

384 Arlington Avenue

Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Strategy Report (Revision #3 for SPA)

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1 Screening

This study has been prepared according to the City of Ottawa’s 2017 Transportation Impact Assessment (TIA) Guidelines, incorporating the 2023 Revision to Transportation Impact Assessment Guidelines. Accordingly, a Step 1 Screening Form has been prepared and is included as Appendix A, along with the Certification Form for the TIA Study PM. As shown in the Screening Form, a TIA is required, and this study has been prepared to support a site plan application.

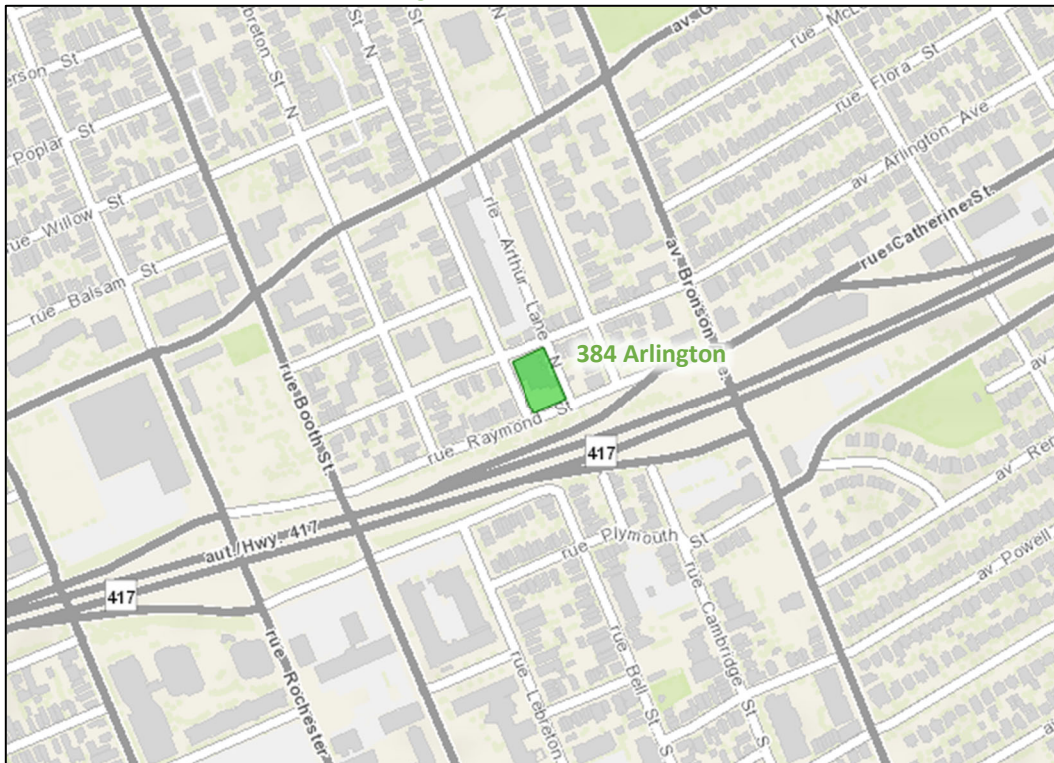
2 Existing and Planned Conditions

2.1 Proposed Development

The existing site is the Ottawa Korean Community Church building and surface parking lot and was recently rezoned to Residential Fifth Density (R5B[2916]-c S488-h). The proposed residential development is for a 24-storey residential building comprising 296 residential dwelling units, with 78 vehicle parking spaces and 296 bike parking spaces. Vehicular access to below grade parking is proposed via a right-in/right-out access on Raymond Street, and the development is anticipated to be built-out in a single phase by 2026.

Figure 1 illustrates the study area context. Figure 2 illustrates the proposed concept plan.

Figure 1: Area Context Plan



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: January 18, 2024

2.2 Existing Conditions

2.2.1 Area Road Network

Highway 417: Highway 417 is a Ministry of Transportation of Ontario urban freeway with a divided eight-lane urban cross-section within the study area. The posted speed limit is 100 km/h and the right-of-way is variable.

Bronson Avenue: Bronson Avenue is a City of Ottawa arterial road with a four-lane urban cross-section. Sidewalks are present on both sides of the road, and no stopping is permitted during the peak hours. Within the study area, the posted speed limit is 50 km/h, and the City-protected right-of-way is 23.0 metres. Bronson Avenue is designated as a truck route.

Catherine Street: Catherine Street is a City of Ottawa arterial one-way road with a three-lane urban cross-section, sidewalks are present on both sides of the road, and no stopping is permitted during the peak hours. The posted speed limit is 50 km/h, and the City-protected right-of-way is 23.0 metres. Catherine Street is designated as a truck route.

Raymond Street: Raymond Street is a City of Ottawa arterial one-way road between Bronson Avenue and the Highway 417 on-ramp, and a one-way local road to the west of the on-ramp. The urban cross-section reduces from a three-lane width to a single lane west of the Highway 417 on-ramp with parking lanes located on the north side. Parking is restricted to one hour between 7AM and 7PM. The posted speed limit is 30 km/h. The City-protected right-of-way is 23.0 metres between Bronson Avenue and the Highway 417 on-ramp, and the existing right-of-way varies between 12.5 to 19.5 metres west of Highway 417 on-ramp. Raymond Street is designated as a truck route east of the Highway 417 on-ramp and west of Booth Street.

Booth Street: Booth Street is a City of Ottawa major collector road with a two-lane urban cross-section. Sidewalks on both sides of the road, and framed parking is provided on the east side of the road north of Raymond Street. The posted speed limit is 40 km/h, and the existing right-of-way is 20.0 metres. Booth Street south of Raymond Street is designated as a truck route.

Gladstone Avenue: Gladstone Avenue is a City of Ottawa City of Ottawa major collector road with a two-lane urban cross-section. Sidewalks are present on both sides of the road. On-street parking is permitted on the north side of the road between Bronson Avenue and Lebreton Street North, and framed parking is provided on the north side of the road west of Lebreton Street North within the study area and on the south side of the road between Lebreton Street N and Booth Street. The posted speed limit is 40 km/h. The City-protected right-of-way is 22.0 metres between Preston Street and Rochester Street, 20.0 metres between Rochester Street and Booth Street, and the existing right-of-way varies from 20.0 to approximately 36.0 metres east of Booth Street. Gladstone Avenue is a truck route.

Arlington Avenue: Arlington Avenue is a City of Ottawa local road with a two-lane urban cross-section. Sidewalks are present on both sides of the road. East of Bronson Avenue within the study area, on-street parking is permitted on the south side of the road and west of Cambridge Street North on-street parking is permitted on the north side of the road. The posted speed limit is 30 km/h, and the existing right-of-way is 15.5 metres.

Bell Street North: Bell Street North is a City of Ottawa local road with a two-lane urban cross-section south of Gladstone Avenue and a one-way (southbound) road with one-lane cross-section north of Gladstone Avenue. Sidewalks are present on both sides of the road. South of Gladstone, on-street parking is permitted on the west side of the road, with a winter restriction between December 1st and March 31st. Between Arlington Street and Gladstone Avenue, the east side of the road is reserved for permit parking and valet service for the LIV apartments at 207 Bell Street. North of Gladstone Avenue, on-street parking is permitted on the east side of the road. The

posted speed limit is 30 km/h, and the existing right-of-way is 16.5 metres with a narrower portion of 10.5 metres along the 207 Bell Street frontage due to partial ownership by that parcel.

Lebreton Street North: Lebreton Street North is a City of Ottawa local road with a two-lane urban cross-section, sidewalks on both sides of the road. On-street parking, signed one-hour between 7AM and 7PM, is permitted on one side of the road, alternating sides every block within the study area. The posted speed limit is 30 km/h north of Gladstone Avenue and the unposted speed limit is assumed to be 50 km/h to the south, and the existing right-of-way is 20.0 metres.

Louisa Street: Louisa Street is a City of Ottawa local road with a two-lane urban cross-section, sidewalks on both sides of the road. On-street parking, signed one-hour between 7AM and 7PM, is permitted on the south side of the road to the east of Lebreton Street North and on the north side to the west. The unposted speed limit is assumed to be 50 km/h, and the existing right-of-way is 20.0 metres.

Arthur Street: Arthur Street is a City of Ottawa local road with a two-lane urban cross-section with sidewalks on both sides of the road and on-street parking permitted on the west side of the road. The posted speed limit is 30 km/h, and the existing right-of-way is 20.0 metres.

Arthur Lane North: Arthur Lane North is a City of Ottawa local one-way (southbound) road north of Arlington Avenue and a two-way local road south of Arlington Avenue. While circulation on the section of roadway south of Arlington Avenue is two-way, one-way signage is provided on Arthur Lane North at Raymond Street, where access to this portion of the lane is from Arlington Avenue only. The speed limit is 30 km/h as part of the gateway area, and the existing right-of-way is 6.0 metres.

2.2.2 Existing Intersections

The key signalized area intersections within 400 metres of the site have been summarized below:

Bronson Avenue at Catherine Street/Raymond Street

The intersection of Bronson Avenue at Catherine Street/Raymond Street is a signalized intersection. The northbound approach consists of an auxiliary left-turn lane and two through lanes, the southbound approach consists of a through and a shared through/right-turn lane and the westbound approach consists of an auxiliary left-turn lane, an auxiliary shared left-turn/through lane, a through lane and a shared through/right-turn lane. No turn restrictions are noted beyond the one-way on Catherine Street/Raymond Street does not permit any movements from the west side of the intersection.

Bronson Avenue at Arlington Avenue

The intersection of Bronson Avenue at Arlington Avenue is a signalized intersection. The northbound and southbound approaches each consist of a shared left-turn/through lane and shared through/right-turn lane, and the eastbound and westbound approaches each consist of a shared all movements lane. No turn restrictions are noted.

Bronson Avenue at Gladstone Avenue

The intersection of Bronson Avenue at Gladstone Avenue is a signalized intersection. The northbound and southbound approaches each consist of an auxiliary left-turn lane, through lane and a shared through/right-turn lane, and the eastbound and westbound approaches each consist of an auxiliary left-turn lane and a shared

through/right-turn lane. Right turns on red are restricted at all approaches weekdays between 7:00AM and 7:00PM.

Bronson Avenue at Highway 417 EB Ramp

The intersection of Bronson Avenue at the Highway 417 eastbound off-ramp is a signalized intersection. The northbound and southbound approaches each consist of two through lanes. The eastbound approach consists of an auxiliary left-turn lane and a right-turn lane.

Booth Street at Gladstone Avenue

The intersection of Booth Street at Gladstone Avenue is a signalized intersection. The northbound and southbound approaches each consist of a shared all movement lane, which operate as an auxiliary left-turn movement and a shared through/right turn movement. The eastbound approach consists of an auxiliary left-turn lane, a through lane, and an auxiliary channelized right-turn lane, and the westbound approach consists of an auxiliary left-turn lane and a shared through/right-turn lane. No right-turns are permitted on the eastbound approach from the through lane.

Arthur Street/Arthur Lane at Gladstone Avenue

The intersection of Arthur Street/Arthur Lane at Gladstone Avenue is a signalized intersection. The southbound, eastbound and westbound approaches all consist of a shared all movements lane. No turn restrictions are noted beyond the one-way on Arthur Lane south of Gladstone Avenue does not permit any movements from the south side of the intersection.

Booth Street at Raymond Street

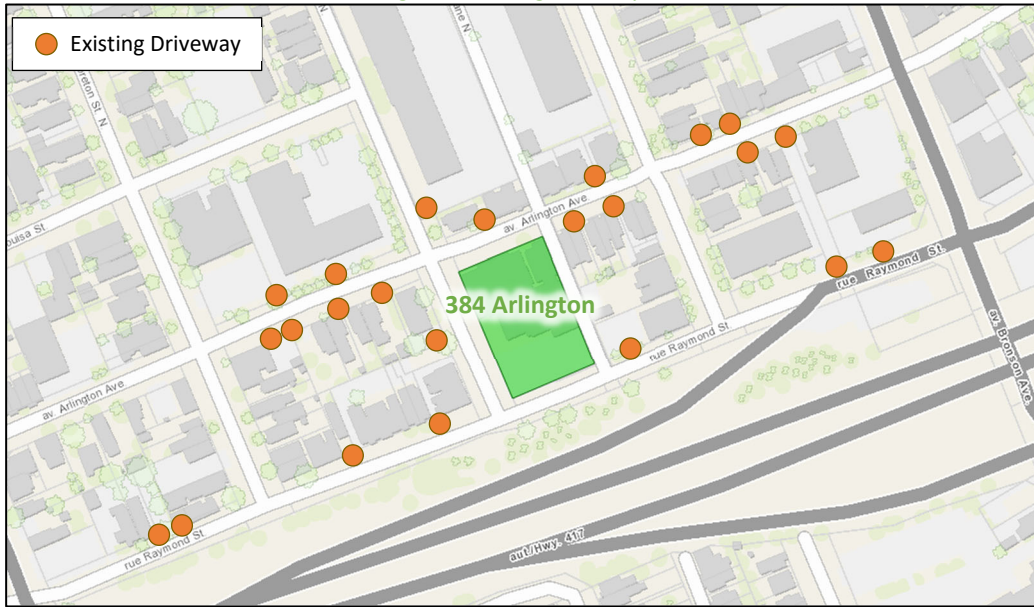
The intersection of Booth Street at Raymond Street is a signalized intersection. The northbound approach consists of an auxiliary left-turn lane and a through lane, the southbound approach consists of a shared through/right-turn lane, and the westbound approach consists of a shared left-turn/through lane and an auxiliary right-turn lane. No turn restrictions are noted beyond the one-way on Catherine Street/Raymond Street does not permit any movements from the west side of the intersection.

2.2.3 Existing Driveways

Within 200 metres of the site access on the boundary streets, driveways to attached, detached, and low-rise residential land uses are generally present. Twelve such residential driveways are present on Arlington Avenue, one on Bell Street North, and four on Raymond Street are present.

On Bell Street North, a driveway to a high-rise residential building is additionally present. On Arlington Avenue, two driveways to a sport and health centre are present, and on Raymond Street, a driveway to an embassy and two driveways to low-rise commercial land uses are present. All driveways to the subject site are proposed as being removed as part of redevelopment. Figure 3 illustrates the existing area driveways.

Figure 3: Existing Driveways



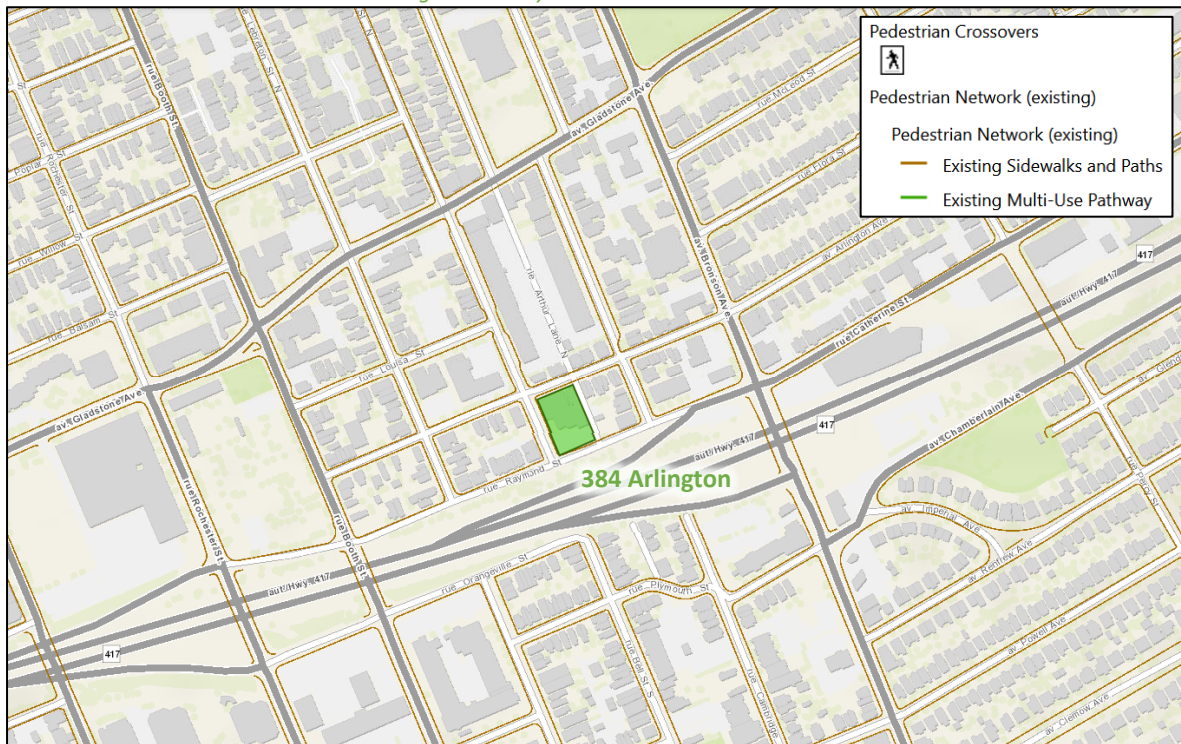
Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: January 18, 2024

2.2.4 Cycling and Pedestrian Facilities

Sidewalks are generally provided along both sides of the study area roadways, with the exception of Raymond Street where a sidewalk is provided on the north side only.

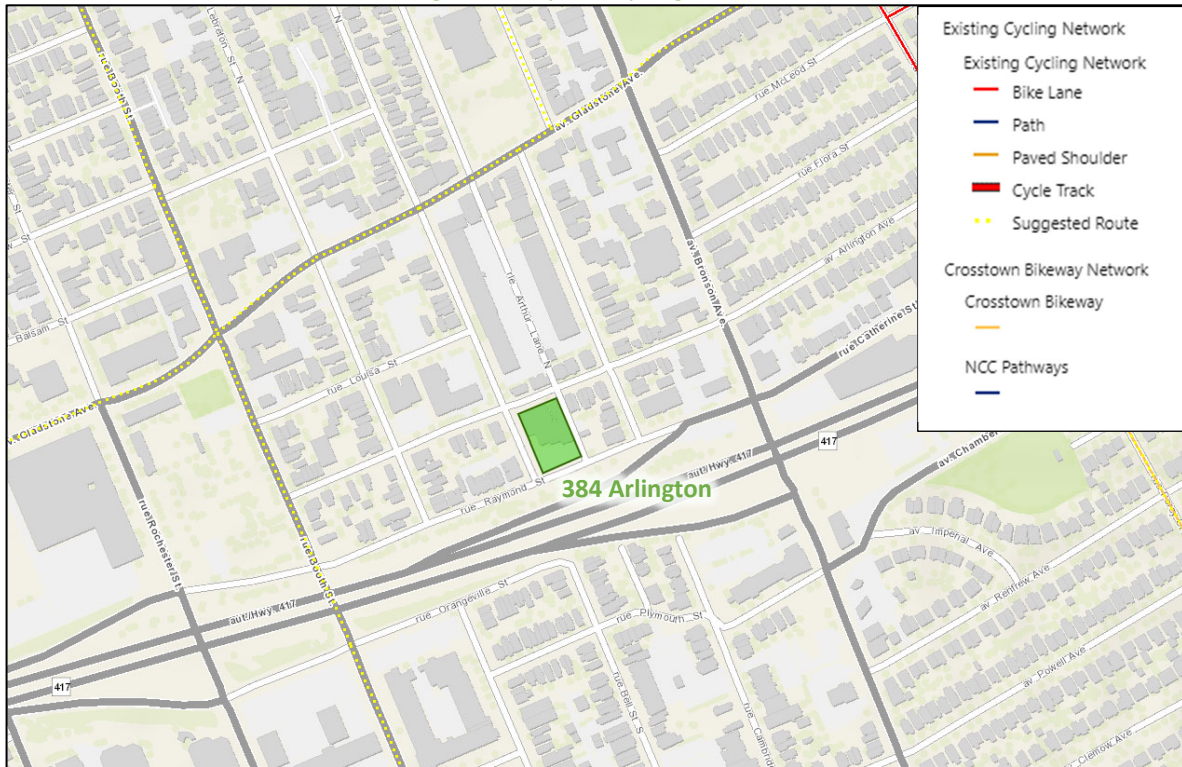
Cycling facilities include the designations of Gladstone Avenue and Booth Street as suggested routes. Figure 4 illustrates the pedestrian facilities in the study area and Figure 5 illustrates the cycling facilities.

Figure 4: Study Area Pedestrian Facilities



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: May 24, 2024

Figure 5: Study Area Cycling Facilities



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: May 24, 2024

Pedestrian and cyclist volumes included in study area intersection counts, presented in Section 2.2.7, have been compiled and are illustrated in Figure 6 and Figure 7 respectively. The City of Ottawa notes that the active mode volumes collected in March may be lower than in other months.

Figure 6: Existing Pedestrian Counts

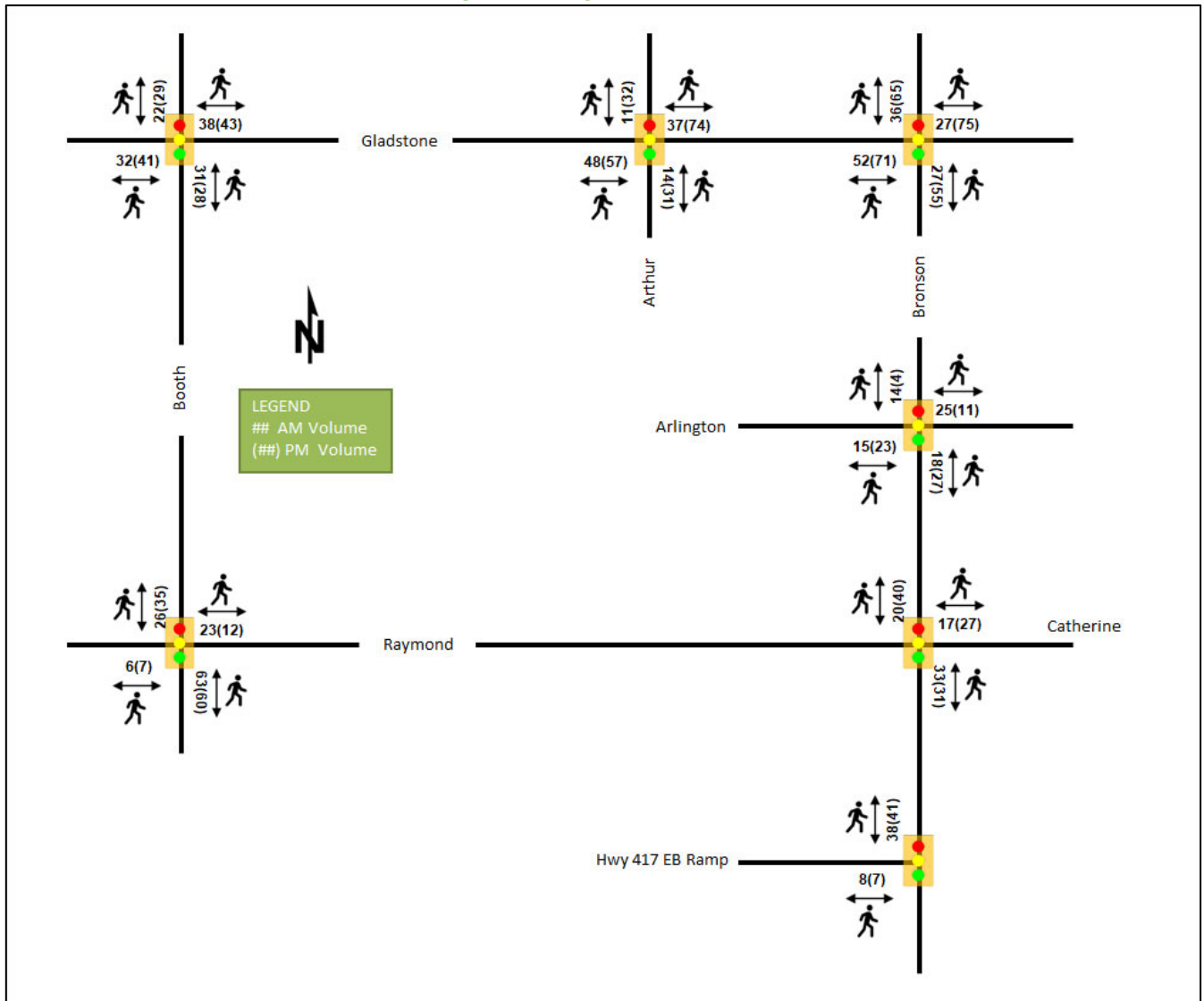
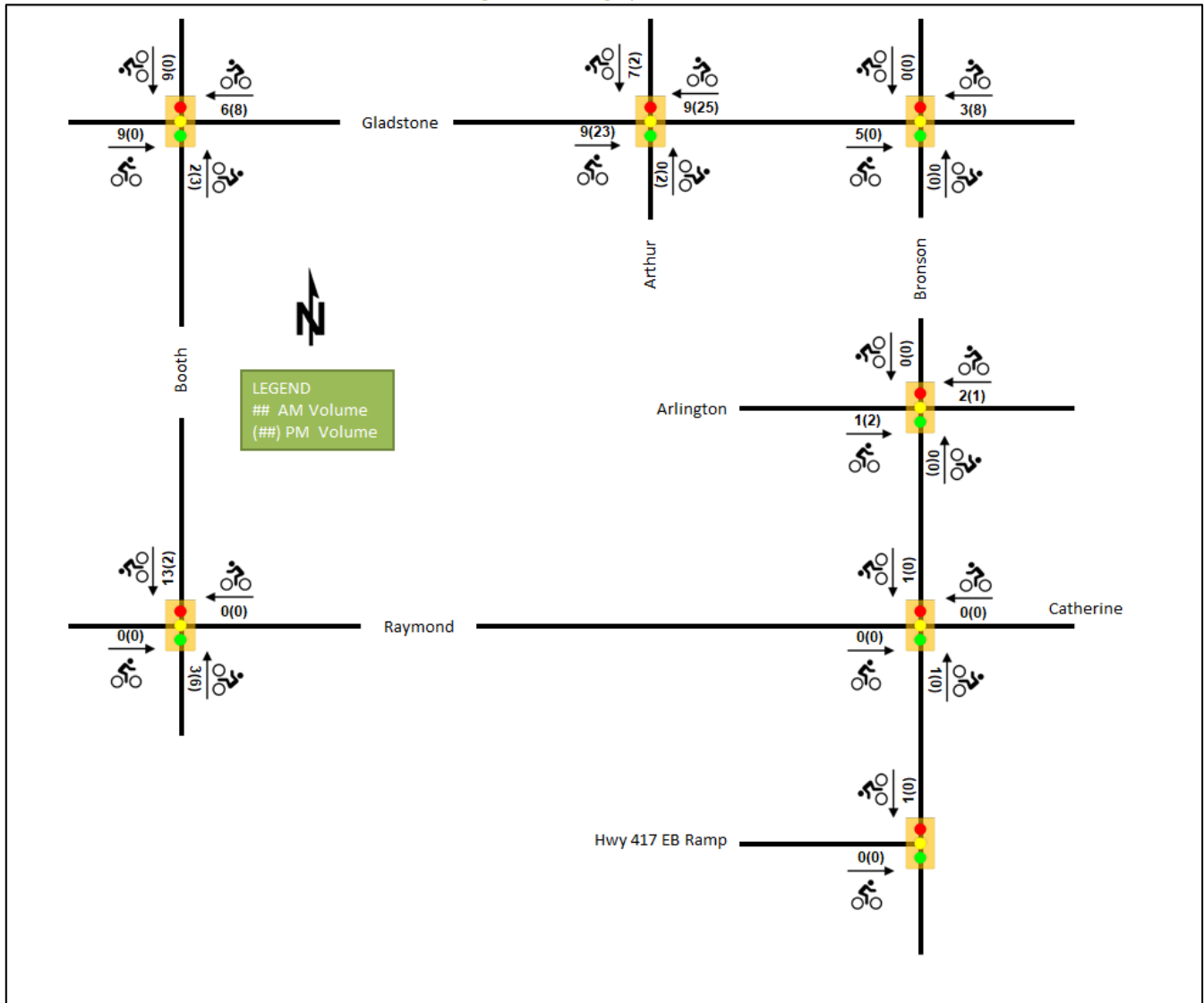


Figure 7: Existing Cyclist Counts



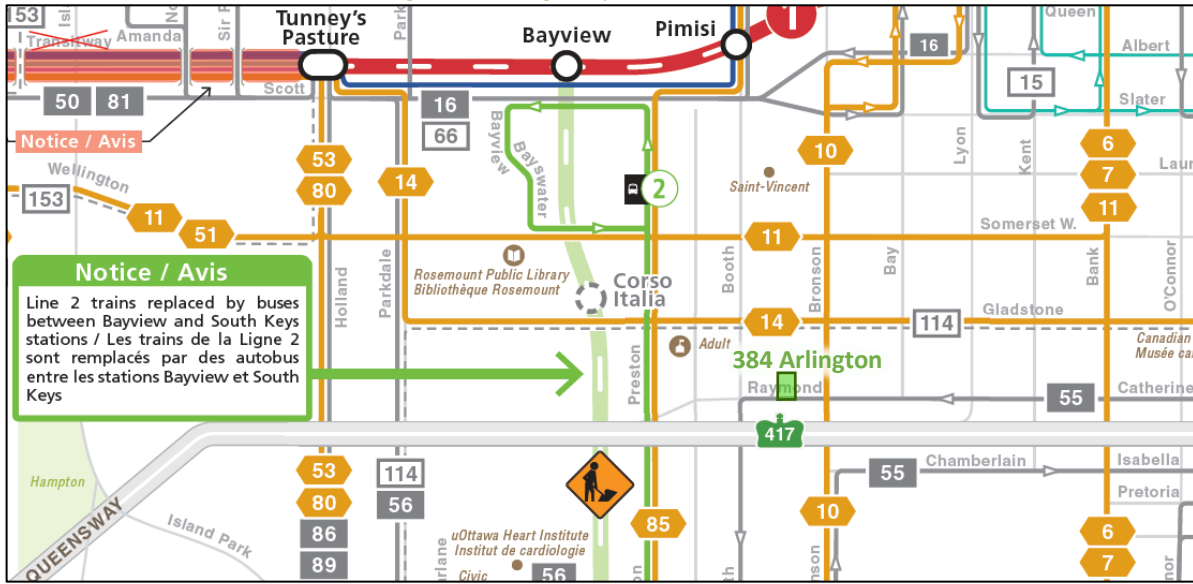
2.2.5 Existing Transit

Within the study area, the routes #10, 14, 55 and 114 area travel in proximity of the proposed site. The frequency of these routes within proximity of the proposed site as of January 18, 2024 are:

- Route #10 – 15-minute service during the day, 30-minute service during the early morning and evenings
- Route #14 – 15-20-minute service during the day, 30-minute service during the evenings
- Route #55 – 15-20-minute service during the day, 30-minute service during the evenings
- Route #114 – two trips downtown in the AM, and two trips to Carlington in the PM

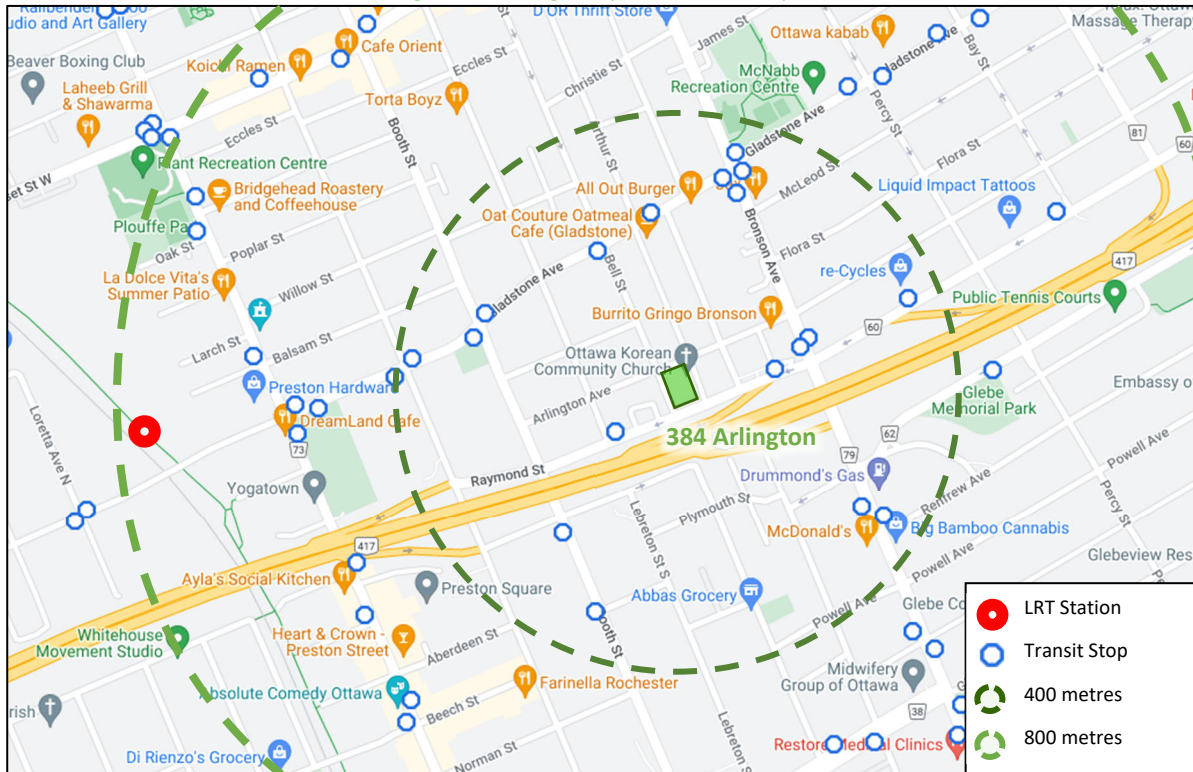
Figure 8 illustrates the transit system map in the study area and Figure 9 illustrates nearby transit stops. All transit information is per January 18, 2024, and for general context of the area.

Figure 8: Existing Study Area Transit Service



Source: <http://www.octranspo.com/> Accessed: January 18, 2024

Figure 9: Existing Study Area Transit Stops



Source: <http://www.octranspo.com/> Accessed: January 18, 2024

2.2.6 Existing Area Traffic Management Measures

Traffic management measures within the study area include on-street parking on local roads, bulb-outs at intersections along Booth Street, Raymond Street, Bell Street, and Gladstone Avenue, speed humps on Arlington Avenue approximately 110 and 188 metres east of Bronson Avenue, and vehicular directional closures on Arlington Avenue approximately 50 metres east of Bronson Avenue.

2.2.7 Existing Peak Hour Travel Demand

Existing turning movement counts were acquired from the City of Ottawa and Ontario Traffic Inc. for the study area intersections. Table 1 summarizes the intersection count dates and sources.

Table 1: Intersection Count Date

Intersection	Count Date	Source
Bronson Avenue at Highway 417 EB Ramp	Thursday, March 7, 2024	Ontario Traffic Inc.
Bronson Avenue at Catherine Street/Raymond Street	Thursday, March 7, 2024	Ontario Traffic Inc.
Bronson Avenue at Arlington Avenue	Thursday, March 7, 2024	Ontario Traffic Inc.
Bronson Avenue at Gladstone Avenue	Thursday, March 7, 2024	Ontario Traffic Inc.
Booth Street at Gladstone Avenue	Thursday, March 7, 2024	Ontario Traffic Inc.
Arthur Street/Arthur Lane at Gladstone Avenue	Thursday, September 21, 2022	City of Ottawa
Booth Street at Raymond Street	Thursday, March 7, 2024	Ontario Traffic Inc.

Figure 10 illustrates the existing traffic counts and Table 2 summarizes the existing intersection operations. The level of service for signalized intersections is based on volume to capacity ratio (v/c) calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. Detailed turning movement count data is included in Appendix B and the Synchro worksheets are provided in Appendix C.

Figure 10: Existing Traffic Counts

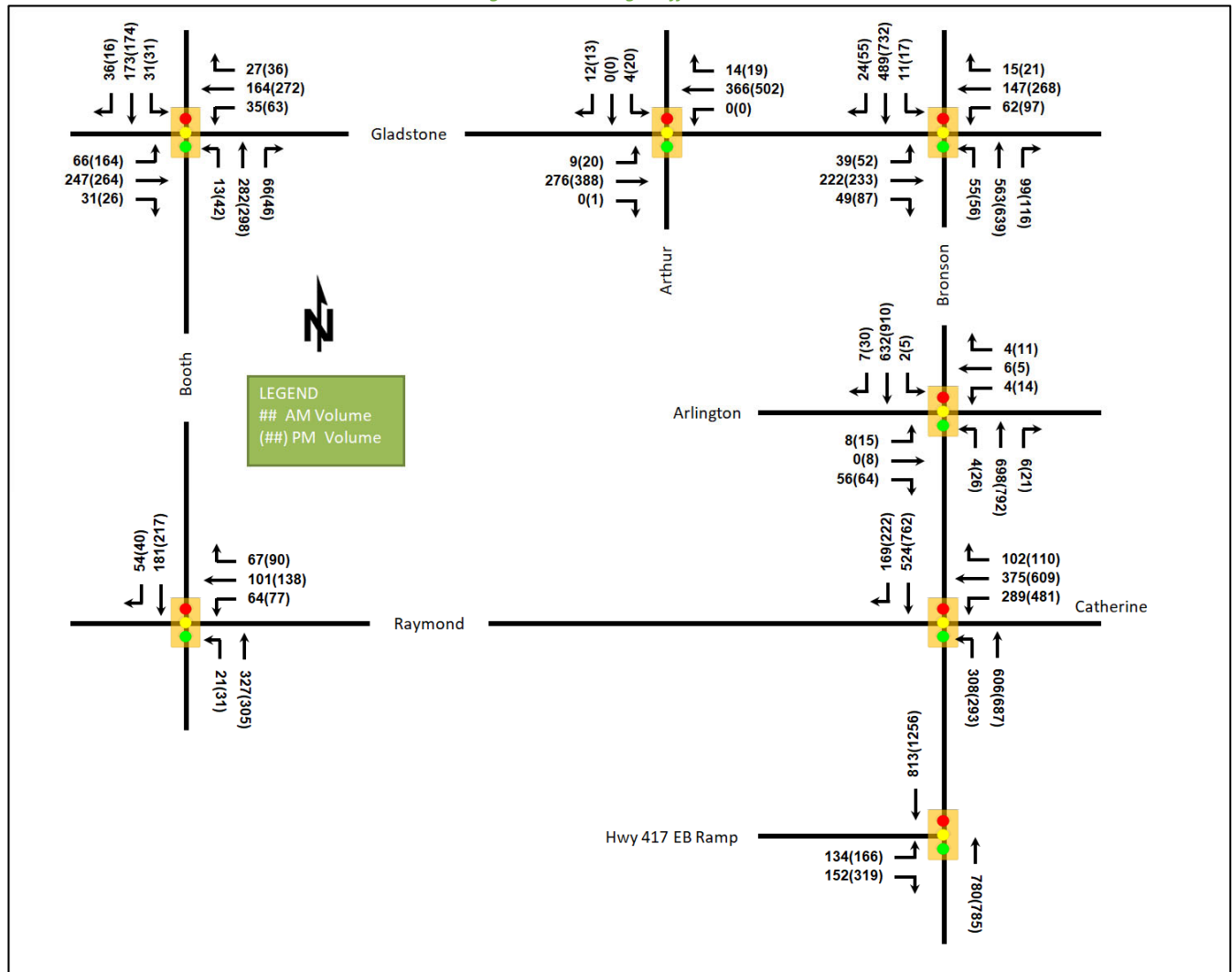


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95 th)	LOS	V/C	Delay (s)	Q (95 th)
Bronson Avenue at Highway 417 EB Ramp <i>Signalized</i>	EBL	A	0.29	30.6	41.0	A	0.36	31.7	49.8
	EBR	A	0.32	11.6	24.1	C	0.74	41.0	96.2
	NBT	A	0.45	14.0	66.5	A	0.45	13.9	66.7
	SBT	A	0.48	49.1	m62.1	C	0.72	68.0	131.6
	Overall	A	0.41	30.2	-	C	0.72	45.4	-
Bronson Avenue at Catherine Street/Raymond Street <i>Signalized</i>	WBL	A	0.60	44.6	75.9	D	0.87	59.4	#127.0
	WBT/R	A	0.59	36.6	57.5	D	0.85	42.2	#88.1
	NBL	B	0.65	22.9	52.0	E	0.92	59.8	#95.5
	NBT	A	0.33	8.4	30.2	A	0.38	13.3	48.7
	SBT/R	E	1.00	104.9	#125.4	E	0.94	46.1	#145.7
Overall	C	0.75	48.2	-	E	0.93	40.4	-	
Bronson Avenue at Arlington Avenue <i>Signalized</i>	EB	A	0.31	16.7	14.2	A	0.40	19.3	18.3
	WB	A	0.08	34.0	7.9	A	0.19	29.4	12.2
	NB	A	0.31	2.0	14.8	A	0.39	2.0	m12.8
	SB	A	0.28	4.1	28.9	A	0.42	2.3	21.6
	Overall	A	0.30	3.9	-	A	0.40	3.4	-
Bronson Avenue at Gladstone Avenue <i>Signalized</i>	EBL	A	0.16	28.4	14.5	A	0.20	22.7	16.6
	EBT/R	B	0.70	41.3	78.6	A	0.57	28.6	81.9
	WBL	A	0.38	35.6	23.2	A	0.40	27.8	30.5
	WBT/R	A	0.40	31.5	45.7	A	0.48	26.1	70.8
	NBL	A	0.20	15.7	14.1	A	0.48	28.4	13.3
	NBT/R	A	0.48	17.2	60.1	B	0.69	20.1	44.3
	SBL	A	0.05	13.3	4.1	A	0.13	22.8	7.7
	SBT/R	A	0.36	15.6	44.3	B	0.69	29.1	95.0
Overall	A	0.51	22.5	-	A	0.59	25.5	-	
Booth Street at Gladstone Avenue <i>Signalized</i>	EBL	A	0.16	14.9	15.0	A	0.48	21.5	41.1
	EBT/R	A	0.41	16.3	51.3	A	0.39	16.6	55.0
	WBL	A	0.10	14.4	9.2	A	0.18	15.4	15.2
	WBT/R	A	0.28	14.3	34.1	A	0.42	16.8	58.6
	NBL	A	0.05	19.8	5.3	A	0.16	25.6	14.9
	NBT/R	D	0.84	42.8	#88.3	C	0.72	36.9	#104.3
	SBL	A	0.24	25.3	10.8	A	0.19	28.0	12.5
	SBT/R	A	0.51	25.4	44.2	A	0.41	28.1	49.3
Overall	A	0.53	25.6	-	A	0.56	24.1	-	
Arthur Street / Arthur Lane at Gladstone Avenue <i>Signalized</i>	EB	A	0.22	4.1	32.0	A	0.34	5.5	47.3
	WB	A	0.29	4.5	44.6	A	0.42	6.3	64.2
	SB	A	0.06	2.7	1.6	A	0.13	11.1	7.2
	Overall	A	0.30	4.3	-	A	0.39	6.1	-
Booth Street at Raymond Street <i>Signalized</i>	WBL/T	A	0.27	13.2	24.8	A	0.39	18.8	39.7
	WBR	A	0.12	3.9	6.1	A	0.17	4.5	8.4
	NBL	A	0.06	11.2	5.1	A	0.08	10.4	6.6
	NBT	A	0.50	16.1	48.8	A	0.40	13.4	44.7
	SBT/R	A	0.37	12.5	31.6	A	0.35	12.0	35.6
Overall	A	0.39	13.4	-	A	0.40	13.3	-	

Notes: Saturation flow rate of 1800 veh/h/lane
 Queue is measured in metres
 Peak Hour Factor = 0.90

m = metered queue
 # = volume for the 95th %ile cycle exceeds capacity
 V/C = volume-to-capacity ratio

The study area intersections generally operate well during both peak hours.

At the intersection of Bronson Avenue at Catherine Street/Raymond Street, the southbound through/right movement is at theoretical capacity and may be subject to high delays and extended queues during the AM peak hour. During the PM peak hour at this intersection, the westbound left, westbound through/right, northbound left, and southbound through/right movements may exhibit extended queues.

At the intersection of Booth Street at Gladstone Avenue, the northbound through/right movement may exhibit extended queues during both peak hours.

2.2.8 Collision Analysis

Collision data have been acquired from the City of Ottawa open data website (data.ottawa.ca) for five years prior to the commencement of this TIA for the surrounding study area road network. Table 3 summarizes the collisions types and conditions in the study area, Figure 11 illustrates the intersections and segments analyzed, and Table 4 summarizes the total collisions for each of these locations. Collision data are included in Appendix D.

Table 3: Study Area Collision Summary, 2018-2022

Total Collisions		Number	%
		117	100%
Classification	Fatality	0	0%
	Non-Fatal Injury	24	21%
	Property Damage Only	93	79%
Initial Impact Type	Angle	33	28%
	Rear end	25	21%
	Sideswipe	28	24%
	Turning Movement	18	15%
	SMV Unattended	3	3%
	SMV Other	8	7%
	Other	2	2%
Road Surface Condition	Dry	84	72%
	Wet	20	17%
	Loose Snow	3	3%
	Slush	3	3%
	Packed Snow	3	3%
	Ice	4	3%
Pedestrian Involved		5	4%
Cyclists Involved		2	2%

Figure 11: Study Area Collision Records 2018-2022

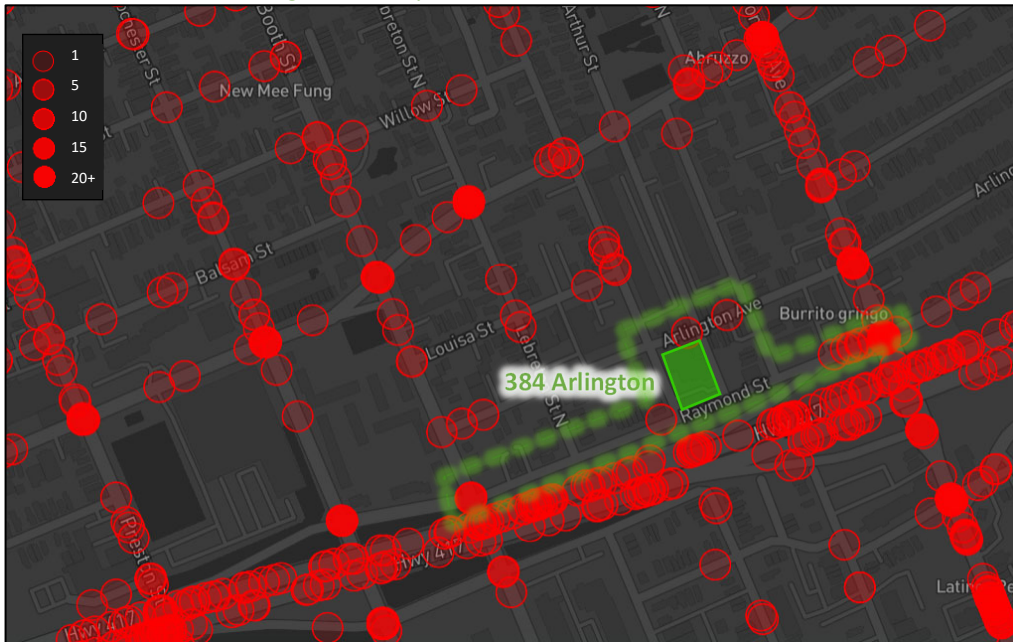


Table 4: Summary of Collision Locations, 2018-2022

Intersections / Segments	Number	%
	117	100%
Bronson Ave @ Catherine St/Raymond St	93	79%
Booth St @ Raymond St	11	9%
Raymond St btwn Hwy 417 Ic121a Ramp16 & Bronson Ave	8	7%
Arlington Ave btwn Bell St N & Arthur Lane N	2	2%
Arlington Ave @ Bell St	1	1%
Arlington Ave btwn Arthur Lane N & Cambridge St N	1	1%
Raymond St btwn Lebreton St N & Bell St N	1	1%

Within the study area during the five-year time period examined, five pedestrian collisions and two cyclist collisions were noted. One pedestrian and one cyclist collisions were noted at the intersection of Bronson Avenue at Catherine Street/Raymond Street, and one pedestrian collision was noted at the intersection of Booth Street at Raymond Street. Further discussion on these collisions will be provided below within this section.

One additional pedestrian collision is noted to have occurred at the intersection of Arlington Avenue at Bell Street North, and one additional collision involving both a cyclist and a pedestrian was noted to have occurred on the segment of Raymond Street between Arthur Lane and Bell Street North. The pedestrian collision at Arlington Avenue at Bell Street North occurred at 11:29PM on a January night, in dark conditions with loose snow on the road and no mitigations are recommended to address conditions at this intersection. The collision on Raymond Street involving both a cyclist and a pedestrian occurred in dark conditions at 7:26 PM on night in late October, which is not considered a peak time for active modes or vehicles. This segment of roadway currently has a sidewalk on the north side of the roadway and is traffic calmed with a pavement width of approximately 7 metres and narrowings to 6 metres. No further mitigation is considered required to address conditions on this segment.

The intersections of Bronson Avenue at Catherine Street/Raymond Street and Booth Street at Raymond Street are noted to have experienced higher collisions than other study area locations. Table 5 and Table 6 summarize the collision types and conditions for each of these intersections, respectively.

Table 5: Bronson Avenue at Catherine Street/Raymond Street Collision Summary

		Number	%
Total Collisions		93	100%
Classification	Fatality	0	0%
	Non-Fatal Injury	17	18%
	Property Damage Only	76	82%
Initial Impact Type	Angle	29	31%
	Rear end	19	20%
	Sideswipe	23	25%
	Turning Movement	18	19%
	SMV Other	3	3%
	Other	1	1%
Road Surface Condition	Dry	69	74%
	Wet	15	16%
	Slush	2	2%
	Packed Snow	3	3%
	Ice	4	4%
Pedestrian Involved		1	1%
Cyclists Involved		1	1%

The Bronson Avenue at Catherine Street/Raymond Street intersection had a total of 93 collisions during the 2018-2022 time period, with 76 involving property damage only and the remaining 17 having non-fatal injuries. The collision types are most represented by angle with 29 collisions, followed by sideswipe with 23, rear end with 10, turning movement with 18, SMV (other) with three, and the “other” collision type with one. Sideswipe and rear end collisions are typical of congested conditions, although the sideswipe collisions on the northbound approach may be influenced by the short left-turn lane developing from the upstream intersection. Historically, 77% of the turning movement collisions were a result of drivers attempting northbound left turns in conflict with drivers completing a southbound through movement. Seventy percent of these collisions occurred at night, thus are not considered to be associated with congestion. This collision pattern may be influenced by the advanced stop line for the northbound approach where northbound left-turning vehicles are required to drive over 20 metres to enter the intersection and speeds along Bronson Avenue. The majority of angle collisions have historically been a result of non-compliance with traffic control and these collisions occur on all approaches. Weather conditions do not affect collisions at this location.

One pedestrian collision and one cyclist collision were noted to have occurred during the five-year time period. The pedestrian collision occurred was the result of a southbound right-turning vehicle failing to yield the right-of-way to a pedestrian in dark and rainy conditions. The cyclist collision was also the result of a turning movement in dark and rainy conditions. This intersection is planned to be modified as part of the Chamberlain Avenue, Catherine Street, and Isabella Street Functional Design Study and subsequent planning efforts, where it is recommended that lighting and surface reflectivity be evaluated as part of the proposed design. No mitigation is required for the two vulnerable user collision within the five-year period, and no further review is required to support this study.

Table 6: Booth Street at Raymond Street Collision Summary

		Number	%
Total Collisions		11	100%
Classification	Fatality	0	0%
	Non-Fatal Injury	2	18%
	Property Damage Only	9	82%

		Number	%
Total Collisions		11	100%
Initial Impact Type	Angle	4	36%
	Rear end	1	9%
	Sideswipe	3	27%
	SMV Other	2	18%
	Other	1	9%
Road Surface Condition	Dry	6	55%
	Wet	3	27%
	Loose Snow	1	9%
	Slush	1	9%
Pedestrian Involved		1	9%
Cyclists Involved		0	0%

The Booth Street at Raymond Street intersection had a total of 11 collisions during the 2018-2022 time period, with nine involving property damage only and the remaining two having non-fatal injuries. The collision types are most represented by angle with four collisions, followed by sideswipe with three collisions, and two or fewer as rear end, SMV (other), and other. Historically, over half of angle collisions were a result of northbound through drivers not complying with traffic control in conflict with westbound drivers. The highway overpass over the northbound approach does not obscure the traffic signal on the approach and furthermore an additional lowered signal head is located over the sidewalk on the east side of the intersection to provide additional signal visibility. No other patterns in the collisions were noted, and weather conditions may affect collisions at this location.

One collision involving a pedestrian was noted within the five-year time period. This collision occurred under rainy and wet conditions and was the result of a westbound left-turning vehicle failing to yield right-of-way to a pedestrian. No geometric or mitigable issues were identified at the intersection, and no further review is required to support this study.

2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

2.3.1.1 Official Plan (2022)

Within the Ultimate Transit Network, Bronson Avenue and Gladstone Avenue are transit priority corridors.

Bronson Avenue is a Mainstreet corridor, and Gladstone Avenue and Booth Street are Minor Corridors within design priority areas in the Official Plan.

2.3.1.2 Transportation Master Plan (2013)

Within the Transportation Master Plan (TMP), the Road Transit and Transit Priority Affordable Network diagram shows a new station, Corso Italia Station, along the Trillium LRT line at Gladstone Avenue which is expected to be completed in 2024 and is within 800 metres of the site. Gladstone Avenue and Bronson Avenue south of Carling Avenue are designated as isolated measures transit priority corridors within the Affordable Network diagram.

2.3.1.3 Transportation Master Plan – Part 1 (2023)

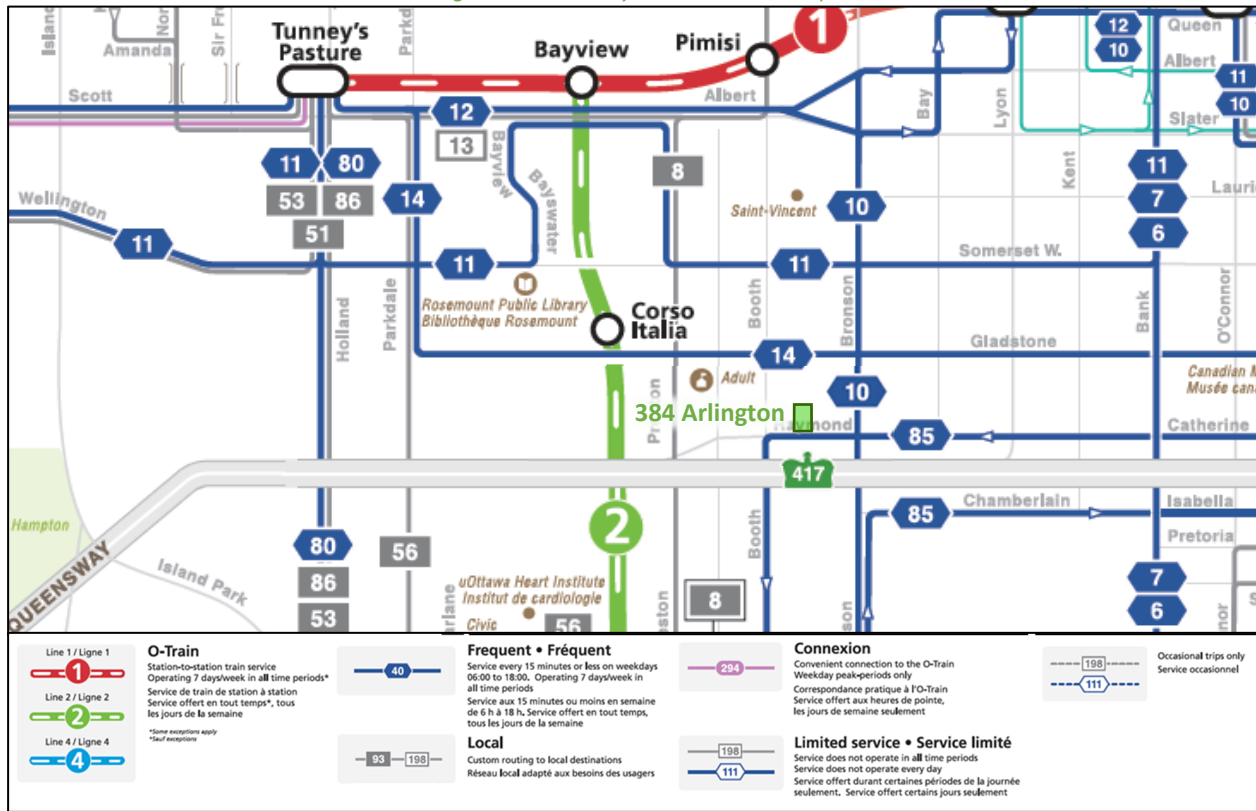
The active transportation project list includes feasibility study of adding cycling facilities on Gladstone Avenue from Percy Street to Corso Italia Station. However, timing for this project is currently undefined.

2.3.1.4 OC Transpo's New Ways to Bus

Responding to recent ridership trends and anticipating the upcoming completion of the Stage 2 expansion of LRT service within the City, the OC Transpo bus service is planned to be recalibrated to focus on frequency, local service

in neighbourhoods, and connections to key destinations. These changes are expected in 2024, and the new service map is illustrated in Figure 12.

Figure 12: New Ways to Bus Service Map



Source: <https://www.octranspo.com/en/plan-your-trip/service-changes/new-ways-to-bus#new-network> Accessed: July 18, 2024

2.3.1.5 The Chamberlain Avenue, Catherine Street, and Isabella Street Functional Design Study

The Chamberlain Avenue, Catherine Street, and Isabella Street Functional Design Study, conducted in 2019, is currently planned for implementation after the build-out horizon, but does not propose any notable improvements for the intersection of Bronson Avenue at Catherine Street/Raymond Street.

2.3.1.6 Planned Construction Projects

Ottawa’s Planned Construction Projects portal lists integrated road, sewer, and water infrastructure upgrades on Booth Street between Orangeville Street and Gladstone Avenue commencing in 2026 at the earliest, pending budget approval. No designs are available at this time.

2.3.2 Other Study Area Developments

245-267 Rochester Street, 27-29 Balsam Street

The application includes a site plan for the construction of a mixed-use building including 118 residential dwelling units and 5,125 square feet of commercial space. The development is anticipated to be built-out by 2025 and to generate 35 new AM and 40 new PM peak hour two-way auto trips. (Parsons, 2023)

818 Gladstone Avenue

The application includes a site plan for the construction of a mixed-use development comprising 270 residential dwelling units and 448 square metres of commercial space. The development is anticipated to be built-out by 2024 and to generate 13 new AM and 12 new PM peak hour two-way auto trips. (J.L. Richards, 2021)

18 Louisa Street

The application includes a site plan for the redevelopment of a portion of a three-storey building and surface parking lot into a ten-storey residential building consisting of 139 residential dwelling units. The development is anticipated to be built-out in 2025 and to generate 90 new AM and 97 new PM peak hour two-way vehicles trips. (CGH, 2021)

448-460 Bronson Avenue

The application includes a zoning by-law amendment to permit the construction of a nine-storey mixed-use building comprising 92 residential dwelling units and 534 square metres of ground floor commercial space. The development was initially anticipated to be built-out in 2022. No traffic generation forecasting has been done to date for the development. (BTE, 2021)

273-281 Bell Street

The application includes zoning by-law amendment and site plan applications to permit the construction of a six-storey residential building comprising 49 dwelling units. No TIA was required.

370 Cambridge Street North

The application includes a site plan for the construction of a low-rise residential building comprising 20 dwelling units. No TIA was required.

3 Study Area and Time Periods

3.1 Study Area

The study area will include the intersections of:

- Bronson Avenue at:
 - Catherine Street/Raymond Street
 - Arlington Avenue
 - Gladstone Avenue
 - Highway 417 EB Ramp
- Booth Street at:
 - Gladstone Avenue
 - Raymond Street
- Arthur Street/Arthur Lane at Gladstone Avenue

The boundary roads will be Raymond Street, Bell Street, Arthur Lane, and Arlington Avenue and no screenlines are present within proximity to the site.

3.2 Time Periods

As the proposed development is composed primarily of residential units the AM and PM peak hours will be examined.

3.3 Horizon Years

The anticipated build-out year is 2026. As a result, the full build-out plus five years horizon year is 2031.

4 Development-Generated Travel Demand

4.1 Mode Shares

Examining the mode shares recommended in the TRANS Trip Generation Manual (2020) for the subject district, derived from the most recent National Capital Region Origin-Destination survey (OD Survey), the existing average district mode shares by land use for Ottawa Inner have been summarized in Table 8.

Table 7: TRANS Trip Generation Manual Recommended Mode Shares – Ottawa Inner

Travel Mode	Multi-Unit (High-Rise)	
	AM	PM
Auto Driver	26%	25%
Auto Passenger	6%	8%
Transit	28%	21%
Cycling	5%	6%
Walking	35%	40%
Total	100%	100%

The proposed development is approximately a one kilometre walk from the future Corso Italia LRT station on the Trillium line. The developer has internal sustainability targets for development, including a 25% relative reduction of residential auto travel for the site through the employment of TDM measures. Based on this proximity to rapid transit, the relative amounts of vehicle and bicycle parking proposed (detailed in Section 7.1), and the recommended TDM program (detailed in Section 9.3), custom mode shares are proposed for the site and are summarized in Table 8.

Table 8: Proposed Development Mode Shares

Travel Mode	Multi-Unit (High-Rise)	
	AM	PM
Auto Driver	20%	19%
Auto Passenger	8%	10%
Transit	32%	25%
Cycling	5%	6%
Walking	35%	40%
Total	100%	100%

4.2 Trip Generation

This TIA has been prepared using the vehicle and person trip rates for the residential dwellings using the TRANS Trip Generation Manual (2020). Table 9 summarizes the person trip rates for the proposed residential land use for each peak period.

Table 9: Trip Generation Person Trip Rates

Land Use	Land Use Code	Peak Period	Person Trip Rates
Multi-Unit (High-Rise)	221 & 222 (TRANS)	AM	0.80
		PM	0.90

Using the above person trip rates, the total person trip generation has been estimated. Table 10 summarizes the total person trip generation for the residential land use.

Table 10: Total Residential Person Trip Generation

Land Use	Units	AM Peak Period			PM Peak Period		
		In	Out	Total	In	Out	Total
Multi-Unit (High-Rise)	296	74	164	238	155	112	267

Using the proposed development mode shares, and the person trip rates, the person trips by mode have been projected. Trip generation by peak hour has been forecasted using the prescribed peak period conversion factors presented in the TRANS Trip Generation Manual (2020) for the residential trips. Table 11 summarizes the trip generation by mode and peak hour.

Table 11: Trip Generation by Mode

Travel Mode		AM Peak Hour				PM Peak Hour			
		Mode Share	In	Out	Total	Mode Share	In	Out	Total
Multi-Unit (High-Rise)	Auto Driver	20%	7	16	23	19%	12	10	22
	Auto Passenger	8%	3	6	9	10%	7	5	12
	Transit	32%	13	29	42	25%	17	14	31
	Cycling	5%	2	5	7	6%	4	4	8
	Walking	35%	14	34	48	40%	31	25	56
	Total	100%	39	90	129	100%	71	58	129

As shown above, a total of 23 AM and 22 PM new peak hour two-way vehicle trips are projected as a result of the proposed development.

4.3 Trip Distribution

To understand the travel patterns of the subject development, the OD Survey has been reviewed to determine the travel for residential developments, and these patterns were applied based on the build-out of Ottawa Inner. Table 12 below summarizes the distributions.

Table 12: OD Survey Distribution – Ottawa Inner

To/From	% of Trips
North	30%
South	20%
East	40%
West	10%
Total	100%

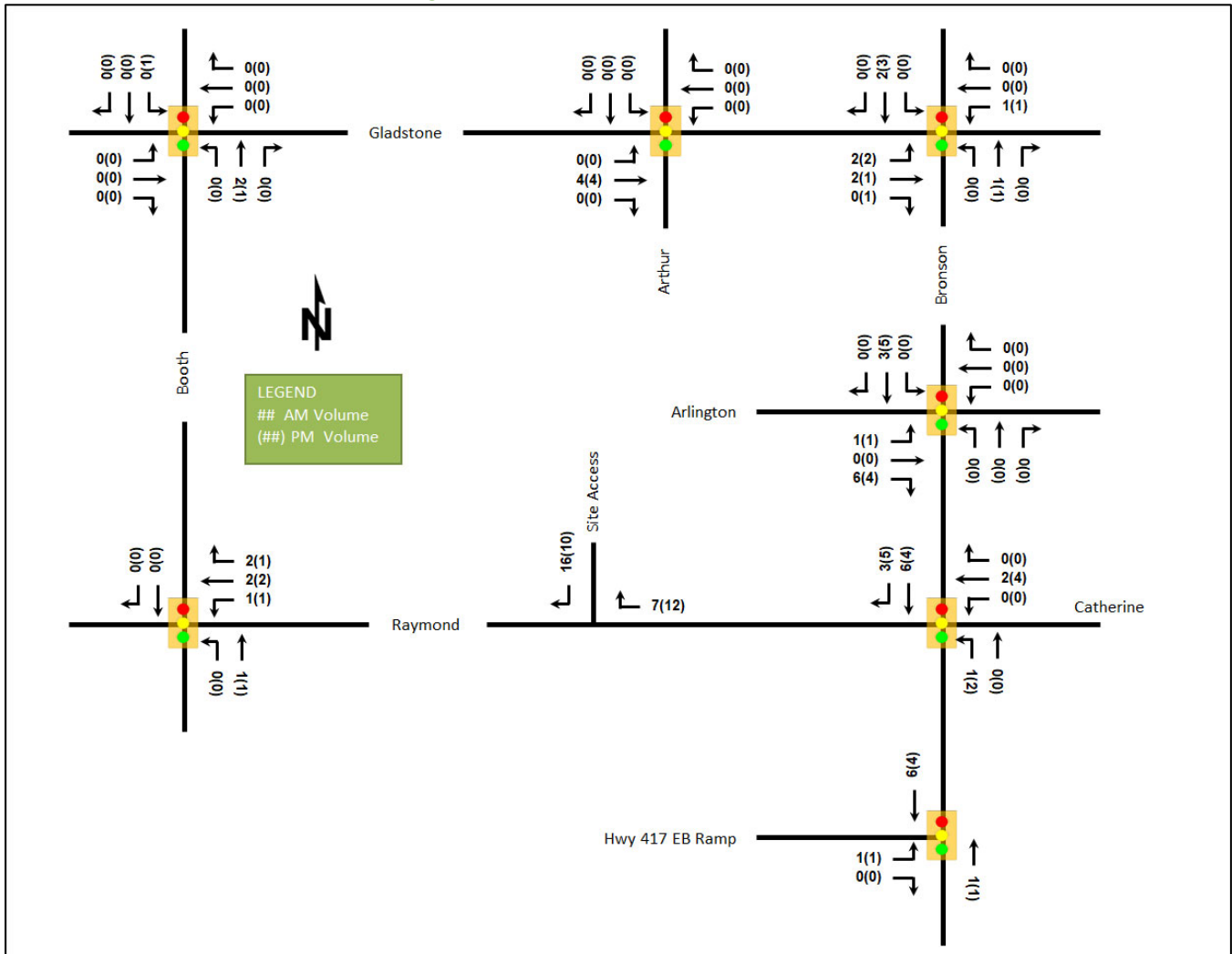
4.4 Trip Assignment

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. Table 13 summarizes the proportional assignment to the study area roadways, and Figure 12 illustrates the new site generated volumes.

Table 13: Trip Assignment

To/From	Inbound Via	Outbound Via
North	5% Booth St, 25% Bronson Ave	10% Booth St, 20% Bronson Ave
South	10% Booth St, 10% Bronson Ave	5% Raymond, 5% Booth St, 10% Bronson Ave
East	10% Gladstone Ave, 30% Catherine St	10% Gladstone Ave, 30% Bronson Ave (S)
West	10% Hwy 417 EB Ramp	10% Raymond St
Total	100%	100%

Figure 13: New Site Generation Auto Volumes



5 Exemption Review

Table 14 summarizes the exemptions for this TIA.

Table 14: Exemption Review

Module	Element	Explanation	Exempt/Required
Site Design and TDM			
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plan and zoning by-law applications	Required
	4.1.3 New Street Networks	Only required for plans of subdivision	Exempt
4.2 Parking	4.2.1 Parking Supply	Only required for site plan and zoning by-law applications	Required
4.3 Boundary Street Design		All applications	Required
4.5 Transportation Demand Management	All Elements	Only required when the development generates more than 60 person-trips	Required
Network Impact			

Module	Element	Explanation	Exempt/Required
3.2 Background Network Travel Demand	All Elements	Only required when one or more other Network Impact Modules are triggered	Exempt
3.3 Demand Rationalization		Only required when one or more other Network Impact Modules are triggered	Exempt
4.6 Neighbourhood Traffic Calming	4.6.1 Adjacent Neighbourhoods	<p>If the development meets all of the following criteria along the route(s) site generated traffic is expected to utilize between an arterial road and the site's access:</p> <ol style="list-style-type: none"> 1. Access to Collector or Local; 2. "Significant sensitive land use presence" exists, where there is at least two of the following adjacent to the subject street segment: <ul style="list-style-type: none"> • School (within 250m walking distance); • Park; • Retirement / Older Adult Facility (i.e. long-term care and retirement homes); • Licenced Child Care Centre; • Community Centre; or • 50%, or greater, of adjacent property along the route(s) is occupied by residential lands and a minimum of 10 occupied residential units are present on the route. 3. Application is for Zoning By-Law Amendment or Draft Plan of Subdivision; 4. At least 75 site-generated auto trips; 5. Site Trip Infiltration is expected. Site traffic will increase peak hour vehicle volumes along the route by 50% or more. 	Exempt
4.7 Transit	4.7.1 Transit Route Capacity	Only required when the development generates more than 75 transit trips	Exempt
	4.7.2 Transit Priority Requirements	Only required when the development generates more than 75 auto trips	Exempt
4.8 Network Concept		Only required when proposed development generates more than 200 person-trips during the peak hour in excess of equivalent volume permitted by established zoning	Exempt
4.9 Intersection Design	4.9.1 Intersection Control	Only required when the development generates more than 75 auto trips	Exempt

Module	Element	Explanation	Exempt/Required
	4.9.2 Intersection Design	Only required when the development generates more than 75 auto trips	Exempt – Access Intersection Design Element required in all applications

6 Development Design

6.1 Design for Sustainable Modes

The proposed development is a residential building with bicycle and vehicle parking provided in three below-grade parking levels. A total of 296 bike spaces are provided, including 20 external spaces within surface racks and the remainder within the below-grade parking levels accessed by a ramp with a 16% grade. Elevators are to be provided to the parking levels, accommodating cyclists for ease of use.

Existing sidewalks are provided on the boundary roads of Arlington Street, Bell Street North, and Raymond Street, and hard surface connections will be provided between building entrances and these facilities which are to be reconstructed as part of the development. Local bus stops to routes discussed in Section 2.2.5 are located within 300 metres of the site entrances. The future Corso Italia Station is within a one kilometre walk of the site entrances.

The infrastructure TDM checklist is provided in Appendix E.

6.2 Circulation and Access

A 6.0-metre-wide right-in-right-out access is proposed on Raymond Street. The ramp to underground parking has a 16% slope with 8% transition slopes. The top of the ramp is approximately 3.5 metres from the back of the existing sidewalk on Raymond Street.

Emergency services can access the development via the four public right-of-way frontages, and garbage collection is to take place on the local roadway of Raymond Street.

7 Parking

7.1 Parking Supply

The site proposes a total of 78 vehicle parking spaces and 296 bicycle parking spaces.

Site-specific zoning has a minimum vehicle parking rate of 0.2 spaces per unit for residents and 0.04 spaces per unit for visitors. The minimum vehicle parking provision therefore equates to 57 residential parking spaces and eleven visitor parking spaces. The site proposes 67 residential parking spaces and eleven visitor parking spaces, and the proposed vehicle parking provision meets the minimum vehicle parking established for the site.

Per the Ottawa Accessibility Design Standards, four accessible parking spaces are required for sites with 78 parking spaces, and the development is proposed as meeting this requirement.

Site-specific zoning has a minimum bicycle parking rate of 1.0 spaces per unit, totalling 297 bicycle parking spaces. A total of 296 bicycle parking is proposed, including 276 internal and 20 external spaces. Therefore, minimum bicycle parking provision requirements are being met.

8 Boundary Street Design

Table 15 summarizes the MMLOS analysis for the boundary streets of Bell Street, Arthur Lane, Arlington Avenue, and Raymond Street. The existing and future conditions for both streets will be the same and are considered in

one row. The boundary street analysis is based on the policy area of “General Urban Area”. The MMLOS worksheets has been provided in Appendix F.

Table 15: Boundary Street MMLOS Analysis

Segment	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target
Bell Street	B	C	A	D	-	-	-	-
Arthur Lane	C	C	A	D	-	-	-	-
Arlington Avenue	B	C	A	D	-	-	-	-
Raymond Street	C	C	D	D	-	-	-	-

The boundary streets meet the MMLOS targets. No infrastructure improvements or mitigation measures are required on the basis of the analysis.

9 Transportation Demand Management

9.1 Context for TDM

The mode shares used within the TIA represent a shift from auto modes to sustainable modes given the proximity of LRT and the reduction in vehicle parking for the development. Overall, the modal shares are likely to be achieved.

The subject site is not within a design priority area, and no age restrictions are noted. The total bedroom is 421 including 159 one-bedroom units, 128 two-bedroom units, and two (2) three-bedroom units.

9.2 Need and Opportunity

The subject site has been assumed to rely predominantly on walking and transit, and those assumptions have been carried through the analysis.

The study area intersections may have residual capacity with signal timing adjustments. Risks associated with failing to meet mode share targets are low given only a 6% reduction to auto travel has been assumed beyond the typical recommended area mode shares trip generation of the area.

9.3 TDM Program

The “suite of post occupancy TDM measures” has been summarized in the TDM checklists for the residential land uses. The checklist is provided in Appendix E. The key TDM measures recommended include:

- Conduct surveys to identify post-occupancy travel-related behaviours, attitudes, challenges and solutions
- Offer on-site cycling courses for residents, or subsidize off-site courses
- Display local area information with walking/cycling maps and relevant transit schedules and route maps
- Provide a multimodal travel option information package to new residents
- Inclusion of a 1-month Presto card for first time new condo purchase and apartment rental, with a set time frame for this offer (e.g. 6-months) from the initial opening of the site
- Contract with provider to install on-site bikeshare (or other micromobility) station
- Provide residents with bikeshare (or other micromobility) memberships, either free or subsidized
- Contract with provider to install on-site carshare vehicles and promote their use by residents
- Provide residents with carshare memberships, either free or subsidized
- Unbundle parking cost from purchase or rental costs

10 Intersection Design

10.1 Intersection Control

The site access on Raymond Street is proposed to be stop-controlled on the minor approach of the access.

10.2 Intersection Location and Design

Vehicular access is proposed via a single 6.0-metre-wide right-in/right-out access on the one-way (westbound) Raymond Street. The site access is proposed to be located approximately 8.5 metres west of the Arthur Lane right-of-way and approximately 22.75 metres east of the Bell Street right-of-way. No traffic hazards are noted based on the proximity between the access and Arthur Lane along the local road.

The ramp grade is proposed to be 16% with 3.0-metre transition slopes of 8% grade at the top and bottom. The top of the ramp is approximately 3.5 metres from the back of the sidewalk on Raymond Street, with a slope of 2% sloping towards the road within this area. The resulting profile on approach to the sidewalk results in the back tires of a TAC-P passenger vehicle template being approximately 0.06 metres below the back edge of the sidewalk when a vehicle is stopped 0.5 metres from the back of the sidewalk. No vertical sightline issues are resultant from this relatively flat condition. Continuous elements within the boulevard such as retaining walls and shrubs are limited to less than 0.75 metres above the surface of the ramp at the garage opening, and thus no potential horizontal sightline obstructions are present.

The site access does not comply with provision 25(1)(u) of the Private Approach By-Law which requires a maximum grade of 2% within the first nine metres of the property line. It is recommended based on the foregoing discussion that the access be approved in line with provision 25(1)(v) of the Private Approach By-Law.

The distance from the garage door to the roadway is approximately 5.2 metres. Given the presence of the parking lane on Raymond Street, and the overall roadway width of 7.5 metres including the parking lane, no operational impacts are anticipated on Raymond Street by not providing the typical minimum recommended eight metres of throat length for local roads, and the proposed configuration is supportable.

10.2.1 Recommended Design Elements

The site access is recommended to comply with City standard SC7.1 with a continuous depressed sidewalk across the access.

11 Summary of Improvements Indicated and Modifications Options

The following summarizes the analysis and results presented in this TIA report:

Proposed Site and Screening

- The proposed site includes 296 residential dwelling units with 78 underground vehicle parking spaces, and 296 bike parking spaces
- Accesses will be provided via a right-in/right-out access on Raymond Street
- The development is proposed to be completed as a single phase by 2026
- The trip generation and safety triggers were met for the TIA Screening

Existing Conditions

- Bronson Avenue, Catherine Street, and Raymond Street east of the 417 on-ramp are arterial roads, and Booth Street and Gladstone Avenue are major collector roads in the study area
- Sidewalks are generally provided on both sides of the study area roadways

- The study area intersections generally operate well during both peak hours, with queuing noted on various movements at the intersection of Bronson Avenue at Catherine Street/Raymond Street, primarily during the PM peak hour
- The intersections of Bronson Avenue at Catherine Street/Raymond Street and Booth Street at Raymond Street are noted to have experienced higher collisions than other locations within the study area
- At the intersection of Bronson Avenue at Catherine Street/Raymond Street, sideswipe and rear end collisions are typical of congested conditions, turning movement collisions may be influenced by the advanced stop line for the northbound approach where northbound left-turning vehicles are required to drive over 20 metres to enter the intersection and speeds along Bronson Avenue, and the angle collisions have historically been a result of non-compliance with traffic control and these collisions occur on the northbound, southbound and westbound approaches
- At the intersection of Booth Street at Raymond Street, historically, over half of angle collisions were a result of northbound through drivers not complying with traffic control in conflict with westbound drivers

Planned Conditions

- The new Corso Italia Station along the Trillium LRT line at Gladstone Avenue is expected to be completed in 2024
- The active transportation project list includes feasibility study of adding cycling facilities on Gladstone Avenue from Percy Street to Corso Italia Station
- Bronson Avenue is a transit priority corridor within the Transportation Master Plan (2013) and the Official Plan

Development Generated Travel Demand

- The proposed development is forecasted produce 129 two-way person trips during both the AM peak hour and PM peak hours
- Of the forecasted person trips, 23 two-way trips are forecast to be vehicle trips during the AM peak hour and 22 two-way trips to be vehicle trips during the PM peak hour
- Of the forecasted trips, 30% are anticipated to travel north, 20% to travel south, 40% to travel east, and 10% to travel west

Development Design

- Bicycle parking is proposed within surface racks and within the below-grade parking levels accessed via a ramp with a 16% grade, with elevators provided to the parking levels for cyclist ease of use
- Local bus stops are located within 300 metres of the site entrances, and Corso Italia Station is within a one kilometre walk of the site entrances
- Hard surface connections are proposed between building entrances and existing sidewalks on the boundary roads of Arlington Street, Bell Street North and Raymond Street, which are to be rebuilt as part of construction
- Emergency services are anticipated to access the development via the four public rights-of-way fronting the site, and garbage collection is anticipated on the local roadway of Raymond Street

Parking

- The site proposes a total of 78 vehicle parking spaces and 296 bicycle parking spaces
- The site proposes four accessible parking spaces

- The proposed vehicle parking and bicycle parking meets the site-specific zoning requirements and meets the accessible parking requirements

Boundary Street Design

- The boundary streets meet the MMLOS targets and no mitigation or area improvements are required on the basis of the analysis

TDM

- Supportive TDM measures recommended to be included within the proposed development are:
 - Conduct surveys to identify post-occupancy travel-related behaviours, attitudes, challenges and solutions
 - Offer on-site cycling courses for residents, or subsidize off-site courses
 - Display local area information with walking/cycling maps and relevant transit schedules and route maps
 - Provide a multimodal travel option information package to new residents
 - Inclusion of a 1-month Presto card for first time new condo purchase and apartment rental, with a set time frame for this offer (e.g. 6-months) from the initial opening of the site
 - Contract with provider to install on-site bikeshare (or other micromobility) station
 - Provide residents with bikeshare (or other micromobility) memberships, either free or subsidized
 - Contract with provider to install on-site carshare vehicles and promote their use by residents
 - Provide residents with carshare memberships, either free or subsidized
 - Unbundle parking cost from purchase or rental costs

Intersection Design

- Vehicular access is proposed via a single 6.0-metre-wide right-in/right-out access on Raymond Street, which is one-way (westbound)
- The site access is proposed to be located approximately 8.5 metres west of the Arthur Lane right-of-way and approximately 22.75 metres east of the Bell Street right-of-way
- The ramp grade is proposed to be 16% with 3.0-metre transition slopes of 8% grade at the top and bottom, approximately 3.5 metres from the back of the sidewalk on Raymond Street
- The site access does not comply with provision 25(1)(u) of the Private Approach By-Law which requires a maximum grade of 2% within the first nine metres of the property line
- Given the sufficient offset from Raymond Street, no sightline obstructions being present, and no traffic hazards anticipated to be present from the spacing of the proposed site access from Arthur Lane, it is recommended that the access be approved in line with provision 25(1)(v) of the Private Approach By-Law
- The typical minimum recommended eight metres of throat length for the local road is not being provided, but the given the 5.2 metres between the roadway and the proposed garage, and the 7.5 metres of asphalt including a parking lane on Raymond Street, no operational issues are anticipated from the throat and the configuration is supportable
- The site access is recommended to comply with City standard SC7.1 with a continuous depressed sidewalk across the access

12 Conclusion

It is recommended that, from a transportation perspective, the proposed development applications proceed.

Prepared By:

Reviewed By:



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Appendix A

TIA Screening Form and PM Certification Form

City of Ottawa 2017 TIA Guidelines
Step 1 - Screening Form

Date: 30-Aug-24
Project Number: 2021-137
Project Reference: 384 Arlington

1.1 Description of Proposed Development	
Municipal Address	384 Arlington Avenue
Description of Location	Block fronting Raymond St, Bell St N, Arlington Ave, Arthur Ln N
Land Use Classification	Residential 5th Density– R5B[2916]-c S488-h
Development Size	296 high-rise dwelling units
Accesses	One RIRO on Raymond St
Phase of Development	Single
Buildout Year	2026
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger	
Land Use Type	Townhomes or apartments
Development Size	296 Units
Trip Generation Trigger	Yes

1.3 Location Triggers	
Does the development propose a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine/ Cross-Town Bicycle Networks?	No
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone, or PMTSA?	No
Location Trigger	No

1.4. Safety Triggers	
Are posted speed limits on a boundary street 80 km/hr or greater?	No
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?	No
Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/ suburban conditions)?	No
Is the proposed driveway within auxiliary lanes of an intersection?	No
Does the proposed driveway make use of an existing median break that serves an existing site?	No
Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?	Yes Bronson Ave at Catherine St/Raymond St 80 collisions from 2015-2019
Does the development include a drive-thru facility?	No
Safety Trigger	Yes



TIA Plan Reports

On 14 June 2017, the Council of the City of Ottawa adopted new Transportation Impact Assessment (TIA) Guidelines. In adopting the guidelines, Council established a requirement for those preparing and delivering transportation impact assessments and reports to sign a letter of certification.

Individuals submitting TIA reports will be responsible for all aspects of development-related transportation assessment and reporting, and undertaking such work, in accordance and compliance with the City of Ottawa's Official Plan, the Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines.

By submitting the attached TIA report (and any associated documents) and signing this document, the individual acknowledges that s/he meets the four criteria listed below.

CERTIFICATION

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed¹ or registered² professional in good standing, whose field of expertise [check appropriate field(s)] is either transportation engineering or transportation planning .

1,2 License of registration body that oversees the profession is required to have a code of conduct and ethics guidelines that will ensure appropriate conduct and representation for transportation planning and/or transportation engineering works.


City Of Ottawa
Infrastructure Services and Community
Sustainability
Planning and Growth Management
110 Laurier Avenue West, 4th fl.
Ottawa, ON K1P 1J1
Tel. : 613-580-2424
Fax: 613-560-6006

Ville d'Ottawa
Services d'infrastructure et Viabilité des
collectivités
Urbanisme et Gestion de la croissance
110, avenue Laurier Ouest
Ottawa (Ontario) K1P 1J1
Tél. : 613-580-2424
Télécopieur: 613-560-6006

Dated at Ottawa this 20 day of September, 2018.
(City)

Name: Andrew Harte
(Please Print)

Professional Title: Professional Engineer



Signature of Individual certifier that s/he meets the above four criteria

Office Contact Information (Please Print)
Address: 6 Plaza Court
City / Postal Code: Ottawa / K2H 7W1
Telephone / Extension: (613) 697-3797
E-Mail Address: Andrew.Harte@CGHTransportation.com



Appendix B

Turning Movement Counts

Peak Hour Diagram



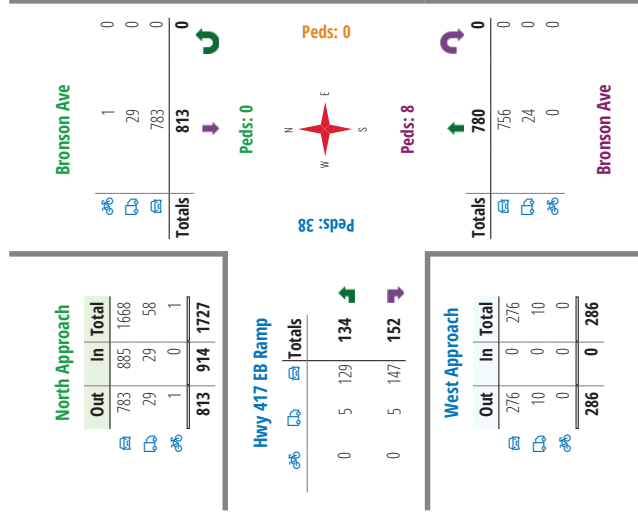
Specified Period **One Hour Peak**
 From: 07:00:00 To: 08:00:00
 From: 10:00:00 To: 09:00:00

Intersection: Bronson Ave & Hwy 417 EB Ramp
Site Code: Z408800001
Count Date: Mar 07, 2024

Weather conditions: Clear

**** Signalized Intersection ****

Major Road: Bronson Ave runs N/S



🚗 - Cars 🚚 - Trucks 🚲 - Bicycles

Comments

Peak Hour Diagram



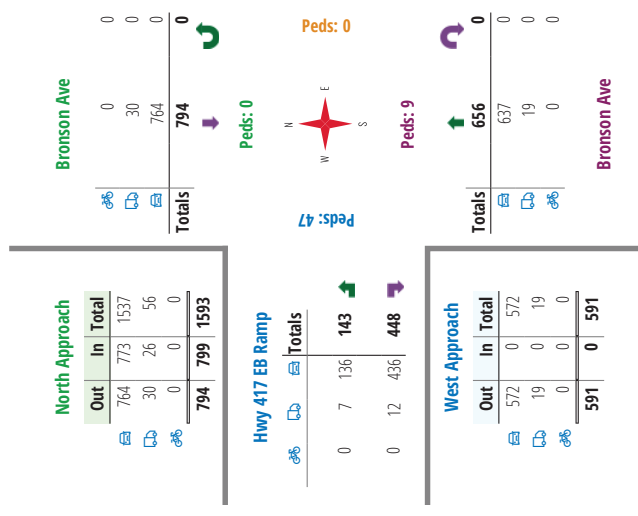
Specified Period **One Hour Peak**
 From: 11:30:00 To: 12:30:00
 From: 13:30:00 To: 12:30:00

Intersection: Bronson Ave & Hwy 417 EB Ramp
Site Code: Z408800001
Count Date: Mar 07, 2024

Weather conditions: Clear

**** Signalized Intersection ****

Major Road: Bronson Ave runs N/S



🚗 - Cars 🚚 - Trucks 🚲 - Bicycles

Comments

Peak Hour Diagram

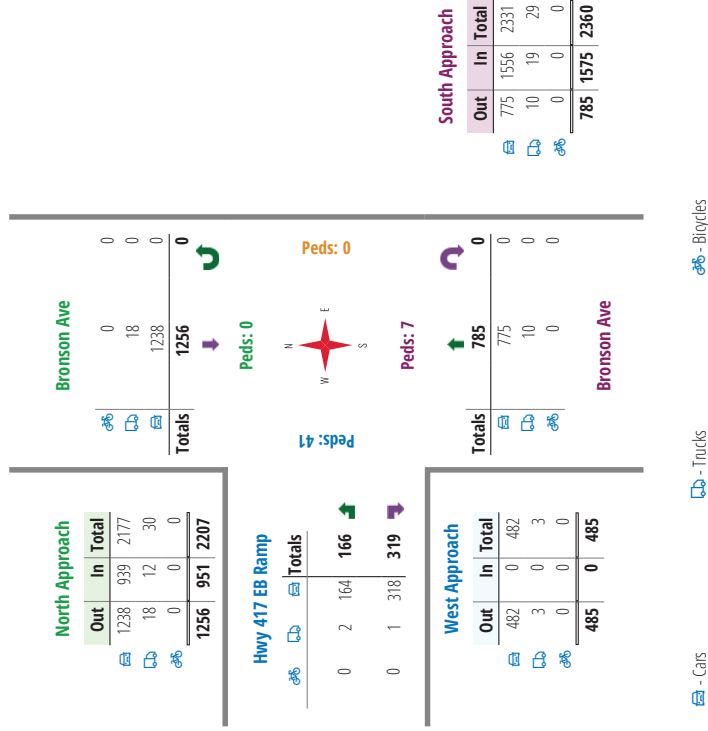


Specified Period **One Hour Peak**
 From: 15:00:00 To: 16:15:00
 From: 18:00:00 To: 17:15:00

Intersection: Bronson Ave & Hwy 417 EB Ramp
Site Code: Z408800001
Count Date: Mar 07, 2024

Weather conditions: Clear

**** Signalized Intersection **** **Major Road:** Bronson Ave runs N/S



Comments

Peak Hour Diagram

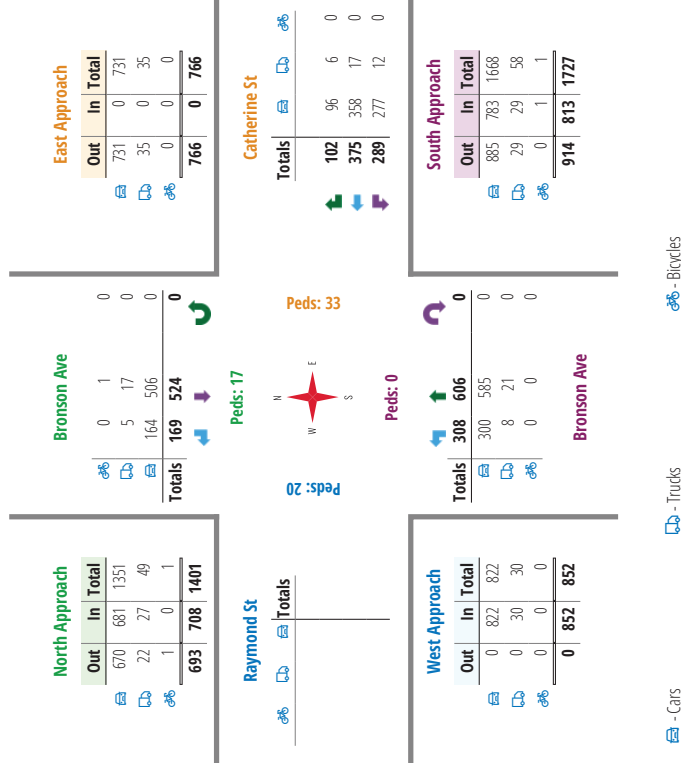


Specified Period **One Hour Peak**
 From: 07:00:00 To: 10:00:00
 From: 08:00:00 To: 09:00:00

Intersection: Bronson Ave & Catherine St - Raymond St
Site Code: Z408800002
Count Date: Mar 07, 2024

Weather conditions: Clear

**** Signalized Intersection **** **Major Road:** Bronson Ave runs N/S



Comments

Peak Hour Diagram

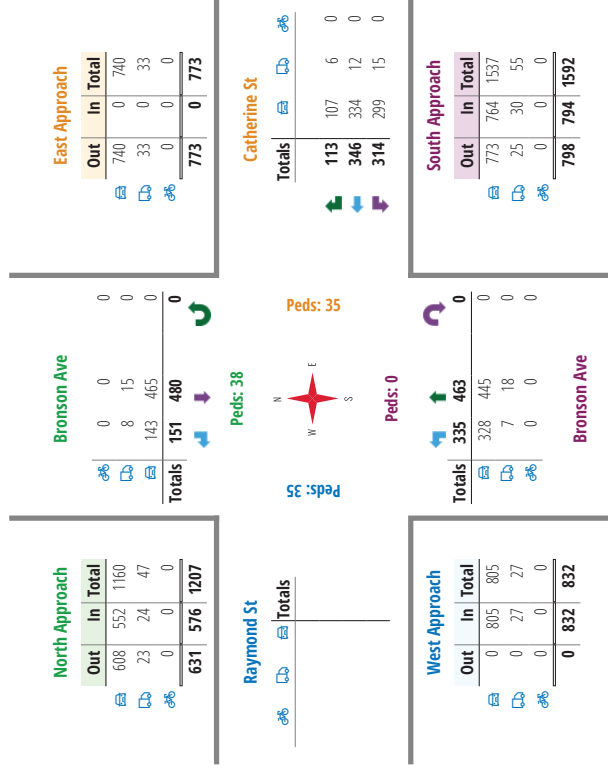


Intersection: Bronson Ave & Catherine St - Raymond St
 Site Code: Z408800002
 Count Date: Mar 07, 2024

Specified Period
 From: 11:30:00 To: 13:30:00
 One Hour Peak
 From: 11:30:00 To: 12:30:00

Weather conditions: Clear

**** Signalized Intersection **** Major Road: Bronson Ave runs N/S



Car - Cars, Truck - Trucks, Bicycle - Bicycles

Comments

Peak Hour Diagram

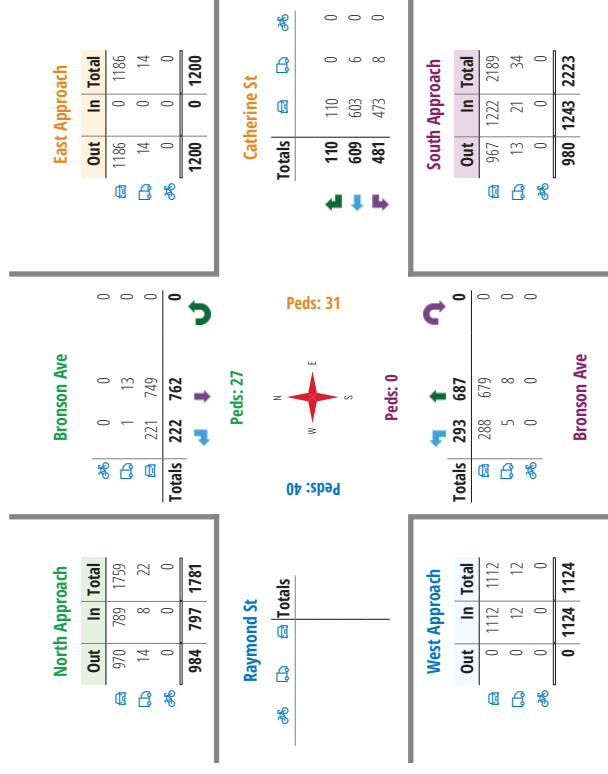


Intersection: Bronson Ave & Catherine St - Raymond St
 Site Code: Z408800002
 Count Date: Mar 07, 2024

Specified Period
 From: 15:00:00 To: 18:00:00
 One Hour Peak
 From: 15:45:00 To: 16:45:00

Weather conditions: Clear

**** Signalized Intersection **** Major Road: Bronson Ave runs N/S



Car - Cars, Truck - Trucks, Bicycle - Bicycles

Comments



Peak Hour Diagram

Specified Period **One Hour Peak**
 From: 07:00:00 From: 08:00:00
 To: 10:00:00 To: 09:00:00



Ontario Traffic Inc.

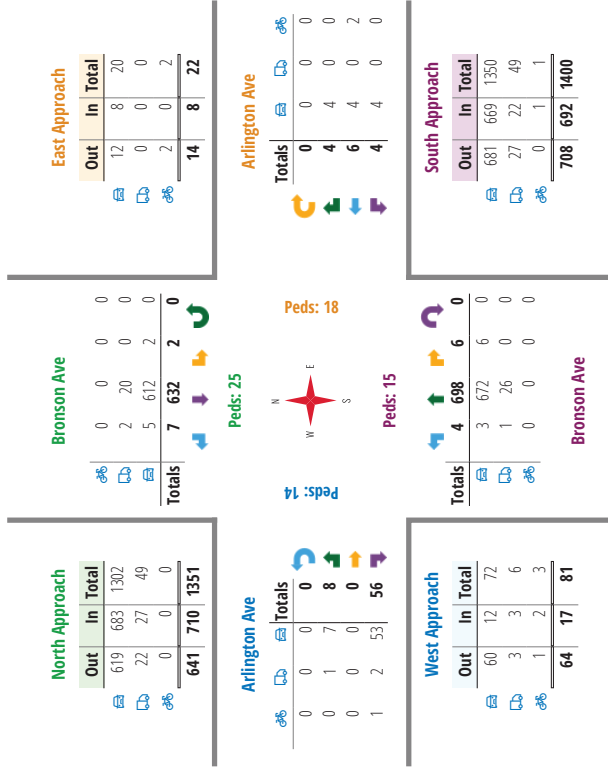
Traffic Monitoring • Services & Products

Intersection: Bronson Ave & Arlington Ave
 Site Code: Z408800003
 Count Date: Mar 07, 2024

Weather conditions: Clear

**** Signalized Intersection ****

Major Road: Bronson Ave runs N/S



🚗 - Cars

🚚 - Trucks

🚲 - Bicycles

Comments



Peak Hour Diagram

Specified Period **One Hour Peak**
 From: 11:30:00 From: 11:30:00
 To: 13:30:00 To: 12:30:00



Ontario Traffic Inc.

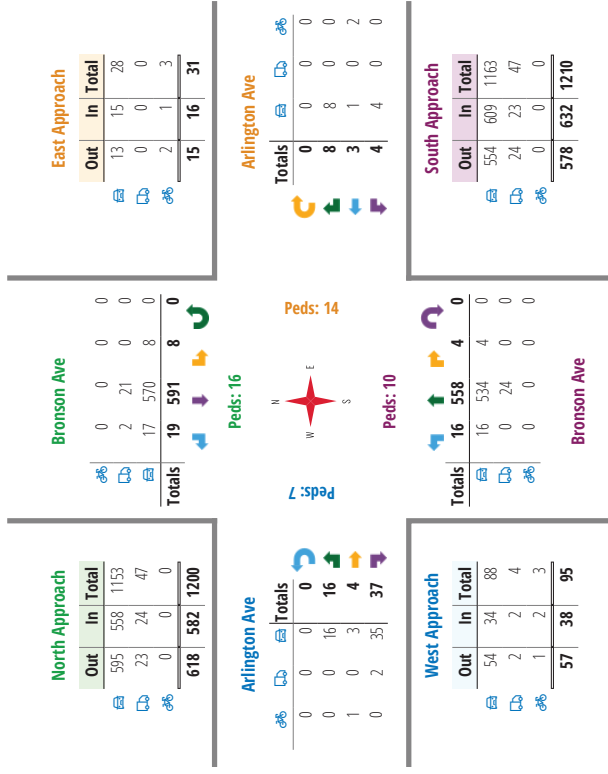
Traffic Monitoring • Services & Products

Intersection: Bronson Ave & Arlington Ave
 Site Code: Z408800003
 Count Date: Mar 07, 2024

Weather conditions: Clear

**** Signalized Intersection ****

Major Road: Bronson Ave runs N/S



🚗 - Cars

🚚 - Trucks

🚲 - Bicycles

Comments



Peak Hour Diagram

Specified Period **One Hour Peak**
 From: 15:00:00 To: 16:15:00
 From: 18:00:00 To: 17:15:00



Peak Hour Diagram

Specified Period **One Hour Peak**
 From: 07:00:00 To: 10:00:00
 From: 08:00:00 To: 09:00:00

Intersection: Bronson Ave & Arlington Ave
Site Code: Z408800003
Count Date: Mar 07, 2024

Intersection: Bronson Ave & Gladstone Ave
Site Code: Z408800004
Count Date: Mar 07, 2024

Weather conditions: Clear

Weather conditions: Clear

**** Signalized Intersection ****

Major Road: Bronson Ave runs N/S

**** Signalized Intersection ****

Major Road: Bronson Ave runs N/S

North Approach

	Out	In	Total
Car	935	808	1743
Truck	10	10	20
Bike	0	0	0
Totals	945	818	1763

Bronson Ave

	0	0	0	0	0
Car	0	0	10	0	0
Truck	0	0	30	900	5
Bike	0	0	0	0	0
Totals	30	910	5	0	0

East Approach

	Out	In	Total
Car	29	32	61
Truck	0	0	0
Bike	1	2	3
Totals	30	34	64

Arlington Ave

	Totals
Car	0
Truck	0
Bike	0
Totals	15
Car	2
Truck	0
Bike	6
Totals	8
Car	0
Truck	2
Bike	62
Totals	64

Arlington Ave

	0	0	0	0	0
Car	0	0	0	0	0
Truck	11	11	0	0	0
Bike	5	4	0	1	0
Totals	14	14	0	0	0

Arlington Ave

	0	0	0	0	0
Car	0	0	0	0	0
Truck	0	0	0	0	0
Bike	0	0	0	0	0
Totals	0	0	0	0	0

North Approach

	Out	In	Total
Car	504	592	1096
Truck	20	25	45
Bike	0	0	0
Totals	524	617	1141

Bronson Ave

	0	0	0	0	0
Car	0	0	19	1	0
Truck	0	0	24	470	10
Bike	0	0	0	0	0
Totals	24	489	11	0	0

East Approach

	Out	In	Total
Car	213	308	521
Truck	8	19	27
Bike	3	5	8
Totals	224	332	556

Gladstone Ave

	Totals
Car	0
Truck	0
Bike	0
Totals	37
Car	2
Truck	18
Bike	199
Totals	222
Car	0
Truck	1
Bike	48
Totals	49

Gladstone Ave

	0	0	0	0	0
Car	0	0	0	0	0
Truck	15	15	0	0	0
Bike	147	137	7	3	3
Totals	62	61	1	0	0

Gladstone Ave

	0	0	0	0	0
Car	0	0	0	0	0
Truck	0	0	0	0	0
Bike	0	0	0	0	0
Totals	0	0	0	0	0

West Approach

	Out	In	Total
Car	284	211	495
Truck	21	12	33
Bike	5	3	8
Totals	310	226	536

Bronson Ave

	55	563	99	0	0
Car	50	540	99	0	0
Truck	5	23	0	0	0
Bike	0	0	0	0	0
Totals	55	563	99	0	0

South Approach

	Out	In	Total
Car	689	579	1268
Truck	28	21	49
Bike	0	0	0
Totals	717	600	1317

West Approach

	Out	In	Total
Car	83	60	143
Truck	2	0	2
Bike	2	1	3
Totals	87	61	148

Bronson Ave

	26	792	21	0	0
Car	26	782	21	0	0
Truck	0	10	0	0	0
Bike	0	0	0	0	0
Totals	26	792	21	0	0

South Approach

	Out	In	Total
Car	829	976	1805
Truck	10	12	22
Bike	0	0	0
Totals	839	988	1827

Car - Cars

Truck - Trucks

Bike - Bicycles

Car - Cars

Truck - Trucks

Bike - Bicycles

Comments

Comments



Ontario Traffic Inc.

Traffic Monitoring • Services & Products

Peak Hour Diagram

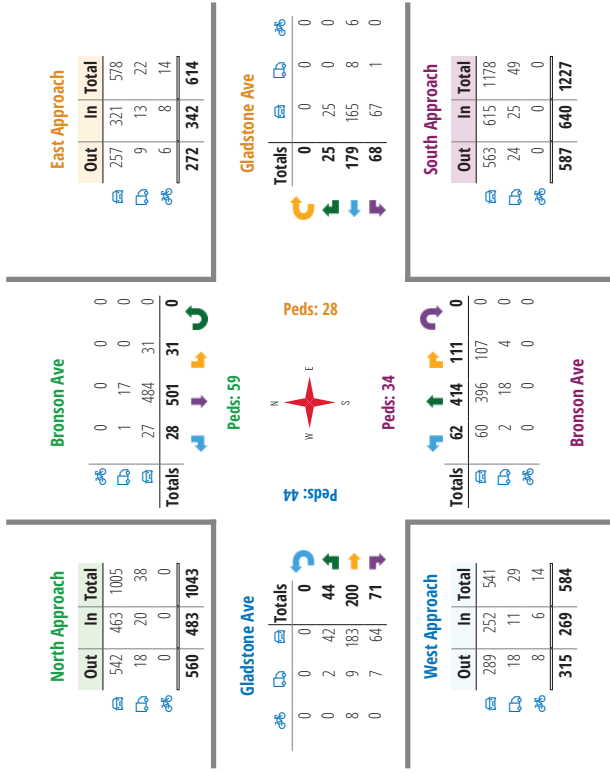
Specified Period **One Hour Peak**
 From: 11:30:00 From: 12:00:00
 To: 13:30:00 To: 13:00:00

Intersection: Bronson Ave & Gladstone Ave
Site Code: Z408800004
Count Date: Mar 07, 2024

Weather conditions: Clear

**** Signalized Intersection ****

Major Road: Bronson Ave runs N/S



🚗 - Cars

🚚 - Trucks

🚲 - Bicycles

Comments



Peak Hour Diagram

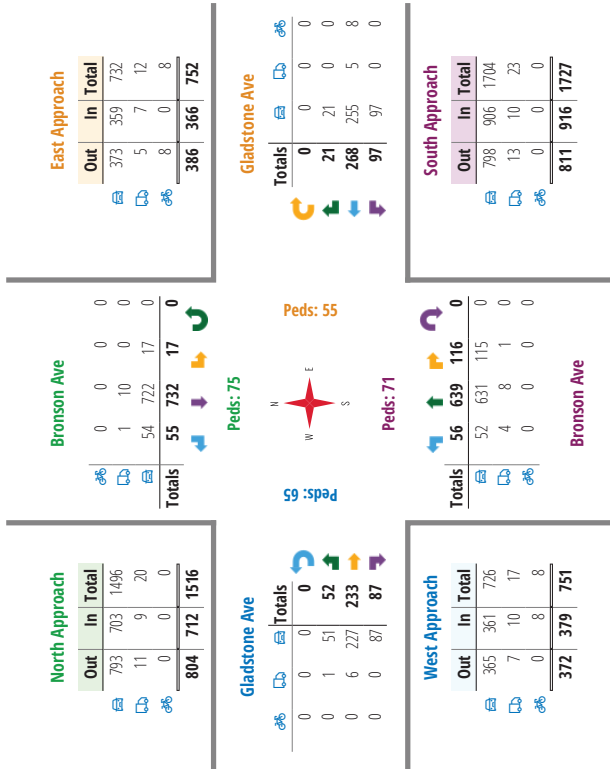
Specified Period **One Hour Peak**
 From: 15:00:00 From: 16:15:00
 To: 18:00:00 To: 17:15:00

Intersection: Bronson Ave & Gladstone Ave
Site Code: Z408800004
Count Date: Mar 07, 2024

Weather conditions: Clear

**** Signalized Intersection ****

Major Road: Bronson Ave runs N/S



🚗 - Cars

🚚 - Trucks

🚲 - Bicycles

Comments



Peak Hour Diagram

Specified Period One Hour Peak
From: 07:00:00 To: 08:15:00
To: 10:00:00 To: 09:15:00

Intersection: Booth St & Gladstone Ave
Site Code: Z408800005
Count Date: Mar 07, 2024

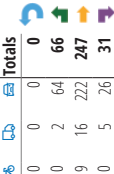
Weather conditions: Clear

**** Signalized Intersection ****

Major Road: Gladstone Ave runs E/W

North Approach		Booth St		East Approach	
Out	In	Out	In	Out	In
230	365	3	6	207	317
1	9	0	0	13	17
9	1	33	167	6	10
9	1	36	173	6	10
240	375	36	173	226	344
344	615	36	173	226	344

Gladstone Ave		Totals	
Out	In	Out	In
0	0	0	0
2	64	27	24
9	16	164	151
0	5	35	32
0	26	31	2



West Approach		South Approach	
Out	In	Out	In
312	197	355	225
23	9	4	6
9	7	2	8
344	213	361	239
344	557	361	600

Car - Cars

Truck - Trucks

Bike - Bicycles

Comments



Peak Hour Diagram

Specified Period One Hour Peak
From: 11:30:00 To: 12:00:00
To: 13:30:00 To: 13:00:00

Intersection: Booth St & Gladstone Ave
Site Code: Z408800005
Count Date: Mar 07, 2024

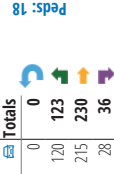
Weather conditions: Clear

**** Signalized Intersection ****

Major Road: Gladstone Ave runs E/W

North Approach		Booth St		East Approach	
Out	In	Out	In	Out	In
175	308	0	0	249	281
5	5	1	1	11	16
0	3	37	108	6	4
180	316	38	109	266	301
180	496	38	109	266	301

Gladstone Ave		Totals	
Out	In	Out	In
0	0	0	0
1	2	120	123
3	12	215	230
0	8	28	36



West Approach		South Approach	
Out	In	Out	In
363	240	209	167
22	12	4	9
4	5	3	1
389	257	216	177
389	646	216	393

Car - Cars

Truck - Trucks

Bike - Bicycles

Comments

Peak Hour Diagram

Specified Period **One Hour Peak**
 From: 07:00:00 To: 08:00:00
 From: 10:00:00 To: 09:00:00

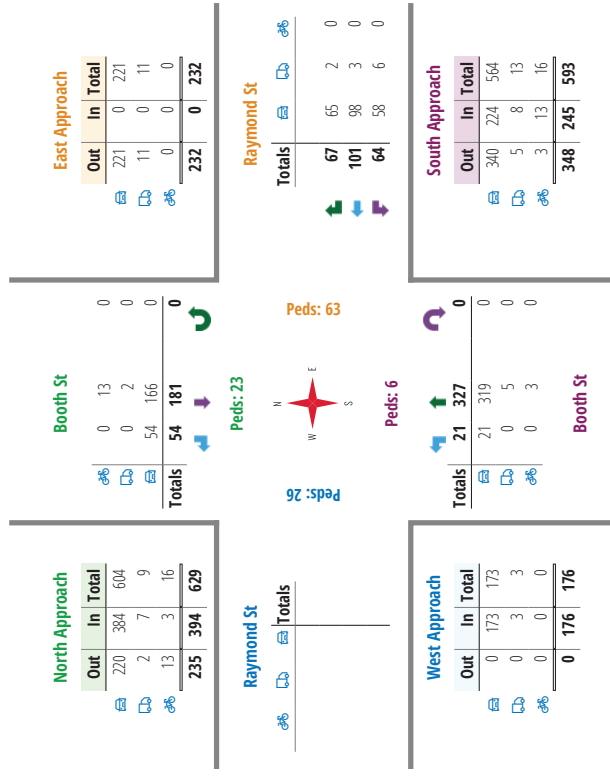


Intersection: Booth St & Raymond St
Site Code: 2408800006
Count Date: Mar 07, 2024

Weather conditions: Clear

Major Road: Booth St runs N/S

**** Signalized Intersection ****



Car - Cars

Truck - Trucks

Bike - Bicycles

Comments

Peak Hour Diagram

Specified Period **One Hour Peak**
 From: 15:00:00 To: 16:15:00
 From: 17:15:00 To: 17:15:00

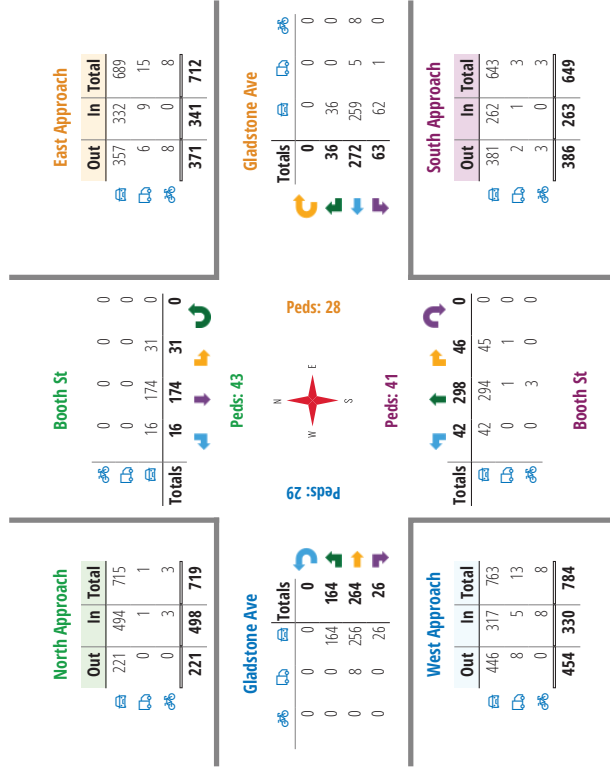


Intersection: Booth St & Gladstone Ave
Site Code: 2408800005
Count Date: Mar 07, 2024

Weather conditions: Clear

Major Road: Gladstone Ave runs E/W

**** Signalized Intersection ****



Car - Cars

Truck - Trucks

Bike - Bicycles

Comments

Peak Hour Diagram



Specified Period **One Hour Peak**
 From: 15:00:00 From: 16:15:00
 To: 18:00:00 To: 17:15:00

Intersection: Booth St & Raymond St
 Site Code: 2408800006
 Count Date: Mar 07, 2024

Weather conditions: Clear

**** Signalized Intersection ****

Major Road: Booth St runs N/S

North Approach

	Out	In	Total
Car	254	388	642
Truck	1	2	3
Bike	2	5	7
Totals	257	395	652

Raymond St

	Totals
Car	0
Truck	0
Bike	0

Booth St

	Out	In	Total
Car	0	2	0
Truck	0	1	0
Bike	40	214	0
Totals	40	217	0

Raymond St

	Totals
Car	35
Truck	0
Bike	0

Peds: 60



Peds: 7

East Approach

	Out	In	Total
Car	303	0	303
Truck	2	0	2
Bike	0	0	0
Totals	305	0	305

Raymond St

	Totals
Car	90
Truck	138
Bike	77

West Approach

	Out	In	Total
Car	0	208	208
Truck	0	0	0
Bike	0	1	1
Totals	0	209	209

Raymond St

	Totals
Car	0
Truck	0
Bike	0

South Approach

	Out	In	Total
Car	328	289	617
Truck	2	3	5
Bike	6	2	8
Totals	336	294	630

Booth St

	Totals
Car	31
Truck	30
Bike	1

Car - Cars

Truck - Trucks

Bike - Bicycles

Comments

Peak Hour Diagram



Specified Period **One Hour Peak**
 From: 11:30:00 From: 12:30:00
 To: 13:30:00 To: 13:30:00

Intersection: Booth St & Raymond St
 Site Code: 2408800006
 Count Date: Mar 07, 2024

Weather conditions: Clear

**** Signalized Intersection ****

Major Road: Booth St runs N/S

North Approach

	Out	In	Total
Car	178	200	378
Truck	4	9	13
Bike	3	2	5
Totals	185	211	396

Raymond St

	Totals
Car	21
Truck	0
Bike	0

Booth St

	Out	In	Total
Car	0	3	0
Truck	1	3	0
Bike	44	134	0
Totals	45	140	0

Raymond St

	Totals
Car	9
Truck	0
Bike	0

Peds: 46



Peds: 4

East Approach

	Out	In	Total
Car	162	0	162
Truck	14	0	14
Bike	0	0	0
Totals	176	0	176

Raymond St

	Totals
Car	59
Truck	75
Bike	42

South Approach

	Out	In	Total
Car	155	171	326
Truck	6	8	14
Bike	2	3	5
Totals	163	182	345

Raymond St

	Totals
Car	11
Truck	11
Bike	0

West Approach

	Out	In	Total
Car	0	124	124
Truck	0	7	7
Bike	0	0	0
Totals	0	131	131

Booth St

	Totals
Car	11
Truck	11
Bike	0

Car - Cars

Truck - Trucks

Bike - Bicycles

Comments



Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

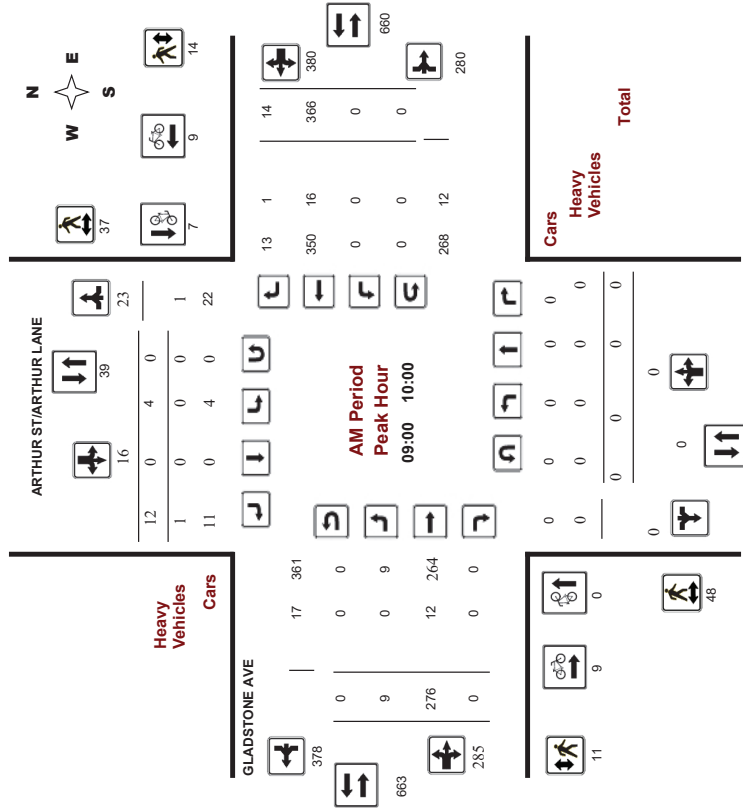
GLADSTONE AVE @ ARTHUR ST/ARTHUR LANE

Survey Date: Thursday, September 01, 2022

WO No: 40567

Start Time: 07:00

Device: Miovision



Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

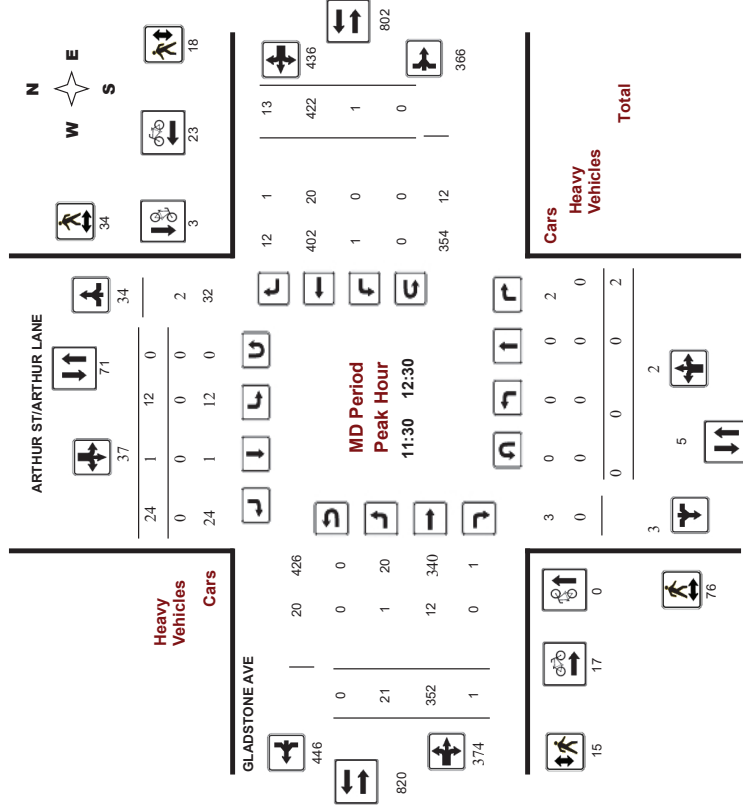
GLADSTONE AVE @ ARTHUR ST/ARTHUR LANE

Survey Date: Thursday, September 01, 2022

WO No: 40567

Start Time: 07:00

Device: Miovision





Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

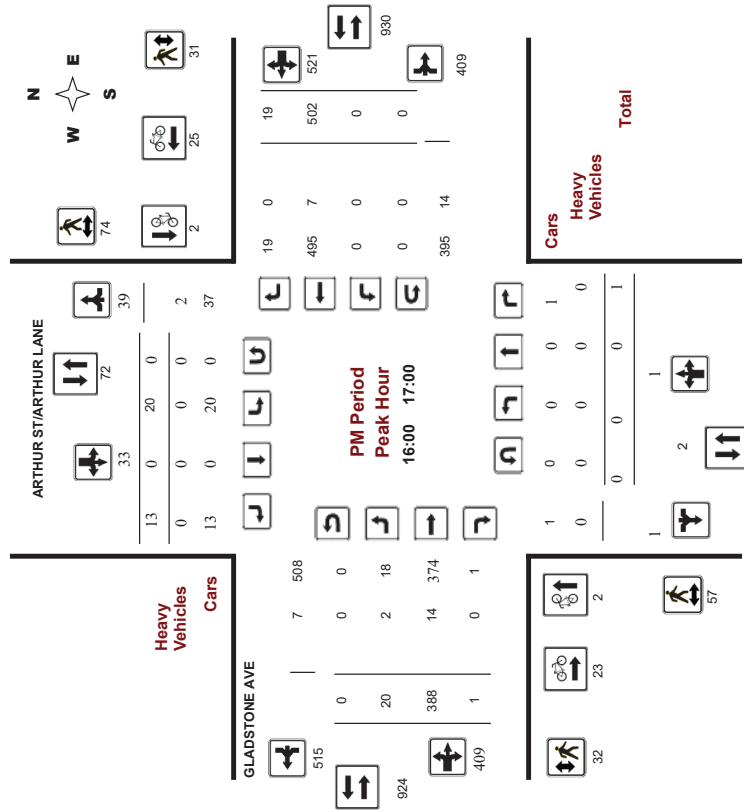
GLADSTONE AVE @ ARTHUR ST/ARTHUR LANE

Survey Date: Thursday, September 01, 2022

WO No: 40567

Start Time: 07:00

Device: Miovision



Appendix C

Synchro Intersection Worksheets – Existing Conditions

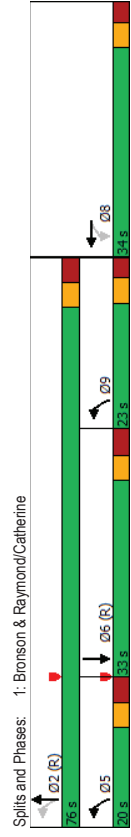
Lanes, Volumes, Timings
1: Bronson & Raymond/Catherine

Lanes, Volumes, Timings
1: Bronson & Raymond/Catherine

Lane Group	WBL	WBT	NBL	NBT	SBT	Ø5	Ø9
Lane Configurations	↔	↔	↔	↔	↔		
Traffic Volume (vph)	289	375	308	606	524		
Future Volume (vph)	289	375	308	606	524		
Lane Group Flow (vph)	212	639	342	673	770		
Turn Type	Perm	NA	pm+pt	NA	NA		
Protected Phases	8	8	5	2	6	5	9
Permitted Phases	8	8	5	2	6		
Detector Phase	8	8	5	2	6		
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	5.0	5.0
Minimum Split (s)	28.3	28.3	24.8	24.8	11.8	11.8	11.8
Total Split (s)	34.0	34.0	76.0	33.0	20.0	23.0	23.0
Total Split (%)	30.9%	30.9%	69.1%	30.0%	18%	21%	21%
Maximum Green (s)	27.7	27.7	69.2	26.2	13.2	16.8	16.8
All-Red Time (s)	3.0	3.0	3.5	3.5	3.5	3.5	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.8	6.8	6.8		
Lead/Lag						Lag	Lead
Lead-Lag Optimize?						Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	Max	Max	C-Max	C-Max	Max	Max	Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		
Pedestrian Calls (#/hr)	17	17	33	33	20		
Act Effr Green (s)	27.7	27.7	69.2	69.2	26.2		
Actuated g/C Ratio	0.25	0.25	0.63	0.63	0.24		
v/c Ratio	0.60	0.59	0.65	0.33	1.00		
Control Delay	44.6	36.6	19.9	7.9	69.1		
Queue Delay	0.0	0.0	3.0	0.5	35.8		
Total Delay	44.6	36.6	22.9	8.4	104.9		
LOS	D	D	C	A	F		
Approach Delay						13.3	104.9
Approach LOS		D		B	F		
Queue Length 50th (m)	46.8	44.1	32.3	27.5	84.1		
Queue Length 95th (m)	75.9	57.5	52.0	30.2	#25.4		
Internal Link Dist (m)		247.5		60.4	56.5		
Turn Bay Length (m)		110.0		45.0			
Base Capacity (vph)	352	1083	526	2065	772		
Starvation Cap Reductn	0	0	100	900	111		
Spillback Cap Reductn	0	0	0	0	134		
Storage Cap Reductn	0	0	0	0	0		
Reduced v/c Ratio	0.60	0.59	0.80	0.58	1.21		

Intersection Summary	
Cycle Length:	110
Actuated Cycle Length:	110
Offset:	38 (35%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle:	90

Control Type: Actuated-Coordinated	
Maximum v/c Ratio:	1.00
Intersection Signal Delay:	48.2
Intersection LOS:	D
Intersection Capacity Utilization:	74.4%
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

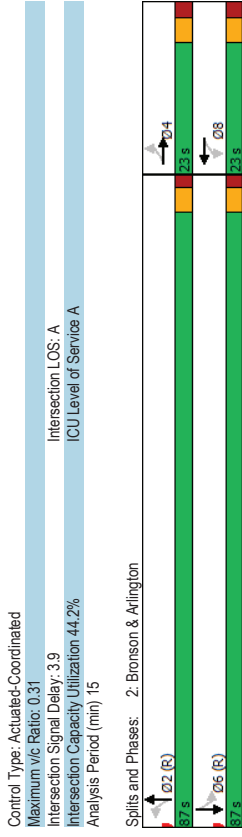


Lanes, Volumes, Timings
2: Bronson & Arlington

Lanes, Volumes, Timings
2: Bronson & Arlington

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	4	4	4	4	4	4	4	4
Traffic Volume (vph)	8	0	4	6	4	698	2	632
Future Volume (vph)	8	0	4	6	4	698	2	632
Lane Group Flow (vph)	0	71	0	15	0	787	0	712
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4	4	8	8	2	2	6	6
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase	4	4	8	8	2	2	6	6
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.6	22.6	22.6	17.2	17.2	17.2	17.2	17.2
Total Split (s)	23.0	23.0	23.0	23.0	87.0	87.0	87.0	87.0
Total Split (%)	20.9%	20.9%	20.9%	79.1%	79.1%	79.1%	79.1%	79.1%
Maximum Green (s)	17.4	17.4	17.4	81.8	81.8	81.8	81.8	81.8
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.3	2.3	2.3	1.9	1.9	1.9	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.6	5.6	5.6	5.2	5.2	5.2	5.2	5.2
Lead/Lag								
Lead-Lag Optimize?								
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	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
Flash Dont Walk (s)	10.0	10.0	10.0	5.0	5.0	5.0	5.0	5.0
Pedestrian Calls (#/hr)	15	15	25	25	18	18	14	14
Act Effr Green (s)	14.2	14.2	14.2	14.2	89.2	89.2	89.2	89.2
Actuated G/C Ratio	0.13	0.13	0.13	0.13	0.81	0.81	0.81	0.81
v/c Ratio	0.31	0.08	0.31	0.08	0.31	0.28	0.28	0.28
Control Delay	16.6	34.0	1.9	3.9	1.9	3.9	3.9	3.9
Queue Delay	0.1	0.0	0.1	0.1	0.2	0.2	0.2	0.2
Total Delay	16.7	34.0	2.0	4.1	2.0	4.1	4.1	4.1
LOS	B	C	A	A	A	A	A	A
Approach Delay	16.7	34.0	2.0	4.1	2.0	4.1	4.1	4.1
Approach LOS	B	C	A	A	A	A	A	A
Queue Length 50th (m)	1.7	2.1	12.2	22.3	12.2	22.3	22.3	22.3
Queue Length 95th (m)	14.2	7.9	14.8	28.9	14.8	28.9	28.9	28.9
Internal Link Dist (m)	80.9	230.9	56.5	207.2	56.5	207.2	207.2	207.2
Turn Bay Length (m)								
Base Capacity (vph)	270	243	2505	2524	2505	2524	2524	2524
Starvation Cap Reductn	0	0	571	0	571	0	0	0
Spillback Cap Reductn	16	0	0	859	0	859	0	859
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.06	0.41	0.43	0.41	0.43	0.43	0.43

Intersection Summary	
Cycle Length:	110
Actuated Cycle Length:	110
Offset:	11 (10%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle:	45



Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.31
 Intersection LOS: A
 ICU Level of Service A
 Intersection Signal Delay: 3.9
 Intersection Capacity Utilization: 44.2%
 Analysis Period (min): 15

Splits and Phases: 2: Bronson & Arlington

Lanes, Volumes, Timings
3: Bronson & Gladstone

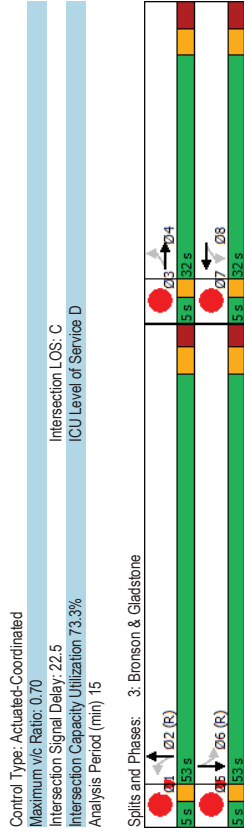
Existing AM Peak Hour
384 Arlington Ave

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	Ø1	Ø3	Ø5	Ø7
Lane Configurations	39	222	62	147	55	563	11	489				
Traffic Volume (vph)	39	222	62	147	55	563	11	489				
Future Volume (vph)	43	301	69	180	61	736	12	570				
Lane Group Flow (vph)	Perm	NA	Perm	NA	Perm	NA	Perm	NA				
Turn Type	4	8	8	2	2	2	6	6	1	3	5	7
Protected Phases	4	8	8	2	2	2	6	6				
Permitted Phases	4	8	8	2	2	2	6	6				
Detector Phase	4	8	8	2	2	2	6	6				
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	1.0	1.0	1.0	1.0
Minimum Split (s)	28.2	28.2	28.2	25.0	25.0	25.0	25.0	25.0	5.0	5.0	5.0	5.0
Total Split (s)	32.0	32.0	32.0	32.0	53.0	53.0	53.0	53.0	5.0	5.0	5.0	5.0
Total Split (%)	33.7%	33.7%	33.7%	33.7%	55.8%	55.8%	55.8%	55.8%	5%	5%	5%	5%
Maximum Green (s)	25.8	25.8	25.8	25.8	47.0	47.0	47.0	47.0	3.0	3.0	3.0	3.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3	2.0	2.0	2.0	2.0
All-Red Time (s)	3.2	3.2	3.2	3.2	2.7	2.7	2.7	2.7	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.0	6.0	6.0	6.0				
Lead/Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead
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	Max	Max	Max	C-Max	C-Max	C-Max	C-Max	C-Max	Max	Max	Max	Max
Flash Dont Walk (s)	52	52	27	27	27	27	36	36	27	52	36	27
Pedestrian Calls (#/hr)	25.8	25.8	25.8	25.8	47.0	47.0	47.0	47.0				
Act Effr Green (s)	0.27	0.27	0.27	0.27	0.49	0.49	0.49	0.49				
Actuated G/C Ratio	0.16	0.70	0.38	0.40	0.20	0.48	0.05	0.36				
v/c Ratio	28.4	41.3	35.6	31.5	15.7	17.2	13.3	15.6				
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Queue Delay	28.4	41.3	35.6	31.5	15.7	17.2	13.3	15.6				
LOS	C	D	D	C	B	B	B	B				
Approach Delay	39.7	32.6	32.6	17.1	15.5							
Approach LOS	D	C	C	B	B							
Queue Length 50th (m)	6.0	49.6	10.3	26.9	6.0	45.0	1.1	32.3				
Queue Length 95th (m)	14.5	78.6	23.2	45.7	14.1	60.1	4.1	44.3				
Internal Link Dist (m)	139.3	203.3	203.3	207.2	176.5							
Turn Bay Length (m)	20.0	20.0	20.0	35.0	45.0							
Base Capacity (vph)	266	429	181	451	303	1540	246	1583				
Starvation Cap Reductn	0	0	0	0	0	0	0	0				
Spillback Cap Reductn	0	0	0	0	0	0	0	0				
Storage Cap Reductn	0	0	0	0	0	0	0	0				
Reduced v/c Ratio	0.16	0.70	0.38	0.40	0.20	0.48	0.05	0.36				

Intersection Summary
 Cycle Length: 95
 Actuated Cycle Length: 95
 Offset: 26 (27%), Referenced to phase 2:NBLT and 6:SBTL, Start of Green
 Natural Cycle: 65

Lanes, Volumes, Timings
3: Bronson & Gladstone

Existing AM Peak Hour
384 Arlington Ave



Lanes, Volumes, Timings
4: Booth & Gladstone

Lanes, Volumes, Timings
4: Booth & Gladstone

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	Ø1	Ø3	Ø5	Ø7
Lane Configurations	←	←	←	←	←	←	←	←				
Traffic Volume (vph)	66	247	35	164	13	282	31	173				
Future Volume (vph)	66	247	35	164	13	282	31	173				
Lane Group Flow (vph)	73	308	39	212	14	386	34	232				
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA				
Protected Phases	2	2	6	6	4	4	8	8	1	3	5	7
Detector Phase	2	2	6	6	4	4	8	8				
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	1.0	1.0	1.0	1.0
Minimum Split (s)	22.1	22.1	22.1	23.9	23.9	23.9	23.9	23.9	5.0	5.0	5.0	5.0
Total Split (s)	36.0	36.0	36.0	36.0	29.0	29.0	29.0	29.0	5.0	5.0	5.0	5.0
Total Split (%)	48.0%	48.0%	48.0%	48.0%	38.7%	38.7%	38.7%	38.7%	7%	7%	7%	7%
Maximum Green (s)	29.9	29.9	29.9	29.9	22.1	22.1	22.1	22.1	3.0	3.0	3.0	3.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0
All-Red Time (s)	3.1	3.1	3.1	3.1	3.9	3.9	3.9	3.9	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.9	6.9	6.9	6.9				
Lead/Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead
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	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None	None	None	None
Flash Dont Walk (s)	9.0	9.0	9.0	9.0	10.0	10.0	10.0	10.0	0.0	0.0	0.0	0.0
Pedestrian Calls (#/hr)	32	32	38	38	31	31	22	22	32	31	38	22
Act Effr Green (s)	34.9	34.9	34.9	34.9	20.1	20.1	20.1	20.1				
Act Effr Green (s)	0.47	0.47	0.47	0.47	0.27	0.27	0.27	0.27				
v/c Ratio	0.16	0.41	0.10	0.28	0.05	0.84	0.24	0.51				
Control Delay	14.9	16.3	14.4	14.3	19.8	42.8	25.3	25.4				
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Delay	14.9	16.3	14.4	14.3	19.8	42.8	25.3	25.4				
LOS	B	B	B	B	B	D	C	C				
Approach Delay	16.0		14.3		14.3		42.0		25.4			
Approach LOS	B		B		B		D		C			
Queue Length 50th (m)	5.7	26.6	3.0	16.5	1.4	47.3	3.6	24.8				
Queue Length 95th (m)	15.0	51.3	9.2	34.1	5.3	#88.3	10.8	44.2				
Internal Link Dist (m)	79.0		246.0		206.0		98.4					
Turn Bay Length (m)	40.0		25.0		8.0		8.0					
Base Capacity (vph)	453	753	401	756	283	501	156	503				
Starvation Cap Reductn	0	0	0	0	0	0	0	0				
Spillback Cap Reductn	0	0	0	0	0	0	0	0				
Storage Cap Reductn	0	0	0	0	0	0	0	0				
Reduced v/c Ratio	0.16	0.41	0.10	0.28	0.05	0.77	0.22	0.46				

Intersection Summary	
Cycle Length: 75	
Actuated Cycle Length: 75	
Offset: 16 (21%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	
Natural Cycle: 60	

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 25.6	Intersection LOS: C
Intersection Capacity Utilization 67.5%	IOU Level of Service C
Analysis Period (min): 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	



Lanes, Volumes, Timings
5: Arthur & Gladstone

Existing AM Peak Hour
384 Arlington Ave

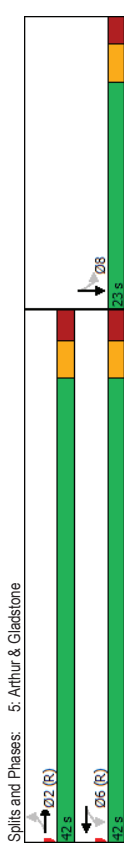
Lane Group	EBL	EBT	WBT	WBT	SBT
Lane Configurations	EBL	EBT	WBT	WBT	SBT
Traffic Volume (vph)	9	276	366	0	0
Future Volume (vph)	9	276	366	0	0
Lane Group Flow (vph)	0	317	423	17	0
Turn Type	Perm	NA	NA	NA	NA
Protected Phases	2	2	6	8	8
Permitted Phases	2	2	6	8	8
Detector Phase	2	2	6	8	8
Switch Phase					
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	29.5	29.5	29.5	23.2	23.2
Total Split (s)	42.0	42.0	42.0	23.0	23.0
Total Split (%)	64.6%	64.6%	64.6%	35.4%	35.4%
Maximum Green (s)	36.5	36.5	36.5	17.8	17.8
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.5	2.5	2.5	2.2	2.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.2	5.2
Lead/Lag					
Lead-Lag Optimize?					
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	None
Walk Time (s)	19.0	19.0	19.0	10.0	10.0
Flash Dont Walk (s)	5.0	5.0	5.0	8.0	8.0
Pedestrian Calls (#/hr)	48	48	37	14	14
Act Effr Green (s)	55.2	55.2	55.2	11.6	11.6
Actuated g/C Ratio	0.85	0.85	0.85	0.18	0.18
v/c Ratio	0.22	0.29	0.29	0.06	0.06
Control Delay	4.1	4.5	2.7	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	4.1	4.5	2.7	0.0	0.0
LOS	A	A	A	A	A
Approach Delay	4.1	4.5	2.7	0.0	0.0
Approach LOS	A	A	A	A	A
Queue Length 50th (m)	0.0	0.0	0.0	0.0	0.0
Queue Length 95th (m)	32.0	44.6	1.6	0.0	0.0
Internal Link Dist (m)	246.0	139.3	183.9	0.0	0.0
Turn Bay Length (m)					
Base Capacity (vph)	1433	1440	418	0	0
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.22	0.29	0.04	0.04	0.04

Intersection Summary	
Cycle Length: 65	
Actuated Cycle Length: 65	
Offset: 15 (23%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	
Natural Cycle: 55	

Lanes, Volumes, Timings
5: Arthur & Gladstone

Existing AM Peak Hour
384 Arlington Ave

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.29
Intersection Signal Delay: 4.3
Intersection LOS: A
Intersection Capacity Utilization: 42.3%
Analysis Period (min): 15
IOU Level of Service A



Lanes, Volumes, Timings
6: Booth & Raymond

Lanes, Volumes, Timings
6: Booth & Raymond

Existing AM Peak Hour
384 Arlington Ave

Existing AM Peak Hour
384 Arlington Ave

Lane Group	WBT	WBR	NBL	NBT	SBT
Lane Configurations	4	4	4	4	4
Traffic Volume (vph)	101	67	21	327	181
Future Volume (vph)	101	67	21	327	181
Lane Group Flow (vph)	183	74	23	363	261
Turn Type	NA	Perm	Perm	NA	NA
Protected Phases	8	8	2	2	6
Permitted Phases	8	8	2	2	6
Detector Phase	8	8	2	2	6
Switch Phase					
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.5	25.5	25.2	25.2	25.2
Total Split (s)	30.0	30.0	30.0	30.0	30.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	24.5	24.5	24.8	24.8	24.8
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.2	2.2	1.9	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.2	5.2	5.2
Lead/Lag					
Lead-Lag Optimize?					
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0
Recall Mode	Max	Max	C-Max	C-Max	C-Max
Walk Time (s)	11.0	11.0	15.0	15.0	15.0
Flash Dont Walk (s)	9.0	9.0	5.0	5.0	5.0
Pedestrian Calls (#/hr)	23	23	63	63	26
Act Effr Green (s)	24.5	24.5	24.8	24.8	24.8
Actuated G/C Ratio	0.41	0.41	0.41	0.41	0.41
v/c Ratio	0.27	0.12	0.06	0.50	0.37
Control Delay	13.2	3.9	11.2	16.1	12.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	13.2	3.9	11.2	16.1	12.5
LOS	B	A	B	B	B
Approach Delay	10.5		15.8	12.5	
Approach LOS	B		B	B	
Queue Length 50th (m)	12.9	0.0	1.5	28.3	16.5
Queue Length 95th (m)	24.8	6.1	5.1	48.8	31.6
Internal Link Dist (m)	302.1		65.0	206.0	
Turn Bay Length (m)	75.0	25.0			
Base Capacity (vph)	674	611	406	721	705
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.27	0.12	0.06	0.50	0.37

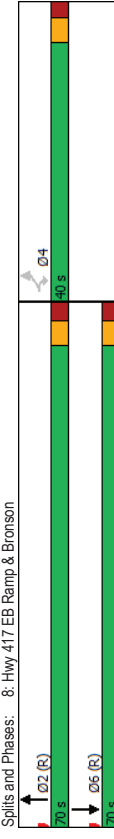
Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 35 (58%), Referenced to phase 2:NBLT and 6:SBT, Start of Green	
Natural Cycle: 55	

Lanes, Volumes, Timings
8: Hwy 417 EB Ramp & Bronson

Lanes, Volumes, Timings
8: Hwy 417 EB Ramp & Bronson

Lane Group	EBL	EBR	NBT	SBT
Lane Configurations	↔	↔	↔	↔
Traffic Volume (vph)	134	152	780	813
Future Volume (vph)	134	152	780	813
Lane Group Flow (vph)	149	169	867	903
Turn Type	Perm	Perm	NA	NA
Protected Phases			2	6
Permitted Phases	4	4		
Detector Phase	4	4	2	6
Switch Phase				
Minimum Initial (s)	10.0	10.0	10.0	10.0
Minimum Split (s)	28.6	28.6	31.9	31.9
Total Split (s)	40.0	40.0	70.0	70.0
Total Split (%)	36.4%	36.4%	63.6%	63.6%
Maximum Green (s)	34.4	34.4	64.1	64.1
Yellow Time (s)	3.3	3.3	3.3	3.3
All-Red Time (s)	2.3	2.3	2.6	2.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.6	5.6	5.9	5.9
Lead/Lag				
Lead-Lag Optimize?				
Vehicle Extension (s)	3.0	3.0	3.0	3.0
Recall Mode	Max	Max	C-Max	C-Max
Walk Time (s)	7.0	7.0	15.0	15.0
Flash Dont Walk (s)	16.0	16.0	10.0	10.0
Pedestrian Calls (#/hr)	8	8	0	38
Act Effr Green (s)	34.4	34.4	64.1	64.1
Actuated g/C Ratio	0.31	0.31	0.98	0.58
v/c Ratio	0.29	0.32	0.45	0.48
Control Delay	30.6	11.6	14.0	9.6
Queue Delay	0.0	0.0	0.0	39.5
Total Delay	30.6	11.6	14.0	49.1
LOS	C	B	B	D
Approach Delay	20.5	14.0	49.1	
Approach LOS	C	B	D	
Queue Length 50th (m)	24.1	7.8	52.2	22.4
Queue Length 95th (m)	41.0	24.1	66.5	62.1
Internal Link Dist (m)	243.0		56.2	60.4
Turn Bay Length (m)	42.0			
Base Capacity (vph)	508	529	1913	1895
Starvation Cap Reductn	0	0	0	1052
Spillback Cap Reductn	0	0	35	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.29	0.32	0.46	1.07
Intersection Summary				
Cycle Length: 110				
Actuated Cycle Length: 110				
Offset: 46 (42%), Referenced to phase 2:NBT and 6:SBT, Start of Green				
Natural Cycle: 65				

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.48
Intersection Signal Delay: 30.2
Intersection LOS: C
Intersection Capacity Utilization: 74.4%
IOU Level of Service D
Analysis Period (min): 15
m. Volume for 95th percentile queue is metered by upstream signal.



Lanes, Volumes, Timings
1: Bronson & Raymond/Catherine

Existing PM Peak Hour
384 Arlington

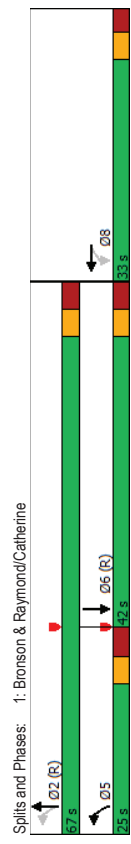
Lane Group	WBL	WBT	NBL	NBT	SBT
Lane Configurations	←	←	←	←	←
Traffic Volume (vph)	481	609	283	687	762
Future Volume (vph)	481	609	283	687	762
Lane Group Flow (vph)	331	1002	326	763	1094
Perm	NA	pm-pt	NA	NA	NA
Protected Phases	8	5	2	6	6
Permitted Phase	8	8	5	2	6
Detector Phase	8	8	5	2	6
Switch Phase					
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.3	28.3	11.8	24.8	24.8
Total Split (s)	33.0	33.0	25.0	67.0	42.0
Total Split (%)	33.0%	33.0%	25.0%	67.0%	42.0%
Maximum Green (s)	26.7	26.7	18.2	60.2	35.2
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	3.0	3.0	3.5	3.5	3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.8	6.8	6.8
Lead/Lag			Lead	Lag	Lag
Lead-Lag Optimize?			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0
Recall Mode	Max	Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	15.0	15.0	10.0	10.0	10.0
Pedestrian Calls (#/hr)	27	27	31	40	40
Act Effr Green (s)	26.7	26.7	60.2	60.2	36.1
Actuated G/C Ratio	0.27	0.27	0.60	0.60	0.36
v/c Ratio	0.87	0.85	0.92	0.38	0.94
Control Delay	59.4	42.2	57.6	11.0	31.0
Queue Delay	0.0	0.0	2.2	2.3	15.0
Total Delay	59.4	42.2	59.8	13.3	46.1
LOS	E	D	E	B	D
Approach Delay	46.5	46.5	27.2	46.1	46.1
Approach LOS	D	D	C	C	D
Queue Length 50th (m)	71.2	63.9	47.1	37.1	109.1
Queue Length 95th (m)	#127.0	#88.1	#95.5	48.7	#145.7
Internal Link Dist (m)	247.5	247.5	63.3	63.3	65.5
Turn Bay Length (m)	110.0	45.0	45.0		
Base Capacity (vph)	380	1178	369	1996	1162
Starvation Cap Reductn	0	0	10	1062	92
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.87	0.85	0.91	0.82	1.02

Intersection Summary
 Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 60 (60%), Referenced to phase 2:NBLT and 6:SBT, Start of Green
 Natural Cycle: 90

Lanes, Volumes, Timings
1: Bronson & Raymond/Catherine

Existing PM Peak Hour
384 Arlington

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 40.4
Intersection LOS: D
Intersection Capacity Utilization: 104.2%
IOU Level of Service G
Analysis Period (min): 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



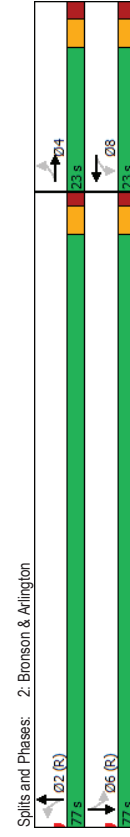
Lanes, Volumes, Timings
2: Bronson & Arlington

Lanes, Volumes, Timings
2: Bronson & Arlington

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	4	4	4	4	4	4	4	4
Traffic Volume (vph)	15	8	14	5	26	792	5	910
Future Volume (vph)	15	8	14	5	26	792	5	910
Lane Group Flow (vph)	0	97	0	34	0	932	0	1060
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4	4	8	8	2	2	6	6
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.6	22.6	22.6	17.2	17.2	17.2	17.2	17.2
Total Split (s)	23.0	23.0	23.0	23.0	77.0	77.0	77.0	77.0
Total Split (%)	23.0%	23.0%	23.0%	23.0%	77.0%	77.0%	77.0%	77.0%
Maximum Green (s)	17.4	17.4	17.4	17.4	71.8	71.8	71.8	71.8
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.3	2.3	2.3	2.3	1.9	1.9	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	5.2	5.2	5.2	5.2
Lead/Lag								
Lead-Lag Optimize?								
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	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
Flash Dont Walk (s)	10.0	10.0	10.0	10.0	5.0	5.0	5.0	5.0
Pedestrian Calls (#/hr)	23	23	11	11	27	27	4	4
Act Effr Green (s)	12.8	12.8	12.8	12.8	80.6	80.6	80.6	80.6
Actuated G/C Ratio	0.13	0.13	0.13	0.13	0.81	0.81	0.81	0.81
v/c Ratio	0.40	0.19	0.39	0.39	2.0	2.0	0.42	0.42
Control Delay	19.3	29.4	29.4	29.4	2.0	2.0	2.2	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Total Delay	19.3	29.4	29.4	29.4	2.0	2.3	2.3	2.3
LOS	B	C	C	C	A	A	A	A
Approach Delay	19.3	29.4	29.4	29.4	2.0	2.3	2.3	2.3
Approach LOS	B	C	C	C	A	A	A	A
Queue Length 50th (m)	4.7	4.0	4.0	4.0	6.8	6.8	16.3	16.3
Queue Length 95th (m)	18.3	12.2	12.2	12.2	m12.8	m12.8	21.6	21.6
Internal Link Dist (m)	80.9	230.9	230.9	230.9	56.5	56.5	207.2	207.2
Turn Bay Length (m)								
Base Capacity (vph)	301	243	243	243	2372	2372	2523	2523
Starvation Cap Reductn	0	0	0	0	256	256	0	0
Spillback Cap Reductn	4	0	0	0	0	0	248	248
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.14	0.14	0.14	0.44	0.44	0.46	0.46

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 23 (23%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 50	

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.42	
Intersection Signal Delay: 3.4	Intersection LOS: A
Intersection Capacity Utilization 64.3%	IOU Level of Service C
Analysis Period (min): 15	
m. Volume for 95th percentile queue is metered by upstream signal.	



Lanes, Volumes, Timings
4: Booth & Gladstone

Existing PM Peak Hour
384 Arlington

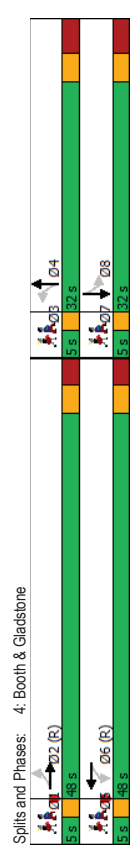
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	Ø1	Ø3	Ø5	Ø7
Lane Configurations	164	264	63	272	42	298	31	174				
Traffic Volume (vph)	164	264	63	272	42	298	31	174				
Future Volume (vph)	182	322	70	342	47	382	34	211				
Lane Group Flow (vph)	Perm	NA	Perm	NA	Perm	NA	Perm	NA				
Turn Type	2	2	6	6	4	4	8	8	1	3	5	7
Protected Phases	2	2	6	6	4	4	8	8				
Detector Phase	2	2	6	6	4	4	8	8				
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	1.0	1.0	1.0	1.0
Minimum Split (s)	22.1	22.1	22.1	23.9	23.9	23.9	23.9	23.9	5.0	5.0	5.0	5.0
Total Split (s)	48.0	48.0	48.0	48.0	32.0	32.0	32.0	32.0	5.0	5.0	5.0	5.0
Total Split (%)	53.3%	53.3%	53.3%	53.3%	35.6%	35.6%	35.6%	35.6%	6%	6%	6%	6%
Maximum Green (s)	41.9	41.9	41.9	41.9	25.1	25.1	25.1	25.1	3.0	3.0	3.0	3.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0
All-Red Time (s)	3.1	3.1	3.1	3.1	3.9	3.9	3.9	3.9	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.9	6.9	6.9	6.9				
Lead/Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead
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	C-Max	C-Max	C-Max	C-Max	Max	Max	Max	Max	None	None	None	None
Walk Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0
Flash Dont Walk (s)	9.0	9.0	9.0	9.0	10.0	10.0	10.0	10.0	0.0	0.0	0.0	0.0
Pedestrian Calls (#/hr)	41	41	43	43	28	28	29	29	41	28	43	29
Act Effr Green (s)	43.9	43.9	43.9	43.9	28.1	28.1	27.1	27.1				
Actuated G/C Ratio	0.49	0.49	0.49	0.49	0.31	0.31	0.30	0.30				
v/c Ratio	21.5	16.6	15.4	16.8	25.6	25.6	28.0	28.1				
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Queue Delay	21.5	16.6	15.4	16.8	25.6	25.6	28.0	28.1				
LOS	C	B	B	B	C	D	C	C				
Approach Delay	18.4				16.6		35.7	28.1				
Approach LOS	B				B		D	C				
Queue Length 50th (m)	21.1	34.5	6.8	36.9	5.6	54.8	4.5	29.2				
Queue Length 95th (m)	41.1	55.0	15.2	58.6	14.9	#104.3	12.5	49.3				
Internal Link Dist (m)	79.0				246.0		206.0	98.4				
Turn Bay Length (m)	40.0		25.0		8.0		8.0	8.0				
Base Capacity (vph)	379	821	383	821	282	531	181	516				
Starvation Cap Reductn	0	0	0	0	0	0	0	0				
Spillback Cap Reductn	0	0	0	0	0	0	0	0				
Storage Cap Reductn	0	0	0	0	0	0	0	0				
Reduced v/c Ratio	0.48	0.39	0.18	0.42	0.16	0.72	0.19	0.41				

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 51 (57%), Referenced to phase 2EBTL and 6:WBTL, Start of Green	
Natural Cycle: 60	

Lanes, Volumes, Timings
4: Booth & Gladstone

Existing PM Peak Hour
384 Arlington

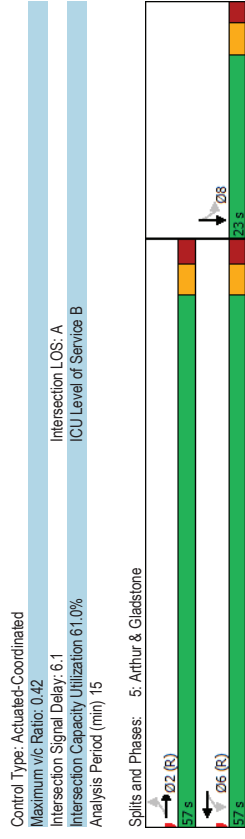
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 24.1	Intersection LOS: C
Intersection Capacity Utilization 77.3%	ICU Level of Service D
Analysis Period (min): 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	



Lanes, Volumes, Timings
5: Arthur & Gladstone

Lanes, Volumes, Timings
5: Arthur & Gladstone

Lane Group	EBL	EBT	WBT	WBT	SBT
Lane Configurations					
Traffic Volume (vph)	20	388	502	0	0
Future Volume (vph)	20	388	502	0	0
Lane Group Flow (vph)	0	454	579	36	0
Turn Type	Perm	NA	NA	NA	NA
Permitted Phases	2	2	6	8	8
Detector Phase	2	2	6	8	8
Switch Phase					
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	29.5	29.5	29.5	23.2	23.0
Total Split (s)	57.0	57.0	57.0	23.0	23.0
Total Split (%)	71.3%	71.3%	71.3%	28.8%	28.8%
Maximum Green (s)	51.5	51.5	51.5	17.8	17.8
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0
Yellow Time (s)	2.5	2.5	2.5	2.2	2.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	5.5	5.2	5.2
Lead/Lag					
Lead-Lag Optimize?					
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	None	None
Walk Time (s)	19.0	19.0	19.0	10.0	10.0
Flash Dont Walk (s)	5.0	5.0	5.0	8.0	8.0
Pedestrian Calls (#/hr)	57	57	74	32	32
Act Effr Green (s)	64.5	64.5	64.5	13.1	13.1
Actuated g/C Ratio	0.81	0.81	0.81	0.16	0.16
v/c Ratio	0.34	0.42	0.42	0.13	0.13
Control Delay	5.5	6.1	11.1		
Queue Delay	0.0	0.2	0.0		
Total Delay	5.5	6.3	11.1		
LOS	A	A	B		
Approach Delay	5.5	6.3	11.1		
Approach LOS	A	A	B		
Queue Length 50th (m)	19.5	26.7	0.3		
Queue Length 95th (m)	47.3	64.2	7.2		
Internal Link Dist (m)	246.0	139.3	183.9		
Turn Bay Length (m)					
Base Capacity (vph)	1325	1392	355		
Starvation Cap Reductn	0	263	0		
Spillback Cap Reductn	0	0	0		
Storage Cap Reductn	0	0	0		
Reduced v/c Ratio	0.34	0.51	0.10		
Intersection Summary					
Cycle Length: 80					
Actuated Cycle Length: 80					
Offset: 65 (81%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green					
Natural Cycle: 60					



Control Type	Actuated-Coordinated
Maximum v/c Ratio	0.42
Intersection Signal Delay	6.1
Intersection LOS	A
ICU Level of Service B	
Intersection Capacity Utilization	61.0%
Analysis Period (min)	15

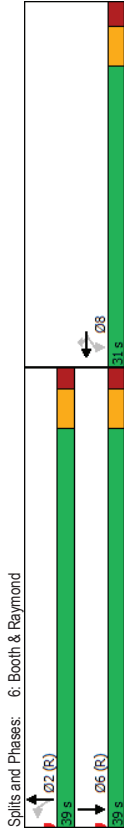


Lanes, Volumes, Timings
6: Booth & Raymond

Lanes, Volumes, Timings
6: Booth & Raymond

←	↖	↗	→	↙	↘	↕
WBT	WBR	NBL	NBT	SBT		
4	4	4	4	4		
138	90	31	305	217		
138	90	31	305	217		
239	100	94	339	285		
NA	Perm	Perm	NA	NA		
8	8	2	2	6		
8	8	2	2	6		
10.0	10.0	10.0	10.0	10.0		
25.5	25.5	25.2	25.2	25.2		
31.0	31.0	39.0	39.0	39.0		
44.3%	44.3%	55.7%	55.7%	55.7%		
25.5	25.5	33.8	33.8	33.8		
3.3	3.3	3.3	3.3	3.3		
2.2	2.2	1.9	1.9	1.9		
0.0	0.0	0.0	0.0	0.0		
5.5	5.5	5.2	5.2	5.2		
3.0	3.0	3.0	3.0	3.0		
11.0	11.0	15.0	15.0	15.0		
9.0	9.0	5.0	5.0	5.0		
12	12	60	60	35		
25.5	25.5	33.8	33.8	33.8		
0.36	0.36	0.48	0.48	0.48		
0.39	0.17	0.08	0.40	0.35		
18.8	4.5	10.4	13.4	12.0		
0.0	0.0	0.0	0.0	0.0		
18.8	4.5	10.4	13.4	12.0		
B	A	B	B	B		
14.6		13.2	12.0			
B		B	B			
22.6	0.0	2.3	26.9	20.2		
39.7	8.4	6.6	44.7	35.6		
302.1		65.0	206.0			
75.0	25.0					
619	581	450	842	823		
0	0	0	0	0		
0	0	0	0	0		
0	0	0	0	0		
0.39	0.17	0.08	0.40	0.35		

Control Type: Actuated-Coordinated	Intersection LOS: B
Maximum v/c Ratio: 0.40	IOU Level of Service A
Intersection Signal Delay: 13.3	
Intersection Capacity Utilization 54.9%	
Analysis Period (min) 15	

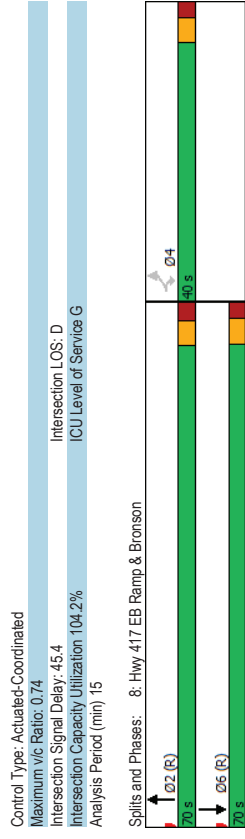


Lanes, Volumes, Timings
8: Hwy 417 EB Ramp & Bronson

Lanes, Volumes, Timings
8: Hwy 417 EB Ramp & Bronson

Lane Group	EBL	EBR	NBT	SBT
Lane Configurations	↔	↔	↔	↔
Traffic Volume (vph)	166	319	785	1256
Future Volume (vph)	166	319	785	1256
Lane Group Flow (vph)	184	354	872	1396
Turn Type	Perm	Perm	NA	NA
Protected Phases	4	2	2	6
Permitted Phases	4	4	2	6
Detector Phase	4	4	2	6
Switch Phase				
Minimum Initial (s)	10.0	10.0	10.0	10.0
Minimum Split (s)	28.6	28.6	30.9	30.6
Total Split (s)	40.0	40.0	70.0	70.0
Total Split (%)	36.4%	36.4%	63.6%	63.6%
Maximum Green (s)	34.4	34.4	64.1	64.4
Yellow Time (s)	3.3	3.3	3.3	3.3
All-Red Time (s)	2.3	2.3	2.6	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.6	5.6	5.9	5.6
Lead/Lag				
Lead-Lag Optimize?				
Vehicle Extension (s)	3.0	3.0	3.0	3.0
Recall Mode	Max	Max	C-Max	C-Max
Walk Time (s)	7.0	7.0	15.0	15.0
Flash Dont Walk (s)	16.0	16.0	10.0	10.0
Pedestrian Calls (#/hr)	7	7	0	41
Act Effr Green (s)	34.4	34.4	64.1	64.4
Actuated G/C Ratio	0.31	0.31	0.58	0.59
v/c Ratio	3.17	4.10	13.9	19.0
Control Delay	0.0	0.0	0.0	48.9
Queue Delay	0.0	0.0	0.0	88.0
Total Delay	31.7	41.0	13.9	68.0
LOS	C	D	B	E
Approach Delay	37.8	37.8	13.9	68.0
Approach LOS	D	D	B	E
Queue Length 50th (m)	30.4	61.3	52.4	106.1
Queue Length 95th (m)	49.8	96.2	66.7	131.6
Internal Link Dist (m)	217.3	217.3	50.4	63.3
Turn Bay Length (m)	42.0	42.0	0	0
Base Capacity (vph)	518	478	1932	1941
Starvation Cap Reductn	0	0	0	781
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.36	0.74	0.45	1.20

Intersection Summary
 Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 46 (42%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 65



Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.74
 Intersection Signal Delay: 45.4
 Intersection LOS: D
 IOU Level of Service: G
 Intersection Capacity Utilization: 104.2%
 Analysis Period (min): 15

Splits and Phases: 8: Hwy 417 EB Ramp & Bronson

Lanes, Volumes, Timings
8: Hwy 417 EB Ramp & Bronson

Lanes, Volumes, Timings
8: Hwy 417 EB Ramp & Bronson

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Appendix D

Collision Data

Accident Date	Accident Year	Accident Time	Location	Environment	Condition	Light	Traffic Control	Traffic Control Condition	Classification Of Accident	Initial Impact Type	Road Surface Condition	# Vehicles	# Motorcycles	# Bicycles	# Pedestrians
2018-01-24	2018	23:29	ARLINGTON AVE @ BELL ST (0000956)	01 - Clear	07 - Dark	02 - Stop sign			02 - Non-fatal injury	03 - Other	03 - Loose snow	0	0	0	0
2018-01-27	2018	Unknown	ARLINGTON AVE btwn ARTHUR LANE N & BELL ST (_ZZAAL)	01 - Clear	00 - Unknown	10 - No control			03 - P.D. only	06 - SMV unattended vehicle	03 - Loose snow	0	0	0	0
2018-02-18	2020	Unknown	ARLINGTON AVE btwn ARTHUR LANE N & BELL ST (_ZZAAL)	01 - Clear	10 - Unknown	10 - No control			03 - P.D. only	06 - SMV unattended vehicle	01 - Dry	0	0	0	1
2018-04-03	2018	20:30	ARLINGTON AVE btwn ARTHUR LANE N & CAMBRIDGE ST N (_3ZABY)	01 - Clear	07 - Dark	10 - No control			03 - P.D. only	06 - SMV unattended vehicle	01 - Dry	0	0	0	0
2018-02-03	2018	20:36	BOOTH ST @ RAYMOND ST (0006498)	03 - Snow	07 - Dark	01 - Traffic signal			03 - P.D. only	02 - Angle	03 - Loose snow	0	0	0	0
2018-08-21	2018	17:58	BOOTH ST @ RAYMOND ST (0006498)	02 - Rain	01 - Daylight	01 - Traffic signal			02 - Non-fatal injury	07 - SMV other	02 - Wet	0	0	0	1
2018-09-12	2018	8:55	BOOTH ST @ RAYMOND ST (0006498)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	02 - Angle	01 - Dry	0	0	0	0
2018-11-20	2018	8:20	BOOTH ST @ RAYMOND ST (0006498)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	03 - Rear end	04 - Slush	0	0	0	0
2019-03-16	2019	11:51	BOOTH ST @ RAYMOND ST (0006498)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	02 - Wet	0	0	0	0
2019-06-09	2019	10:50	BOOTH ST @ RAYMOND ST (0006498)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	99 - Other	01 - Dry	0	0	0	0
2019-09-27	2019	15:42	BOOTH ST @ RAYMOND ST (0006498)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2020-01-13	2020	17:08	BOOTH ST @ RAYMOND ST (0006498)	01 - Clear	05 - Dusk	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	02 - Wet	0	0	0	0
2020-07-03	2020	7:30	BOOTH ST @ RAYMOND ST (0006498)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	07 - SMV other	01 - Dry	0	0	0	1
2020-07-15	2020	8:29	BOOTH ST @ RAYMOND ST (0006498)	01 - Clear	01 - Daylight	01 - Traffic signal			02 - Non-fatal injury	02 - Angle	01 - Dry	0	0	0	0
2020-11-10	2020	18:14	BOOTH ST @ RAYMOND ST (0006498)	01 - Clear	07 - Dark	01 - Traffic signal			03 - P.D. only	02 - Angle	01 - Dry	0	0	0	0
2018-01-09	2018	17:37	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	09 - Dusk	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	04 - Slush	0	0	0	0
2018-01-15	2018	13:11	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2018-02-19	2018	14:00	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	07 - SMV other	01 - Dry	0	0	0	0
2018-03-05	2018	16:25	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
2018-04-13	2018	23:12	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	07 - Dark	01 - Traffic signal			03 - P.D. only	05 - Turning movement	02 - Wet	0	0	0	0
2018-04-30	2018	16:36	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2018-05-03	2018	16:51	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	1
2018-07-30	2018	15:29	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2018-08-04	2018	6:48	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	02 - Angle	01 - Dry	0	0	0	0
2018-09-27	2018	21:59	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	07 - Dark	01 - Traffic signal			03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
2018-10-08	2018	18:30	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	02 - Rain	05 - Dusk	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	02 - Wet	0	0	0	0
2018-10-29	2018	21:25	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	07 - Dark	01 - Traffic signal			03 - P.D. only	05 - Turning movement	02 - Wet	0	0	0	0
2018-12-18	2018	0:34	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	07 - Dark	01 - Traffic signal			03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
2019-03-20	2019	11:24	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	02 - Angle	01 - Dry	0	0	0	0
2019-03-03	2019	11:30	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2019-04-16	2019	14:01	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2019-05-03	2019	5:30	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	02 - Rain	03 - Dawn	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	02 - Wet	0	0	0	0
2019-06-04	2019	8:45	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	02 - Angle	01 - Dry	0	0	0	0
2019-06-22	2019	8:06	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	02 - Angle	01 - Dry	0	0	0	0
2019-07-10	2019	13:52	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			02 - Non-fatal injury	04 - Sidewipe	01 - Dry	0	0	0	0
2019-08-12	2019	20:50	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	05 - Dusk	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2019-08-16	2019	8:11	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2019-08-22	2019	17:10	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2019-08-26	2019	16:30	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	02 - Angle	01 - Dry	0	0	0	0
2019-09-09	2019	16:24	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2019-09-16	2019	8:20	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2019-09-29	2019	13:18	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2019-10-19	2019	12:09	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	99 - Other	01 - Dry	0	0	0	0
2019-10-30	2019	15:05	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2019-11-16	2019	12:10	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2019-11-27	2019	14:40	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	02 - Rain	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	02 - Wet	0	0	0	0
2019-12-24	2019	11:28	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	02 - Angle	01 - Dry	0	0	0	0
2020-01-15	2020	10:11	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2020-01-21	2020	9:36	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
2020-01-21	2020	14:20	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	05 - Packed snow	0	0	0	0
2020-03-09	2020	15:00	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	02 - Angle	01 - Dry	0	0	0	0
2020-03-14	2020	20:53	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	07 - Dark	01 - Traffic signal			03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
2020-04-30	2020	13:11	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	02 - Rain	01 - Daylight	01 - Traffic signal			03 - P.D. only	02 - Angle	02 - Wet	0	0	0	0
2020-07-08	2020	8:59	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2020-09-16	2020	7:30	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2020-09-24	2020	21:25	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	07 - Dark	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2020-10-10	2020	6:57	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	02 - Rain	03 - Dawn	01 - Traffic signal			03 - P.D. only	03 - Rear end	02 - Wet	0	0	0	0
2020-10-27	2020	8:50	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2020-11-01	2020	17:24	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	02 - Rain	07 - Dark	01 - Traffic signal			02 - Non-fatal injury	07 - SMV other	02 - Wet	0	0	0	0
2020-11-14	2020	20:37	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	07 - Dark	01 - Traffic signal			02 - Non-fatal injury	05 - Turning movement	01 - Dry	0	0	0	0
2020-12-29	2020	13:15	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			02 - Non-fatal injury	05 - Turning movement	01 - Dry	0	0	0	0
2021-01-01	2021	12:00	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2021-01-04	2021	9:30	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2021-03-04	2021	10:43	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2021-04-04	2021	10:17	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			02 - Non-fatal injury	02 - Angle	01 - Dry	0	0	0	0
2021-04-24	2021	8:55	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
2021-04-25	2021	16:13	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	02 - Rain	01 - Daylight	01 - Traffic signal			03 - P.D. only	04 - Sidewipe	01 - Dry	0	0	0	0
2021-05-09	2021	21:23	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	07 - Dark	01 - Traffic signal			03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	1
2021-06-02	2021	16:39	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198)	01 - Clear	01 - Daylight	01 - Traffic signal			03 - P.D. only	02 - Angle	01 - Dry	0	0	0	0
2021-07-05	2021	15:40	BRONSON AVE @ CATHERINE ST/RAYMOND ST (0007198												

Appendix E

TDM Checklist

TDM Measures Checklist:
Residential Developments (multi-family, condominium or subdivision)

Legend	
BASIC	The measure is generally feasible and effective, and in most cases would benefit the development and its users
BETTER	The measure could maximize support for users of sustainable modes, and optimize development performance
★	The measure is one of the most dependably effective tools to encourage the use of sustainable modes

TDM measures: Residential developments		Check if proposed & add descriptions
1. TDM PROGRAM MANAGEMENT		
1.1 Program coordinator		
BASIC ★	1.1.1 Designate an internal coordinator, or contract with an external coordinator	<input type="checkbox"/>
1.2 Travel surveys		
BETTER	1.2.1 Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	<input checked="" type="checkbox"/>
2. WALKING AND CYCLING		
2.1 Information on walking/cycling routes & destinations		
BASIC	2.1.1 Display local area maps with walking/cycling access routes and key destinations at major entrances (<i>multi-family, condominium</i>)	<input checked="" type="checkbox"/>
2.2 Bicycle skills training		
BETTER	2.2.1 Offer on-site cycling courses for residents, or subsidize off-site courses	<input checked="" type="checkbox"/>

TDM measures: Residential developments		Check if proposed & add descriptions
3. TRANSIT		
3.1 Transit information		
BASIC	3.1.1 Display relevant transit schedules and route maps at entrances (<i>multi-family, condominium</i>)	<input checked="" type="checkbox"/>
BETTER	3.1.2 Provide real-time arrival information display at entrances (<i>multi-family, condominium</i>)	<input type="checkbox"/>
3.2 Transit fare incentives		
BASIC ★	3.2.1 Offer PRESTO cards preloaded with one monthly transit pass on residence purchase/move-in, to encourage residents to use transit	<input checked="" type="checkbox"/>
BETTER	3.2.2 Offer at least one year of free monthly transit passes on residence purchase/move-in	<input type="checkbox"/>
3.3 Enhanced public transit service		
BETTER ★	3.3.1 Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels (<i>subdivision</i>)	<input type="checkbox"/>
3.4 Private transit service		
BETTER	3.4.1 Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)	<input type="checkbox"/>
4. CARSHARING & BIKESHARING		
4.1 Bikeshare stations & memberships		
BETTER	4.1.1 Contract with provider to install on-site bikeshare station (<i>multi-family</i>)	<input checked="" type="checkbox"/>
BETTER	4.1.2 Provide residents with bikeshare memberships, either free or subsidized (<i>multi-family</i>)	<input checked="" type="checkbox"/>
4.2 Carshare vehicles & memberships		
BETTER	4.2.1 Contract with provider to install on-site carshare vehicles and promote their use by residents	<input checked="" type="checkbox"/>
BETTER	4.2.2 Provide residents with carshare memberships, either free or subsidized	<input checked="" type="checkbox"/>
5. PARKING		
5.1 Priced parking		
BASIC ★	5.1.1 Unbundle parking cost from purchase price (<i>condominium</i>)	<input checked="" type="checkbox"/>
BASIC ★	5.1.2 Unbundle parking cost from monthly rent (<i>multi-family</i>)	<input checked="" type="checkbox"/>

TDM measures: Residential developments		Check if proposed & add descriptions
6. TDM MARKETING & COMMUNICATIONS		
6.1 Multimodal travel information		
BASIC ★	6.1.1 Provide a multimodal travel option information package to new residents	<input checked="" type="checkbox"/>
6.2 Personalized trip planning		
BETTER ★	6.2.1 Offer personalized trip planning to new residents	<input type="checkbox"/>

TDM-Supportive Development Design and Infrastructure Checklist:
Residential Developments (multi-family or condominium)

Legend	
REQUIRED	The Official Plan or Zoning By-law provides related guidance that must be followed
BASIC	The measure is generally feasible and effective, and in most cases would benefit the development and its users
BETTER	The measure could maximize support for users of sustainable modes, and optimize development performance

TDM-supportive design & infrastructure measures: Residential developments		Check if completed & add descriptions, explanations or plan/drawing references
1. WALKING & CYCLING: ROUTES		
1.1 Building location & access points		
BASIC	1.1.1 Locate building close to the street, and do not locate parking areas between the street and building entrances	<input checked="" type="checkbox"/>
BASIC	1.1.2 Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	<input checked="" type="checkbox"/>
BASIC	1.1.3 Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	<input checked="" type="checkbox"/>
1.2 Facilities for walking & cycling		
REQUIRED	1.2.1 Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations (see <i>Official Plan policy 4.3.3</i>)	<input type="checkbox"/>
REQUIRED	1.2.2 Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible (see <i>Official Plan policy 4.3.12</i>)	<input checked="" type="checkbox"/>

TDM-supportive design & infrastructure measures: <i>Residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3 Provide sidewalks of smooth, well-drained walking surfaces of contrasting materials or treatments to differentiate pedestrian areas from vehicle areas, and provide marked pedestrian crosswalks at intersection sidewalks (see <i>Official Plan policy 4.3.10</i>)	<input checked="" type="checkbox"/>
REQUIRED	1.2.4 Make sidewalks and open space areas easily accessible through features such as gradual grade transition, depressed curbs at street corners and convenient access to extra-wide parking spaces and ramps (see <i>Official Plan policy 4.3.10</i>)	<input checked="" type="checkbox"/>
REQUIRED	1.2.5 Include adequately spaced inter-block/street cycling and pedestrian connections to facilitate travel by active transportation. Provide links to the existing or planned network of public sidewalks, multi-use pathways and on-road cycle routes. Where public sidewalks and multi-use pathways intersect with roads, consider providing traffic control devices to give priority to cyclists and pedestrians (see <i>Official Plan policy 4.3.11</i>)	<input checked="" type="checkbox"/>
BASIC	1.2.6 Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	<input checked="" type="checkbox"/>
BASIC	1.2.7 Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	<input type="checkbox"/>
BASIC	1.2.8 Design roads used for access or circulation by cyclists using a target operating speed of no more than 30 km/h, or provide a separated cycling facility	<input type="checkbox"/>
1.3 Amenities for walking & cycling		
BASIC	1.3.1 Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	<input type="checkbox"/>
BASIC	1.3.2 Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	<input type="checkbox"/>

TDM-supportive design & infrastructure measures: <i>Residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
2. WALKING & CYCLING: END-OF-TRIP FACILITIES		
2.1 Bicycle parking		
REQUIRED	2.1.1 Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible (see <i>Official Plan policy 4.3.6</i>)	<input checked="" type="checkbox"/>
REQUIRED	2.1.2 Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas (see <i>Zoning By-law Section 111</i>)	<input checked="" type="checkbox"/>
REQUIRED	2.1.3 Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored (see <i>Zoning By-law Section 111</i>)	<input checked="" type="checkbox"/>
BASIC	2.1.4 Provide bicycle parking spaces equivalent to the expected number of resident-owned bicycles, plus the expected peak number of visitor cyclists	<input type="checkbox"/>
2.2 Secure bicycle parking		
REQUIRED	2.2.1 Where more than 50 bicycle parking spaces are provided for a single residential building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers (see <i>Zoning By-law Section 111</i>)	<input checked="" type="checkbox"/>
BETTER	2.2.2 Provide secure bicycle parking spaces equivalent to at least the number of units at condominiums or multi-family residential developments	<input checked="" type="checkbox"/>
2.3 Bicycle repair station		
BETTER	2.3.1 Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	<input type="checkbox"/>
3. TRANSIT		
3.1 Customer amenities		
BASIC	3.1.1 Provide shelters, lighting and benches at any on-site transit stops	<input type="checkbox"/>
BASIC	3.1.2 Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	<input type="checkbox"/>
BETTER	3.1.3 Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	<input type="checkbox"/>

TDM-supportive design & infrastructure measures: <i>Residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
4. RIDESHARING		
4.1 Pick-up & drop-off facilities		
BASIC	4.1.1 Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	<input type="checkbox"/>
5. CARSHARING & BIKESHARING		
5.1 Carshare parking spaces		
BETTER	5.1.1 Provide up to three carshare parking spaces in an R3, R4 or R5 Zone for specified residential uses (see <i>Zoning By-law Section 94</i>)	<input checked="" type="checkbox"/>
5.2 Bikeshare station location		
BETTER	5.2.1 Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	<input type="checkbox"/>
6. PARKING		
6.1 Number of parking spaces		
REQUIRED	6.1.1 Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	<input checked="" type="checkbox"/>
BASIC	6.1.2 Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	<input type="checkbox"/>
BASIC	6.1.3 Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly (see <i>Zoning By-law Section 104</i>)	<input type="checkbox"/>
BETTER	6.1.4 Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking (see <i>Zoning By-law Section 111</i>)	<input type="checkbox"/>
6.2 Separate long-term & short-term parking areas		
BETTER	6.2.1 Provide separate areas for short-term and long-term parking (using signage or physical barriers) to permit access controls and simplify enforcement (i.e. to discourage residents from parking in visitor spaces, and vice versa)	<input type="checkbox"/>

Appendix F

MMLOS Analysis

Multi-Modal Level of Service - Segments Form

Consultant	CGH Transportation Inc.
Scenario	Existing/Future
Comments	

Project	2021-137
Date	2024-07-19

SEGMENTS		Bell Street	Arthur Lane	Arlington Avenue	Raymond Street
Pedestrian	Sidewalk Width Boulevard Width	1.8 m < 0.5 m	no sidewalk n/a	1.8 m < 0.5 m	1.8 m < 0.5 m
	Avg Daily Curb Lane Traffic Volume	≤ 3000	≤ 3000	≤ 3000	≤ 3000
	Operating Speed On-Street Parking	> 30 to 50 km/h yes	≤ 30 km/h no	> 30 to 50 km/h yes	> 50 to 60 km/h yes
	Exposure to Traffic PLoS	B	C	B	C
	Effective Sidewalk Width Pedestrian Volume				
	Crowding PLoS				
	Level of Service	B	C	B	C
Bicycle	Type of Cycling Facility	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic
	Number of Travel Lanes	≤ 2 (no centreline)	≤ 2 (no centreline)	≤ 2 (no centreline)	≤ 2 (no centreline)
	Operating Speed	≤ 40 km/h	≤ 40 km/h	≤ 40 km/h	≥ 50 to 60 km/h
	# of Lanes & Operating Speed LoS	A	A	A	D
	Bike Lane (+ Parking Lane) Width				
	Bike Lane Width LoS	-	-	-	-
	Bike Lane Blockages				
	Blockage LoS	-	-	-	-
	Median Refuge Width (no median = < 1.8 m) No. of Lanes at Unsignalized Crossing Sidestreet Operating Speed				
	Unsignalized Crossing - Lowest LoS	-	-	-	-
Level of Service	-	-	-	-	
Transit	Facility Type				Mixed Traffic
	Friction or Ratio Transit:Posted Speed				Vt/Vp ≥ 0.8
	Level of Service	-	-	-	D
Truck	Truck Lane Width Travel Lanes per Direction				
	Level of Service	-	-	-	-
Auto	Level of Service	Not Applicable			