peds Cross: $\nlessgtr$

West Peds: 0

West Entering: 0

West Leg Total: 1

Cars	1253
Trucks	7
Heavys	44
Totals	1304

Cars	1	2142	6	2149
Trucks	0	5	1	6
Heavys	0	52	0	52
Totals	1	2199	7	

Peds Cross: $\nlessgtr$

South Peds: 0

South Entering: 2207

South Leg Total: 3511

Comments

Bronte Rd @ Woodlands Entrance

Total Count Diagram

Municipality: Halton Region
Site #: 0000003340
Intersection: Bronte Rd & Woodlands Entrance
TFR File #: 16
Count date: 4-Dec-2019

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

**** Signalized Intersection ****

Major Road: Bronte Rd runs N/S

North Leg Total: 22341
 North Entering: 11704
 North Peds: 1
 Peds Cross: $\nlessgtr$

	Heavys	Trucks	Cars	Totals
North	0	585	1	586
East	0	179	0	179
South	1	10637	301	10939
Totals	1	11401	302	

	Heavys	Trucks	Cars	Totals
North	472	136	10029	10637
East	0	0	0	0
South	0	0	0	0
Totals	472	136	10029	

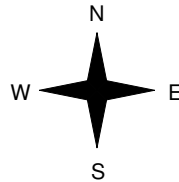
East Leg Total: 769
 East Entering: 364
 East Peds: 21
 Peds Cross: $\nlessgtr$

Heavys	Trucks	Cars	Totals
0	0	7	7



Driveway

Heavys	Trucks	Cars	Totals
0	0	3	3
0	0	0	0
0	0	2	2
0	0	5	



Bronte Rd



Cars	Trucks	Heavys	Totals
216	3	1	220
0	0	0	0
137	5	2	144
353	8	3	

Woodlands Entrance



Cars	Trucks	Heavys	Totals
396	7	2	405

Peds Cross: $\nlessgtr$
 West Peds: 2
 West Entering: 5
 West Leg Total: 12

	Cars	Trucks	Heavys	Totals
West	10776	184	587	11547
East	6	0	0	6
Totals	10782	184	587	

	Cars	Trucks	Heavys	Totals
West	9810	133	471	10414
East	95	7	1	103
Totals	9905	140	472	

Peds Cross: $\nlessgtr$
 South Peds: 0
 South Entering: 10523
 South Leg Total: 22070

Comments

Appendix D

Traffic Control Signal Warrant

Saw Whet Boulevard @ Bronte Road
2031 Future Total

Justification #7

Justification	Description	Minimum Requirement		Minimum Requirement		Compliance		Signal	
		1 Lane Highway		2 or More Lanes		Sectional			Entire %
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	2572	286%	78%	No
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	132	78%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	2440	271%	121%	No
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	91	121%		

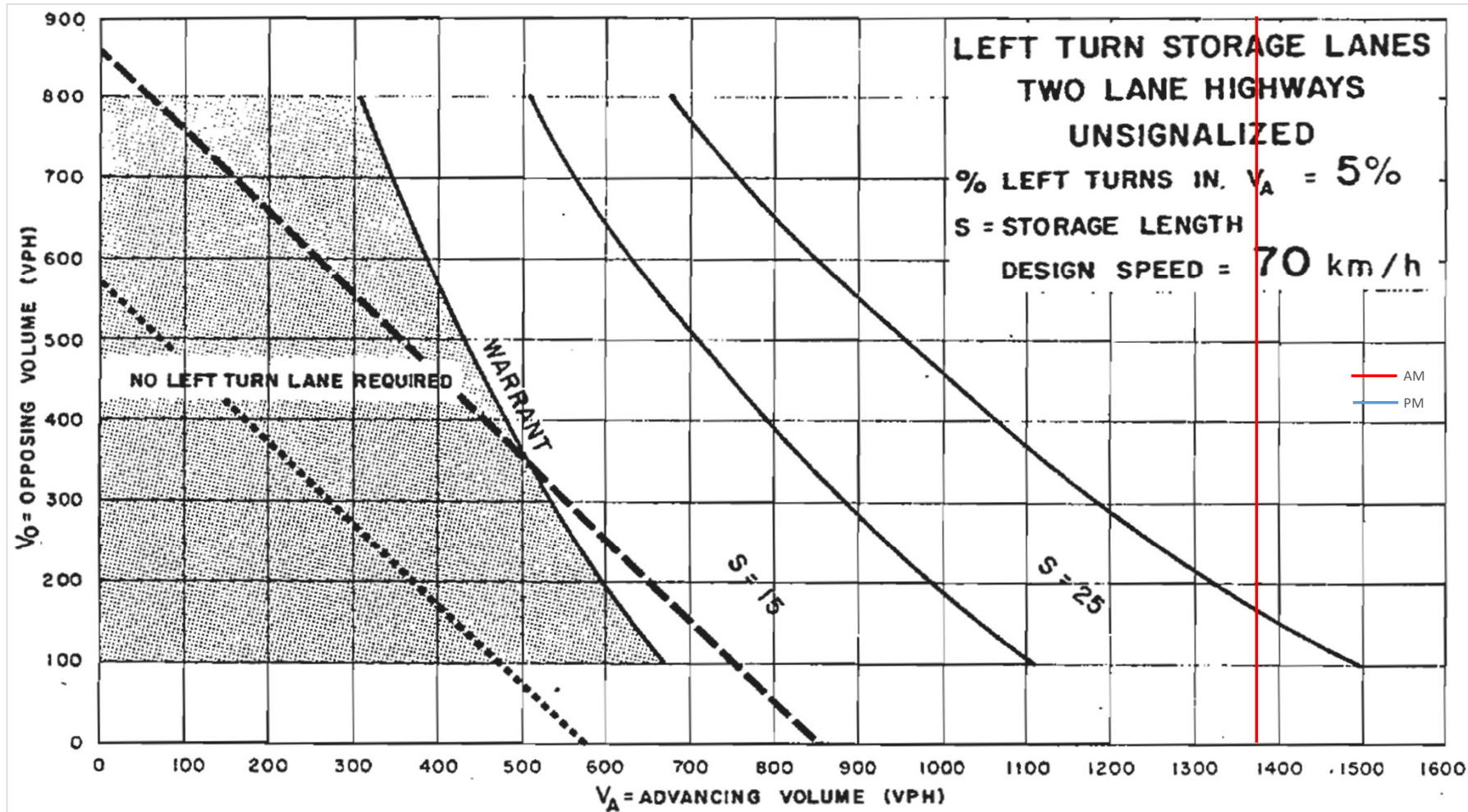
Notes

1. Refer to OTM Book 12, pg 92, Mar 2012
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, $AHV = PM/2$ or $(AM + PM) / 4$, including amplification factors
4. T-intersection factor corrected, applies only to 1B

Appendix E

Left Turn Lane Warrant

Design Speed 70 km/h	Northbound Left							Yes									
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing		
	AM	16	0	46	169	0	95	14	1311	52	30	3421	5	1.0%	1377	3456	
	PM	10	0	29	104	0	59	47	2921	174	99	1670	17	1.5%	3142	1786	



Appendix F

Turning Template Drawings



Notes:

Halton Region Collection

Width	: 2600
Track	: 2600
Lock to Lock Time	: 6.0
Steering Angle	: 40.0

01	Issued for Review	BB	2021-12-21
REV:	DESCRIPTION:	BY:	DATE:
STATUS:			

CGH Transportation

628 Haines Road
Newmarket, ON
L3Y 6V5
(905) 251-4070

CLIENT: Valery Homes

ARCHITECT:

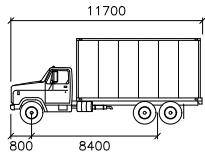
SITE: 1354 Bronte Road

TITLE: Turning Movement Analysis
Garbage into Site

SCALE AT A3: NTS	DATE: 2021-12-21	DRAWN: BB	CHECKED: MC
PROJECT NO: 2021-109	DRAWING NO: 001	REVISION: 01	

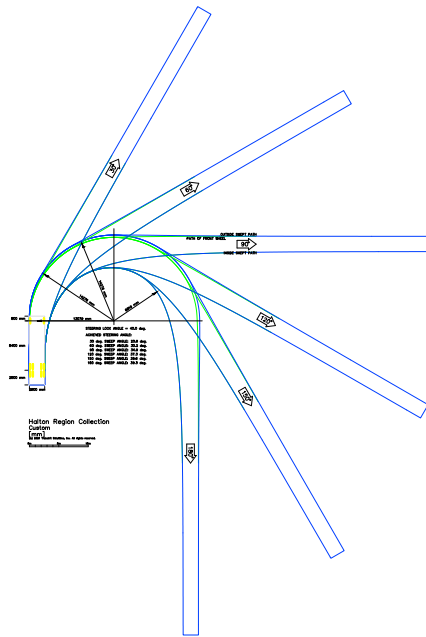


Notes:



Halton Region Collection

mm
Width : 2600
Track : 2600
Lock to Lock Time : 6.0
Steering Angle : 40.0



01	Issued for Review	BB	2021-12-21
REV:	DESCRIPTION:	BY:	DATE:
STATUS:			



CGH Transportation

628 Haines Road
Newmarket, ON
L3Y 6V5
(905) 251-4070

CLIENT: Valery Homes

ARCHITECT:

SITE:
1354 Bronte Road

TITLE:
Turning Movement Analysis
Garbage Out of Site

SCALE AT A3: NTS	DATE: 2021-12-21	DRAWN: BB	CHECKED: MC
PROJECT NO: 2021-109	DRAWING NO: 002	REVISION: 01	

Appendix G

Heavy Vehicle Percent Calculations

AM/PM Intersection

AM
verify results after output
PM
verify results after output

1 Upper Middle Road/Bronte Road

	NBL	NBT	NBR	WBL	WBT	WBR	SBL	SBT	SBR	EBL	EBT	EBR
AM	3	61	12	10	5	8	3	107	2	1	2	0
PM	2	36	4	6	1	3	1	39	1	0	1	1
SAT												
	5%(2%)	8%(2%)	7%(2%)	2%(3%)	6%(2%)	4%(2%)	2%(2%)	6%(4%)	18%(7%)	9%(2%)	2%(2%)	2%(2%)

2 Saw Whet Boulevard Road/Bronte Road

	NBL	NBT	NBR	WBL	WBT	WBR	SBL	SBT	SBR	EBL	EBT	EBR
AM												
PM												
SAT												
	2%(2%)	2%(2%)	2%(2%)	2%(2%)	2%(2%)	2%(2%)	2%(2%)	2%(2%)	2%(2%)	2%(2%)	2%(2%)	2%(2%)

3 Charles Cornwall Road/Bronte Road

	NBL	NBT	NBR	WBL	WBT	WBR	SBL	SBT	SBR	EBL	EBT	EBR
AM	0	61	1	3	0	3	0	101	0	0	0	0
PM	0	57	1	0	0	0	0	51	0	0	0	0
SAT												
	2%(2%)	6%(3%)	10%(14%)	18%(2%)	2%(2%)	16%(2%)	2%(2%)	4%(4%)	2%(2%)	2%(2%)	2%(2%)	2%(2%)

Appendix H

2021 Existing Conditions Synchro Worksheets

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2021 Existing AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	203	388	504	88	196	59	798	177	234	1897	11
Future Volume (vph)	11	203	388	504	88	196	59	798	177	234	1897	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0		70.0	140.0		0.0	135.0		80.0	180.0		50.0
Storage Lanes	1		1	2		1	1		1	1		1
Taper Length (m)	65.0			100.0			70.0			70.0		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99		0.98			0.97			0.96	1.00		0.97
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1656	1863	1583	3433	1792	1553	1719	3343	1485	1770	3406	1336
Flt Permitted	0.698			0.277			0.056			0.255		
Satd. Flow (perm)	1200	1863	1550	1001	1792	1502	101	3343	1427	473	3406	1289
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			152			202			182			122
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		296.6			291.2			1189.9			120.4	
Travel Time (s)		17.8			17.5			71.4			7.2	
Confl. Peds. (#/hr)	11					11	5		7	7		5
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	9%	2%	2%	2%	6%	4%	5%	8%	7%	2%	6%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Adj. Flow (vph)	11	209	400	520	91	202	61	823	182	241	1956	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	209	400	520	91	202	61	823	182	241	1956	11
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.2			7.2			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.02	1.00	1.00	1.03
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	

12-14-2021

NA

CGH Transportation

Page 1

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2021 Existing AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	10.0	10.0	6.0	10.0	10.0	6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	10.5	36.7	36.7	10.5	36.7	36.7	10.5	36.5	36.5	10.5	36.5	36.5
Total Split (s)	11.2	23.8	23.8	19.6	32.2	32.2	11.2	79.8	79.8	16.8	85.4	85.4
Total Split (%)	8.0%	17.0%	17.0%	14.0%	23.0%	23.0%	8.0%	57.0%	57.0%	12.0%	61.0%	61.0%
Maximum Green (s)	7.2	17.1	17.1	15.6	25.5	25.5	7.2	73.3	73.3	12.8	78.9	78.9
Yellow Time (s)	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7
All-Red Time (s)	1.0	3.0	3.0	1.0	3.0	3.0	1.0	2.8	2.8	1.0	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)					7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)					23.0	23.0		23.0	23.0		23.0	23.0
Pedestrian Calls (#/hr)					11	11		7	7		5	5
Act Effct Green (s)	26.2	17.1	17.1	39.4	32.3	32.3	83.6	74.2	74.2	92.6	81.3	81.3
Actuated g/C Ratio	0.19	0.12	0.12	0.28	0.23	0.23	0.60	0.53	0.53	0.66	0.58	0.58
v/c Ratio	0.04	0.92	1.24	0.94	0.22	0.40	0.44	0.46	0.22	0.57	0.99	0.01
Control Delay	37.6	102.6	162.9	70.4	47.3	8.8	30.2	21.9	8.3	14.9	47.4	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.6	102.6	162.9	70.4	47.3	8.8	30.2	21.9	8.3	14.9	47.4	0.0
LOS	D	F	F	E	D	A	C	C	A	B	D	A
Approach Delay		140.3			52.5			20.1			43.6	
Approach LOS		F			D			C			D	
Queue Length 50th (m)	2.3	61.1	~103.5	66.4	20.8	0.0	7.1	51.5	13.1	25.7	~317.0	0.0
Queue Length 95th (m)	7.5	#110.8	#170.9	#85.9	40.6	22.7	24.7	91.4	34.9	37.7	#360.6	0.0
Internal Link Dist (m)		272.6			267.2			1165.9			96.4	
Turn Bay Length (m)	70.0		70.0	140.0			135.0		80.0	180.0		50.0
Base Capacity (vph)	254	227	322	552	413	501	144	1772	841	431	1977	799
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.92	1.24	0.94	0.22	0.40	0.42	0.46	0.22	0.56	0.99	0.01

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 82.6 (59%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 145

Control Type: Actuated-Coordinated

Lanes, Volumes, Timings

1: Bronte Road & Upper Middle Road

2021 Existing AM Peak Hour
1354 Bronte

Maximum v/c Ratio: 1.24

Intersection Signal Delay: 52.5

Intersection LOS: D

Intersection Capacity Utilization 105.2%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Bronte Road & Upper Middle Road

 Ø1 16.8 s		 Ø2 (R) 79.8 s		 Ø3 19.6 s		 Ø4 23.8 s	
 Ø5 11.2 s		 Ø6 (R) 85.4 s		 Ø7 11.2 s		 Ø8 32.2 s	

HCM Signalized Intersection Capacity Analysis

1: Bronte Road & Upper Middle Road

2021 Existing AM Peak Hour

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	203	388	504	88	196	59	798	177	234	1897	11
Future Volume (vph)	11	203	388	504	88	196	59	798	177	234	1897	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.96	1.00	1.00	0.97
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1641	1863	1552	3433	1792	1504	1719	3343	1426	1768	3406	1289
Flt Permitted	0.70	1.00	1.00	0.28	1.00	1.00	0.06	1.00	1.00	0.26	1.00	1.00
Satd. Flow (perm)	1205	1863	1552	1000	1792	1504	101	3343	1426	475	3406	1289
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	11	209	400	520	91	202	61	823	182	241	1956	11
RTOR Reduction (vph)	0	0	131	0	0	155	0	0	89	0	0	5
Lane Group Flow (vph)	11	209	269	520	91	47	61	823	93	241	1956	6
Confl. Peds. (#/hr)	11						11	5		7		5
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	9%	2%	2%	2%	6%	4%	5%	8%	7%	2%	6%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	22.3	19.5	19.5	39.1	32.3	32.3	77.4	71.8	71.8	87.7	78.1	78.1
Effective Green, g (s)	22.3	19.5	19.5	39.1	32.3	32.3	77.4	71.8	71.8	87.7	78.1	78.1
Actuated g/C Ratio	0.16	0.14	0.14	0.28	0.23	0.23	0.55	0.51	0.51	0.63	0.56	0.56
Clearance Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	200	259	216	550	413	346	120	1714	731	407	1900	719
v/s Ratio Prot	0.00	0.11		c0.11	0.05		0.02	0.25		c0.05	c0.57	
v/s Ratio Perm	0.01		c0.17	0.16		0.03	0.26		0.07	0.32		0.00
v/c Ratio	0.06	0.81	1.25	0.95	0.22	0.13	0.51	0.48	0.13	0.59	1.03	0.01
Uniform Delay, d1	49.8	58.4	60.2	45.4	43.6	42.8	31.5	22.0	17.8	13.4	31.0	13.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.49	1.01	3.38	1.00	1.00	1.00
Incremental Delay, d2	0.1	16.6	143.4	25.3	0.3	0.2	3.2	0.9	0.3	2.3	28.6	0.0
Delay (s)	49.9	75.0	203.6	70.6	43.9	42.9	49.9	23.2	60.5	15.7	59.6	13.8
Level of Service	D	E	F	E	D	D	D	C	E	B	E	B
Approach Delay (s)		157.5			60.8			31.1			54.5	
Approach LOS		F			E			C			D	
Intersection Summary												
HCM 2000 Control Delay			63.9									
HCM 2000 Volume to Capacity ratio			1.04									
Actuated Cycle Length (s)			140.0									
Intersection Capacity Utilization			105.2%									
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2021 Existing AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	1	17	0	19	0	1057	10	125	2666	0
Future Volume (vph)	1	0	1	17	0	19	0	1057	10	125	2666	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		40.0	35.0		30.0	70.0		0.0
Storage Lanes	0		0	1		1	1		1	1		0
Taper Length (m)	7.5			7.5			20.0			60.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor		0.99				0.98			0.98			
Frt		0.932				0.850			0.850			
Flt Protected		0.976		0.950						0.950		
Satd. Flow (prot)	0	1680	0	1530	0	1392	1863	3406	1439	1770	3471	0
Flt Permitted		0.976		0.757						0.235		
Satd. Flow (perm)	0	1680	0	1219	0	1369	1863	3406	1406	438	3471	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		54				54			56			
Link Speed (k/h)		20			20			60			60	
Link Distance (m)		78.7			109.0			435.9			1189.9	
Travel Time (s)		14.2			19.6			26.2			71.4	
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	2%	18%	2%	16%	2%	6%	10%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Adj. Flow (vph)	1	0	1	18	0	20	0	1090	10	129	2748	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2	0	18	0	20	0	1090	10	129	2748	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.03	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1		1	1	2	1	1	2	
Detector Template	Left	Thru		Left		Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0		2.0		2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0		2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4						9.4			9.4	
Detector 2 Size(m)		0.6						0.6			0.6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2021 Existing AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Perm	NA		Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4			8		8	2		2	6		
Detector Phase	4	4		8		8	2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0		10.0	15.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	24.2	24.2		35.2		35.2	34.9	34.9	34.9	9.5	34.9	
Total Split (s)	40.6	40.6		40.6		40.6	88.2	88.2	88.2	11.2	99.4	
Total Split (%)	29.0%	29.0%		29.0%		29.0%	63.0%	63.0%	63.0%	8.0%	71.0%	
Maximum Green (s)	34.4	34.4		34.4		34.4	82.3	82.3	82.3	7.2	93.5	
Yellow Time (s)	3.1	3.1		3.1		3.1	3.7	3.7	3.7	3.0	3.7	
All-Red Time (s)	3.1	3.1		3.1		3.1	2.2	2.2	2.2	1.0	2.2	
Lost Time Adjust (s)		0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.2		6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?							Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0		3.0	3.6	3.6	3.6	3.0	3.6	
Recall Mode	None	None		None		None	C-Max	C-Max	C-Max	None	C-Max	
Walk Time (s)				7.0		7.0	7.0	7.0	7.0		7.0	
Flash Dont Walk (s)				22.0		22.0	22.0	22.0	22.0		22.0	
Pedestrian Calls (#/hr)				0		0	0	0	0		0	
Act Effect Green (s)		10.1		10.1		10.1		113.5	113.5	126.2	126.6	
Actuated g/C Ratio		0.07		0.07		0.07		0.81	0.81	0.90	0.90	
v/c Ratio		0.01		0.20		0.14		0.39	0.01	0.28	0.88	
Control Delay		0.0		66.9		1.9		7.4	0.9	1.6	7.5	
Queue Delay		0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay		0.0		66.9		1.9		7.4	0.9	1.6	7.5	
LOS		A		E		A		A	A	A	A	
Approach Delay					32.7			7.4			7.2	
Approach LOS					C			A			A	
Queue Length 50th (m)		0.0		5.1		0.0		50.8	0.0	5.2	192.8	
Queue Length 95th (m)		0.0		13.7		0.0		116.3	m0.1	m5.2	m188.6	
Internal Link Dist (m)		54.7			85.0			411.9			1165.9	
Turn Bay Length (m)						40.0			30.0	70.0		
Base Capacity (vph)		453		299		377		2761	1150	465	3139	
Starvation Cap Reductn		0		0		0		0	0	0	0	
Spillback Cap Reductn		0		0		0		0	0	0	0	
Storage Cap Reductn		0		0		0		0	0	0	0	
Reduced v/c Ratio		0.00		0.06		0.05		0.39	0.01	0.28	0.88	

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 128.8 (92%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

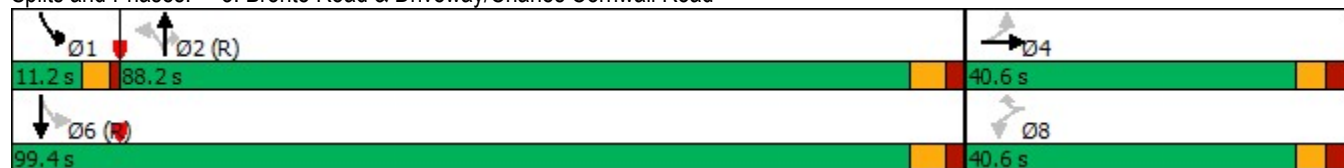
Maximum v/c Ratio: 0.88

Lanes, Volumes, Timings 3: Bronte Road & Driveway/Charles Cornwall Road

2021 Existing AM Peak Hour
1354 Bronte

Intersection Signal Delay: 7.5 Intersection LOS: A
Intersection Capacity Utilization 109.5% ICU Level of Service H
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Bronte Road & Driveway/Charles Cornwall Road



HCM Signalized Intersection Capacity Analysis

3: Bronte Road & Driveway/Charles Cornwall Road

2021 Existing AM Peak Hour

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	1	17	0	19	0	1057	10	125	2666	0
Future Volume (vph)	1	0	1	17	0	19	0	1057	10	125	2666	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.2		6.2		6.2		5.9	5.9	4.0	5.9	
Lane Util. Factor		1.00		1.00		1.00		0.95	1.00	1.00	0.95	
Frpb, ped/bikes		0.98		1.00		0.96		1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00		1.00		1.00		1.00	1.00	1.00	1.00	
Frt		0.93		1.00		0.85		1.00	0.85	1.00	1.00	
Flt Protected		0.98		0.95		1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1663		1530		1340		3406	1407	1770	3471	
Flt Permitted		0.98		0.76		1.00		1.00	1.00	0.24	1.00	
Satd. Flow (perm)		1663		1218		1340		3406	1407	439	3471	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	1	0	1	18	0	20	0	1090	10	129	2748	0
RTOR Reduction (vph)	0	2	0	0	0	19	0	0	2	0	0	0
Lane Group Flow (vph)	0	0	0	18	0	1	0	1090	8	129	2748	0
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	2%	2%	2%	18%	2%	16%	2%	6%	10%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Turn Type	Perm	NA		Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		6.1		6.1		6.1		111.0	111.0	121.8	121.8	
Effective Green, g (s)		6.1		6.1		6.1		111.0	111.0	121.8	121.8	
Actuated g/C Ratio		0.04		0.04		0.04		0.79	0.79	0.87	0.87	
Clearance Time (s)		6.2		6.2		6.2		5.9	5.9	4.0	5.9	
Vehicle Extension (s)		3.0		3.0		3.0		3.6	3.6	3.0	3.6	
Lane Grp Cap (vph)		72		53		58		2700	1115	446	3019	
v/s Ratio Prot								0.32		0.01	c0.79	
v/s Ratio Perm		0.00		c0.01		0.00			0.01	0.24		
v/c Ratio		0.00		0.34		0.02		0.40	0.01	0.29	0.91	
Uniform Delay, d1		64.0		65.0		64.1		4.4	3.0	1.9	5.7	
Progression Factor		1.00		1.00		1.00		1.54	1.00	1.14	1.01	
Incremental Delay, d2		0.0		3.8		0.1		0.4	0.0	0.0	0.5	
Delay (s)		64.0		68.8		64.2		7.2	3.0	2.2	6.3	
Level of Service		E		E		E		A	A	A	A	
Approach Delay (s)		64.0			66.4			7.2			6.1	
Approach LOS		E			E			A			A	
Intersection Summary												
HCM 2000 Control Delay			7.0									
HCM 2000 Volume to Capacity ratio			0.91									
Actuated Cycle Length (s)			140.0							16.1		
Intersection Capacity Utilization			109.5%									
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2021 Existing - MM - AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	203	388	504	88	196	59	798	177	234	1897	11
Future Volume (vph)	11	203	388	504	88	196	59	798	177	234	1897	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0		70.0	140.0		0.0	135.0		80.0	180.0		50.0
Storage Lanes	1		1	2		1	1		1	1		1
Taper Length (m)	65.0			100.0			70.0			70.0		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99		0.98			0.97			0.96	1.00		0.97
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1656	1863	1583	3433	1792	1553	1719	3343	1485	1770	3406	1336
Flt Permitted	0.698			0.421			0.061			0.238		
Satd. Flow (perm)	1200	1863	1556	1521	1792	1503	110	3343	1426	442	3406	1289
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			121			202			182			91
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		296.6			291.2			1189.9			120.4	
Travel Time (s)		17.8			17.5			71.4			7.2	
Confl. Peds. (#/hr)	11					11	5		7	7		5
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	9%	2%	2%	2%	6%	4%	5%	8%	7%	2%	6%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Adj. Flow (vph)	11	209	400	520	91	202	61	823	182	241	1956	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	209	400	520	91	202	61	823	182	241	1956	11
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.2			7.2			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.02	1.00	1.00	1.03
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	

12-14-2021

NA

CGH Transportation

Page 1

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2021 Existing - MM - AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	10.0	10.0	6.0	10.0	10.0	6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	10.5	36.7	36.7	10.5	36.7	36.7	10.5	36.5	36.5	10.5	36.5	36.5
Total Split (s)	10.8	36.7	36.7	12.1	38.0	38.0	10.5	69.0	69.0	22.2	80.7	80.7
Total Split (%)	7.7%	26.2%	26.2%	8.6%	27.1%	27.1%	7.5%	49.3%	49.3%	15.9%	57.6%	57.6%
Maximum Green (s)	6.8	30.0	30.0	8.1	31.3	31.3	6.5	62.5	62.5	18.2	74.2	74.2
Yellow Time (s)	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7
All-Red Time (s)	1.0	3.0	3.0	1.0	3.0	3.0	1.0	2.8	2.8	1.0	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)					7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)					23.0	23.0		23.0	23.0		23.0	23.0
Pedestrian Calls (#/hr)					11	11		7	7		5	5
Act Effct Green (s)	37.9	28.9	28.9	42.7	36.7	36.7	76.9	68.0	68.0	88.3	77.4	77.4
Actuated g/C Ratio	0.27	0.21	0.21	0.30	0.26	0.26	0.55	0.49	0.49	0.63	0.55	0.55
v/c Ratio	0.03	0.54	0.96	0.91	0.19	0.37	0.46	0.51	0.23	0.59	1.04	0.01
Control Delay	33.1	55.2	72.9	63.6	42.7	7.7	30.1	20.1	8.3	17.5	63.2	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.1	55.2	72.9	63.6	42.7	7.7	30.1	20.1	8.3	17.5	63.2	0.0
LOS	C	E	E	E	D	A	C	C	A	B	E	A
Approach Delay		66.2			47.3			18.6			57.9	
Approach LOS		E			D			B			E	
Queue Length 50th (m)	2.2	54.4	84.6	62.5	19.6	0.0	7.1	51.6	13.1	29.1	~335.2	0.0
Queue Length 95th (m)	7.1	81.7	#150.0	#93.3	38.5	21.2	22.8	91.7	34.9	42.7	#378.8	0.0
Internal Link Dist (m)		272.6			267.2			1165.9			96.4	
Turn Bay Length (m)	70.0		70.0	140.0			135.0		80.0	180.0		50.0
Base Capacity (vph)	351	399	428	574	470	543	135	1622	785	450	1882	752
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.52	0.93	0.91	0.19	0.37	0.45	0.51	0.23	0.54	1.04	0.01

Intersection Summary

Area Type: Other
 Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 82.6 (59%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 145
 Control Type: Actuated-Coordinated

Lanes, Volumes, Timings

1: Bronte Road & Upper Middle Road

2021 Existing - MM - AM Peak Hour

1354 Bronte

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 48.3

Intersection LOS: D

Intersection Capacity Utilization 105.2%

ICU Level of Service G

Analysis Period (min) 15

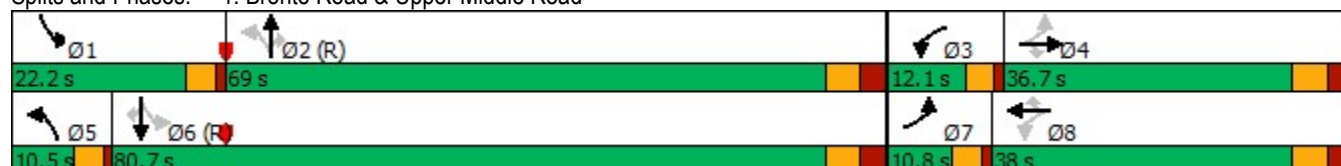
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Bronte Road & Upper Middle Road



HCM Signalized Intersection Capacity Analysis

1: Bronte Road & Upper Middle Road

2021 Existing - MM - AM Peak Hour

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	203	388	504	88	196	59	798	177	234	1897	11
Future Volume (vph)	11	203	388	504	88	196	59	798	177	234	1897	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.96	1.00	1.00	0.97
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1641	1863	1556	3433	1792	1504	1719	3343	1426	1768	3406	1289
Flt Permitted	0.70	1.00	1.00	0.42	1.00	1.00	0.06	1.00	1.00	0.24	1.00	1.00
Satd. Flow (perm)	1205	1863	1556	1523	1792	1504	110	3343	1426	443	3406	1289
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	11	209	400	520	91	202	61	823	182	241	1956	11
RTOR Reduction (vph)	0	0	94	0	0	149	0	0	97	0	0	5
Lane Group Flow (vph)	11	209	306	520	91	53	61	823	85	241	1956	6
Confl. Peds. (#/hr)	11						11	5		7		5
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	9%	2%	2%	2%	6%	4%	5%	8%	7%	2%	6%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	34.0	31.3	31.3	43.4	36.7	36.7	70.8	65.6	65.6	83.4	74.2	74.2
Effective Green, g (s)	34.0	31.3	31.3	43.4	36.7	36.7	70.8	65.6	65.6	83.4	74.2	74.2
Actuated g/C Ratio	0.24	0.22	0.22	0.31	0.26	0.26	0.51	0.47	0.47	0.60	0.53	0.53
Clearance Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	301	416	347	582	469	394	115	1566	668	394	1805	683
v/s Ratio Prot	0.00	0.11		c0.05	0.05		0.02	0.25		c0.06	c0.57	
v/s Ratio Perm	0.01		0.20	c0.23		0.04	0.25		0.06	0.30		0.00
v/c Ratio	0.04	0.50	0.88	0.89	0.19	0.13	0.53	0.53	0.13	0.61	1.08	0.01
Uniform Delay, d1	40.4	47.5	52.6	46.5	40.2	39.5	31.8	26.2	21.0	15.8	32.9	15.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.18	0.74	2.51	1.00	1.00	1.00
Incremental Delay, d2	0.0	1.0	22.1	16.0	0.2	0.2	4.4	1.2	0.4	2.8	47.8	0.0
Delay (s)	40.4	48.5	74.7	62.5	40.4	39.7	41.7	20.7	53.1	18.6	80.7	15.6
Level of Service	D	D	E	E	D	D	D	C	D	B	F	B
Approach Delay (s)		65.2			54.4			27.4			73.6	
Approach LOS		E			D			C			E	
Intersection Summary												
HCM 2000 Control Delay			58.7									
HCM 2000 Volume to Capacity ratio			1.03									
Actuated Cycle Length (s)			140.0									
Intersection Capacity Utilization			105.2%									
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2021 Existing PM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	74	110	182	155	252	263	1727	303	209	1031	16
Future Volume (vph)	7	74	110	182	155	252	263	1727	303	209	1031	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0		70.0	140.0		0.0	135.0		80.0	180.0		50.0
Storage Lanes	1		1	2		1	1		1	1		1
Taper Length (m)	65.0			100.0			70.0			70.0		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99		0.98			0.97	1.00		0.97			0.97
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	3400	1863	1583	1770	3539	1558	1770	3471	1473
Flt Permitted	0.653			0.562			0.192			0.051		
Satd. Flow (perm)	1208	1863	1550	2011	1863	1542	358	3539	1518	95	3471	1435
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			121			189			211			122
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		296.6			291.2			1189.9			120.4	
Travel Time (s)		17.8			17.5			71.4			7.2	
Confl. Peds. (#/hr)	6					6	1		1	1		1
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%	2%	2%	2%	2%	4%	7%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Adj. Flow (vph)	7	79	117	194	165	268	280	1837	322	222	1097	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	79	117	194	165	268	280	1837	322	222	1097	17
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.2			7.2			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.02	1.00	1.00	1.03
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	

12-14-2021

NA

CGH Transportation

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Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2021 Existing PM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	10.0	10.0	6.0	10.0	10.0	6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	10.5	36.7	36.7	10.5	36.7	36.7	10.5	36.5	36.5	10.5	36.5	36.5
Total Split (s)	11.2	23.8	23.8	19.6	32.2	32.2	12.6	84.0	84.0	12.6	84.0	84.0
Total Split (%)	8.0%	17.0%	17.0%	14.0%	23.0%	23.0%	9.0%	60.0%	60.0%	9.0%	60.0%	60.0%
Maximum Green (s)	7.2	17.1	17.1	15.6	25.5	25.5	8.6	77.5	77.5	8.6	77.5	77.5
Yellow Time (s)	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7
All-Red Time (s)	1.0	3.0	3.0	1.0	3.0	3.0	1.0	2.8	2.8	1.0	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)					7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)					23.0	23.0		23.0	23.0		23.0	23.0
Pedestrian Calls (#/hr)					6	6		1	1		1	1
Act Effct Green (s)	21.4	12.5	12.5	31.2	26.3	26.3	93.4	77.5	77.5	98.8	80.9	80.9
Actuated g/C Ratio	0.15	0.09	0.09	0.22	0.19	0.19	0.67	0.55	0.55	0.71	0.58	0.58
v/c Ratio	0.03	0.48	0.47	0.34	0.47	0.60	0.75	0.94	0.34	0.83	0.55	0.02
Control Delay	39.9	69.6	15.1	45.6	55.4	21.9	25.3	19.3	1.9	62.8	20.0	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.9	69.6	15.1	45.6	55.4	21.9	25.3	19.3	1.9	62.8	20.0	0.1
LOS	D	E	B	D	E	C	C	B	A	E	C	A
Approach Delay		37.2			38.0			17.7			26.9	
Approach LOS		D			D			B			C	
Queue Length 50th (m)	1.6	22.5	0.0	24.4	42.8	19.7	20.0	157.5	0.0	45.9	102.7	0.0
Queue Length 95th (m)	5.6	38.4	17.5	32.9	67.8	52.2	m#29.4	#276.7	m12.9	#123.2	126.8	0.0
Internal Link Dist (m)		272.6			267.2			1165.9			96.4	
Turn Bay Length (m)	70.0		70.0	140.0			135.0		80.0	180.0		50.0
Base Capacity (vph)	221	229	297	602	358	449	374	1959	934	268	2005	880
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.34	0.39	0.32	0.46	0.60	0.75	0.94	0.34	0.83	0.55	0.02

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 35 (25%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 145

Control Type: Actuated-Coordinated

Lanes, Volumes, Timings 1: Bronte Road & Upper Middle Road

2021 Existing PM Peak Hour
1354 Bronte

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 24.0

Intersection LOS: C

Intersection Capacity Utilization 87.9%

ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Bronte Road & Upper Middle Road

 Ø1	 Ø2 (R)	 Ø3	 Ø4
12.6 s	84 s	19.6 s	23.8 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
12.6 s	84 s	11.2 s	32.2 s

HCM Signalized Intersection Capacity Analysis

2021 Existing PM Peak Hour

1: Bronte Road & Upper Middle Road

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	74	110	182	155	252	263	1727	303	209	1031	16
Future Volume (vph)	7	74	110	182	155	252	263	1727	303	209	1031	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1762	1863	1549	3400	1863	1542	1770	3539	1518	1770	3471	1435
Flt Permitted	0.65	1.00	1.00	0.56	1.00	1.00	0.19	1.00	1.00	0.05	1.00	1.00
Satd. Flow (perm)	1211	1863	1549	2012	1863	1542	357	3539	1518	96	3471	1435
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	7	79	117	194	165	268	280	1837	322	222	1097	17
RTOR Reduction (vph)	0	0	104	0	0	153	0	0	99	0	0	8
Lane Group Flow (vph)	7	79	13	194	165	115	280	1837	223	222	1097	9
Confl. Peds. (#/hr)	6					6	1		1	1		1
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%	2%	2%	2%	2%	4%	7%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	17.1	15.7	15.7	31.7	26.3	26.3	87.7	74.3	74.3	94.5	77.7	77.7
Effective Green, g (s)	17.1	15.7	15.7	31.7	26.3	26.3	87.7	74.3	74.3	94.5	77.7	77.7
Actuated g/C Ratio	0.12	0.11	0.11	0.23	0.19	0.19	0.63	0.53	0.53	0.68	0.56	0.56
Clearance Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	153	208	173	574	349	289	358	1878	805	265	1926	796
v/s Ratio Prot	0.00	0.04		c0.03	c0.09		0.07	c0.52		c0.10	0.32	
v/s Ratio Perm	0.01		0.01	0.05		0.07	0.41		0.15	0.46		0.01
v/c Ratio	0.05	0.38	0.08	0.34	0.47	0.40	0.78	0.98	0.28	0.84	0.57	0.01
Uniform Delay, d1	54.2	57.6	55.7	44.5	50.7	49.9	14.8	32.1	18.1	46.9	20.3	14.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.79	0.41	0.23	1.00	1.00	1.00
Incremental Delay, d2	0.1	1.2	0.2	0.4	1.0	0.9	6.5	11.7	0.5	20.0	1.2	0.0
Delay (s)	54.3	58.8	55.8	44.8	51.7	50.8	33.1	24.8	4.7	66.9	21.5	14.0
Level of Service	D	E	E	D	D	D	C	C	A	E	C	B
Approach Delay (s)		56.9			49.2			23.1			28.9	
Approach LOS		E			D			C			C	
Intersection Summary												
HCM 2000 Control Delay			29.8									
HCM 2000 Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			140.0									
Intersection Capacity Utilization			87.9%									
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2021 Existing PM Peak Hour

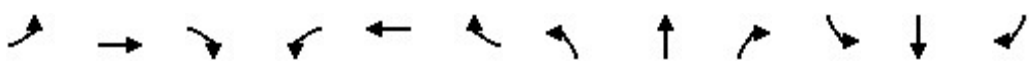
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	18	0	53	1	2288	7	19	1338	0
Future Volume (vph)	0	0	0	18	0	53	1	2288	7	19	1338	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		40.0	35.0		30.0	70.0		0.0
Storage Lanes	0		0	1		1	1		1	1		0
Taper Length (m)	7.5			7.5			20.0			60.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor						0.98			0.98			
Frt						0.850			0.850			
Flt Protected				0.950			0.950			0.950		
Satd. Flow (prot)	0	1863	0	1770	0	1583	1770	3505	1388	1770	3471	0
Flt Permitted				0.757			0.196			0.035		
Satd. Flow (perm)	0	1863	0	1410	0	1557	365	3505	1356	65	3471	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						55			56			
Link Speed (k/h)		20			20			60			60	
Link Distance (m)		78.7			109.0			435.9			1189.9	
Travel Time (s)		14.2			19.6			26.2			71.4	
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	3%	14%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Adj. Flow (vph)	0	0	0	19	0	55	1	2359	7	20	1379	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	19	0	55	1	2359	7	20	1379	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.03	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1		1	1	2	1	1	2	
Detector Template	Left	Thru		Left		Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0		2.0		2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0		2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4						9.4			9.4	
Detector 2 Size(m)		0.6						0.6			0.6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2021 Existing PM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type				Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4			8		8	2		2	6		
Detector Phase	4	4		8		8	2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0		10.0	15.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	24.2	24.2		35.2		35.2	34.9	34.9	34.9	9.5	34.9	
Total Split (s)	40.6	40.6		40.6		40.6	88.2	88.2	88.2	11.2	99.4	
Total Split (%)	29.0%	29.0%		29.0%		29.0%	63.0%	63.0%	63.0%	8.0%	71.0%	
Maximum Green (s)	34.4	34.4		34.4		34.4	82.3	82.3	82.3	7.2	93.5	
Yellow Time (s)	3.1	3.1		3.1		3.1	3.7	3.7	3.7	3.0	3.7	
All-Red Time (s)	3.1	3.1		3.1		3.1	2.2	2.2	2.2	1.0	2.2	
Lost Time Adjust (s)		0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.2		6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?							Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0		3.0	3.6	3.6	3.6	3.0	3.6	
Recall Mode	None	None		None		None	C-Max	C-Max	C-Max	None	C-Max	
Walk Time (s)				7.0		7.0	7.0	7.0	7.0		7.0	
Flash Dont Walk (s)				22.0		22.0	22.0	22.0	22.0		22.0	
Pedestrian Calls (#/hr)				0		0	0	0	0		0	
Act Effect Green (s)				10.0		10.0	116.4	116.4	116.4	123.0	122.3	
Actuated g/C Ratio				0.07		0.07	0.83	0.83	0.83	0.88	0.87	
v/c Ratio				0.19		0.34	0.00	0.81	0.01	0.16	0.45	
Control Delay				66.0		20.9	0.0	8.1	0.0	9.5	2.5	
Queue Delay				0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay				66.0		20.9	0.0	8.1	0.0	9.5	2.5	
LOS				E		C	A	A	A	A	A	
Approach Delay					32.5			8.1			2.6	
Approach LOS					C			A			A	
Queue Length 50th (m)				5.3		0.0	0.0	37.4	0.0	0.8	32.1	
Queue Length 95th (m)				14.3		14.2	m0.0	m25.6	m0.0	m1.4	33.2	
Internal Link Dist (m)		54.7			85.0			411.9			1165.9	
Turn Bay Length (m)						40.0	35.0		30.0	70.0		
Base Capacity (vph)				346		424	303	2914	1136	144	3033	
Starvation Cap Reductn				0		0	0	0	0	0	0	
Spillback Cap Reductn				0		0	0	0	0	0	0	
Storage Cap Reductn				0		0	0	0	0	0	0	
Reduced v/c Ratio				0.05		0.13	0.00	0.81	0.01	0.14	0.45	

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 103.6 (74%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

12-14-2021

NA

CGH Transportation

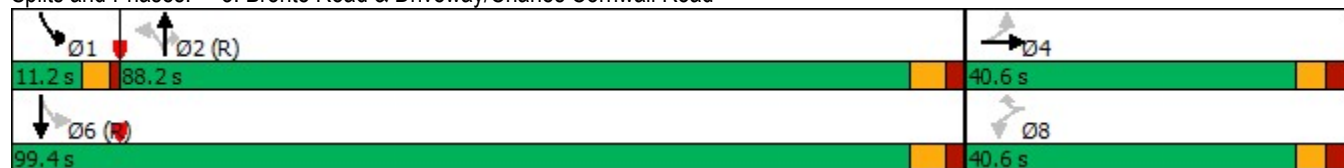
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Lanes, Volumes, Timings 3: Bronte Road & Driveway/Charles Cornwall Road

2021 Existing PM Peak Hour
1354 Bronte

Intersection Signal Delay: 6.5 Intersection LOS: A
Intersection Capacity Utilization 81.7% ICU Level of Service D
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Bronte Road & Driveway/Charles Cornwall Road

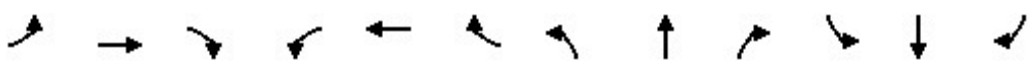


HCM Signalized Intersection Capacity Analysis

3: Bronte Road & Driveway/Charles Cornwall Road

2021 Existing PM Peak Hour

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔		↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	0	0	0	18	0	53	1	2288	7	19	1338	0
Future Volume (vph)	0	0	0	18	0	53	1	2288	7	19	1338	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Lane Util. Factor				1.00		1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes				1.00		0.97	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes				1.00		1.00	1.00	1.00	1.00	1.00	1.00	
Frt				1.00		0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95		1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1770		1534	1770	3505	1357	1770	3471	
Flt Permitted				0.76		1.00	0.20	1.00	1.00	0.03	1.00	
Satd. Flow (perm)				1410		1534	365	3505	1357	65	3471	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	19	0	55	1	2359	7	20	1379	0
RTOR Reduction (vph)	0	0	0	0	0	52	0	0	1	0	0	0
Lane Group Flow (vph)	0	0	0	19	0	3	1	2359	6	20	1379	0
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	3%	14%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Turn Type				Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)				8.0		8.0	112.4	112.4	112.4	119.9	119.9	
Effective Green, g (s)				8.0		8.0	112.4	112.4	112.4	119.9	119.9	
Actuated g/C Ratio				0.06		0.06	0.80	0.80	0.80	0.86	0.86	
Clearance Time (s)				6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Vehicle Extension (s)				3.0		3.0	3.6	3.6	3.6	3.0	3.6	
Lane Grp Cap (vph)				80		87	293	2814	1089	98	2972	
v/s Ratio Prot								c0.67		0.01	c0.40	
v/s Ratio Perm				c0.01		0.00	0.00		0.00	0.17		
v/c Ratio				0.24		0.04	0.00	0.84	0.01	0.20	0.46	
Uniform Delay, d1				63.1		62.4	2.7	8.3	2.7	16.3	2.4	
Progression Factor				1.00		1.00	0.10	0.85	1.00	4.83	0.83	
Incremental Delay, d2				1.5		0.2	0.0	0.3	0.0	0.9	0.5	
Delay (s)				64.6		62.5	0.3	7.3	2.7	79.7	2.4	
Level of Service				E		E	A	A	A	E	A	
Approach Delay (s)		0.0			63.1			7.3			3.6	
Approach LOS		A			E			A			A	
Intersection Summary												
HCM 2000 Control Delay			7.0									
HCM 2000 Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			140.0							16.1		
Intersection Capacity Utilization			81.7%									
Analysis Period (min)			15									
c Critical Lane Group												

Appendix I

2026 Future Background Conditions Synchro Worksheets

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2026 Future Background AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	203	390	526	88	196	65	981	257	262	2125	12
Future Volume (vph)	11	203	390	526	88	196	65	981	257	262	2125	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0		70.0	140.0		0.0	135.0		80.0	180.0		50.0
Storage Lanes	1		1	2		1	1		1	1		1
Taper Length (m)	65.0			100.0			70.0			70.0		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99		0.98			0.97			0.96			0.97
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1656	1863	1583	3433	1792	1553	1719	3343	1485	1770	3406	1336
Flt Permitted	0.698			0.423			0.062			0.162		
Satd. Flow (perm)	1200	1863	1556	1529	1792	1503	112	3343	1425	302	3406	1289
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			121			202			240			91
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		296.6			291.2			731.4			120.4	
Travel Time (s)		17.8			17.5			43.9			7.2	
Confl. Peds. (#/hr)	11					11	5		7	7		5
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	9%	2%	2%	2%	6%	4%	5%	8%	7%	2%	6%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Adj. Flow (vph)	11	209	402	542	91	202	67	1011	265	270	2191	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	209	402	542	91	202	67	1011	265	270	2191	12
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.2			7.2			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.02	1.00	1.00	1.03
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2026 Future Background AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	10.0	10.0	6.0	10.0	10.0	6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	10.5	36.7	36.7	10.5	36.7	36.7	10.5	36.5	36.5	10.5	36.5	36.5
Total Split (s)	10.5	36.7	36.7	10.5	36.7	36.7	10.5	64.3	64.3	28.5	82.3	82.3
Total Split (%)	7.5%	26.2%	26.2%	7.5%	26.2%	26.2%	7.5%	45.9%	45.9%	20.4%	58.8%	58.8%
Maximum Green (s)	6.5	30.0	30.0	6.5	30.0	30.0	6.5	57.8	57.8	24.5	75.8	75.8
Yellow Time (s)	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7
All-Red Time (s)	1.0	3.0	3.0	1.0	3.0	3.0	1.0	2.8	2.8	1.0	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)					7.0	7.0			7.0	7.0		
Flash Dont Walk (s)					23.0	23.0			23.0	23.0		
Pedestrian Calls (#/hr)					11	11			7	7		
Act Effct Green (s)	37.9	29.0	29.0	40.6	35.3	35.3	75.7	66.8	66.8	89.8	78.9	78.9
Actuated g/C Ratio	0.27	0.21	0.21	0.29	0.25	0.25	0.54	0.48	0.48	0.64	0.56	0.56
v/c Ratio	0.03	0.54	0.96	1.02	0.20	0.38	0.50	0.63	0.33	0.74	1.14	0.02
Control Delay	34.2	55.1	73.4	89.4	44.0	8.0	40.8	27.5	8.6	26.5	100.6	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.2	55.1	73.4	89.4	44.0	8.0	40.8	27.5	8.6	26.5	100.6	0.0
LOS	C	E	E	F	D	A	D	C	A	C	F	A
Approach Delay	66.6			64.8			24.4			92.0		
Approach LOS	E			E			C			F		
Queue Length 50th (m)	2.2	54.4	85.4	66.9	19.9	0.0	4.9	111.0	20.1	32.0	~403.8	0.0
Queue Length 95th (m)	7.2	81.7	#151.2	#112.3	38.9	21.6	22.0	153.4	42.6	57.9	#445.8	0.0
Internal Link Dist (m)	272.6			267.2			707.4			96.4		
Turn Bay Length (m)	70.0			70.0	140.0			135.0			180.0	50.0
Base Capacity (vph)	349	399	428	532	452	530	135	1595	805	450	1919	765
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.52	0.94	1.02	0.20	0.38	0.50	0.63	0.33	0.60	1.14	0.02

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 82.6 (59%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 145

Control Type: Actuated-Coordinated

Lanes, Volumes, Timings

1: Bronte Road & Upper Middle Road

2026 Future Background AM Peak Hour

1354 Bronte

Maximum v/c Ratio: 1.14

Intersection Signal Delay: 67.5

Intersection LOS: E

Intersection Capacity Utilization 112.2%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Bronte Road & Upper Middle Road

 Ø1 28.5 s		 Ø2 (R) 64.3 s		 Ø3 10.5 s		 Ø4 36.7 s	
 Ø5 10.5 s		 Ø6 (R) 82.3 s		 Ø7 10.5 s		 Ø8 36.7 s	

HCM Signalized Intersection Capacity Analysis

1: Bronte Road & Upper Middle Road

2026 Future Background AM Peak Hour

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	203	390	526	88	196	65	981	257	262	2125	12
Future Volume (vph)	11	203	390	526	88	196	65	981	257	262	2125	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.96	1.00	1.00	0.97
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1641	1863	1556	3433	1792	1504	1719	3343	1426	1769	3406	1289
Flt Permitted	0.70	1.00	1.00	0.42	1.00	1.00	0.06	1.00	1.00	0.16	1.00	1.00
Satd. Flow (perm)	1205	1863	1556	1530	1792	1504	112	3343	1426	302	3406	1289
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	11	209	402	542	91	202	67	1011	265	270	2191	12
RTOR Reduction (vph)	0	0	94	0	0	151	0	0	130	0	0	6
Lane Group Flow (vph)	11	209	308	542	91	51	67	1011	135	270	2191	6
Confl. Peds. (#/hr)	11						11	5		7		5
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	9%	2%	2%	2%	6%	4%	5%	8%	7%	2%	6%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	34.0	31.4	31.4	41.8	35.3	35.3	69.6	64.4	64.4	84.9	75.7	75.7
Effective Green, g (s)	34.0	31.4	31.4	41.8	35.3	35.3	69.6	64.4	64.4	84.9	75.7	75.7
Actuated g/C Ratio	0.24	0.22	0.22	0.30	0.25	0.25	0.50	0.46	0.46	0.61	0.54	0.54
Clearance Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	300	417	348	545	451	379	115	1537	655	356	1841	696
v/s Ratio Prot	0.00	0.11		c0.05	0.05		0.02	0.30		c0.09	c0.64	
v/s Ratio Perm	0.01		0.20	c0.25		0.03	0.27		0.09	0.37		0.01
v/c Ratio	0.04	0.50	0.89	0.99	0.20	0.13	0.58	0.66	0.21	0.76	1.19	0.01
Uniform Delay, d1	40.4	47.5	52.6	50.2	41.2	40.5	31.9	29.3	22.6	19.0	32.1	14.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.50	0.89	1.81	1.00	1.00	1.00
Incremental Delay, d2	0.1	1.0	22.5	36.9	0.2	0.2	6.6	2.0	0.6	8.9	91.3	0.0
Delay (s)	40.4	48.4	75.1	87.1	41.5	40.7	54.5	28.1	41.4	28.0	123.4	14.9
Level of Service	D	D	E	F	D	D	D	C	D	C	F	B
Approach Delay (s)		65.5			70.9			32.0			112.5	
Approach LOS		E			E			C			F	
Intersection Summary												
HCM 2000 Control Delay			79.9									
HCM 2000 Volume to Capacity ratio			1.14									
Actuated Cycle Length (s)			140.0									
Intersection Capacity Utilization			112.2%									
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2026 Future Background AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	0	39	172	0	95	12	1193	54	30	3100	4
Future Volume (vph)	14	0	39	172	0	95	12	1193	54	30	3100	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	15.0		0.0	15.0		0.0	15.0		15.0	15.0		15.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.850			0.850				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1583	0	1770	1583	0	1770	3539	1583	1770	3539	1583
Flt Permitted	0.645			0.730			0.038			0.181		
Satd. Flow (perm)	1201	1583	0	1360	1583	0	71	3539	1583	337	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		19			96				22			19
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		42.5			50.2			458.5			731.4	
Travel Time (s)		3.1			3.6			27.5			43.9	
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
Adj. Flow (vph)	15	0	42	187	0	103	13	1297	59	33	3370	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	15	42	0	187	103	0	13	1297	59	33	3370	4
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2026 Future Background AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		8	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	35.5	35.5		35.5	35.5		35.5	35.5	35.5	35.5	35.5	35.5
Total Split (s)	35.5	35.5		35.5	35.5		104.5	104.5	104.5	104.5	104.5	104.5
Total Split (%)	25.4%	25.4%		25.4%	25.4%		74.6%	74.6%	74.6%	74.6%	74.6%	74.6%
Maximum Green (s)	30.0	30.0		30.0	30.0		99.0	99.0	99.0	99.0	99.0	99.0
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.2	2.2		2.2	2.2		1.8	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	23.0	23.0		23.0	23.0		23.0	23.0	23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	0
Act Effect Green (s)	23.7	23.7		23.7	23.7		105.3	105.3	105.3	105.3	105.3	105.3
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.75	0.75	0.75	0.75	0.75	0.75
v/c Ratio	0.07	0.15		0.81	0.30		0.25	0.49	0.05	0.13	1.27	0.00
Control Delay	46.7	30.6		81.2	12.3		25.4	10.3	6.1	4.4	136.0	0.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.7	30.6		81.2	12.3		25.4	10.3	6.1	4.4	136.0	0.0
LOS	D	C		F	B		C	B	A	A	F	A
Approach Delay		34.8			56.7			10.3			134.5	
Approach LOS		C			E			B			F	
Queue Length 50th (m)	3.7	5.7		52.8	1.7		1.0	70.5	2.5	1.9	~651.0	0.0
Queue Length 95th (m)	10.1	16.2		78.2	17.7		m3.9	126.9	m11.1	m2.3	m#590.8	m0.0
Internal Link Dist (m)		18.5			26.2			434.5			707.4	
Turn Bay Length (m)	15.0			15.0			15.0		15.0	15.0		15.0
Base Capacity (vph)	257	354		291	414		53	2661	1195	253	2661	1195
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.12		0.64	0.25		0.25	0.49	0.05	0.13	1.27	0.00

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 85 (61%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.27

Intersection Signal Delay: 95.8

Intersection LOS: F

Intersection Capacity Utilization 111.1%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Bronte Road & Saw Whet Boulevard



HCM Signalized Intersection Capacity Analysis

2: Bronte Road & Saw Whet Boulevard

2026 Future Background AM Peak Hour

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	0	39	172	0	95	12	1193	54	30	3100	4
Future Volume (vph)	14	0	39	172	0	95	12	1193	54	30	3100	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85		1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1583		1770	1583		1770	3539	1583	1770	3539	1583
Flt Permitted	0.65	1.00		0.73	1.00		0.04	1.00	1.00	0.18	1.00	1.00
Satd. Flow (perm)	1202	1583		1359	1583		71	3539	1583	337	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	0	42	187	0	103	13	1297	59	33	3370	4
RTOR Reduction (vph)	0	16	0	0	80	0	0	0	5	0	0	1
Lane Group Flow (vph)	15	26	0	187	23	0	13	1297	54	33	3370	3
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	23.7	23.7		23.7	23.7		105.3	105.3	105.3	105.3	105.3	105.3
Effective Green, g (s)	23.7	23.7		23.7	23.7		105.3	105.3	105.3	105.3	105.3	105.3
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.75	0.75	0.75	0.75	0.75	0.75
Clearance Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	203	267		230	267		53	2661	1190	253	2661	1190
v/s Ratio Prot		0.02			0.01			0.37			c0.95	
v/s Ratio Perm	0.01			c0.14			0.18		0.03	0.10		0.00
v/c Ratio	0.07	0.10		0.81	0.09		0.25	0.49	0.04	0.13	1.27	0.00
Uniform Delay, d1	48.9	49.1		56.0	49.0		5.3	6.8	4.5	4.8	17.4	4.3
Progression Factor	1.00	1.00		1.00	1.00		1.73	1.32	1.62	0.67	0.54	1.00
Incremental Delay, d2	0.2	0.2		19.3	0.1		9.1	0.5	0.1	0.1	120.2	0.0
Delay (s)	49.1	49.3		75.3	49.2		18.3	9.5	7.3	3.3	129.5	4.3
Level of Service	D	D		E	D		B	A	A	A	F	A
Approach Delay (s)		49.2			66.0			9.5			128.2	
Approach LOS		D			E			A			F	
Intersection Summary												
HCM 2000 Control Delay	92.1			HCM 2000 Level of Service					F			
HCM 2000 Volume to Capacity ratio	1.18											
Actuated Cycle Length (s)	140.0			Sum of lost time (s)					11.0			
Intersection Capacity Utilization	111.1%			ICU Level of Service					H			
Analysis Period (min)	15											
c Critical Lane Group												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2026 Future Background AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	1	161	0	65	0	1241	78	149	3151	0
Future Volume (vph)	1	0	1	161	0	65	0	1241	78	149	3151	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		40.0	35.0		30.0	70.0		0.0
Storage Lanes	0		0	1		1	1		1	1		0
Taper Length (m)	7.5			7.5			20.0			60.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor		0.99				0.98			0.98			
Frt		0.932				0.850			0.850			
Flt Protected		0.976		0.950						0.950		
Satd. Flow (prot)	0	1680	0	1530	0	1392	1863	3406	1439	1770	3471	0
Flt Permitted		0.976		0.757						0.156		
Satd. Flow (perm)	0	1680	0	1219	0	1368	1863	3406	1406	291	3471	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		54				67			56			
Link Speed (k/h)		20			20			60			60	
Link Distance (m)		78.7			109.0			218.2			458.5	
Travel Time (s)		14.2			19.6			13.1			27.5	
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	2%	18%	2%	16%	2%	6%	10%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Adj. Flow (vph)	1	0	1	166	0	67	0	1279	80	154	3248	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2	0	166	0	67	0	1279	80	154	3248	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.03	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1		1	1	2	1	1	2	
Detector Template	Left	Thru		Left		Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0		2.0		2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0		2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4						9.4			9.4	
Detector 2 Size(m)		0.6						0.6			0.6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2026 Future Background AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Perm	NA		Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4			8		8	2		2	6		
Detector Phase	4	4		8		8	2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0		10.0	15.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	24.2	24.2		35.2		35.2	34.9	34.9	34.9	9.5	34.9	
Total Split (s)	35.2	35.2		35.2		35.2	88.2	88.2	88.2	16.6	104.8	
Total Split (%)	25.1%	25.1%		25.1%		25.1%	63.0%	63.0%	63.0%	11.9%	74.9%	
Maximum Green (s)	29.0	29.0		29.0		29.0	82.3	82.3	82.3	12.6	98.9	
Yellow Time (s)	3.1	3.1		3.1		3.1	3.7	3.7	3.7	3.0	3.7	
All-Red Time (s)	3.1	3.1		3.1		3.1	2.2	2.2	2.2	1.0	2.2	
Lost Time Adjust (s)		0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.2		6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?							Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0		3.0	3.6	3.6	3.6	3.0	3.6	
Recall Mode	None	None		None		None	C-Max	C-Max	C-Max	None	C-Max	
Walk Time (s)				7.0		7.0	7.0	7.0	7.0		7.0	
Flash Dont Walk (s)				22.0		22.0	22.0	22.0	22.0		22.0	
Pedestrian Calls (#/hr)				0		0	0	0	0		0	
Act Effect Green (s)		23.3		23.3		23.3		91.8	91.8	106.5	104.6	
Actuated g/C Ratio		0.17		0.17		0.17		0.66	0.66	0.76	0.75	
v/c Ratio		0.01		0.82		0.24		0.57	0.09	0.49	1.25	
Control Delay		0.0		85.8		12.2		15.6	4.5	3.1	126.4	
Queue Delay		0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay		0.0		85.8		12.2		15.6	4.5	3.1	126.4	
LOS		A		F		B		B	A	A	F	
Approach Delay					64.6			14.9			120.8	
Approach LOS					E			B			F	
Queue Length 50th (m)		0.0		46.9		0.0		103.0	2.3	2.9	~624.5	
Queue Length 95th (m)		0.0		71.9		13.4		144.1	10.1	m2.5 m#	438.8	
Internal Link Dist (m)		54.7			85.0			194.2			434.5	
Turn Bay Length (m)						40.0			30.0	70.0		
Base Capacity (vph)		390		252		336		2232	940	354	2594	
Starvation Cap Reductn		0		0		0		0	0	0	0	
Spillback Cap Reductn		0		0		0		0	0	0	0	
Storage Cap Reductn		0		0		0		0	0	0	0	
Reduced v/c Ratio		0.01		0.66		0.20		0.57	0.09	0.44	1.25	

Intersection Summary

Area Type: Other
 Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 128.8 (92%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.25

Lanes, Volumes, Timings 3: Bronte Road & Driveway/Charles Cornwall Road

2026 Future Background AM Peak Hour

1354 Bronte

Intersection Signal Delay: 89.4

Intersection LOS: F

Intersection Capacity Utilization 128.4%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

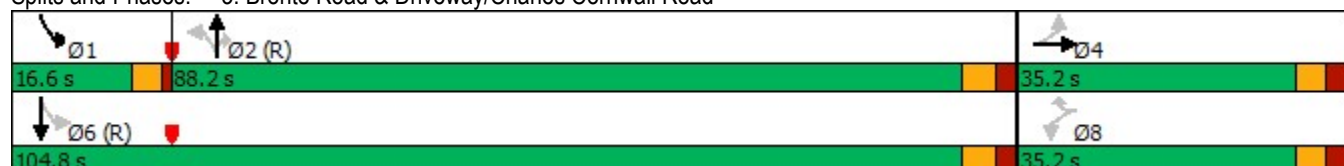
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Bronte Road & Driveway/Charles Cornwall Road



HCM Signalized Intersection Capacity Analysis

3: Bronte Road & Driveway/Charles Cornwall Road

2026 Future Background AM Peak Hour

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	1	161	0	65	0	1241	78	149	3151	0
Future Volume (vph)	1	0	1	161	0	65	0	1241	78	149	3151	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.2		6.2		6.2		5.9	5.9	4.0	5.9	
Lane Util. Factor		1.00		1.00		1.00		0.95	1.00	1.00	0.95	
Frpb, ped/bikes		0.99		1.00		0.98		1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00		1.00		1.00		1.00	1.00	1.00	1.00	
Frt		0.93		1.00		0.85		1.00	0.85	1.00	1.00	
Flt Protected		0.98		0.95		1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1679		1530		1366		3406	1406	1770	3471	
Flt Permitted		0.98		0.76		1.00		1.00	1.00	0.16	1.00	
Satd. Flow (perm)		1679		1218		1366		3406	1406	290	3471	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	1	0	1	166	0	67	0	1279	80	154	3248	0
RTOR Reduction (vph)	0	2	0	0	0	56	0	0	19	0	0	0
Lane Group Flow (vph)	0	0	0	166	0	11	0	1279	61	154	3248	0
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	2%	2%	2%	18%	2%	16%	2%	6%	10%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Turn Type	Perm	NA		Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		23.3		23.3		23.3		91.7	91.7	104.6	104.6	
Effective Green, g (s)		23.3		23.3		23.3		91.7	91.7	104.6	104.6	
Actuated g/C Ratio		0.17		0.17		0.17		0.66	0.66	0.75	0.75	
Clearance Time (s)		6.2		6.2		6.2		5.9	5.9	4.0	5.9	
Vehicle Extension (s)		3.0		3.0		3.0		3.6	3.6	3.0	3.6	
Lane Grp Cap (vph)		279		202		227		2230	920	310	2593	
v/s Ratio Prot								0.38		0.03	c0.94	
v/s Ratio Perm		0.00		c0.14		0.01			0.04	0.34		
v/c Ratio		0.00		0.82		0.05		0.57	0.07	0.50	1.25	
Uniform Delay, d1		48.6		56.3		49.0		13.3	8.7	9.1	17.7	
Progression Factor		1.00		1.00		1.00		1.00	1.00	0.52	0.27	
Incremental Delay, d2		0.0		22.8		0.1		1.1	0.1	0.1	114.0	
Delay (s)		48.7		79.1		49.1		14.4	8.8	4.8	118.7	
Level of Service		D		E		D		B	A	A	F	
Approach Delay (s)		48.7			70.5			14.1			113.6	
Approach LOS		D			E			B			F	
Intersection Summary												
HCM 2000 Control Delay			84.5				HCM 2000 Level of Service		F			
HCM 2000 Volume to Capacity ratio			1.21									
Actuated Cycle Length (s)			140.0				Sum of lost time (s)		16.1			
Intersection Capacity Utilization			128.4%				ICU Level of Service		H			
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2026 Future Background PM Peak Hour

1300 Bronte Enns

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	74	114	250	155	252	294	1975	379	241	1235	18
Future Volume (vph)	7	74	114	250	155	252	294	1975	379	241	1235	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0		70.0	140.0		0.0	135.0		80.0	180.0		50.0
Storage Lanes	1		1	2		1	1		1	1		1
Taper Length (m)	65.0			100.0			70.0			70.0		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99		0.98			0.97			0.97			0.97
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	3400	1863	1583	1770	3539	1558	1770	3471	1473
Flt Permitted	0.653			0.561			0.112			0.054		
Satd. Flow (perm)	1208	1863	1550	2008	1863	1542	209	3539	1518	101	3471	1435
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			121			185			231			122
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		296.6			291.2			731.4			120.4	
Travel Time (s)		17.8			17.5			43.9			7.2	
Confl. Peds. (#/hr)	6					6	1		1	1		1
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%	2%	2%	2%	2%	4%	7%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Adj. Flow (vph)	7	79	121	266	165	268	313	2101	403	256	1314	19
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	79	121	266	165	268	313	2101	403	256	1314	19
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.2			7.2			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.02	1.00	1.00	1.03
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	

12-15-2021

NA

CGH Transportation

Page 1

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2026 Future Background PM Peak Hour
1300 Bronte Enns

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	10.0	10.0	6.0	10.0	10.0	6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	10.5	36.7	36.7	10.5	36.7	36.7	10.5	36.5	36.5	10.5	36.5	36.5
Total Split (s)	11.2	23.8	23.8	19.6	32.2	32.2	12.6	84.0	84.0	12.6	84.0	84.0
Total Split (%)	8.0%	17.0%	17.0%	14.0%	23.0%	23.0%	9.0%	60.0%	60.0%	9.0%	60.0%	60.0%
Maximum Green (s)	7.2	17.1	17.1	15.6	25.5	25.5	8.6	77.5	77.5	8.6	77.5	77.5
Yellow Time (s)	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7
All-Red Time (s)	1.0	3.0	3.0	1.0	3.0	3.0	1.0	2.8	2.8	1.0	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)					7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)					23.0	23.0		23.0	23.0		23.0	23.0
Pedestrian Calls (#/hr)					6	6		1	1		1	1
Act Effct Green (s)	21.2	12.3	12.3	33.0	28.1	28.1	95.0	77.5	77.5	95.0	77.5	77.5
Actuated g/C Ratio	0.15	0.09	0.09	0.24	0.20	0.20	0.68	0.55	0.55	0.68	0.55	0.55
v/c Ratio	0.03	0.48	0.49	0.43	0.44	0.59	1.01	1.07	0.43	1.04	0.68	0.02
Control Delay	39.1	70.3	16.5	46.0	53.2	21.6	66.0	59.4	5.5	106.6	24.8	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.1	70.3	16.5	46.0	53.2	21.6	66.0	59.4	5.5	106.6	24.8	0.1
LOS	D	E	B	D	D	C	E	E	A	F	C	A
Approach Delay		37.8			38.3			52.4			37.7	
Approach LOS		D			D			D			D	
Queue Length 50th (m)	1.6	22.5	0.0	33.5	41.9	20.3	60.2	~355.5	17.4	~59.3	139.7	0.0
Queue Length 95th (m)	5.6	38.7	19.3	43.9	67.8	53.5	m#52.3	m#343.6	m19.4	#145.0	165.3	0.0
Internal Link Dist (m)		272.6			267.2			707.4			96.4	
Turn Bay Length (m)	70.0		70.0	140.0			135.0		80.0	180.0		50.0
Base Capacity (vph)	220	227	295	628	375	458	309	1959	943	247	1921	848
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.35	0.41	0.42	0.44	0.59	1.01	1.07	0.43	1.04	0.68	0.02

Intersection Summary

Area Type: Other
 Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 35 (25%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 145
 Control Type: Actuated-Coordinated

Lanes, Volumes, Timings

1: Bronte Road & Upper Middle Road

2026 Future Background PM Peak Hour

1300 Bronte Enns

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 45.6

Intersection LOS: D

Intersection Capacity Utilization 98.1%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Bronte Road & Upper Middle Road

 Ø1	 Ø2 (R)	 Ø3	 Ø4
12.6 s	84 s	19.6 s	23.8 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
12.6 s	84 s	11.2 s	32.2 s

HCM Signalized Intersection Capacity Analysis

1: Bronte Road & Upper Middle Road

2026 Future Background PM Peak Hour

1300 Bronte Enns

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	74	114	250	155	252	294	1975	379	241	1235	18
Future Volume (vph)	7	74	114	250	155	252	294	1975	379	241	1235	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1762	1863	1548	3400	1863	1543	1770	3539	1518	1770	3471	1435
Flt Permitted	0.65	1.00	1.00	0.56	1.00	1.00	0.11	1.00	1.00	0.05	1.00	1.00
Satd. Flow (perm)	1211	1863	1548	2007	1863	1543	209	3539	1518	100	3471	1435
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	7	79	121	266	165	268	313	2101	403	256	1314	19
RTOR Reduction (vph)	0	0	108	0	0	148	0	0	108	0	0	9
Lane Group Flow (vph)	7	79	13	266	165	120	313	2101	295	256	1314	10
Confl. Peds. (#/hr)	6					6	1		1	1		1
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%	2%	2%	2%	2%	4%	7%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	16.9	15.5	15.5	33.5	28.1	28.1	89.3	74.3	74.3	89.3	74.3	74.3
Effective Green, g (s)	16.9	15.5	15.5	33.5	28.1	28.1	89.3	74.3	74.3	89.3	74.3	74.3
Actuated g/C Ratio	0.12	0.11	0.11	0.24	0.20	0.20	0.64	0.53	0.53	0.64	0.53	0.53
Clearance Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	151	206	171	619	373	309	300	1878	805	242	1842	761
v/s Ratio Prot	0.00	0.04		c0.04	c0.09		0.11	c0.59		c0.11	0.38	
v/s Ratio Perm	0.01		0.01	0.06		0.08	0.55		0.19	0.56		0.01
v/c Ratio	0.05	0.38	0.08	0.43	0.44	0.39	1.04	1.12	0.37	1.06	0.71	0.01
Uniform Delay, d1	54.3	57.8	55.8	44.0	49.1	48.5	33.6	32.9	19.1	49.2	24.8	15.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.64	0.73	0.73	1.00	1.00	1.00
Incremental Delay, d2	0.1	1.2	0.2	0.5	0.8	0.8	37.0	55.4	0.3	73.9	2.4	0.0
Delay (s)	54.5	59.0	56.0	44.5	49.9	49.3	92.1	79.5	14.2	123.2	27.2	15.6
Level of Service	D	E	E	D	D	D	F	E	B	F	C	B
Approach Delay (s)		57.1			47.6			71.6			42.5	
Approach LOS		E			D			E			D	
Intersection Summary												
HCM 2000 Control Delay			59.2									
HCM 2000 Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			140.0									
Intersection Capacity Utilization			98.1%									
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2026 Future Background PM Peak Hour

1300 Bronte Enns

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	0	24	106	0	60	40	2652	177	99	1518	14
Future Volume (vph)	8	0	24	106	0	60	40	2652	177	99	1518	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	15.0		0.0	15.0		0.0	15.0		15.0	15.0		15.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.850			0.850				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1583	0	1770	1583	0	1770	3539	1583	1770	3539	1583
Flt Permitted	0.715			0.740			0.121			0.036		
Satd. Flow (perm)	1332	1583	0	1378	1583	0	225	3539	1583	67	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		48			19				32			19
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		42.5			50.2			458.5			731.4	
Travel Time (s)		3.1			3.6			27.5			43.9	
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
Adj. Flow (vph)	9	0	26	115	0	65	43	2883	192	108	1650	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	9	26	0	115	65	0	43	2883	192	108	1650	15
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2026 Future Background PM Peak Hour
1300 Bronte Enns

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		8	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	35.5	35.5		35.5	35.5		35.5	35.5	35.5	35.5	35.5	35.5
Total Split (s)	35.5	35.5		35.5	35.5		104.5	104.5	104.5	104.5	104.5	104.5
Total Split (%)	25.4%	25.4%		25.4%	25.4%		74.6%	74.6%	74.6%	74.6%	74.6%	74.6%
Maximum Green (s)	30.0	30.0		30.0	30.0		99.0	99.0	99.0	99.0	99.0	99.0
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.2	2.2		2.2	2.2		1.8	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	23.0	23.0		23.0	23.0		23.0	23.0	23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	0
Act Effect Green (s)	17.0	17.0		17.0	17.0		112.0	112.0	112.0	112.0	112.0	112.0
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.80	0.80	0.80	0.80	0.80	0.80
v/c Ratio	0.06	0.11		0.69	0.31		0.24	1.02	0.15	2.04	0.58	0.01
Control Delay	51.6	4.8		78.8	42.7		1.1	28.1	0.4	538.6	12.6	4.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.6	4.8		78.8	42.7		1.1	28.1	0.4	538.6	12.6	4.2
LOS	D	A		E	D		A	C	A	F	B	A
Approach Delay		16.9			65.8			26.0			44.6	
Approach LOS		B			E			C			D	
Queue Length 50th (m)	2.4	0.0		32.6	12.3		0.9	~480.1	2.5	~43.8	129.7	0.3
Queue Length 95th (m)	7.8	3.5		51.9	26.2		m0.2	m398.9	m0.0	m#79.6	196.5	m1.7
Internal Link Dist (m)		18.5			26.2			434.5			707.4	
Turn Bay Length (m)	15.0			15.0			15.0		15.0	15.0		15.0
Base Capacity (vph)	285	376		295	354		180	2831	1272	53	2831	1270
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.07		0.39	0.18		0.24	1.02	0.15	2.04	0.58	0.01

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.04

Intersection Signal Delay: 33.8

Intersection LOS: C

Intersection Capacity Utilization 104.0%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Lanes, Volumes, Timings
 2: Bronte Road & Saw Whet Boulevard

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Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Bronte Road & Saw Whet Boulevard

 Ø2 (R) 104.5 s	 Ø4 35.5 s
 Ø6 (R) 104.5 s	 Ø8 35.5 s

HCM Signalized Intersection Capacity Analysis

2: Bronte Road & Saw Whet Boulevard

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1300 Bronte Enns

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	0	24	106	0	60	40	2652	177	99	1518	14
Future Volume (vph)	8	0	24	106	0	60	40	2652	177	99	1518	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85		1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1583		1770	1583		1770	3539	1583	1770	3539	1583
Flt Permitted	0.71	1.00		0.74	1.00		0.12	1.00	1.00	0.04	1.00	1.00
Satd. Flow (perm)	1331	1583		1379	1583		226	3539	1583	67	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	0	26	115	0	65	43	2883	192	108	1650	15
RTOR Reduction (vph)	0	23	0	0	17	0	0	0	6	0	0	3
Lane Group Flow (vph)	9	3	0	115	48	0	43	2883	186	108	1650	12
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	17.0	17.0		17.0	17.0		112.0	112.0	112.0	112.0	112.0	112.0
Effective Green, g (s)	17.0	17.0		17.0	17.0		112.0	112.0	112.0	112.0	112.0	112.0
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.80	0.80	0.80	0.80	0.80	0.80
Clearance Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	161	192		167	192		180	2831	1266	53	2831	1266
v/s Ratio Prot		0.00			0.03			0.81			0.47	
v/s Ratio Perm	0.01			c0.08			0.19		0.12	c1.62		0.01
v/c Ratio	0.06	0.02		0.69	0.25		0.24	1.02	0.15	2.04	0.58	0.01
Uniform Delay, d1	54.4	54.1		59.0	55.7		3.5	14.0	3.2	14.0	5.2	2.8
Progression Factor	1.00	1.00		1.00	1.00		0.16	1.18	0.13	2.51	2.02	3.11
Incremental Delay, d2	0.1	0.0		11.2	0.7		0.3	10.7	0.0	515.5	0.7	0.0
Delay (s)	54.5	54.2		70.2	56.4		0.8	27.2	0.4	550.7	11.3	8.8
Level of Service	D	D		E	E		A	C	A	F	B	A
Approach Delay (s)		54.3			65.2			25.2			44.2	
Approach LOS		D			E			C			D	
Intersection Summary												
HCM 2000 Control Delay	33.4			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	1.84											
Actuated Cycle Length (s)	140.0			Sum of lost time (s)			11.0					
Intersection Capacity Utilization	104.0%			ICU Level of Service			G					
Analysis Period (min)	15											
c Critical Lane Group												

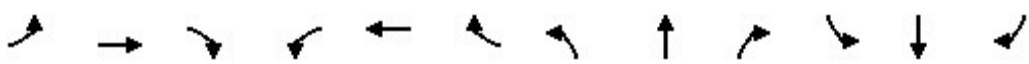
Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2026 Future Background PM Peak Hour
1300 Bronte Enns

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕		↕	↕	↕	↕	↕	↕	
Traffic Volume (vph)	0	0	0	138	0	110	1	2766	175	89	1595	0
Future Volume (vph)	0	0	0	138	0	110	1	2766	175	89	1595	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		40.0	35.0		30.0	70.0		0.0
Storage Lanes	0		0	1		1	1		1	1		0
Taper Length (m)	7.5			7.5			20.0			60.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor						0.98			0.98			
Frt						0.850			0.850			
Flt Protected				0.950			0.950			0.950		
Satd. Flow (prot)	0	1863	0	1770	0	1583	1770	3505	1388	1770	3471	0
Flt Permitted				0.757			0.133			0.040		
Satd. Flow (perm)	0	1863	0	1410	0	1557	248	3505	1356	75	3471	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						89			56			
Link Speed (k/h)		20			20			60			60	
Link Distance (m)		78.7			109.0			218.2			458.5	
Travel Time (s)		14.2			19.6			13.1			27.5	
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	3%	14%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Adj. Flow (vph)	0	0	0	142	0	113	1	2852	180	92	1644	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	142	0	113	1	2852	180	92	1644	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.03	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1		1	1	2	1	1	2	
Detector Template	Left	Thru		Left		Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0		2.0		2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0		2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4						9.4			9.4	
Detector 2 Size(m)		0.6						0.6			0.6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2026 Future Background PM Peak Hour
1300 Bronte Enns

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)	0.0							0.0			0.0	
Turn Type				Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4			8		8	2		2	6		
Detector Phase	4	4		8		8	2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0		10.0	15.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	24.2	24.2		35.2		35.2	34.9	34.9	34.9	9.5	34.9	
Total Split (s)	40.6	40.6		40.6		40.6	88.2	88.2	88.2	11.2	99.4	
Total Split (%)	29.0%	29.0%		29.0%		29.0%	63.0%	63.0%	63.0%	8.0%	71.0%	
Maximum Green (s)	34.4	34.4		34.4		34.4	82.3	82.3	82.3	7.2	93.5	
Yellow Time (s)	3.1	3.1		3.1		3.1	3.7	3.7	3.7	3.0	3.7	
All-Red Time (s)	3.1	3.1		3.1		3.1	2.2	2.2	2.2	1.0	2.2	
Lost Time Adjust (s)		0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.2		6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?							Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0		3.0	3.6	3.6	3.6	3.0	3.6	
Recall Mode	None	None		None		None	C-Max	C-Max	C-Max	None	C-Max	
Walk Time (s)				7.0		7.0	7.0	7.0	7.0		7.0	
Flash Dont Walk (s)				22.0		22.0	22.0	22.0	22.0		22.0	
Pedestrian Calls (#/hr)				0		0	0	0	0		0	
Act Effect Green (s)				19.4		19.4	95.7	95.7	95.7	110.4	108.5	
Actuated g/C Ratio				0.14		0.14	0.68	0.68	0.68	0.79	0.78	
v/c Ratio				0.73		0.39	0.01	1.19	0.19	0.56	0.61	
Control Delay				77.9		18.8	10.0	113.5	7.1	38.7	8.9	
Queue Delay				0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay				77.9		18.8	10.0	113.5	7.1	38.7	8.9	
LOS				E		B	A	F	A	D	A	
Approach Delay					51.7			107.2			10.5	
Approach LOS					D			F			B	
Queue Length 50th (m)				40.2		6.2	0.1	~523.6	11.4	14.0	51.8	
Queue Length 95th (m)				61.0		23.7	0.9	#609.5	27.7	34.1	144.2	
Internal Link Dist (m)		54.7			85.0			194.2			434.5	
Turn Bay Length (m)						40.0	35.0		30.0	70.0		
Base Capacity (vph)				346		449	169	2396	944	169	2689	
Starvation Cap Reductn				0		0	0	0	0	0	0	
Spillback Cap Reductn				0		0	0	0	0	0	0	
Storage Cap Reductn				0		0	0	0	0	0	0	
Reduced v/c Ratio				0.41		0.25	0.01	1.19	0.19	0.54	0.61	

Intersection Summary

Area Type: Other
 Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 103.6 (74%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.19

Lanes, Volumes, Timings 3: Bronte Road & Driveway/Charles Cornwall Road

2026 Future Background PM Peak Hour
1300 Bronte Enns

Intersection Signal Delay: 70.9

Intersection LOS: E

Intersection Capacity Utilization 94.9%

ICU Level of Service F

Analysis Period (min) 15

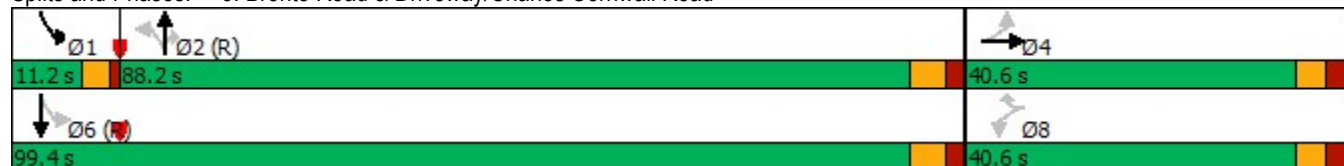
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

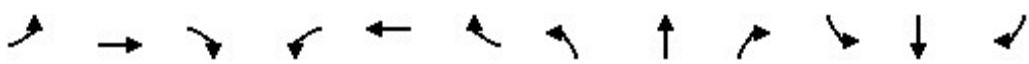
Splits and Phases: 3: Bronte Road & Driveway/Charles Cornwall Road



HCM Signalized Intersection Capacity Analysis

3: Bronte Road & Driveway/Charles Cornwall Road

2026 Future Background PM Peak Hour
1300 Bronte Enns

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔		↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	0	0	0	138	0	110	1	2766	175	89	1595	0
Future Volume (vph)	0	0	0	138	0	110	1	2766	175	89	1595	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Lane Util. Factor				1.00		1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes				1.00		0.98	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes				1.00		1.00	1.00	1.00	1.00	1.00	1.00	
Frt				1.00		0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95		1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1770		1552	1770	3505	1357	1770	3471	
Flt Permitted				0.76		1.00	0.13	1.00	1.00	0.04	1.00	
Satd. Flow (perm)				1410		1552	248	3505	1357	75	3471	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	142	0	113	1	2852	180	92	1644	0
RTOR Reduction (vph)	0	0	0	0	0	77	0	0	18	0	0	0
Lane Group Flow (vph)	0	0	0	142	0	36	1	2852	162	92	1644	0
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	3%	14%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Turn Type				Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4					2			1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)				19.4		19.4	95.7	95.7	95.7	108.5	108.5	
Effective Green, g (s)				19.4		19.4	95.7	95.7	95.7	108.5	108.5	
Actuated g/C Ratio				0.14		0.14	0.68	0.68	0.68	0.78	0.78	
Clearance Time (s)				6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Vehicle Extension (s)				3.0		3.0	3.6	3.6	3.6	3.0	3.6	
Lane Grp Cap (vph)				195		215	169	2395	927	164	2690	
v/s Ratio Prot								c0.81		0.04	c0.47	
v/s Ratio Perm				c0.10		0.02	0.00		0.12	0.40		
v/c Ratio				0.73		0.17	0.01	1.19	0.18	0.56	0.61	
Uniform Delay, d1				57.8		53.2	7.0	22.1	8.0	42.6	6.7	
Progression Factor				1.00		1.00	1.00	1.00	1.00	1.29	1.06	
Incremental Delay, d2				12.7		0.4	0.1	90.3	0.4	3.6	0.9	
Delay (s)				70.5		53.6	7.1	112.5	8.4	58.8	8.0	
Level of Service				E		D	A	F	A	E	A	
Approach Delay (s)		0.0			63.0			106.3			10.7	
Approach LOS		A			E			F			B	
Intersection Summary												
HCM 2000 Control Delay			71.1									
HCM 2000 Volume to Capacity ratio			1.08									
Actuated Cycle Length (s)			140.0							16.1		
Intersection Capacity Utilization			94.9%							F		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2026 FB - MM - PM Peak Hour
1354 Valery

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	0	24	106	0	60	40	2652	177	99	1518	14
Future Volume (vph)	8	0	24	106	0	60	40	2652	177	99	1518	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	15.0		0.0	15.0		0.0	15.0		15.0	15.0		15.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.850			0.850				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1583	0	1770	1583	0	1770	3539	1583	1770	3539	1583
Flt Permitted	0.715			0.740			0.141			0.039		
Satd. Flow (perm)	1332	1583	0	1378	1583	0	263	3539	1583	73	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		55			60				55			19
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		42.5			50.2			458.5			731.4	
Travel Time (s)		3.1			3.6			27.5			43.9	
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
Adj. Flow (vph)	9	0	26	115	0	65	43	2883	192	108	1650	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	9	26	0	115	65	0	43	2883	192	108	1650	15
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		6

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2026 FB - MM - PM Peak Hour
1354 Valery

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		8	8		2	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		15.0	15.0	15.0	5.0	15.0	15.0
Minimum Split (s)	35.5	35.5		35.5	35.5		35.5	35.5	35.5	9.5	35.5	35.5
Total Split (s)	35.5	35.5		35.5	35.5		95.0	95.0	95.0	9.5	104.5	104.5
Total Split (%)	25.4%	25.4%		25.4%	25.4%		67.9%	67.9%	67.9%	6.8%	74.6%	74.6%
Maximum Green (s)	30.0	30.0		30.0	30.0		89.5	89.5	89.5	5.0	99.0	99.0
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.5	3.7	3.7
All-Red Time (s)	2.2	2.2		2.2	2.2		1.8	1.8	1.8	1.0	1.8	1.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	4.5	5.5	5.5
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?							Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Max	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)	23.0	23.0		23.0	23.0		23.0	23.0	23.0		23.0	23.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0		0	0
Act Effect Green (s)	17.0	17.0		17.0	17.0		96.8	96.8	96.8	113.0	112.0	112.0
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.69	0.69	0.69	0.81	0.80	0.80
v/c Ratio	0.06	0.11		0.69	0.27		0.24	1.18	0.17	0.57	0.58	0.01
Control Delay	51.6	2.3		78.8	16.4		6.7	93.7	3.6	31.2	18.6	2.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.6	2.3		78.8	16.4		6.7	93.7	3.6	31.2	18.6	2.8
LOS	D	A		E	B		A	F	A	C	B	A
Approach Delay		15.0			56.3			86.9			19.3	
Approach LOS		B			E			F			B	
Queue Length 50th (m)	2.4	0.0		32.6	1.3		2.0	~527.9	3.3	12.3	216.0	0.6
Queue Length 95th (m)	7.8	1.7		51.9	15.0		m2.1	m#426.8	m3.1	m25.8	255.9	m1.0
Internal Link Dist (m)		18.5			26.2			434.5			707.4	
Turn Bay Length (m)	15.0			15.0			15.0		15.0	15.0		15.0
Base Capacity (vph)	285	382		295	386		181	2447	1111	188	2831	1270
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.07		0.39	0.17		0.24	1.18	0.17	0.57	0.58	0.01

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 119 (85%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 145

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.18

Intersection Signal Delay: 61.9

Intersection LOS: E

Intersection Capacity Utilization 104.0%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Lanes, Volumes, Timings
 2: Bronte Road & Saw Whet Boulevard

2026 FB - MM - PM Peak Hour

1354 Valery

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Bronte Road & Saw Whet Boulevard



HCM Signalized Intersection Capacity Analysis

2: Bronte Road & Saw Whet Boulevard

2026 FB - MM - PM Peak Hour
1354 Valery

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	0	24	106	0	60	40	2652	177	99	1518	14
Future Volume (vph)	8	0	24	106	0	60	40	2652	177	99	1518	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	4.5	5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85		1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1583		1770	1583		1770	3539	1583	1770	3539	1583
Flt Permitted	0.71	1.00		0.74	1.00		0.14	1.00	1.00	0.04	1.00	1.00
Satd. Flow (perm)	1331	1583		1379	1583		262	3539	1583	74	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	0	26	115	0	65	43	2883	192	108	1650	15
RTOR Reduction (vph)	0	23	0	0	53	0	0	0	17	0	0	3
Lane Group Flow (vph)	9	3	0	115	12	0	43	2883	175	108	1650	12
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	17.0	17.0		17.0	17.0		96.8	96.8	96.8	112.0	112.0	112.0
Effective Green, g (s)	17.0	17.0		17.0	17.0		96.8	96.8	96.8	112.0	112.0	112.0
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.69	0.69	0.69	0.80	0.80	0.80
Clearance Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	4.5	5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	161	192		167	192		181	2446	1094	188	2831	1266
v/s Ratio Prot		0.00			0.01			c0.81		0.04	c0.47	
v/s Ratio Perm	0.01			c0.08			0.16		0.11	0.42		0.01
v/c Ratio	0.06	0.02		0.69	0.06		0.24	1.18	0.16	0.57	0.58	0.01
Uniform Delay, d1	54.4	54.1		59.0	54.5		8.0	21.6	7.5	45.8	5.2	2.8
Progression Factor	1.00	1.00		1.00	1.00		0.60	0.33	0.58	0.84	3.06	2.07
Incremental Delay, d2	0.1	0.0		11.2	0.1		0.3	80.8	0.0	3.2	0.7	0.0
Delay (s)	54.5	54.2		70.2	54.6		5.0	87.9	4.4	41.8	16.7	5.8
Level of Service	D	D		E	D		A	F	A	D	B	A
Approach Delay (s)		54.3			64.5			81.6			18.1	
Approach LOS		D			E			F			B	
Intersection Summary												
HCM 2000 Control Delay	58.8			HCM 2000 Level of Service			E					
HCM 2000 Volume to Capacity ratio	1.07											
Actuated Cycle Length (s)	140.0			Sum of lost time (s)			15.5					
Intersection Capacity Utilization	104.0%			ICU Level of Service			G					
Analysis Period (min)	15											
c Critical Lane Group												

Appendix J

2026 Future Total Conditions Synchro Worksheets

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2026 Future Total AM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	203	390	527	88	196	65	982	260	262	2125	12
Future Volume (vph)	11	203	390	527	88	196	65	982	260	262	2125	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0		70.0	140.0		0.0	135.0		80.0	180.0		50.0
Storage Lanes	1		1	2		1	1		1	1		1
Taper Length (m)	65.0			100.0			70.0			70.0		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99		0.98			0.97			0.96			0.97
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1656	1863	1583	3433	1792	1553	1719	3343	1485	1770	3406	1336
Flt Permitted	0.698			0.423			0.062			0.162		
Satd. Flow (perm)	1200	1863	1556	1529	1792	1503	112	3343	1425	302	3406	1289
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			121			202			242			91
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		296.6			291.2			731.4			120.4	
Travel Time (s)		17.8			17.5			43.9			7.2	
Confl. Peds. (#/hr)	11					11	5		7	7		5
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	9%	2%	2%	2%	6%	4%	5%	8%	7%	2%	6%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Adj. Flow (vph)	11	209	402	543	91	202	67	1012	268	270	2191	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	209	402	543	91	202	67	1012	268	270	2191	12
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.2			7.2			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.02	1.00	1.00	1.03
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2026 Future Total AM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	10.0	10.0	6.0	10.0	10.0	6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	10.5	36.7	36.7	10.5	36.7	36.7	10.5	36.5	36.5	10.5	36.5	36.5
Total Split (s)	10.5	36.7	36.7	10.5	36.7	36.7	10.5	64.3	64.3	28.5	82.3	82.3
Total Split (%)	7.5%	26.2%	26.2%	7.5%	26.2%	26.2%	7.5%	45.9%	45.9%	20.4%	58.8%	58.8%
Maximum Green (s)	6.5	30.0	30.0	6.5	30.0	30.0	6.5	57.8	57.8	24.5	75.8	75.8
Yellow Time (s)	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7
All-Red Time (s)	1.0	3.0	3.0	1.0	3.0	3.0	1.0	2.8	2.8	1.0	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)					7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)					23.0	23.0		23.0	23.0		23.0	23.0
Pedestrian Calls (#/hr)					11	11		7	7		5	5
Act Effct Green (s)	37.9	29.0	29.0	40.6	35.3	35.3	75.7	66.8	66.8	89.8	78.9	78.9
Actuated g/C Ratio	0.27	0.21	0.21	0.29	0.25	0.25	0.54	0.48	0.48	0.64	0.56	0.56
v/c Ratio	0.03	0.54	0.96	1.02	0.20	0.38	0.50	0.63	0.33	0.74	1.14	0.02
Control Delay	34.2	55.1	73.4	89.9	44.0	8.0	40.8	27.7	8.6	26.4	100.6	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.2	55.1	73.4	89.9	44.0	8.0	40.8	27.7	8.6	26.4	100.6	0.0
LOS	C	E	E	F	D	A	D	C	A	C	F	A
Approach Delay		66.6			65.1			24.5			92.0	
Approach LOS		E			E			C			F	
Queue Length 50th (m)	2.2	54.4	85.4	67.1	19.9	0.0	5.0	112.2	20.4	32.0	~403.8	0.0
Queue Length 95th (m)	7.2	81.7	#151.2	#112.7	38.9	21.6	22.1	153.6	42.6	57.9	#445.8	0.0
Internal Link Dist (m)		272.6			267.2			707.4			96.4	
Turn Bay Length (m)	70.0		70.0	140.0			135.0		80.0	180.0		50.0
Base Capacity (vph)	349	399	428	532	452	530	135	1594	806	450	1919	765
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.52	0.94	1.02	0.20	0.38	0.50	0.63	0.33	0.60	1.14	0.02

Intersection Summary

Area Type: Other
 Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 82.6 (59%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 145
 Control Type: Actuated-Coordinated

Lanes, Volumes, Timings 1: Bronte Road & Upper Middle Road

2026 Future Total AM Peak Hour
1354 Bronte

Maximum v/c Ratio: 1.14

Intersection Signal Delay: 67.5

Intersection LOS: E

Intersection Capacity Utilization 112.3%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Bronte Road & Upper Middle Road

 Ø1 28.5 s		 Ø2 (R) 64.3 s		 Ø3 10.5 s		 Ø4 36.7 s	
 Ø5 10.5 s		 Ø6 (R) 82.3 s		 Ø7 10.5 s		 Ø8 36.7 s	

HCM Signalized Intersection Capacity Analysis

1: Bronte Road & Upper Middle Road

2026 Future Total AM Peak Hour

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	203	390	527	88	196	65	982	260	262	2125	12
Future Volume (vph)	11	203	390	527	88	196	65	982	260	262	2125	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.96	1.00	1.00	0.97
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1641	1863	1556	3433	1792	1504	1719	3343	1426	1769	3406	1289
Flt Permitted	0.70	1.00	1.00	0.42	1.00	1.00	0.06	1.00	1.00	0.16	1.00	1.00
Satd. Flow (perm)	1205	1863	1556	1530	1792	1504	112	3343	1426	302	3406	1289
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	11	209	402	543	91	202	67	1012	268	270	2191	12
RTOR Reduction (vph)	0	0	94	0	0	151	0	0	131	0	0	6
Lane Group Flow (vph)	11	209	308	543	91	51	67	1012	137	270	2191	6
Confl. Peds. (#/hr)	11					11	5		7	7		5
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	9%	2%	2%	2%	6%	4%	5%	8%	7%	2%	6%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	34.0	31.4	31.4	41.8	35.3	35.3	69.6	64.4	64.4	84.9	75.7	75.7
Effective Green, g (s)	34.0	31.4	31.4	41.8	35.3	35.3	69.6	64.4	64.4	84.9	75.7	75.7
Actuated g/C Ratio	0.24	0.22	0.22	0.30	0.25	0.25	0.50	0.46	0.46	0.61	0.54	0.54
Clearance Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	300	417	348	545	451	379	115	1537	655	356	1841	696
v/s Ratio Prot	0.00	0.11		c0.05	0.05		0.02	0.30		c0.09	c0.64	
v/s Ratio Perm	0.01		0.20	c0.25		0.03	0.27		0.10	0.37		0.01
v/c Ratio	0.04	0.50	0.89	1.00	0.20	0.13	0.58	0.66	0.21	0.76	1.19	0.01
Uniform Delay, d1	40.4	47.5	52.6	50.2	41.2	40.5	31.9	29.3	22.6	19.1	32.1	14.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.49	0.89	1.80	1.00	1.00	1.00
Incremental Delay, d2	0.1	1.0	22.5	37.4	0.2	0.2	6.6	2.0	0.7	8.9	91.3	0.0
Delay (s)	40.4	48.4	75.1	87.6	41.5	40.7	54.3	28.2	41.3	28.0	123.4	14.9
Level of Service	D	D	E	F	D	D	D	C	D	C	F	B
Approach Delay (s)		65.5			71.2			32.1			112.5	
Approach LOS		E			E			C			F	
Intersection Summary												
HCM 2000 Control Delay			79.9									
HCM 2000 Volume to Capacity ratio			1.14									
Actuated Cycle Length (s)			140.0									
Intersection Capacity Utilization			112.3%									
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2026 Future Total AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	0	50	172	0	95	16	1193	54	30	3100	5
Future Volume (vph)	18	0	50	172	0	95	16	1193	54	30	3100	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	15.0		0.0	15.0		0.0	15.0		15.0	15.0		15.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.850			0.850				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1583	0	1770	1583	0	1770	3539	1583	1770	3539	1583
Flt Permitted	0.646			0.722			0.038			0.181		
Satd. Flow (perm)	1203	1583	0	1345	1583	0	71	3539	1583	337	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		19			96				22			19
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		42.5			50.2			458.5			731.4	
Travel Time (s)		3.1			3.6			27.5			43.9	
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
Adj. Flow (vph)	20	0	54	187	0	103	17	1297	59	33	3370	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	54	0	187	103	0	17	1297	59	33	3370	5
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2026 Future Total AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		8	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	35.5	35.5		35.5	35.5		35.5	35.5	35.5	35.5	35.5	35.5
Total Split (s)	35.5	35.5		35.5	35.5		104.5	104.5	104.5	104.5	104.5	104.5
Total Split (%)	25.4%	25.4%		25.4%	25.4%		74.6%	74.6%	74.6%	74.6%	74.6%	74.6%
Maximum Green (s)	30.0	30.0		30.0	30.0		99.0	99.0	99.0	99.0	99.0	99.0
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.2	2.2		2.2	2.2		1.8	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	23.0	23.0		23.0	23.0		23.0	23.0	23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	0
Act Effect Green (s)	23.9	23.9		23.9	23.9		105.1	105.1	105.1	105.1	105.1	105.1
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.75	0.75	0.75	0.75	0.75	0.75
v/c Ratio	0.10	0.19		0.82	0.30		0.32	0.49	0.05	0.13	1.27	0.00
Control Delay	47.2	34.0		81.9	12.2		34.4	10.4	6.2	4.4	136.9	0.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.2	34.0		81.9	12.2		34.4	10.4	6.2	4.4	136.9	0.0
LOS	D	C		F	B		C	B	A	A	F	A
Approach Delay		37.6			57.1			10.6			135.4	
Approach LOS		D			E			B			F	
Queue Length 50th (m)	4.9	8.7		52.8	1.7		1.5	71.2	2.5	1.9	~652.2	0.0
Queue Length 95th (m)	12.3	20.8		78.5	17.7		m5.2	127.4	m11.1	m2.3	m#590.6	m0.0
Internal Link Dist (m)		18.5			26.2			434.5			707.4	
Turn Bay Length (m)	15.0			15.0			15.0		15.0	15.0		15.0
Base Capacity (vph)	257	354		288	414		53	2657	1193	253	2657	1193
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.15		0.65	0.25		0.32	0.49	0.05	0.13	1.27	0.00

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 85 (61%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.27

Intersection Signal Delay: 96.3

Intersection LOS: F

Intersection Capacity Utilization 111.1%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Lanes, Volumes, Timings
 2: Bronte Road & Saw Whet Boulevard

2026 Future Total AM Peak Hour
 1354 Bronte

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Bronte Road & Saw Whet Boulevard



HCM Signalized Intersection Capacity Analysis

2: Bronte Road & Saw Whet Boulevard

2026 Future Total AM Peak Hour

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	0	50	172	0	95	16	1193	54	30	3100	5
Future Volume (vph)	18	0	50	172	0	95	16	1193	54	30	3100	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85		1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1583		1770	1583		1770	3539	1583	1770	3539	1583
Flt Permitted	0.65	1.00		0.72	1.00		0.04	1.00	1.00	0.18	1.00	1.00
Satd. Flow (perm)	1203	1583		1345	1583		71	3539	1583	337	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	0	54	187	0	103	17	1297	59	33	3370	5
RTOR Reduction (vph)	0	16	0	0	80	0	0	0	5	0	0	1
Lane Group Flow (vph)	20	38	0	187	23	0	17	1297	54	33	3370	4
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	23.9	23.9		23.9	23.9		105.1	105.1	105.1	105.1	105.1	105.1
Effective Green, g (s)	23.9	23.9		23.9	23.9		105.1	105.1	105.1	105.1	105.1	105.1
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.75	0.75	0.75	0.75	0.75	0.75
Clearance Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	205	270		229	270		53	2656	1188	252	2656	1188
v/s Ratio Prot		0.02			0.01			0.37			c0.95	
v/s Ratio Perm	0.02			c0.14			0.24		0.03	0.10		0.00
v/c Ratio	0.10	0.14		0.82	0.09		0.32	0.49	0.05	0.13	1.27	0.00
Uniform Delay, d1	49.0	49.3		55.9	48.9		5.7	6.9	4.5	4.8	17.5	4.4
Progression Factor	1.00	1.00		1.00	1.00		1.88	1.32	1.63	0.68	0.54	0.53
Incremental Delay, d2	0.2	0.2		19.7	0.1		13.0	0.5	0.1	0.1	121.3	0.0
Delay (s)	49.2	49.6		75.6	49.0		23.8	9.6	7.4	3.4	130.7	2.3
Level of Service	D	D		E	D		C	A	A	A	F	A
Approach Delay (s)		49.5			66.2			9.7			129.2	
Approach LOS		D			E			A			F	
Intersection Summary												
HCM 2000 Control Delay			92.6			HCM 2000 Level of Service				F		
HCM 2000 Volume to Capacity ratio			1.18									
Actuated Cycle Length (s)			140.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			111.1%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2026 Future Total AM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	1	161	0	65	0	1245	78	149	3162	0
Future Volume (vph)	1	0	1	161	0	65	0	1245	78	149	3162	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		40.0	35.0		30.0	70.0		0.0
Storage Lanes	0		0	1		1	1		1	1		0
Taper Length (m)	7.5			7.5			20.0			60.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor		0.99				0.98			0.98			
Frt		0.932				0.850			0.850			
Flt Protected		0.976		0.950						0.950		
Satd. Flow (prot)	0	1680	0	1530	0	1392	1863	3406	1439	1770	3471	0
Flt Permitted		0.976		0.757						0.155		
Satd. Flow (perm)	0	1680	0	1219	0	1368	1863	3406	1406	289	3471	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		54				67			56			
Link Speed (k/h)		20			20			60			60	
Link Distance (m)		78.7			109.0			218.2			458.5	
Travel Time (s)		14.2			19.6			13.1			27.5	
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	2%	18%	2%	16%	2%	6%	10%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Adj. Flow (vph)	1	0	1	166	0	67	0	1284	80	154	3260	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2	0	166	0	67	0	1284	80	154	3260	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.03	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1		1	1	2	1	1	2	
Detector Template	Left	Thru		Left		Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0		2.0		2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0		2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4						9.4			9.4	
Detector 2 Size(m)		0.6						0.6			0.6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2026 Future Total AM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Perm	NA		Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4			8		8	2		2	6		
Detector Phase	4	4		8		8	2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0		10.0	15.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	24.2	24.2		35.2		35.2	34.9	34.9	34.9	9.5	34.9	
Total Split (s)	35.2	35.2		35.2		35.2	88.2	88.2	88.2	16.6	104.8	
Total Split (%)	25.1%	25.1%		25.1%		25.1%	63.0%	63.0%	63.0%	11.9%	74.9%	
Maximum Green (s)	29.0	29.0		29.0		29.0	82.3	82.3	82.3	12.6	98.9	
Yellow Time (s)	3.1	3.1		3.1		3.1	3.7	3.7	3.7	3.0	3.7	
All-Red Time (s)	3.1	3.1		3.1		3.1	2.2	2.2	2.2	1.0	2.2	
Lost Time Adjust (s)		0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.2		6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?							Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0		3.0	3.6	3.6	3.6	3.0	3.6	
Recall Mode	None	None		None		None	C-Max	C-Max	C-Max	None	C-Max	
Walk Time (s)				7.0		7.0	7.0	7.0	7.0		7.0	
Flash Dont Walk (s)				22.0		22.0	22.0	22.0	22.0		22.0	
Pedestrian Calls (#/hr)				0		0	0	0	0		0	
Act Effect Green (s)		23.3		23.3		23.3		91.8	91.8	106.5	104.6	
Actuated g/C Ratio		0.17		0.17		0.17		0.66	0.66	0.76	0.75	
v/c Ratio		0.01		0.82		0.24		0.58	0.09	0.49	1.26	
Control Delay		0.0		85.8		12.2		15.6	4.5	3.3	128.7	
Queue Delay		0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay		0.0		85.8		12.2		15.6	4.5	3.3	128.7	
LOS		A		F		B		B	A	A	F	
Approach Delay					64.6			15.0			123.0	
Approach LOS					E			B			F	
Queue Length 50th (m)		0.0		46.9		0.0		103.6	2.3	3.0	~628.5	
Queue Length 95th (m)		0.0		71.9		13.4		145.1	10.1	m2.6 m	#441.8	
Internal Link Dist (m)		54.7			85.0			194.2			434.5	
Turn Bay Length (m)						40.0			30.0	70.0		
Base Capacity (vph)		390		252		336		2232	940	353	2594	
Starvation Cap Reductn		0		0		0		0	0	0	0	
Spillback Cap Reductn		0		0		0		0	0	0	0	
Storage Cap Reductn		0		0		0		0	0	0	0	
Reduced v/c Ratio		0.01		0.66		0.20		0.58	0.09	0.44	1.26	

Intersection Summary

Area Type: Other
 Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 128.8 (92%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.26

Lanes, Volumes, Timings 3: Bronte Road & Driveway/Charles Cornwall Road

2026 Future Total AM Peak Hour
1354 Bronte

Intersection Signal Delay: 90.8

Intersection LOS: F

Intersection Capacity Utilization 128.7%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

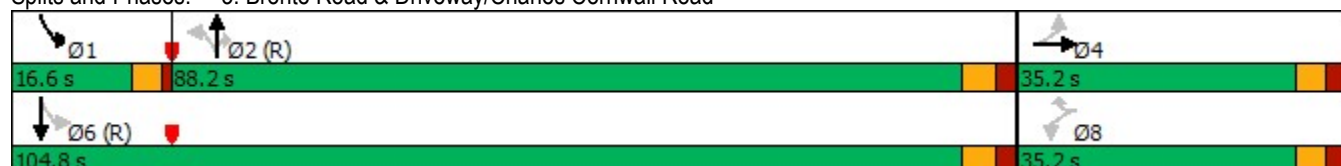
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Bronte Road & Driveway/Charles Cornwall Road



HCM Signalized Intersection Capacity Analysis

3: Bronte Road & Driveway/Charles Cornwall Road

2026 Future Total AM Peak Hour
1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	1	161	0	65	0	1245	78	149	3162	0
Future Volume (vph)	1	0	1	161	0	65	0	1245	78	149	3162	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.2		6.2		6.2		5.9	5.9	4.0	5.9	
Lane Util. Factor		1.00		1.00		1.00		0.95	1.00	1.00	0.95	
Frpb, ped/bikes		0.99		1.00		0.98		1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00		1.00		1.00		1.00	1.00	1.00	1.00	
Frt		0.93		1.00		0.85		1.00	0.85	1.00	1.00	
Flt Protected		0.98		0.95		1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1679		1530		1366		3406	1406	1770	3471	
Flt Permitted		0.98		0.76		1.00		1.00	1.00	0.15	1.00	
Satd. Flow (perm)		1679		1218		1366		3406	1406	288	3471	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	1	0	1	166	0	67	0	1284	80	154	3260	0
RTOR Reduction (vph)	0	2	0	0	0	56	0	0	19	0	0	0
Lane Group Flow (vph)	0	0	0	166	0	11	0	1284	61	154	3260	0
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	2%	2%	2%	18%	2%	16%	2%	6%	10%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Turn Type	Perm	NA		Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		23.3		23.3		23.3		91.7	91.7	104.6	104.6	
Effective Green, g (s)		23.3		23.3		23.3		91.7	91.7	104.6	104.6	
Actuated g/C Ratio		0.17		0.17		0.17		0.66	0.66	0.75	0.75	
Clearance Time (s)		6.2		6.2		6.2		5.9	5.9	4.0	5.9	
Vehicle Extension (s)		3.0		3.0		3.0		3.6	3.6	3.0	3.6	
Lane Grp Cap (vph)		279		202		227		2230	920	309	2593	
v/s Ratio Prot								0.38		0.03	c0.94	
v/s Ratio Perm		0.00		c0.14		0.01			0.04	0.34		
v/c Ratio		0.00		0.82		0.05		0.58	0.07	0.50	1.26	
Uniform Delay, d1		48.6		56.3		49.0		13.4	8.7	9.2	17.7	
Progression Factor		1.00		1.00		1.00		1.00	1.00	0.55	0.27	
Incremental Delay, d2		0.0		22.8		0.1		1.1	0.1	0.1	116.1	
Delay (s)		48.7		79.1		49.1		14.5	8.8	5.2	120.9	
Level of Service		D		E		D		B	A	A	F	
Approach Delay (s)		48.7			70.5			14.1			115.7	
Approach LOS		D			E			B			F	
Intersection Summary												
HCM 2000 Control Delay			85.9				HCM 2000 Level of Service			F		
HCM 2000 Volume to Capacity ratio			1.22									
Actuated Cycle Length (s)			140.0				Sum of lost time (s)			16.1		
Intersection Capacity Utilization			128.7%				ICU Level of Service			H		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2026 Future Total PM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	74	114	253	155	252	294	1975	381	241	1236	18
Future Volume (vph)	7	74	114	253	155	252	294	1975	381	241	1236	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0		70.0	140.0		0.0	135.0		80.0	180.0		50.0
Storage Lanes	1		1	2		1	1		1	1		1
Taper Length (m)	65.0			100.0			70.0			70.0		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99		0.98			0.97			0.97			0.97
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	3400	1863	1583	1770	3539	1558	1770	3471	1473
Flt Permitted	0.653			0.561			0.112			0.054		
Satd. Flow (perm)	1208	1863	1550	2008	1863	1542	209	3539	1518	101	3471	1435
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			121			185			232			122
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		296.6			291.2			731.4			120.4	
Travel Time (s)		17.8			17.5			43.9			7.2	
Confl. Peds. (#/hr)	6					6	1		1	1		1
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%	2%	2%	2%	2%	4%	7%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Adj. Flow (vph)	7	79	121	269	165	268	313	2101	405	256	1315	19
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	79	121	269	165	268	313	2101	405	256	1315	19
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.2			7.2			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.02	1.00	1.00	1.03
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2026 Future Total PM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	10.0	10.0	6.0	10.0	10.0	6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	10.5	36.7	36.7	10.5	36.7	36.7	10.5	36.5	36.5	10.5	36.5	36.5
Total Split (s)	11.2	23.8	23.8	19.6	32.2	32.2	12.6	84.0	84.0	12.6	84.0	84.0
Total Split (%)	8.0%	17.0%	17.0%	14.0%	23.0%	23.0%	9.0%	60.0%	60.0%	9.0%	60.0%	60.0%
Maximum Green (s)	7.2	17.1	17.1	15.6	25.5	25.5	8.6	77.5	77.5	8.6	77.5	77.5
Yellow Time (s)	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7
All-Red Time (s)	1.0	3.0	3.0	1.0	3.0	3.0	1.0	2.8	2.8	1.0	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)					7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)					23.0	23.0		23.0	23.0		23.0	23.0
Pedestrian Calls (#/hr)					6	6		1	1		1	1
Act Effct Green (s)	21.2	12.3	12.3	33.0	28.2	28.2	95.0	77.5	77.5	95.0	77.5	77.5
Actuated g/C Ratio	0.15	0.09	0.09	0.24	0.20	0.20	0.68	0.55	0.55	0.68	0.55	0.55
v/c Ratio	0.03	0.48	0.49	0.44	0.44	0.59	1.02	1.07	0.43	1.04	0.68	0.02
Control Delay	39.1	70.3	16.5	46.0	53.1	21.6	61.2	54.2	4.2	107.4	24.8	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.1	70.3	16.5	46.0	53.1	21.6	61.2	54.2	4.2	107.4	24.8	0.1
LOS	D	E	B	D	D	C	E	D	A	F	C	A
Approach Delay		37.8			38.4			47.8			37.8	
Approach LOS		D			D			D			D	
Queue Length 50th (m)	1.6	22.5	0.0	33.9	41.8	20.3	60.9	~353.7	15.2	~61.0	140.0	0.0
Queue Length 95th (m)	5.6	38.7	19.3	44.3	67.8	53.5	m#59.6	m110.5	m12.5	#145.0	165.6	0.0
Internal Link Dist (m)		272.6			267.2			707.4			96.4	
Turn Bay Length (m)	70.0		70.0	140.0			135.0		80.0	180.0		50.0
Base Capacity (vph)	220	227	295	629	375	458	308	1959	943	247	1921	848
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.35	0.41	0.43	0.44	0.59	1.02	1.07	0.43	1.04	0.68	0.02

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 35 (25%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 145
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings 1: Bronte Road & Upper Middle Road

2026 Future Total PM Peak Hour
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Maximum v/c Ratio: 1.07

Intersection Signal Delay: 43.2

Intersection LOS: D

Intersection Capacity Utilization 98.2%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Bronte Road & Upper Middle Road

 Ø1	 Ø2 (R)	 Ø3	 Ø4
12.6 s	84 s	19.6 s	23.8 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
12.6 s	84 s	11.2 s	32.2 s

HCM Signalized Intersection Capacity Analysis

1: Bronte Road & Upper Middle Road

2026 Future Total PM Peak Hour

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	74	114	253	155	252	294	1975	381	241	1236	18
Future Volume (vph)	7	74	114	253	155	252	294	1975	381	241	1236	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1762	1863	1548	3400	1863	1543	1770	3539	1518	1770	3471	1435
Flt Permitted	0.65	1.00	1.00	0.56	1.00	1.00	0.11	1.00	1.00	0.05	1.00	1.00
Satd. Flow (perm)	1211	1863	1548	2007	1863	1543	208	3539	1518	100	3471	1435
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	7	79	121	269	165	268	313	2101	405	256	1315	19
RTOR Reduction (vph)	0	0	108	0	0	148	0	0	109	0	0	9
Lane Group Flow (vph)	7	79	13	269	165	120	313	2101	296	256	1315	10
Confl. Peds. (#/hr)	6						6	1		1		1
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%	2%	2%	2%	2%	4%	7%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	16.9	15.5	15.5	33.6	28.2	28.2	89.2	74.2	74.2	89.2	74.2	74.2
Effective Green, g (s)	16.9	15.5	15.5	33.6	28.2	28.2	89.2	74.2	74.2	89.2	74.2	74.2
Actuated g/C Ratio	0.12	0.11	0.11	0.24	0.20	0.20	0.64	0.53	0.53	0.64	0.53	0.53
Clearance Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	151	206	171	621	375	310	299	1875	804	242	1839	760
v/s Ratio Prot	0.00	0.04		c0.04	c0.09		0.11	c0.59		c0.11	0.38	
v/s Ratio Perm	0.01		0.01	0.06		0.08	0.55		0.19	0.56		0.01
v/c Ratio	0.05	0.38	0.08	0.43	0.44	0.39	1.05	1.12	0.37	1.06	0.72	0.01
Uniform Delay, d1	54.3	57.8	55.8	44.0	49.0	48.4	33.7	32.9	19.2	49.2	24.9	15.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.85	0.60	0.57	1.00	1.00	1.00
Incremental Delay, d2	0.1	1.2	0.2	0.5	0.8	0.8	29.7	55.0	0.1	73.9	2.4	0.0
Delay (s)	54.5	59.0	56.0	44.5	49.8	49.2	92.2	74.8	11.0	123.1	27.3	15.6
Level of Service	D	E	E	D	D	D	F	E	B	F	C	B
Approach Delay (s)		57.1			47.5			67.5			42.6	
Approach LOS		E			D			E			D	
Intersection Summary												
HCM 2000 Control Delay			57.0				HCM 2000 Level of Service			E		
HCM 2000 Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			140.0				Sum of lost time (s)			21.2		
Intersection Capacity Utilization			98.2%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2026 Future Total PM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	0	31	106	0	60	52	2652	177	99	1518	18
Future Volume (vph)	11	0	31	106	0	60	52	2652	177	99	1518	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	15.0		0.0	15.0		0.0	15.0		15.0	15.0		15.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.850			0.850				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1583	0	1770	1583	0	1770	3539	1583	1770	3539	1583
Flt Permitted	0.715			0.735			0.140			0.040		
Satd. Flow (perm)	1332	1583	0	1369	1583	0	261	3539	1583	75	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		55			60				55			19
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		42.5			50.2			458.5			731.4	
Travel Time (s)		3.1			3.6			27.5			43.9	
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
Adj. Flow (vph)	12	0	34	115	0	65	57	2883	192	108	1650	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	12	34	0	115	65	0	57	2883	192	108	1650	20
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		6

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2026 Future Total PM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		8	8		2	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		15.0	15.0	15.0	5.0	15.0	15.0
Minimum Split (s)	35.5	35.5		35.5	35.5		35.5	35.5	35.5	9.5	35.5	35.5
Total Split (s)	35.5	35.5		35.5	35.5		95.0	95.0	95.0	9.5	104.5	104.5
Total Split (%)	25.4%	25.4%		25.4%	25.4%		67.9%	67.9%	67.9%	6.8%	74.6%	74.6%
Maximum Green (s)	30.0	30.0		30.0	30.0		89.5	89.5	89.5	5.0	99.0	99.0
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.5	3.7	3.7
All-Red Time (s)	2.2	2.2		2.2	2.2		1.8	1.8	1.8	1.0	1.8	1.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	4.5	5.5	5.5
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Max	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)	23.0	23.0		23.0	23.0		23.0	23.0	23.0		23.0	23.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0		0	0
Act Effect Green (s)	17.1	17.1		17.1	17.1		96.8	96.8	96.8	112.9	111.9	111.9
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.69	0.69	0.69	0.81	0.80	0.80
v/c Ratio	0.07	0.14		0.69	0.27		0.32	1.18	0.17	0.57	0.58	0.02
Control Delay	52.2	6.0		79.0	16.4		3.2	100.1	1.1	26.9	16.3	4.9
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.2	6.0		79.0	16.4		3.2	100.1	1.1	26.9	16.3	4.9
LOS	D	A		E	B		A	F	A	C	B	A
Approach Delay		18.0			56.4			92.3			16.8	
Approach LOS		B			E			F			B	
Queue Length 50th (m)	3.1	0.0		32.6	1.3		3.2	~546.0	5.8	16.2	166.7	1.1
Queue Length 95th (m)	9.3	5.0		51.9	15.0		m1.9	m#433.9	m2.6	m31.5	220.4	m2.6
Internal Link Dist (m)		18.5			26.2			434.5			707.4	
Turn Bay Length (m)	15.0			15.0			15.0		15.0	15.0		15.0
Base Capacity (vph)	285	382		293	386		180	2446	1111	189	2829	1269
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.09		0.39	0.17		0.32	1.18	0.17	0.57	0.58	0.02

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 145

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.18

Intersection Signal Delay: 64.2

Intersection LOS: E

Intersection Capacity Utilization 104.0%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Lanes, Volumes, Timings
 2: Bronte Road & Saw Whet Boulevard

2026 Future Total PM Peak Hour
 1354 Bronte

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Bronte Road & Saw Whet Boulevard



HCM Signalized Intersection Capacity Analysis

2: Bronte Road & Saw Whet Boulevard

2026 Future Total PM Peak Hour

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	0	31	106	0	60	52	2652	177	99	1518	18
Future Volume (vph)	11	0	31	106	0	60	52	2652	177	99	1518	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	4.5	5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85		1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1583		1770	1583		1770	3539	1583	1770	3539	1583
Flt Permitted	0.71	1.00		0.73	1.00		0.14	1.00	1.00	0.04	1.00	1.00
Satd. Flow (perm)	1331	1583		1369	1583		261	3539	1583	74	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	0	34	115	0	65	57	2883	192	108	1650	20
RTOR Reduction (vph)	0	30	0	0	53	0	0	0	17	0	0	4
Lane Group Flow (vph)	12	4	0	115	12	0	57	2883	175	108	1650	16
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	17.1	17.1		17.1	17.1		96.7	96.7	96.7	111.9	111.9	111.9
Effective Green, g (s)	17.1	17.1		17.1	17.1		96.7	96.7	96.7	111.9	111.9	111.9
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.69	0.69	0.69	0.80	0.80	0.80
Clearance Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	4.5	5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	162	193		167	193		180	2444	1093	188	2828	1265
v/s Ratio Prot		0.00			0.01			c0.81		0.04	c0.47	
v/s Ratio Perm	0.01			c0.08			0.22		0.11	0.42		0.01
v/c Ratio	0.07	0.02		0.69	0.06		0.32	1.18	0.16	0.57	0.58	0.01
Uniform Delay, d1	54.4	54.1		58.9	54.4		8.6	21.6	7.5	45.7	5.3	2.8
Progression Factor	1.00	1.00		1.00	1.00		0.24	0.75	0.17	0.68	2.63	2.90
Incremental Delay, d2	0.2	0.0		11.2	0.1		0.4	81.3	0.0	3.4	0.7	0.0
Delay (s)	54.6	54.1		70.1	54.5		2.5	97.4	1.3	34.5	14.6	8.3
Level of Service	D	D		E	D		A	F	A	C	B	A
Approach Delay (s)		54.3			64.5			89.8			15.8	
Approach LOS		D			E			F			B	
Intersection Summary												
HCM 2000 Control Delay	63.0			HCM 2000 Level of Service			E					
HCM 2000 Volume to Capacity ratio	1.07											
Actuated Cycle Length (s)	140.0			Sum of lost time (s)			15.5					
Intersection Capacity Utilization	104.0%			ICU Level of Service			G					
Analysis Period (min)	15											
c Critical Lane Group												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2026 Future Total PM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	138	0	110	1	2778	175	89	1602	0
Future Volume (vph)	0	0	0	138	0	110	1	2778	175	89	1602	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		40.0	35.0		30.0	70.0		0.0
Storage Lanes	0		0	1		1	1		1	1		0
Taper Length (m)	7.5			7.5			20.0			60.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor						0.98			0.98			
Frt						0.850			0.850			
Flt Protected				0.950			0.950			0.950		
Satd. Flow (prot)	0	1863	0	1770	0	1583	1770	3505	1388	1770	3471	0
Flt Permitted				0.757			0.132			0.040		
Satd. Flow (perm)	0	1863	0	1410	0	1557	246	3505	1356	75	3471	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						89			56			
Link Speed (k/h)		20			20			60			60	
Link Distance (m)		78.7			109.0			218.2			458.5	
Travel Time (s)		14.2			19.6			13.1			27.5	
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	3%	14%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Adj. Flow (vph)	0	0	0	142	0	113	1	2864	180	92	1652	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	142	0	113	1	2864	180	92	1652	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.03	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1		1	1	2	1	1	2	
Detector Template	Left	Thru		Left		Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0		2.0		2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0		2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4						9.4			9.4	
Detector 2 Size(m)		0.6						0.6			0.6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2026 Future Total PM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)	0.0							0.0		0.0		
Turn Type				Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases	4							2		1 6		
Permitted Phases	4			8			8 2	2		6		
Detector Phase	4	4	8		8		2 2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0		10.0		15.0 15.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	24.2	24.2	35.2		35.2		34.9 34.9	34.9	34.9	9.5	34.9	
Total Split (s)	40.6	40.6	40.6		40.6		88.2 88.2	88.2	88.2	11.2	99.4	
Total Split (%)	29.0%	29.0%	29.0%		29.0%		63.0% 63.0%	63.0%	63.0%	8.0%	71.0%	
Maximum Green (s)	34.4	34.4	34.4		34.4		82.3 82.3	82.3	82.3	7.2	93.5	
Yellow Time (s)	3.1	3.1	3.1		3.1		3.7 3.7	3.7	3.7	3.0	3.7	
All-Red Time (s)	3.1	3.1	3.1		3.1		2.2 2.2	2.2	2.2	1.0	2.2	
Lost Time Adjust (s)	0.0		0.0		0.0		0.0 0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.2		6.2		6.2		5.9 5.9	5.9	5.9	4.0	5.9	
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?							Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0		3.0		3.6 3.6	3.6	3.6	3.0	3.6	
Recall Mode	None	None	None		None		C-Max C-Max	C-Max	C-Max	None	C-Max	
Walk Time (s)				7.0		7.0		7.0 7.0	7.0	7.0		
Flash Dont Walk (s)				22.0		22.0		22.0 22.0	22.0	22.0		
Pedestrian Calls (#/hr)				0		0		0 0	0	0		
Act Effct Green (s)				19.4		19.4		95.7 95.7	95.7	110.4	108.5	
Actuated g/C Ratio				0.14		0.14		0.68 0.68	0.68	0.79	0.78	
v/c Ratio				0.73		0.39		0.01 1.20	0.19	0.56	0.61	
Control Delay				77.9		18.8		10.0 115.7	7.1	36.9	8.6	
Queue Delay				0.0		0.0		0.0 0.0	0.0	0.0	0.0	
Total Delay				77.9		18.8		10.0 115.7	7.1	36.9	8.6	
LOS				E		B		A F	A	D	A	
Approach Delay					51.7		109.3				10.1	
Approach LOS					D		F				B	
Queue Length 50th (m)				40.2		6.2 0.1		~527.4	11.4	14.5	51.4	
Queue Length 95th (m)				61.0		23.7 0.9		#613.4	27.7	34.0	138.0	
Internal Link Dist (m)	54.7				85.0		194.2				434.5	
Turn Bay Length (m)						40.0	35.0	30.0		70.0		
Base Capacity (vph)				346		449	168	2396	944	169	2689	
Starvation Cap Reductn				0		0	0	0	0	0	0	
Spillback Cap Reductn				0		0	0	0	0	0	0	
Storage Cap Reductn				0		0	0	0	0	0	0	
Reduced v/c Ratio				0.41		0.25	0.01	1.20	0.19	0.54	0.61	

Intersection Summary

Area Type: Other
 Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 103.6 (74%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.20

Lanes, Volumes, Timings 3: Bronte Road & Driveway/Charles Cornwall Road

2026 Future Total PM Peak Hour
1354 Bronte

Intersection Signal Delay: 72.1

Intersection LOS: E

Intersection Capacity Utilization 95.2%

ICU Level of Service F

Analysis Period (min) 15

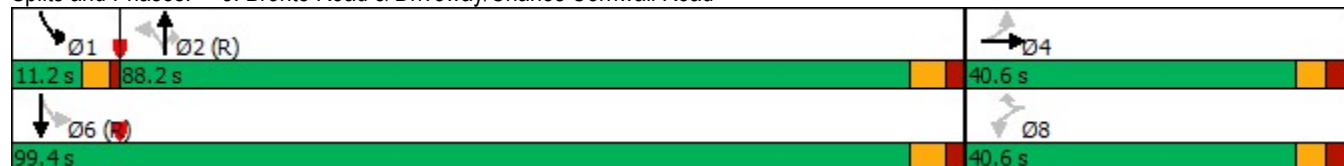
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 3: Bronte Road & Driveway/Charles Cornwall Road



HCM Signalized Intersection Capacity Analysis

3: Bronte Road & Driveway/Charles Cornwall Road

2026 Future Total PM Peak Hour
1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔		↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	0	0	0	138	0	110	1	2778	175	89	1602	0
Future Volume (vph)	0	0	0	138	0	110	1	2778	175	89	1602	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Lane Util. Factor				1.00		1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes				1.00		0.98	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes				1.00		1.00	1.00	1.00	1.00	1.00	1.00	
Frt				1.00		0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95		1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1770		1552	1770	3505	1357	1770	3471	
Flt Permitted				0.76		1.00	0.13	1.00	1.00	0.04	1.00	
Satd. Flow (perm)				1410		1552	246	3505	1357	75	3471	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	142	0	113	1	2864	180	92	1652	0
RTOR Reduction (vph)	0	0	0	0	0	77	0	0	18	0	0	0
Lane Group Flow (vph)	0	0	0	142	0	36	1	2864	162	92	1652	0
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	3%	14%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Turn Type				Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4					2			1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)				19.4		19.4	95.7	95.7	95.7	108.5	108.5	
Effective Green, g (s)				19.4		19.4	95.7	95.7	95.7	108.5	108.5	
Actuated g/C Ratio				0.14		0.14	0.68	0.68	0.68	0.78	0.78	
Clearance Time (s)				6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Vehicle Extension (s)				3.0		3.0	3.6	3.6	3.6	3.0	3.6	
Lane Grp Cap (vph)				195		215	168	2395	927	164	2690	
v/s Ratio Prot								c0.82		0.04	c0.48	
v/s Ratio Perm				c0.10		0.02	0.00		0.12	0.40		
v/c Ratio				0.73		0.17	0.01	1.20	0.18	0.56	0.61	
Uniform Delay, d1				57.8		53.2	7.0	22.1	8.0	42.6	6.8	
Progression Factor				1.00		1.00	1.00	1.00	1.00	1.21	1.02	
Incremental Delay, d2				12.7		0.4	0.1	92.5	0.4	3.6	0.9	
Delay (s)				70.5		53.6	7.1	114.6	8.4	55.2	7.8	
Level of Service				E		D	A	F	A	E	A	
Approach Delay (s)		0.0			63.0			108.3			10.3	
Approach LOS		A			E			F			B	
Intersection Summary												
HCM 2000 Control Delay			72.1									
HCM 2000 Volume to Capacity ratio			1.09									
Actuated Cycle Length (s)			140.0							16.1		
Intersection Capacity Utilization			95.2%							F		
Analysis Period (min)			15									
c Critical Lane Group												

Appendix K

2031 Future Background Conditions Synchro Worksheets

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2031 Future Background AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	203	390	526	88	196	72	1073	277	289	2343	13
Future Volume (vph)	11	203	390	526	88	196	72	1073	277	289	2343	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0		70.0	140.0		0.0	135.0		80.0	180.0		50.0
Storage Lanes	1		1	2		1	1		1	1		1
Taper Length (m)	65.0			100.0			70.0			70.0		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	*0.80	1.00	1.00	*0.80	1.00
Ped Bike Factor	0.99		0.98			0.97			0.96	1.00		0.97
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1656	1863	1583	3433	1792	1553	1719	4222	1485	1770	4302	1336
Flt Permitted	0.698			0.422			0.068			0.124		
Satd. Flow (perm)	1200	1863	1556	1525	1792	1503	123	4222	1424	231	4302	1289
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			121			202			279			91
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		296.6			291.2			731.4			120.4	
Travel Time (s)		17.8			17.5			43.9			7.2	
Confl. Peds. (#/hr)	11					11	5		7	7		5
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	9%	2%	2%	2%	6%	4%	5%	8%	7%	2%	6%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Adj. Flow (vph)	11	209	402	542	91	202	74	1106	286	298	2415	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	209	402	542	91	202	74	1106	286	298	2415	13
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.2			7.2			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.02	1.00	1.00	1.03
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2031 Future Background AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	10.0	10.0	6.0	10.0	10.0	6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	10.5	36.7	36.7	10.5	36.7	36.7	10.5	36.5	36.5	10.5	36.5	36.5
Total Split (s)	10.5	36.7	36.7	12.2	38.4	38.4	10.5	58.5	58.5	32.6	80.6	80.6
Total Split (%)	7.5%	26.2%	26.2%	8.7%	27.4%	27.4%	7.5%	41.8%	41.8%	23.3%	57.6%	57.6%
Maximum Green (s)	6.5	30.0	30.0	8.2	31.7	31.7	6.5	52.0	52.0	28.6	74.1	74.1
Yellow Time (s)	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7
All-Red Time (s)	1.0	3.0	3.0	1.0	3.0	3.0	1.0	2.8	2.8	1.0	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)					7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)					23.0	23.0		23.0	23.0		23.0	23.0
Pedestrian Calls (#/hr)					11	11		7	7		5	5
Act Effct Green (s)	37.9	29.0	29.0	43.0	37.0	37.0	69.9	61.0	61.0	88.1	77.2	77.2
Actuated g/C Ratio	0.27	0.21	0.21	0.31	0.26	0.26	0.50	0.44	0.44	0.63	0.55	0.55
v/c Ratio	0.03	0.54	0.96	0.94	0.19	0.37	0.55	0.60	0.37	0.80	1.02	0.02
Control Delay	33.1	55.1	73.4	67.9	42.5	7.7	49.8	28.2	9.5	39.9	55.0	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.1	55.1	73.4	67.9	42.5	7.7	49.8	28.2	9.5	39.9	55.0	0.1
LOS	C	E	E	E	D	A	D	C	A	D	D	A
Approach Delay		66.5			50.6			25.6			53.1	
Approach LOS		E			D			C			D	
Queue Length 50th (m)	2.2	54.4	85.4	65.7	19.6	0.0	6.5	91.6	29.1	49.2	~321.6	0.0
Queue Length 95th (m)	7.1	81.7	#151.2	#99.7	38.3	21.2	#27.0	129.3	36.2	81.6	#353.8	0.0
Internal Link Dist (m)		272.6			267.2			707.4			96.4	
Turn Bay Length (m)	70.0		70.0	140.0			135.0		80.0	180.0		50.0
Base Capacity (vph)	349	399	428	579	473	546	135	1840	778	460	2371	751
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.52	0.94	0.94	0.19	0.37	0.55	0.60	0.37	0.65	1.02	0.02

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 82.6 (59%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 145

Control Type: Actuated-Coordinated

Lanes, Volumes, Timings 1: Bronte Road & Upper Middle Road

2031 Future Background AM Peak Hour

1354 Bronte

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 47.1

Intersection LOS: D

Intersection Capacity Utilization 98.8%

ICU Level of Service F

Analysis Period (min) 15

* User Entered Value

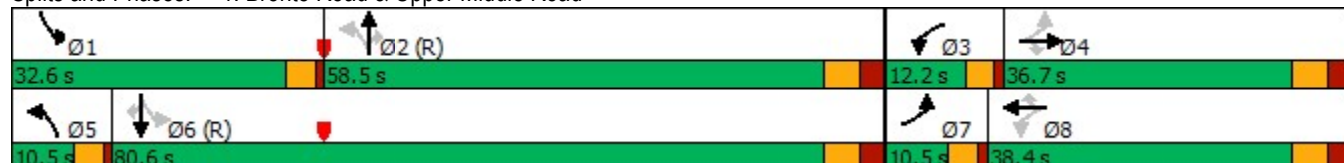
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Bronte Road & Upper Middle Road



HCM Signalized Intersection Capacity Analysis

1: Bronte Road & Upper Middle Road

2031 Future Background AM Peak Hour

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	203	390	526	88	196	72	1073	277	289	2343	13
Future Volume (vph)	11	203	390	526	88	196	72	1073	277	289	2343	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	*0.80	1.00	1.00	*0.80	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.96	1.00	1.00	0.97
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1641	1863	1556	3433	1792	1504	1719	4222	1425	1769	4302	1289
Flt Permitted	0.70	1.00	1.00	0.42	1.00	1.00	0.07	1.00	1.00	0.12	1.00	1.00
Satd. Flow (perm)	1205	1863	1556	1526	1792	1504	123	4222	1425	232	4302	1289
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	11	209	402	542	91	202	74	1106	286	298	2415	13
RTOR Reduction (vph)	0	0	94	0	0	149	0	0	162	0	0	6
Lane Group Flow (vph)	11	209	308	542	91	53	74	1106	124	298	2415	7
Confl. Peds. (#/hr)	11					11	5		7	7		5
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	9%	2%	2%	2%	6%	4%	5%	8%	7%	2%	6%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	34.0	31.4	31.4	43.6	37.0	37.0	63.9	58.7	58.7	83.2	74.0	74.0
Effective Green, g (s)	34.0	31.4	31.4	43.6	37.0	37.0	63.9	58.7	58.7	83.2	74.0	74.0
Actuated g/C Ratio	0.24	0.22	0.22	0.31	0.26	0.26	0.46	0.42	0.42	0.59	0.53	0.53
Clearance Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	300	417	348	586	473	397	115	1770	597	362	2273	681
v/s Ratio Prot	0.00	0.11		c0.05	0.05		0.02	0.26		c0.12	c0.56	
v/s Ratio Perm	0.01		0.20	c0.23		0.04	0.27		0.09	0.37		0.01
v/c Ratio	0.04	0.50	0.89	0.92	0.19	0.13	0.64	0.62	0.21	0.82	1.06	0.01
Uniform Delay, d1	40.4	47.5	52.6	47.0	39.9	39.3	32.8	32.0	25.9	28.4	33.0	15.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.56	0.84	2.28	1.00	1.00	1.00
Incremental Delay, d2	0.1	1.0	22.5	20.5	0.2	0.2	10.9	1.6	0.7	14.0	38.1	0.0
Delay (s)	40.4	48.4	75.1	67.5	40.1	39.4	61.9	28.6	59.7	42.4	71.1	15.7
Level of Service	D	D	E	E	D	D	E	C	E	D	E	B
Approach Delay (s)		65.5			57.8			36.3			67.7	
Approach LOS		E			E			D			E	
Intersection Summary												
HCM 2000 Control Delay			57.8									
HCM 2000 Volume to Capacity ratio			1.04									
Actuated Cycle Length (s)			140.0									
Intersection Capacity Utilization			98.8%									
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2031 Future Background AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	0	36	169	0	95	10	1311	52	30	3421	4
Future Volume (vph)	12	0	36	169	0	95	10	1311	52	30	3421	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	15.0		0.0	15.0		0.0	15.0		15.0	15.0		15.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.80	1.00	1.00	*0.80	1.00
Frt		0.850			0.850				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1583	0	1770	1583	0	1770	4471	1583	1770	4471	1583
Flt Permitted	0.644			0.732			0.038			0.127		
Satd. Flow (perm)	1200	1583	0	1364	1583	0	71	4471	1583	237	4471	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		19			74				24			19
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		42.5			50.2			458.5			731.4	
Travel Time (s)		3.1			3.6			27.5			43.9	
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
Adj. Flow (vph)	13	0	39	184	0	103	11	1425	57	33	3718	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	39	0	184	103	0	11	1425	57	33	3718	4
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2031 Future Background AM Peak Hour

1354 Bronte

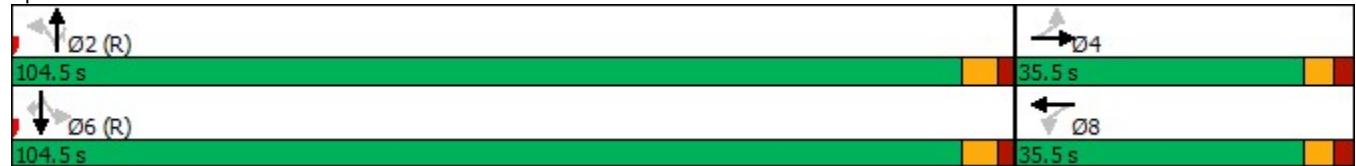
												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		8	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	35.5	35.5		35.5	35.5		35.5	35.5	35.5	35.5	35.5	35.5
Total Split (s)	35.5	35.5		35.5	35.5		104.5	104.5	104.5	104.5	104.5	104.5
Total Split (%)	25.4%	25.4%		25.4%	25.4%		74.6%	74.6%	74.6%	74.6%	74.6%	74.6%
Maximum Green (s)	30.0	30.0		30.0	30.0		99.0	99.0	99.0	99.0	99.0	99.0
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.2	2.2		2.2	2.2		1.8	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	23.0	23.0		23.0	23.0		23.0	23.0	23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	0
Act Effct Green (s)	23.5	23.5		23.5	23.5		105.5	105.5	105.5	105.5	105.5	105.5
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.75	0.75	0.75	0.75	0.75	0.75
v/c Ratio	0.06	0.14		0.81	0.32		0.21	0.42	0.05	0.19	1.10	0.00
Control Delay	46.5	29.3		80.8	19.1		24.7	9.3	5.8	5.2	61.5	0.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.5	29.3		80.8	19.1		24.7	9.3	5.8	5.2	61.5	0.0
LOS	D	C		F	B		C	A	A	A	E	A
Approach Delay		33.6			58.6			9.3			60.9	
Approach LOS		C			E			A			E	
Queue Length 50th (m)	3.2	5.0		51.9	7.2		0.8	56.4	2.2	1.8	~513.7	0.0
Queue Length 95th (m)	9.3	15.2		76.8	23.5		m4.2	113.4	12.0	m2.5	m#535.1	m0.0
Internal Link Dist (m)		18.5			26.2			434.5			707.4	
Turn Bay Length (m)	15.0			15.0			15.0		15.0	15.0		15.0
Base Capacity (vph)	257	354		292	397		53	3370	1199	178	3370	1197
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.11		0.63	0.26		0.21	0.42	0.05	0.19	1.10	0.00
Intersection Summary												
Area Type:	Other											
Cycle Length: 140												
Actuated Cycle Length: 140												
Offset: 80 (57%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green												
Natural Cycle: 150												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.10												
Intersection Signal Delay: 46.8						Intersection LOS: D						
Intersection Capacity Utilization 91.3%						ICU Level of Service F						
Analysis Period (min) 15												
* User Entered Value												

~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Bronte Road & Saw Whet Boulevard



HCM Signalized Intersection Capacity Analysis

2: Bronte Road & Saw Whet Boulevard

2031 Future Background AM Peak Hour

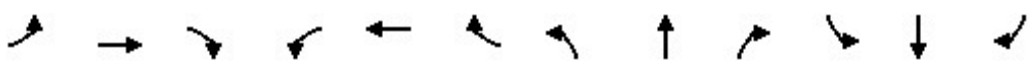
1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	0	36	169	0	95	10	1311	52	30	3421	4
Future Volume (vph)	12	0	36	169	0	95	10	1311	52	30	3421	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	*0.80	1.00	1.00	*0.80	1.00
Frt	1.00	0.85		1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1583		1770	1583		1770	4471	1583	1770	4471	1583
Flt Permitted	0.64	1.00		0.73	1.00		0.04	1.00	1.00	0.13	1.00	1.00
Satd. Flow (perm)	1200	1583		1363	1583		71	4471	1583	237	4471	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	0	39	184	0	103	11	1425	57	33	3718	4
RTOR Reduction (vph)	0	16	0	0	62	0	0	0	6	0	0	1
Lane Group Flow (vph)	13	23	0	184	41	0	11	1425	51	33	3718	3
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	23.5	23.5		23.5	23.5		105.5	105.5	105.5	105.5	105.5	105.5
Effective Green, g (s)	23.5	23.5		23.5	23.5		105.5	105.5	105.5	105.5	105.5	105.5
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.75	0.75	0.75	0.75	0.75	0.75
Clearance Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	201	265		228	265		53	3369	1192	178	3369	1192
v/s Ratio Prot		0.01			0.03			0.32			c0.83	
v/s Ratio Perm	0.01			c0.14			0.16		0.03	0.14		0.00
v/c Ratio	0.06	0.09		0.81	0.16		0.21	0.42	0.04	0.19	1.10	0.00
Uniform Delay, d1	49.0	49.2		56.1	49.8		5.0	6.2	4.4	4.9	17.2	4.3
Progression Factor	1.00	1.00		1.00	1.00		1.92	1.32	1.63	0.62	0.50	1.00
Incremental Delay, d2	0.1	0.1		18.5	0.3		7.8	0.3	0.1	1.0	49.0	0.0
Delay (s)	49.1	49.3		74.6	50.1		17.5	8.6	7.2	4.1	57.5	4.3
Level of Service	D	D		E	D		B	A	A	A	E	A
Approach Delay (s)		49.3			65.8			8.6			57.0	
Approach LOS		D			E			A			E	
Intersection Summary												
HCM 2000 Control Delay			44.5			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			1.05									
Actuated Cycle Length (s)			140.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			91.3%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2031 Future Background AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔		↔	↔	↑↑↑	↔	↔	↑↑↑	
Traffic Volume (vph)	1	0	1	161	0	65	0	1358	78	149	3452	0
Future Volume (vph)	1	0	1	161	0	65	0	1358	78	149	3452	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		40.0	35.0		30.0	70.0		0.0
Storage Lanes	0		0	1		1	1		1	1		0
Taper Length (m)	7.5			7.5			20.0			60.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.80	1.00	1.00	*0.80	0.91
Ped Bike Factor		0.99				0.98			0.98			
Frt		0.932				0.850			0.850			
Flt Protected		0.976		0.950						0.950		
Satd. Flow (prot)	0	1680	0	1530	0	1392	1863	4302	1439	1770	4385	0
Flt Permitted		0.976		0.757						0.114		
Satd. Flow (perm)	0	1680	0	1219	0	1368	1863	4302	1405	212	4385	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		54				67			56			
Link Speed (k/h)		20			20			60			60	
Link Distance (m)		78.7			109.0			218.2			458.5	
Travel Time (s)		14.2			19.6			13.1			27.5	
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	2%	18%	2%	16%	2%	6%	10%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Adj. Flow (vph)	1	0	1	166	0	67	0	1400	80	154	3559	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2	0	166	0	67	0	1400	80	154	3559	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.03	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1		1	1	2	1	1	2	
Detector Template	Left	Thru		Left		Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0		2.0		2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0		2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4						9.4			9.4	
Detector 2 Size(m)		0.6						0.6			0.6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2031 Future Background AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Perm	NA		Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4			8		8	2		2	6		
Detector Phase	4	4		8		8	2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0		10.0	15.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	24.2	24.2		35.2		35.2	34.9	34.9	34.9	9.5	34.9	
Total Split (s)	35.2	35.2		35.2		35.2	86.8	86.8	86.8	18.0	104.8	
Total Split (%)	25.1%	25.1%		25.1%		25.1%	62.0%	62.0%	62.0%	12.9%	74.9%	
Maximum Green (s)	29.0	29.0		29.0		29.0	80.9	80.9	80.9	14.0	98.9	
Yellow Time (s)	3.1	3.1		3.1		3.1	3.7	3.7	3.7	3.0	3.7	
All-Red Time (s)	3.1	3.1		3.1		3.1	2.2	2.2	2.2	1.0	2.2	
Lost Time Adjust (s)		0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.2		6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?							Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0		3.0	3.6	3.6	3.6	3.0	3.6	
Recall Mode	None	None		None		None	C-Max	C-Max	C-Max	None	C-Max	
Walk Time (s)				7.0		7.0	7.0	7.0	7.0		7.0	
Flash Dont Walk (s)				22.0		22.0	22.0	22.0	22.0		22.0	
Pedestrian Calls (#/hr)				0		0	0	0	0		0	
Act Effect Green (s)		23.3		23.3		23.3		91.3	91.3	106.5	104.6	
Actuated g/C Ratio		0.17		0.17		0.17		0.65	0.65	0.76	0.75	
v/c Ratio		0.01		0.82		0.24		0.50	0.09	0.58	1.09	
Control Delay		0.0		85.8		12.2		14.3	4.7	10.8	50.6	
Queue Delay		0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay		0.0		85.8		12.2		14.3	4.7	10.8	50.6	
LOS		A		F		B		B	A	B	D	
Approach Delay					64.6			13.8			48.9	
Approach LOS					E			B			D	
Queue Length 50th (m)		0.0		46.9		0.0		82.6	2.3	0.0	~498.5	
Queue Length 95th (m)		0.0		71.9		13.4		118.0	10.6	m0.0 m	#438.5	
Internal Link Dist (m)		54.7			85.0			194.2			434.5	
Turn Bay Length (m)						40.0			30.0	70.0		
Base Capacity (vph)		390		252		336		2804	935	317	3277	
Starvation Cap Reductn		0		0		0		0	0	0	0	
Spillback Cap Reductn		0		0		0		0	0	0	0	
Storage Cap Reductn		0		0		0		0	0	0	0	
Reduced v/c Ratio		0.01		0.66		0.20		0.50	0.09	0.49	1.09	

Intersection Summary

Area Type: Other
 Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 128.8 (92%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.09

Intersection Signal Delay: 40.0

Intersection LOS: D

Intersection Capacity Utilization 108.0%

ICU Level of Service G

Analysis Period (min) 15

* User Entered Value

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Bronte Road & Driveway/Charles Cornwall Road

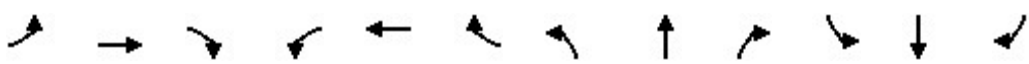
 Ø1	 Ø2 (R)	 Ø4
18 s	86.8 s	35.2 s
 Ø6 (R)		 Ø8
104.8 s		35.2 s

HCM Signalized Intersection Capacity Analysis

3: Bronte Road & Driveway/Charles Cornwall Road

2031 Future Background AM Peak Hour

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔		↔	↔	↑↑↑	↔	↔	↑↑↑	
Traffic Volume (vph)	1	0	1	161	0	65	0	1358	78	149	3452	0
Future Volume (vph)	1	0	1	161	0	65	0	1358	78	149	3452	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.2		6.2		6.2		5.9	5.9	4.0	5.9	
Lane Util. Factor		1.00		1.00		1.00		*0.80	1.00	1.00	*0.80	
Frpb, ped/bikes		0.99		1.00		0.98		1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00		1.00		1.00		1.00	1.00	1.00	1.00	
Frt		0.93		1.00		0.85		1.00	0.85	1.00	1.00	
Flt Protected		0.98		0.95		1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1679		1530		1366		4302	1406	1770	4385	
Flt Permitted		0.98		0.76		1.00		1.00	1.00	0.11	1.00	
Satd. Flow (perm)		1679		1218		1366		4302	1406	212	4385	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	1	0	1	166	0	67	0	1400	80	154	3559	0
RTOR Reduction (vph)	0	2	0	0	0	56	0	0	20	0	0	0
Lane Group Flow (vph)	0	0	0	166	0	11	0	1400	60	154	3559	0
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	2%	2%	2%	18%	2%	16%	2%	6%	10%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Turn Type	Perm	NA		Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		23.3		23.3		23.3		91.2	91.2	104.6	104.6	
Effective Green, g (s)		23.3		23.3		23.3		91.2	91.2	104.6	104.6	
Actuated g/C Ratio		0.17		0.17		0.17		0.65	0.65	0.75	0.75	
Clearance Time (s)		6.2		6.2		6.2		5.9	5.9	4.0	5.9	
Vehicle Extension (s)		3.0		3.0		3.0		3.6	3.6	3.0	3.6	
Lane Grp Cap (vph)		279		202		227		2802	915	263	3276	
v/s Ratio Prot								0.33		0.04	c0.81	
v/s Ratio Perm		0.00		c0.14		0.01			0.04	0.40		
v/c Ratio		0.00		0.82		0.05		0.50	0.07	0.59	1.09	
Uniform Delay, d1		48.6		56.3		49.0		12.6	8.9	8.7	17.7	
Progression Factor		1.00		1.00		1.00		1.00	1.00	1.48	0.41	
Incremental Delay, d2		0.0		22.8		0.1		0.6	0.1	0.3	39.5	
Delay (s)		48.7		79.1		49.1		13.2	9.0	13.1	46.7	
Level of Service		D		E		D		B	A	B	D	
Approach Delay (s)		48.7			70.5			13.0			45.3	
Approach LOS		D			E			B			D	
Intersection Summary												
HCM 2000 Control Delay			37.6									HCM 2000 Level of Service D
HCM 2000 Volume to Capacity ratio			1.07									
Actuated Cycle Length (s)			140.0							16.1		
Intersection Capacity Utilization			108.0%								G	
ICU Level of Service												
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2031 FB PM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	74	114	249	155	252	325	2173	412	265	1354	20
Future Volume (vph)	7	74	114	249	155	252	325	2173	412	265	1354	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0		70.0	140.0		0.0	135.0		80.0	180.0		50.0
Storage Lanes	1		1	2		1	1		1	1		1
Taper Length (m)	65.0			100.0			70.0			70.0		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	*0.80	1.00	1.00	*0.80	1.00
Ped Bike Factor	0.99		0.98			0.97			0.97			0.97
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	3400	1863	1583	1770	4471	1558	1770	4385	1473
Flt Permitted	0.653			0.578			0.081			0.059		
Satd. Flow (perm)	1209	1863	1556	2068	1863	1543	151	4471	1517	110	4385	1433
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			121			268			248			122
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		296.6			291.2			731.4			120.4	
Travel Time (s)		17.8			17.5			43.9			7.2	
Confl. Peds. (#/hr)	6					6	1		1	1		1
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%	2%	2%	2%	2%	4%	7%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Adj. Flow (vph)	7	79	121	265	165	268	346	2312	438	282	1440	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	79	121	265	165	268	346	2312	438	282	1440	21
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.2			7.2			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.02	1.00	1.00	1.03
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2031 FB PM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	10.0	10.0	6.0	10.0	10.0	6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	10.5	36.7	36.7	10.5	36.7	36.7	10.5	36.5	36.5	10.5	36.5	36.5
Total Split (s)	10.5	36.7	36.7	10.5	36.7	36.7	32.4	73.8	73.8	19.0	60.4	60.4
Total Split (%)	7.5%	26.2%	26.2%	7.5%	26.2%	26.2%	23.1%	52.7%	52.7%	13.6%	43.1%	43.1%
Maximum Green (s)	6.5	30.0	30.0	6.5	30.0	30.0	28.4	67.3	67.3	15.0	53.9	53.9
Yellow Time (s)	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7
All-Red Time (s)	1.0	3.0	3.0	1.0	3.0	3.0	1.0	2.8	2.8	1.0	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)					7.0	7.0			7.0	7.0	7.0	7.0
Flash Dont Walk (s)					23.0	23.0			23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)					6	6			1	1	1	1
Act Effct Green (s)	23.8	14.9	14.9	27.3	23.3	23.3	96.9	70.2	70.2	98.4	71.3	71.3
Actuated g/C Ratio	0.17	0.11	0.11	0.20	0.17	0.17	0.69	0.50	0.50	0.70	0.51	0.51
v/c Ratio	0.03	0.40	0.44	0.57	0.53	0.56	0.85	1.03	0.50	0.70	0.64	0.03
Control Delay	40.3	62.2	13.4	53.4	59.4	10.0	53.4	43.0	8.1	47.1	28.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.3	62.2	13.4	53.4	59.4	10.0	53.4	43.0	8.1	47.1	28.7	0.1
LOS	D	E	B	D	E	B	D	D	A	D	C	A
Approach Delay	32.9			38.2			39.2			31.3		
Approach LOS	C			D			D			C		
Queue Length 50th (m)	1.7	22.5	0.0	36.0	45.1	0.0	84.5	226.0	26.9	56.7	120.5	0.0
Queue Length 95th (m)	5.3	34.5	17.2	42.0	65.2	24.7	m85.2 m#294.2	m29.1	#146.5	183.5	0.0	
Internal Link Dist (m)	272.6			267.2			707.4			96.4		
Turn Bay Length (m)	70.0			70.0	140.0			135.0			180.0	50.0
Base Capacity (vph)	233	399	428	464	399	541	443	2241	884	400	2233	789
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.20	0.28	0.57	0.41	0.50	0.78	1.03	0.50	0.70	0.64	0.03

Intersection Summary

Area Type: Other
 Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 35 (25%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 145
 Control Type: Actuated-Coordinated

Lanes, Volumes, Timings

1: Bronte Road & Upper Middle Road

2031 FB PM Peak Hour
1354 Bronte

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 36.5

Intersection LOS: D

Intersection Capacity Utilization 86.8%

ICU Level of Service E

Analysis Period (min) 15

* User Entered Value

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Bronte Road & Upper Middle Road

 Ø1	 Ø2 (R) 	 Ø3	 Ø4
19 s	73.8 s	10.5 s	36.7 s
 Ø5	 Ø6 (R) 	 Ø7	 Ø8
32.4 s	60.4 s	10.5 s	36.7 s

HCM Signalized Intersection Capacity Analysis

1: Bronte Road & Upper Middle Road

2031 FB PM Peak Hour

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	74	114	249	155	252	325	2173	412	265	1354	20
Future Volume (vph)	7	74	114	249	155	252	325	2173	412	265	1354	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	*0.80	1.00	1.00	*0.80	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1762	1863	1551	3400	1863	1541	1770	4471	1517	1770	4385	1435
Flt Permitted	0.65	1.00	1.00	0.58	1.00	1.00	0.08	1.00	1.00	0.06	1.00	1.00
Satd. Flow (perm)	1211	1863	1551	2068	1863	1541	150	4471	1517	109	4385	1435
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	7	79	121	265	165	268	346	2312	438	282	1440	21
RTOR Reduction (vph)	0	0	105	0	0	223	0	0	129	0	0	11
Lane Group Flow (vph)	7	79	16	265	165	45	346	2312	309	282	1440	10
Confl. Peds. (#/hr)	6					6	1		1	1		1
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%	2%	2%	2%	2%	4%	7%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	19.4	18.1	18.1	28.6	23.3	23.3	93.1	67.0	67.0	95.3	68.1	68.1
Effective Green, g (s)	19.4	18.1	18.1	28.6	23.3	23.3	93.1	67.0	67.0	95.3	68.1	68.1
Actuated g/C Ratio	0.14	0.13	0.13	0.20	0.17	0.17	0.66	0.48	0.48	0.68	0.49	0.49
Clearance Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	172	240	200	484	310	256	401	2139	725	396	2132	698
v/s Ratio Prot	0.00	0.04		c0.03	0.09		c0.16	c0.52		0.14	0.33	
v/s Ratio Perm	0.01		0.01	c0.09		0.03	0.41		0.20	0.34		0.01
v/c Ratio	0.04	0.33	0.08	0.55	0.53	0.17	0.86	1.08	0.43	0.71	0.68	0.01
Uniform Delay, d1	52.2	55.4	53.6	49.4	53.4	50.1	38.8	36.5	23.9	41.7	27.5	18.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.43	0.75	0.84	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.8	0.2	1.3	1.8	0.3	1.9	37.4	0.2	6.0	1.7	0.0
Delay (s)	52.2	56.2	53.8	50.6	55.1	50.4	57.3	64.8	20.3	47.6	29.2	18.6
Level of Service	D	E	D	D	E	D	E	E	C	D	C	B
Approach Delay (s)		54.7			51.6			57.6			32.1	
Approach LOS		D			D			E			C	
Intersection Summary												
HCM 2000 Control Delay			49.0									
HCM 2000 Volume to Capacity ratio			0.93									
Actuated Cycle Length (s)			140.0									
Intersection Capacity Utilization			86.8%									
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2031 FB PM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	0	22	104	0	59	36	2921	174	99	1670	13
Future Volume (vph)	7	0	22	104	0	59	36	2921	174	99	1670	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	15.0		0.0	15.0		0.0	15.0		15.0	15.0		15.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.80	1.00	1.00	*0.80	1.00
Frt		0.850			0.850				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1583	0	1770	1583	0	1770	4471	1583	1770	4471	1583
Flt Permitted	0.715			0.742			0.088			0.039		
Satd. Flow (perm)	1332	1583	0	1382	1583	0	164	4471	1583	73	4471	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		55			59				55			19
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		42.5			50.2			458.5			731.4	
Travel Time (s)		3.1			3.6			27.5			43.9	
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
Adj. Flow (vph)	8	0	24	113	0	64	39	3175	189	108	1815	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	8	24	0	113	64	0	39	3175	189	108	1815	14
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		6

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2031 FB PM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		8	8		2	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		15.0	15.0	15.0	5.0	15.0	15.0
Minimum Split (s)	35.5	35.5		35.5	35.5		35.5	35.5	35.5	9.5	35.5	35.5
Total Split (s)	35.5	35.5		35.5	35.5		95.0	95.0	95.0	9.5	104.5	104.5
Total Split (%)	25.4%	25.4%		25.4%	25.4%		67.9%	67.9%	67.9%	6.8%	74.6%	74.6%
Maximum Green (s)	30.0	30.0		30.0	30.0		89.5	89.5	89.5	5.0	99.0	99.0
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.5	3.7	3.7
All-Red Time (s)	2.2	2.2		2.2	2.2		1.8	1.8	1.8	1.0	1.8	1.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	4.5	5.5	5.5
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?							Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Max	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)	23.0	23.0		23.0	23.0		23.0	23.0	23.0		23.0	23.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0		0	0
Act Effect Green (s)	16.8	16.8		16.8	16.8		96.9	96.9	96.9	113.2	112.2	112.2
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.69	0.69	0.69	0.81	0.80	0.80
v/c Ratio	0.05	0.10		0.68	0.27		0.35	1.03	0.17	0.57	0.51	0.01
Control Delay	51.7	1.2		78.5	16.7		5.9	24.2	0.9	28.7	13.9	4.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.7	1.2		78.5	16.7		5.9	24.2	0.9	28.7	13.9	4.8
LOS	D	A		E	B		A	C	A	C	B	A
Approach Delay		13.8			56.2			22.7			14.6	
Approach LOS		B			E			C			B	
Queue Length 50th (m)	2.1	0.0		32.1	1.3		0.9	~407.6	0.0	18.0	110.2	0.3
Queue Length 95th (m)	7.3	1.0		51.4	15.0		m1.0	m#422.1	m0.7	m30.1	238.3	m1.7
Internal Link Dist (m)		18.5			26.2			434.5			707.4	
Turn Bay Length (m)	15.0			15.0			15.0		15.0	15.0		15.0
Base Capacity (vph)	285	382		296	385		113	3095	1113	189	3582	1272
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.06		0.38	0.17		0.35	1.03	0.17	0.57	0.51	0.01

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 127 (91%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 145

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 20.9

Intersection LOS: C

Intersection Capacity Utilization 87.3%

ICU Level of Service E

Analysis Period (min) 15

* User Entered Value

Lanes, Volumes, Timings 2: Bronte Road & Saw Whet Boulevard

2031 FB PM Peak Hour
1354 Bronte

~ Volume exceeds capacity, queue is theoretically infinite.

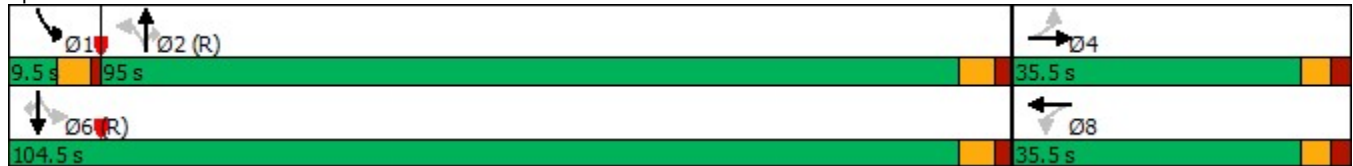
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Bronte Road & Saw Whet Boulevard



HCM Signalized Intersection Capacity Analysis

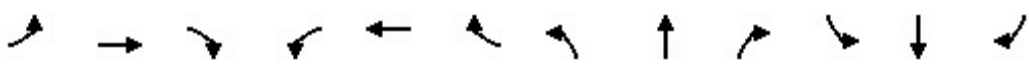
2: Bronte Road & Saw Whet Boulevard

2031 FB PM Peak Hour
1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	0	22	104	0	59	36	2921	174	99	1670	13
Future Volume (vph)	7	0	22	104	0	59	36	2921	174	99	1670	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	4.5	5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	*0.80	1.00	1.00	*0.80	1.00
Frt	1.00	0.85		1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1583		1770	1583		1770	4471	1583	1770	4471	1583
Flt Permitted	0.72	1.00		0.74	1.00		0.09	1.00	1.00	0.04	1.00	1.00
Satd. Flow (perm)	1332	1583		1381	1583		165	4471	1583	73	4471	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	0	24	113	0	64	39	3175	189	108	1815	14
RTOR Reduction (vph)	0	21	0	0	52	0	0	0	17	0	0	3
Lane Group Flow (vph)	8	3	0	113	12	0	39	3175	172	108	1815	11
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	16.8	16.8		16.8	16.8		97.0	97.0	97.0	112.2	112.2	112.2
Effective Green, g (s)	16.8	16.8		16.8	16.8		97.0	97.0	97.0	112.2	112.2	112.2
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.69	0.69	0.69	0.80	0.80	0.80
Clearance Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	4.5	5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	159	189		165	189		114	3097	1096	188	3583	1268
v/s Ratio Prot		0.00			0.01			c0.71		0.04	c0.41	
v/s Ratio Perm	0.01			c0.08			0.24		0.11	0.41		0.01
v/c Ratio	0.05	0.02		0.68	0.06		0.34	1.03	0.16	0.57	0.51	0.01
Uniform Delay, d1	54.5	54.3		59.1	54.6		8.7	21.5	7.4	45.9	4.6	2.8
Progression Factor	1.00	1.00		1.00	1.00		0.23	0.17	0.14	0.72	2.62	3.79
Incremental Delay, d2	0.1	0.0		11.2	0.1		2.7	16.7	0.1	3.5	0.4	0.0
Delay (s)	54.7	54.3		70.2	54.8		4.7	20.4	1.1	36.5	12.6	10.6
Level of Service	D	D		E	D		A	C	A	D	B	B
Approach Delay (s)		54.4			64.6			19.1			13.9	
Approach LOS		D			E			B			B	
Intersection Summary												
HCM 2000 Control Delay			19.0			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.94									
Actuated Cycle Length (s)			140.0			Sum of lost time (s)			15.5			
Intersection Capacity Utilization			87.3%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2031 FB PM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↗		↗	↗	↕	↗	↗	↕	
Traffic Volume (vph)	0	0	0	138	0	110	1	3022	175	89	1744	0
Future Volume (vph)	0	0	0	138	0	110	1	3022	175	89	1744	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		40.0	35.0		30.0	70.0		0.0
Storage Lanes	0		0	1		1	1		1	1		0
Taper Length (m)	7.5			7.5			20.0			60.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.80	1.00	1.00	*0.80	0.91
Ped Bike Factor						0.98			0.98			
Frt						0.850			0.850			
Flt Protected				0.950			0.950			0.950		
Satd. Flow (prot)	0	1863	0	1770	0	1583	1770	4427	1388	1770	4385	0
Flt Permitted				0.757			0.086			0.040		
Satd. Flow (perm)	0	1863	0	1410	0	1556	160	4427	1357	75	4385	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						64			56			
Link Speed (k/h)		20			20			60			60	
Link Distance (m)		78.7			109.0			218.2			458.5	
Travel Time (s)		14.2			19.6			13.1			27.5	
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	3%	14%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Adj. Flow (vph)	0	0	0	142	0	113	1	3115	180	92	1798	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	142	0	113	1	3115	180	92	1798	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.03	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1		1	1	2	1	1	2	
Detector Template	Left	Thru		Left		Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0		2.0		2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0		2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4						9.4			9.4	
Detector 2 Size(m)		0.6						0.6			0.6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2031 FB PM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)	0.0							0.0			0.0	
Turn Type				Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4			8		8	2		2	6		
Detector Phase	4	4		8		8	2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0		10.0	15.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	24.2	24.2		35.2		35.2	34.9	34.9	34.9	9.5	34.9	
Total Split (s)	35.2	35.2		35.2		35.2	95.3	95.3	95.3	9.5	104.8	
Total Split (%)	25.1%	25.1%		25.1%		25.1%	68.1%	68.1%	68.1%	6.8%	74.9%	
Maximum Green (s)	29.0	29.0		29.0		29.0	89.4	89.4	89.4	5.5	98.9	
Yellow Time (s)	3.1	3.1		3.1		3.1	3.7	3.7	3.7	3.0	3.7	
All-Red Time (s)	3.1	3.1		3.1		3.1	2.2	2.2	2.2	1.0	2.2	
Lost Time Adjust (s)		0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.2		6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?							Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0		3.0	3.6	3.6	3.6	3.0	3.6	
Recall Mode	None	None		None		None	C-Max	C-Max	C-Max	None	C-Max	
Walk Time (s)				7.0		7.0	7.0	7.0	7.0		7.0	
Flash Dont Walk (s)				22.0		22.0	22.0	22.0	22.0		22.0	
Pedestrian Calls (#/hr)				0		0	0	0	0		0	
Act Effect Green (s)				19.3		19.3	96.4	96.4	96.4	110.5	108.6	
Actuated g/C Ratio				0.14		0.14	0.69	0.69	0.69	0.79	0.78	
v/c Ratio				0.73		0.42	0.01	1.02	0.19	0.58	0.53	
Control Delay				78.3		28.9	9.0	44.6	6.6	45.6	2.2	
Queue Delay				0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay				78.3		28.9	9.0	44.6	6.6	45.6	2.2	
LOS				E		C	A	D	A	D	A	
Approach Delay					56.4			42.6			4.3	
Approach LOS					E			D			A	
Queue Length 50th (m)				40.2		12.9	0.1	~403.2	11.6	9.8	5.5	
Queue Length 95th (m)				61.1		30.9	0.9	#455.9	24.5	#37.8	39.5	
Internal Link Dist (m)		54.7			85.0			194.2			434.5	
Turn Bay Length (m)						40.0	35.0		30.0	70.0		
Base Capacity (vph)				292		373	110	3048	951	158	3400	
Starvation Cap Reductn				0		0	0	0	0	0	0	
Spillback Cap Reductn				0		0	0	0	0	0	0	
Storage Cap Reductn				0		0	0	0	0	0	0	
Reduced v/c Ratio				0.49		0.30	0.01	1.02	0.19	0.58	0.53	

Intersection Summary

Area Type: Other
 Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 103.6 (74%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.02

Lanes, Volumes, Timings 3: Bronte Road & Driveway/Charles Cornwall Road

2031 FB PM Peak Hour
1354 Bronte

Intersection Signal Delay: 29.9	Intersection LOS: C
Intersection Capacity Utilization 82.5%	ICU Level of Service E
Analysis Period (min) 15	
* User Entered Value	
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 3: Bronte Road & Driveway/Charles Cornwall Road

 Ø1  Ø2 (R)	 Ø4
9.5 s 95.3 s	35.2 s
 Ø6 (R)	 Ø8
104.8 s	35.2 s

HCM Signalized Intersection Capacity Analysis

3: Bronte Road & Driveway/Charles Cornwall Road

2031 FB PM Peak Hour
1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔		↔	↔	↑↑↑	↔	↔	↑↑↑	
Traffic Volume (vph)	0	0	0	138	0	110	1	3022	175	89	1744	0
Future Volume (vph)	0	0	0	138	0	110	1	3022	175	89	1744	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Lane Util. Factor				1.00		1.00	1.00	*0.80	1.00	1.00	*0.80	
Frpb, ped/bikes				1.00		0.98	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes				1.00		1.00	1.00	1.00	1.00	1.00	1.00	
Frt				1.00		0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95		1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1770		1552	1770	4427	1357	1770	4385	
Flt Permitted				0.76		1.00	0.09	1.00	1.00	0.04	1.00	
Satd. Flow (perm)				1410		1552	161	4427	1357	74	4385	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	142	0	113	1	3115	180	92	1798	0
RTOR Reduction (vph)	0	0	0	0	0	55	0	0	17	0	0	0
Lane Group Flow (vph)	0	0	0	142	0	58	1	3115	163	92	1798	0
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	3%	14%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Turn Type				Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)				19.3		19.3	96.4	96.4	96.4	108.6	108.6	
Effective Green, g (s)				19.3		19.3	96.4	96.4	96.4	108.6	108.6	
Actuated g/C Ratio				0.14		0.14	0.69	0.69	0.69	0.78	0.78	
Clearance Time (s)				6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Vehicle Extension (s)				3.0		3.0	3.6	3.6	3.6	3.0	3.6	
Lane Grp Cap (vph)				194		213	110	3048	934	156	3401	
v/s Ratio Prot								c0.70		0.03	c0.41	
v/s Ratio Perm				c0.10		0.04	0.01		0.12	0.42		
v/c Ratio				0.73		0.27	0.01	1.02	0.17	0.59	0.53	
Uniform Delay, d1				57.9		54.1	6.8	21.8	7.7	43.2	6.0	
Progression Factor				1.00		1.00	1.00	1.00	1.00	1.48	0.25	
Incremental Delay, d2				13.3		0.7	0.2	22.2	0.4	5.0	0.5	
Delay (s)				71.2		54.7	7.0	44.0	8.1	69.0	2.0	
Level of Service				E		D	A	D	A	E	A	
Approach Delay (s)		0.0			63.9			42.0			5.3	
Approach LOS		A			E			D			A	
Intersection Summary												
HCM 2000 Control Delay			30.3									
HCM 2000 Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			140.0							16.1		
Intersection Capacity Utilization			82.5%							E		
Analysis Period (min)			15									
c Critical Lane Group												

Appendix L

2031 Future Total Conditions Synchro Worksheets

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2031 Future Total AM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	203	390	527	88	196	72	1074	280	289	2343	13
Future Volume (vph)	11	203	390	527	88	196	72	1074	280	289	2343	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0		70.0	140.0		0.0	135.0		80.0	180.0		50.0
Storage Lanes	1		1	2		1	1		1	1		1
Taper Length (m)	65.0			100.0			70.0			70.0		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	*0.80	1.00	1.00	*0.80	1.00
Ped Bike Factor	0.99		0.98			0.97			0.96	1.00		0.97
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1656	1863	1583	3433	1792	1553	1719	4222	1485	1770	4302	1336
Flt Permitted	0.698			0.422			0.068			0.124		
Satd. Flow (perm)	1200	1863	1556	1525	1792	1503	123	4222	1424	231	4302	1289
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			121			202			281			91
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		296.6			291.2			731.4			120.4	
Travel Time (s)		17.8			17.5			43.9			7.2	
Confl. Peds. (#/hr)	11					11	5		7	7		5
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	9%	2%	2%	2%	6%	4%	5%	8%	7%	2%	6%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Adj. Flow (vph)	11	209	402	543	91	202	74	1107	289	298	2415	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	209	402	543	91	202	74	1107	289	298	2415	13
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.2			7.2			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.02	1.00	1.00	1.03
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2031 Future Total AM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	10.0	10.0	6.0	10.0	10.0	6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	10.5	36.7	36.7	10.5	36.7	36.7	10.5	36.5	36.5	10.5	36.5	36.5
Total Split (s)	10.5	36.7	36.7	12.3	38.5	38.5	10.5	58.3	58.3	32.7	80.5	80.5
Total Split (%)	7.5%	26.2%	26.2%	8.8%	27.5%	27.5%	7.5%	41.6%	41.6%	23.4%	57.5%	57.5%
Maximum Green (s)	6.5	30.0	30.0	8.3	31.8	31.8	6.5	51.8	51.8	28.7	74.0	74.0
Yellow Time (s)	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7
All-Red Time (s)	1.0	3.0	3.0	1.0	3.0	3.0	1.0	2.8	2.8	1.0	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)					7.0	7.0			7.0	7.0	7.0	7.0
Flash Dont Walk (s)					23.0	23.0			23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)					11	11			7	7	5	5
Act Effct Green (s)	37.9	29.0	29.0	43.1	37.1	37.1	69.7	60.8	60.8	88.0	77.1	77.1
Actuated g/C Ratio	0.27	0.21	0.21	0.31	0.26	0.26	0.50	0.43	0.43	0.63	0.55	0.55
v/c Ratio	0.03	0.54	0.96	0.93	0.19	0.37	0.55	0.60	0.37	0.80	1.02	0.02
Control Delay	33.0	55.1	73.4	67.2	42.4	7.6	51.5	32.1	10.4	39.7	55.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.0	55.1	73.4	67.2	42.4	7.6	51.5	32.1	10.4	39.7	55.4	0.1
LOS	C	E	E	E	D	A	D	C	B	D	E	A
Approach Delay	66.5				50.1			28.8			53.4	
Approach LOS	E				D			C			D	
Queue Length 50th (m)	2.2	54.4	85.4	65.7	19.6	0.0	6.5	107.9	29.3	49.3	~322.0	0.0
Queue Length 95th (m)	7.1	81.7	#151.2	#99.3	38.3	21.2	#27.1	144.8	47.0	81.6	#354.2	0.0
Internal Link Dist (m)	272.6				267.2			707.4			96.4	
Turn Bay Length (m)	70.0	70.0		140.0				135.0	80.0		180.0	50.0
Base Capacity (vph)	349	399	428	583	475	547	135	1834	777	461	2368	750
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.52	0.94	0.93	0.19	0.37	0.55	0.60	0.37	0.65	1.02	0.02

Intersection Summary

Area Type: Other
 Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 82.6 (59%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 145
 Control Type: Actuated-Coordinated

Lanes, Volumes, Timings 1: Bronte Road & Upper Middle Road

2031 Future Total AM Peak Hour
1354 Bronte

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 48.0

Intersection LOS: D

Intersection Capacity Utilization 98.8%

ICU Level of Service F

Analysis Period (min) 15

* User Entered Value

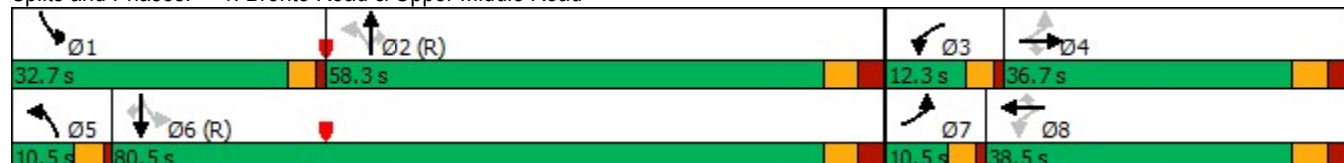
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Bronte Road & Upper Middle Road



HCM Signalized Intersection Capacity Analysis

1: Bronte Road & Upper Middle Road

2031 Future Total AM Peak Hour

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	203	390	527	88	196	72	1074	280	289	2343	13
Future Volume (vph)	11	203	390	527	88	196	72	1074	280	289	2343	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	*0.80	1.00	1.00	*0.80	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.96	1.00	1.00	0.97
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1641	1863	1556	3433	1792	1504	1719	4222	1425	1769	4302	1289
Flt Permitted	0.70	1.00	1.00	0.42	1.00	1.00	0.07	1.00	1.00	0.12	1.00	1.00
Satd. Flow (perm)	1205	1863	1556	1526	1792	1504	124	4222	1425	230	4302	1289
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	11	209	402	543	91	202	74	1107	289	298	2415	13
RTOR Reduction (vph)	0	0	94	0	0	148	0	0	164	0	0	6
Lane Group Flow (vph)	11	209	308	543	91	54	74	1107	125	298	2415	7
Confl. Peds. (#/hr)	11						11	5		7		5
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	9%	2%	2%	2%	6%	4%	5%	8%	7%	2%	6%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	34.0	31.4	31.4	43.7	37.1	37.1	63.7	58.5	58.5	83.1	73.9	73.9
Effective Green, g (s)	34.0	31.4	31.4	43.7	37.1	37.1	63.7	58.5	58.5	83.1	73.9	73.9
Actuated g/C Ratio	0.24	0.22	0.22	0.31	0.27	0.27	0.46	0.42	0.42	0.59	0.53	0.53
Clearance Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	300	417	348	589	474	398	115	1764	595	362	2270	680
v/s Ratio Prot	0.00	0.11		c0.05	0.05		0.02	0.26		c0.12	c0.56	
v/s Ratio Perm	0.01		0.20	c0.23		0.04	0.27		0.09	0.37		0.01
v/c Ratio	0.04	0.50	0.89	0.92	0.19	0.13	0.64	0.63	0.21	0.82	1.06	0.01
Uniform Delay, d1	40.4	47.5	52.6	46.9	39.8	39.2	32.8	32.2	26.0	28.6	33.0	15.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.63	0.96	2.50	1.00	1.00	1.00
Incremental Delay, d2	0.1	1.0	22.5	20.0	0.2	0.2	10.9	1.6	0.7	14.0	38.6	0.0
Delay (s)	40.4	48.4	75.1	66.9	40.0	39.4	64.2	32.6	65.7	42.6	71.6	15.7
Level of Service	D	D	E	E	D	D	E	C	E	D	E	B
Approach Delay (s)		65.5			57.3			40.7			68.2	
Approach LOS		E			E			D			E	
Intersection Summary												
HCM 2000 Control Delay			59.1									
HCM 2000 Volume to Capacity ratio			1.04									
Actuated Cycle Length (s)			140.0									
Intersection Capacity Utilization			98.8%									
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2031 Future Total AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	0	46	169	0	95	14	1311	52	30	3421	5
Future Volume (vph)	16	0	46	169	0	95	14	1311	52	30	3421	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	15.0		0.0	15.0		0.0	15.0		15.0	15.0		15.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.80	1.00	1.00	*0.80	1.00
Frt		0.850			0.850				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1583	0	1770	1583	0	1770	4471	1583	1770	4471	1583
Flt Permitted	0.645			0.724			0.038			0.127		
Satd. Flow (perm)	1201	1583	0	1349	1583	0	71	4471	1583	237	4471	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		19			74				24			19
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		42.5			50.2			458.5			731.4	
Travel Time (s)		3.1			3.6			27.5			43.9	
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
Adj. Flow (vph)	17	0	50	184	0	103	15	1425	57	33	3718	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	17	50	0	184	103	0	15	1425	57	33	3718	5
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2031 Future Total AM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		8	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	35.5	35.5		35.5	35.5		35.5	35.5	35.5	35.5	35.5	35.5
Total Split (s)	35.5	35.5		35.5	35.5		104.5	104.5	104.5	104.5	104.5	104.5
Total Split (%)	25.4%	25.4%		25.4%	25.4%		74.6%	74.6%	74.6%	74.6%	74.6%	74.6%
Maximum Green (s)	30.0	30.0		30.0	30.0		99.0	99.0	99.0	99.0	99.0	99.0
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.2	2.2		2.2	2.2		1.8	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	23.0	23.0		23.0	23.0		23.0	23.0	23.0	23.0	23.0	23.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	0
Act Effect Green (s)	23.6	23.6		23.6	23.6		105.4	105.4	105.4	105.4	105.4	105.4
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.75	0.75	0.75	0.75	0.75	0.75
v/c Ratio	0.08	0.18		0.81	0.31		0.28	0.42	0.05	0.19	1.10	0.00
Control Delay	47.0	33.1		81.2	19.0		30.9	8.3	5.0	6.4	64.9	0.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.0	33.1		81.2	19.0		30.9	8.3	5.0	6.4	64.9	0.0
LOS	D	C		F	B		C	A	A	A	E	A
Approach Delay		36.6			58.9			8.4			64.3	
Approach LOS		D			E			A			E	
Queue Length 50th (m)	4.2	7.7		51.9	7.2		1.2	56.8	2.2	2.1	~529.2	0.0
Queue Length 95th (m)	11.1	19.2		76.9	23.5		m5.2	95.2	10.2	m2.8	m#548.7	m0.0
Internal Link Dist (m)		18.5			26.2			434.5			707.4	
Turn Bay Length (m)	15.0			15.0			15.0		15.0	15.0		15.0
Base Capacity (vph)	257	354		289	397		53	3365	1197	178	3365	1196
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.14		0.64	0.26		0.28	0.42	0.05	0.19	1.10	0.00

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 85 (61%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.10

Intersection Signal Delay: 48.8

Intersection LOS: D

Intersection Capacity Utilization 91.3%

ICU Level of Service F

Analysis Period (min) 15

* User Entered Value

Lanes, Volumes, Timings 2: Bronte Road & Saw Whet Boulevard

2031 Future Total AM Peak Hour
1354 Bronte

~ Volume exceeds capacity, queue is theoretically infinite.

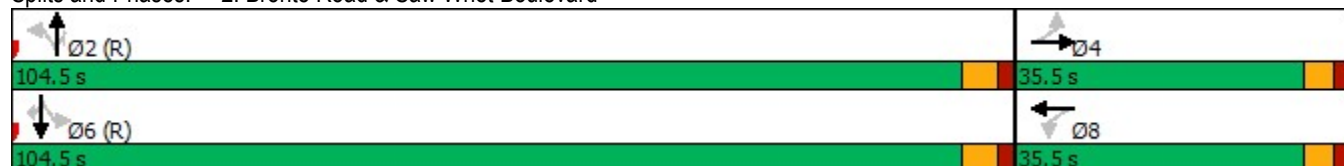
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Bronte Road & Saw Whet Boulevard



HCM Signalized Intersection Capacity Analysis

2: Bronte Road & Saw Whet Boulevard

2031 Future Total AM Peak Hour
1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	0	46	169	0	95	14	1311	52	30	3421	5
Future Volume (vph)	16	0	46	169	0	95	14	1311	52	30	3421	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	*0.80	1.00	1.00	*0.80	1.00
Frt	1.00	0.85		1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1583		1770	1583		1770	4471	1583	1770	4471	1583
Flt Permitted	0.64	1.00		0.72	1.00		0.04	1.00	1.00	0.13	1.00	1.00
Satd. Flow (perm)	1201	1583		1349	1583		71	4471	1583	236	4471	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	0	50	184	0	103	15	1425	57	33	3718	5
RTOR Reduction (vph)	0	16	0	0	62	0	0	0	6	0	0	1
Lane Group Flow (vph)	17	34	0	184	41	0	15	1425	51	33	3718	4
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	23.6	23.6		23.6	23.6		105.4	105.4	105.4	105.4	105.4	105.4
Effective Green, g (s)	23.6	23.6		23.6	23.6		105.4	105.4	105.4	105.4	105.4	105.4
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.75	0.75	0.75	0.75	0.75	0.75
Clearance Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	202	266		227	266		53	3366	1191	177	3366	1191
v/s Ratio Prot		0.02			0.03			0.32			c0.83	
v/s Ratio Perm	0.01			c0.14			0.21		0.03	0.14		0.00
v/c Ratio	0.08	0.13		0.81	0.16		0.28	0.42	0.04	0.19	1.10	0.00
Uniform Delay, d1	49.1	49.5		56.0	49.7		5.4	6.3	4.4	5.0	17.3	4.3
Progression Factor	1.00	1.00		1.00	1.00		1.91	1.17	1.40	0.79	0.70	0.00
Incremental Delay, d2	0.2	0.2		19.3	0.3		11.5	0.3	0.1	1.0	49.4	0.0
Delay (s)	49.3	49.7		75.3	50.0		21.9	7.7	6.2	4.9	61.5	0.0
Level of Service	D	D		E	D		C	A	A	A	E	A
Approach Delay (s)		49.6			66.2			7.8			60.9	
Approach LOS		D			E			A			E	
Intersection Summary												
HCM 2000 Control Delay			46.9			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			1.05									
Actuated Cycle Length (s)			140.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			91.3%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2031 Future Total AM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	1	161	0	65	0	1362	78	149	3462	0
Future Volume (vph)	1	0	1	161	0	65	0	1362	78	149	3462	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		40.0	35.0		30.0	70.0		0.0
Storage Lanes	0		0	1		1	1		1	1		0
Taper Length (m)	7.5			7.5			20.0			60.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.80	1.00	1.00	*0.80	0.91
Ped Bike Factor		0.99				0.98			0.98			
Frt		0.932				0.850			0.850			
Flt Protected		0.976		0.950						0.950		
Satd. Flow (prot)	0	1680	0	1530	0	1392	1863	4302	1439	1770	4385	0
Flt Permitted		0.976		0.757						0.113		
Satd. Flow (perm)	0	1680	0	1219	0	1368	1863	4302	1405	210	4385	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		54				67			56			
Link Speed (k/h)		20			20			60			60	
Link Distance (m)		78.7			109.0			218.2			458.5	
Travel Time (s)		14.2			19.6			13.1			27.5	
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	2%	18%	2%	16%	2%	6%	10%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Adj. Flow (vph)	1	0	1	166	0	67	0	1404	80	154	3569	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2	0	166	0	67	0	1404	80	154	3569	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.03	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1		1	1	2	1	1	2	
Detector Template	Left	Thru		Left		Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0		2.0		2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0		2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4						9.4			9.4	
Detector 2 Size(m)		0.6						0.6			0.6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2031 Future Total AM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Perm	NA		Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4			8		8	2		2	6		
Detector Phase	4	4		8		8	2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0		10.0	15.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	24.2	24.2		35.2		35.2	34.9	34.9	34.9	9.5	34.9	
Total Split (s)	35.2	35.2		35.2		35.2	86.4	86.4	86.4	18.4	104.8	
Total Split (%)	25.1%	25.1%		25.1%		25.1%	61.7%	61.7%	61.7%	13.1%	74.9%	
Maximum Green (s)	29.0	29.0		29.0		29.0	80.5	80.5	80.5	14.4	98.9	
Yellow Time (s)	3.1	3.1		3.1		3.1	3.7	3.7	3.7	3.0	3.7	
All-Red Time (s)	3.1	3.1		3.1		3.1	2.2	2.2	2.2	1.0	2.2	
Lost Time Adjust (s)		0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.2		6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?							Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0		3.0	3.6	3.6	3.6	3.0	3.6	
Recall Mode	None	None		None		None	C-Max	C-Max	C-Max	None	C-Max	
Walk Time (s)				7.0		7.0	7.0	7.0	7.0		7.0	
Flash Dont Walk (s)				22.0		22.0	22.0	22.0	22.0		22.0	
Pedestrian Calls (#/hr)				0		0	0	0	0		0	
Act Effect Green (s)		23.3		23.3		23.3		91.2	91.2	106.5	104.6	
Actuated g/C Ratio		0.17		0.17		0.17		0.65	0.65	0.76	0.75	
v/c Ratio		0.01		0.82		0.24		0.50	0.09	0.58	1.09	
Control Delay		0.0		85.8		12.2		14.4	4.7	11.8	49.9	
Queue Delay		0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay		0.0		85.8		12.2		14.4	4.7	11.8	49.9	
LOS		A		F		B		B	A	B	D	
Approach Delay					64.6			13.9			48.4	
Approach LOS					E			B			D	
Queue Length 50th (m)		0.0		46.9		0.0		83.0	2.3	2.8	~488.3	
Queue Length 95th (m)		0.0		71.9		13.4		119.2	10.6	m2.7 m	#427.0	
Internal Link Dist (m)		54.7			85.0			194.2			434.5	
Turn Bay Length (m)						40.0			30.0	70.0		
Base Capacity (vph)		390		252		336		2802	934	320	3277	
Starvation Cap Reductn		0		0		0		0	0	0	0	
Spillback Cap Reductn		0		0		0		0	0	0	0	
Storage Cap Reductn		0		0		0		0	0	0	0	
Reduced v/c Ratio		0.01		0.66		0.20		0.50	0.09	0.48	1.09	

Intersection Summary

Area Type: Other
 Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 128.8 (92%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.09

Lanes, Volumes, Timings 3: Bronte Road & Driveway/Charles Cornwall Road

2031 Future Total AM Peak Hour
1354 Bronte

Intersection Signal Delay: 39.6	Intersection LOS: D
Intersection Capacity Utilization 108.1%	ICU Level of Service G
Analysis Period (min) 15	
* User Entered Value	
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 3: Bronte Road & Driveway/Charles Cornwall Road



HCM Signalized Intersection Capacity Analysis

3: Bronte Road & Driveway/Charles Cornwall Road

2031 Future Total AM Peak Hour
1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	1	161	0	65	0	1362	78	149	3462	0
Future Volume (vph)	1	0	1	161	0	65	0	1362	78	149	3462	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.2		6.2		6.2		5.9	5.9	4.0	5.9	
Lane Util. Factor		1.00		1.00		1.00		*0.80	1.00	1.00	*0.80	
Frpb, ped/bikes		0.99		1.00		0.98		1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00		1.00		1.00		1.00	1.00	1.00	1.00	
Frt		0.93		1.00		0.85		1.00	0.85	1.00	1.00	
Flt Protected		0.98		0.95		1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1679		1530		1366		4302	1406	1770	4385	
Flt Permitted		0.98		0.76		1.00		1.00	1.00	0.11	1.00	
Satd. Flow (perm)		1679		1218		1366		4302	1406	211	4385	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	1	0	1	166	0	67	0	1404	80	154	3569	0
RTOR Reduction (vph)	0	2	0	0	0	56	0	0	20	0	0	0
Lane Group Flow (vph)	0	0	0	166	0	11	0	1404	60	154	3569	0
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	2%	2%	2%	18%	2%	16%	2%	6%	10%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Turn Type	Perm	NA		Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		23.3		23.3		23.3		91.2	91.2	104.6	104.6	
Effective Green, g (s)		23.3		23.3		23.3		91.2	91.2	104.6	104.6	
Actuated g/C Ratio		0.17		0.17		0.17		0.65	0.65	0.75	0.75	
Clearance Time (s)		6.2		6.2		6.2		5.9	5.9	4.0	5.9	
Vehicle Extension (s)		3.0		3.0		3.0		3.6	3.6	3.0	3.6	
Lane Grp Cap (vph)		279		202		227		2802	915	262	3276	
v/s Ratio Prot								0.33		0.04	c0.81	
v/s Ratio Perm		0.00		c0.14		0.01			0.04	0.40		
v/c Ratio		0.00		0.82		0.05		0.50	0.07	0.59	1.09	
Uniform Delay, d1		48.6		56.3		49.0		12.6	8.9	8.7	17.7	
Progression Factor		1.00		1.00		1.00		1.00	1.00	1.61	0.26	
Incremental Delay, d2		0.0		22.8		0.1		0.6	0.1	0.3	40.8	
Delay (s)		48.7		79.1		49.1		13.3	9.0	14.4	45.5	
Level of Service		D		E		D		B	A	B	D	
Approach Delay (s)		48.7			70.5			13.0			44.2	
Approach LOS		D			E			B			D	
Intersection Summary												
HCM 2000 Control Delay			36.8									
HCM 2000 Volume to Capacity ratio			1.07									
Actuated Cycle Length (s)			140.0									
Intersection Capacity Utilization			108.1%									
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2031 Future Total PM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	74	114	252	155	252	325	2173	414	265	1355	20
Future Volume (vph)	7	74	114	252	155	252	325	2173	414	265	1355	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0		70.0	140.0		0.0	135.0		80.0	180.0		50.0
Storage Lanes	1		1	2		1	1		1	1		1
Taper Length (m)	65.0			100.0			70.0			70.0		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	*0.80	1.00	1.00	*0.80	1.00
Ped Bike Factor	0.99		0.98			0.97			0.97			0.97
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	3400	1863	1583	1770	4471	1558	1770	4385	1473
Flt Permitted	0.653			0.578			0.081			0.059		
Satd. Flow (perm)	1209	1863	1556	2068	1863	1543	151	4471	1517	110	4385	1433
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			121			268			249			122
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		296.6			291.2			731.4			120.4	
Travel Time (s)		17.8			17.5			43.9			7.2	
Confl. Peds. (#/hr)	6					6	1		1	1		1
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%	2%	2%	2%	2%	4%	7%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Adj. Flow (vph)	7	79	121	268	165	268	346	2312	440	282	1441	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	79	121	268	165	268	346	2312	440	282	1441	21
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.2			7.2			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.02	1.00	1.00	1.03
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	

Lanes, Volumes, Timings
1: Bronte Road & Upper Middle Road

2031 Future Total PM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	10.0	10.0	6.0	10.0	10.0	6.0	20.0	20.0	6.0	20.0	20.0
Minimum Split (s)	10.5	36.7	36.7	10.5	36.7	36.7	10.5	36.5	36.5	10.5	36.5	36.5
Total Split (s)	10.5	36.7	36.7	10.5	36.7	36.7	32.4	73.8	73.8	19.0	60.4	60.4
Total Split (%)	7.5%	26.2%	26.2%	7.5%	26.2%	26.2%	23.1%	52.7%	52.7%	13.6%	43.1%	43.1%
Maximum Green (s)	6.5	30.0	30.0	6.5	30.0	30.0	28.4	67.3	67.3	15.0	53.9	53.9
Yellow Time (s)	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.7	3.7
All-Red Time (s)	1.0	3.0	3.0	1.0	3.0	3.0	1.0	2.8	2.8	1.0	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)					7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)					23.0	23.0		23.0	23.0		23.0	23.0
Pedestrian Calls (#/hr)					6	6		1	1		1	1
Act Effct Green (s)	23.8	14.9	14.9	27.3	23.3	23.3	96.9	70.2	70.2	98.4	71.3	71.3
Actuated g/C Ratio	0.17	0.11	0.11	0.20	0.17	0.17	0.69	0.50	0.50	0.70	0.51	0.51
v/c Ratio	0.03	0.40	0.44	0.58	0.53	0.56	0.85	1.03	0.50	0.70	0.65	0.03
Control Delay	40.3	62.2	13.4	53.6	59.4	10.0	45.5	47.8	13.0	47.1	28.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.3	62.2	13.4	53.6	59.4	10.0	45.5	47.8	13.0	47.1	28.7	0.1
LOS	D	E	B	D	E	B	D	D	B	D	C	A
Approach Delay		32.9			38.3			42.6			31.3	
Approach LOS		C			D			D			C	
Queue Length 50th (m)	1.7	22.5	0.0	36.4	45.1	0.0	88.7	226.0	38.1	56.7	120.6	0.0
Queue Length 95th (m)	5.3	34.5	17.2	42.5	65.2	24.7	m89.5 m#294.1	m41.4	#146.5	183.6	0.0	
Internal Link Dist (m)		272.6			267.2			707.4			96.4	
Turn Bay Length (m)	70.0		70.0	140.0			135.0		80.0	180.0		50.0
Base Capacity (vph)	233	399	428	464	399	541	443	2241	884	400	2233	789
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.20	0.28	0.58	0.41	0.50	0.78	1.03	0.50	0.70	0.65	0.03

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 35 (25%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 145
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings 1: Bronte Road & Upper Middle Road

2031 Future Total PM Peak Hour
1354 Bronte

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 38.3

Intersection LOS: D

Intersection Capacity Utilization 86.9%

ICU Level of Service E

Analysis Period (min) 15

* User Entered Value

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Bronte Road & Upper Middle Road

 Ø1	 Ø2 (R) 	 Ø3	 Ø4
19 s	73.8 s	10.5 s	36.7 s
 Ø5	 Ø6 (R) 	 Ø7	 Ø8
32.4 s	60.4 s	10.5 s	36.7 s

HCM Signalized Intersection Capacity Analysis

1: Bronte Road & Upper Middle Road

2031 Future Total PM Peak Hour

1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	74	114	252	155	252	325	2173	414	265	1355	20
Future Volume (vph)	7	74	114	252	155	252	325	2173	414	265	1355	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	*0.80	1.00	1.00	*0.80	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1762	1863	1551	3400	1863	1541	1770	4471	1517	1770	4385	1435
Flt Permitted	0.65	1.00	1.00	0.58	1.00	1.00	0.08	1.00	1.00	0.06	1.00	1.00
Satd. Flow (perm)	1211	1863	1551	2068	1863	1541	150	4471	1517	109	4385	1435
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	7	79	121	268	165	268	346	2312	440	282	1441	21
RTOR Reduction (vph)	0	0	105	0	0	223	0	0	130	0	0	11
Lane Group Flow (vph)	7	79	16	268	165	45	346	2312	310	282	1441	10
Confl. Peds. (#/hr)	6					6	1		1	1		1
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	2%	2%	2%	3%	2%	2%	2%	2%	2%	2%	4%	7%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	6
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	19.4	18.1	18.1	28.6	23.3	23.3	93.1	67.0	67.0	95.3	68.1	68.1
Effective Green, g (s)	19.4	18.1	18.1	28.6	23.3	23.3	93.1	67.0	67.0	95.3	68.1	68.1
Actuated g/C Ratio	0.14	0.13	0.13	0.20	0.17	0.17	0.66	0.48	0.48	0.68	0.49	0.49
Clearance Time (s)	4.0	6.7	6.7	4.0	6.7	6.7	4.0	6.5	6.5	4.0	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	172	240	200	484	310	256	401	2139	725	396	2132	698
v/s Ratio Prot	0.00	0.04		c0.03	0.09		c0.16	c0.52		0.14	0.33	
v/s Ratio Perm	0.01		0.01	c0.09		0.03	0.41		0.20	0.34		0.01
v/c Ratio	0.04	0.33	0.08	0.55	0.53	0.17	0.86	1.08	0.43	0.71	0.68	0.01
Uniform Delay, d1	52.2	55.4	53.6	49.5	53.4	50.1	38.8	36.5	23.9	41.7	27.5	18.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.20	0.91	1.36	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.8	0.2	1.4	1.8	0.3	1.9	37.4	0.2	6.0	1.7	0.0
Delay (s)	52.2	56.2	53.8	50.8	55.1	50.4	48.6	70.4	32.7	47.6	29.2	18.6
Level of Service	D	E	D	D	E	D	D	E	C	D	C	B
Approach Delay (s)		54.7			51.7			62.6			32.1	
Approach LOS		D			D			E			C	
Intersection Summary												
HCM 2000 Control Delay			51.8									
HCM 2000 Volume to Capacity ratio			0.93									
Actuated Cycle Length (s)			140.0									
Intersection Capacity Utilization			86.9%									
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2031 Future Total PM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations								  			  	
Traffic Volume (vph)	10	0	29	104	0	59	47	2921	174	99	1670	17
Future Volume (vph)	10	0	29	104	0	59	47	2921	174	99	1670	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	15.0		0.0	15.0		0.0	15.0		15.0	15.0		15.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.80	1.00	1.00	*0.80	1.00
Frt		0.850			0.850				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1583	0	1770	1583	0	1770	4471	1583	1770	4471	1583
Flt Permitted	0.715			0.736			0.088			0.039		
Satd. Flow (perm)	1332	1583	0	1371	1583	0	164	4471	1583	73	4471	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		55			59				55			19
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		42.5			50.2			458.5			731.4	
Travel Time (s)		3.1			3.6			27.5			43.9	
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
Adj. Flow (vph)	11	0	32	113	0	64	51	3175	189	108	1815	18
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	32	0	113	64	0	51	3175	189	108	1815	18
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		6

Lanes, Volumes, Timings
2: Bronte Road & Saw Whet Boulevard

2031 Future Total PM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4		8	8		2	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		15.0	15.0	15.0	5.0	15.0	15.0
Minimum Split (s)	35.5	35.5		35.5	35.5		35.5	35.5	35.5	9.5	35.5	35.5
Total Split (s)	35.5	35.5		35.5	35.5		95.0	95.0	95.0	9.5	104.5	104.5
Total Split (%)	25.4%	25.4%		25.4%	25.4%		67.9%	67.9%	67.9%	6.8%	74.6%	74.6%
Maximum Green (s)	30.0	30.0		30.0	30.0		89.5	89.5	89.5	5.0	99.0	99.0
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.5	3.7	3.7
All-Red Time (s)	2.2	2.2		2.2	2.2		1.8	1.8	1.8	1.0	1.8	1.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	4.5	5.5	5.5
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?							Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Max	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)	23.0	23.0		23.0	23.0		23.0	23.0	23.0		23.0	23.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0		0	0
Act Effect Green (s)	16.9	16.9		16.9	16.9		96.9	96.9	96.9	113.1	112.1	112.1
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.69	0.69	0.69	0.81	0.80	0.80
v/c Ratio	0.07	0.13		0.68	0.26		0.45	1.03	0.17	0.57	0.51	0.01
Control Delay	52.3	5.3		78.9	16.7		8.2	29.5	0.5	30.0	10.3	4.7
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.3	5.3		78.9	16.7		8.2	29.5	0.5	30.0	10.3	4.7
LOS	D	A		E	B		A	C	A	C	B	A
Approach Delay		17.3			56.4			27.5			11.4	
Approach LOS		B			E			C			B	
Queue Length 50th (m)	2.9	0.0		32.1	1.3		1.4	~419.5	1.3	18.5	58.9	0.1
Queue Length 95th (m)	8.8	4.0		51.4	15.0		m2.2	m#433.1	m1.8	m34.9	201.0	m2.9
Internal Link Dist (m)		18.5			26.2			434.5			707.4	
Turn Bay Length (m)	15.0			15.0			15.0		15.0	15.0		15.0
Base Capacity (vph)	285	382		293	385		113	3095	1112	189	3581	1271
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.08		0.39	0.17		0.45	1.03	0.17	0.57	0.51	0.01

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 145

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 22.8

Intersection LOS: C

Intersection Capacity Utilization 87.3%

ICU Level of Service E

Analysis Period (min) 15

* User Entered Value

~ Volume exceeds capacity, queue is theoretically infinite.

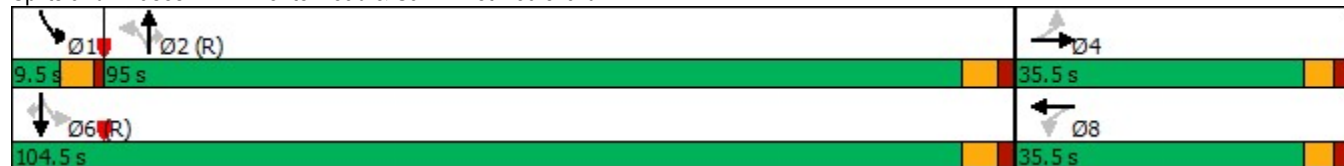
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Bronte Road & Saw Whet Boulevard



HCM Signalized Intersection Capacity Analysis

2: Bronte Road & Saw Whet Boulevard

2031 Future Total PM Peak Hour
1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	0	29	104	0	59	47	2921	174	99	1670	17
Future Volume (vph)	10	0	29	104	0	59	47	2921	174	99	1670	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	4.5	5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	*0.80	1.00	1.00	*0.80	1.00
Frt	1.00	0.85		1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1583		1770	1583		1770	4471	1583	1770	4471	1583
Flt Permitted	0.72	1.00		0.74	1.00		0.09	1.00	1.00	0.04	1.00	1.00
Satd. Flow (perm)	1332	1583		1372	1583		165	4471	1583	73	4471	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	0	32	113	0	64	51	3175	189	108	1815	18
RTOR Reduction (vph)	0	28	0	0	52	0	0	0	17	0	0	4
Lane Group Flow (vph)	11	4	0	113	12	0	51	3175	172	108	1815	14
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	16.9	16.9		16.9	16.9		96.9	96.9	96.9	112.1	112.1	112.1
Effective Green, g (s)	16.9	16.9		16.9	16.9		96.9	96.9	96.9	112.1	112.1	112.1
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.69	0.69	0.69	0.80	0.80	0.80
Clearance Time (s)	5.5	5.5		5.5	5.5		5.5	5.5	5.5	4.5	5.5	5.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	160	191		165	191		114	3094	1095	188	3579	1267
v/s Ratio Prot		0.00			0.01			c0.71		0.04	c0.41	
v/s Ratio Perm	0.01			c0.08			0.31		0.11	0.41		0.01
v/c Ratio	0.07	0.02		0.68	0.06		0.45	1.03	0.16	0.57	0.51	0.01
Uniform Delay, d1	54.6	54.3		59.0	54.5		9.6	21.5	7.4	45.8	4.7	2.8
Progression Factor	1.00	1.00		1.00	1.00		0.26	0.46	0.06	0.77	1.93	3.07
Incremental Delay, d2	0.2	0.0		11.2	0.1		4.1	16.9	0.1	3.5	0.4	0.0
Delay (s)	54.8	54.3		70.2	54.7		6.6	26.9	0.6	38.6	9.5	8.6
Level of Service	D	D		E	D		A	C	A	D	A	A
Approach Delay (s)		54.4			64.6			25.2			11.1	
Approach LOS		D			E			C			B	
Intersection Summary												
HCM 2000 Control Delay	21.7			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	0.94											
Actuated Cycle Length (s)	140.0			Sum of lost time (s)			15.5					
Intersection Capacity Utilization	87.3%			ICU Level of Service			E					
Analysis Period (min)	15											
c Critical Lane Group												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2031 Future Total PM Peak Hour

1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↗		↗	↗	↕	↗	↗	↕	↕
Traffic Volume (vph)	0	0	0	138	0	110	1	3033	175	89	1751	0
Future Volume (vph)	0	0	0	138	0	110	1	3033	175	89	1751	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		40.0	35.0		30.0	70.0		0.0
Storage Lanes	0		0	1		1	1		1	1		0
Taper Length (m)	7.5			7.5			20.0			60.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.80	1.00	1.00	*0.80	0.91
Ped Bike Factor						0.98			0.98			
Frt						0.850			0.850			
Flt Protected				0.950			0.950			0.950		
Satd. Flow (prot)	0	1863	0	1770	0	1583	1770	4427	1388	1770	4385	0
Flt Permitted				0.757			0.085			0.040		
Satd. Flow (perm)	0	1863	0	1410	0	1556	158	4427	1357	75	4385	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						64			56			
Link Speed (k/h)		20			20			60			60	
Link Distance (m)		78.7			109.0			218.2			458.5	
Travel Time (s)		14.2			19.6			13.1			27.5	
Confl. Bikes (#/hr)			5			5			5			5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	3%	14%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Adj. Flow (vph)	0	0	0	142	0	113	1	3127	180	92	1805	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	142	0	113	1	3127	180	92	1805	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.03	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1		1	1	2	1	1	2	
Detector Template	Left	Thru		Left		Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0		2.0		2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0		2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4						9.4			9.4	
Detector 2 Size(m)		0.6						0.6			0.6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												

Lanes, Volumes, Timings
3: Bronte Road & Driveway/Charles Cornwall Road

2031 Future Total PM Peak Hour
1354 Bronte

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)	0.0							0.0			0.0	
Turn Type				Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases	4							2		1	6	
Permitted Phases	4			8		8	2		2	6		
Detector Phase	4	4		8		8	2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0		10.0	15.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	24.2	24.2		35.2		35.2	34.9	34.9	34.9	9.5	34.9	
Total Split (s)	35.2	35.2		35.2		35.2	95.3	95.3	95.3	9.5	104.8	
Total Split (%)	25.1%	25.1%		25.1%		25.1%	68.1%	68.1%	68.1%	6.8%	74.9%	
Maximum Green (s)	29.0	29.0		29.0		29.0	89.4	89.4	89.4	5.5	98.9	
Yellow Time (s)	3.1	3.1		3.1		3.1	3.7	3.7	3.7	3.0	3.7	
All-Red Time (s)	3.1	3.1		3.1		3.1	2.2	2.2	2.2	1.0	2.2	
Lost Time Adjust (s)		0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.2		6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?							Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0		3.0	3.6	3.6	3.6	3.0	3.6	
Recall Mode	None	None		None		None	C-Max	C-Max	C-Max	None	C-Max	
Walk Time (s)				7.0		7.0	7.0	7.0	7.0		7.0	
Flash Dont Walk (s)				22.0		22.0	22.0	22.0	22.0		22.0	
Pedestrian Calls (#/hr)				0		0	0	0	0		0	
Act Effct Green (s)				19.3		19.3	96.4	96.4	96.4	110.5	108.6	
Actuated g/C Ratio				0.14		0.14	0.69	0.69	0.69	0.79	0.78	
v/c Ratio				0.73		0.42	0.01	1.03	0.19	0.58	0.53	
Control Delay				78.3		28.9	9.0	45.9	6.6	45.3	2.6	
Queue Delay				0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay				78.3		28.9	9.0	45.9	6.6	45.3	2.6	
LOS				E		C	A	D	A	D	A	
Approach Delay					56.4		43.7			4.6		
Approach LOS					E		D			A		
Queue Length 50th (m)				40.2			12.9	0.1	~406.2	11.6	9.7	5.7
Queue Length 95th (m)				61.1			30.9	0.9	#458.6	24.5	#34.9	50.4
Internal Link Dist (m)	54.7					85.0		194.2			434.5	
Turn Bay Length (m)						40.0	35.0			30.0	70.0	
Base Capacity (vph)				292			373	108	3048	951	158	3400
Starvation Cap Reductn				0			0	0	0	0	0	0
Spillback Cap Reductn				0			0	0	0	0	0	0
Storage Cap Reductn				0			0	0	0	0	0	0
Reduced v/c Ratio				0.49			0.30	0.01	1.03	0.19	0.58	0.53

Intersection Summary

Area Type: Other
 Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 103.6 (74%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.03

Lanes, Volumes, Timings 3: Bronte Road & Driveway/Charles Cornwall Road

2031 Future Total PM Peak Hour
1354 Bronte

Intersection Signal Delay: 30.7

Intersection LOS: C

Intersection Capacity Utilization 82.8%

ICU Level of Service E

Analysis Period (min) 15

* User Entered Value

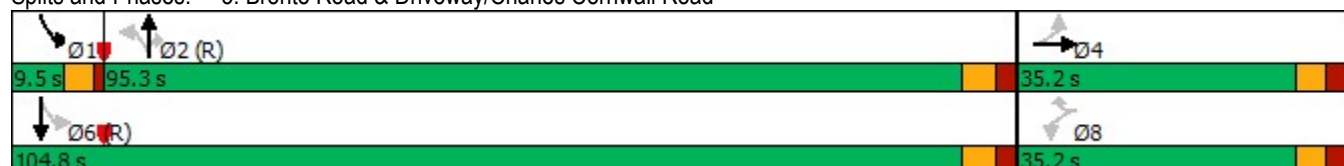
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 3: Bronte Road & Driveway/Charles Cornwall Road



HCM Signalized Intersection Capacity Analysis

3: Bronte Road & Driveway/Charles Cornwall Road

2031 Future Total PM Peak Hour
1354 Bronte

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	138	0	110	1	3033	175	89	1751	0
Future Volume (vph)	0	0	0	138	0	110	1	3033	175	89	1751	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Lane Util. Factor				1.00		1.00	1.00	*0.80	1.00	1.00	*0.80	
Frpb, ped/bikes				1.00		0.98	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes				1.00		1.00	1.00	1.00	1.00	1.00	1.00	
Frt				1.00		0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95		1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1770		1552	1770	4427	1357	1770	4385	
Flt Permitted				0.76		1.00	0.09	1.00	1.00	0.04	1.00	
Satd. Flow (perm)				1410		1552	159	4427	1357	74	4385	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	142	0	113	1	3127	180	92	1805	0
RTOR Reduction (vph)	0	0	0	0	0	55	0	0	17	0	0	0
Lane Group Flow (vph)	0	0	0	142	0	58	1	3127	163	92	1805	0
Confl. Bikes (#/hr)			5			5			5			5
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	3%	14%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	6
Turn Type				Perm		Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)				19.3		19.3	96.4	96.4	96.4	108.6	108.6	
Effective Green, g (s)				19.3		19.3	96.4	96.4	96.4	108.6	108.6	
Actuated g/C Ratio				0.14		0.14	0.69	0.69	0.69	0.78	0.78	
Clearance Time (s)				6.2		6.2	5.9	5.9	5.9	4.0	5.9	
Vehicle Extension (s)				3.0		3.0	3.6	3.6	3.6	3.0	3.6	
Lane Grp Cap (vph)				194		213	109	3048	934	156	3401	
v/s Ratio Prot								c0.71		0.03	c0.41	
v/s Ratio Perm				c0.10		0.04	0.01		0.12	0.42		
v/c Ratio				0.73		0.27	0.01	1.03	0.17	0.59	0.53	
Uniform Delay, d1				57.9		54.1	6.8	21.8	7.7	43.2	6.0	
Progression Factor				1.00		1.00	1.00	1.00	1.00	1.47	0.31	
Incremental Delay, d2				13.3		0.7	0.2	23.3	0.4	5.0	0.5	
Delay (s)				71.2		54.7	7.0	45.1	8.1	68.4	2.4	
Level of Service				E		D	A	D	A	E	A	
Approach Delay (s)		0.0			63.9			43.1			5.6	
Approach LOS		A			E			D			A	
Intersection Summary												
HCM 2000 Control Delay			31.0									
HCM 2000 Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			140.0							16.1		
Intersection Capacity Utilization			82.8%									
Analysis Period (min)			15									
c Critical Lane Group												