March
2019

412 Sparks - Ottawa Retirement Residence by Signature

Site Plan Application - Transportation Impact Assessment Study

Prepared for:

Cathedral Hills GP Inc.
c/o Reichmann Seniors Housing Development Corporation

Prepared by:

PARSONS

Ottawa Retirement Residence by Signature

412 Sparks Street

Transportation Impact Assessment Study

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March 12, 2019

476520 – 01000

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 licensed[1] or registered[2] 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.**

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Dated at Ottawa (City) this 20 day of February, 2019.

Name: Austin Shih
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Signature of Individual certifier that s/he meets the above four criteria

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Table of Contents

List of Figures

List of Tables

List of Appendices

Transportation Impact Assessment Report

1. SCREENING FORM

The Screening Form was completed for submission to City of Ottawa staff in conjunction with the Scoping Report. All triggers were met based on the number of proposed dwelling units, the location within a Design Priority Area and the development's proximity to existing signals. It is important to note the land use is not the traditional residential type, but a retirement residence. The estimated number of trips generated by the proposed development is less than 60 veh/h, which does not meet minimum requirements. The Screening Form is provided in Appendix A.

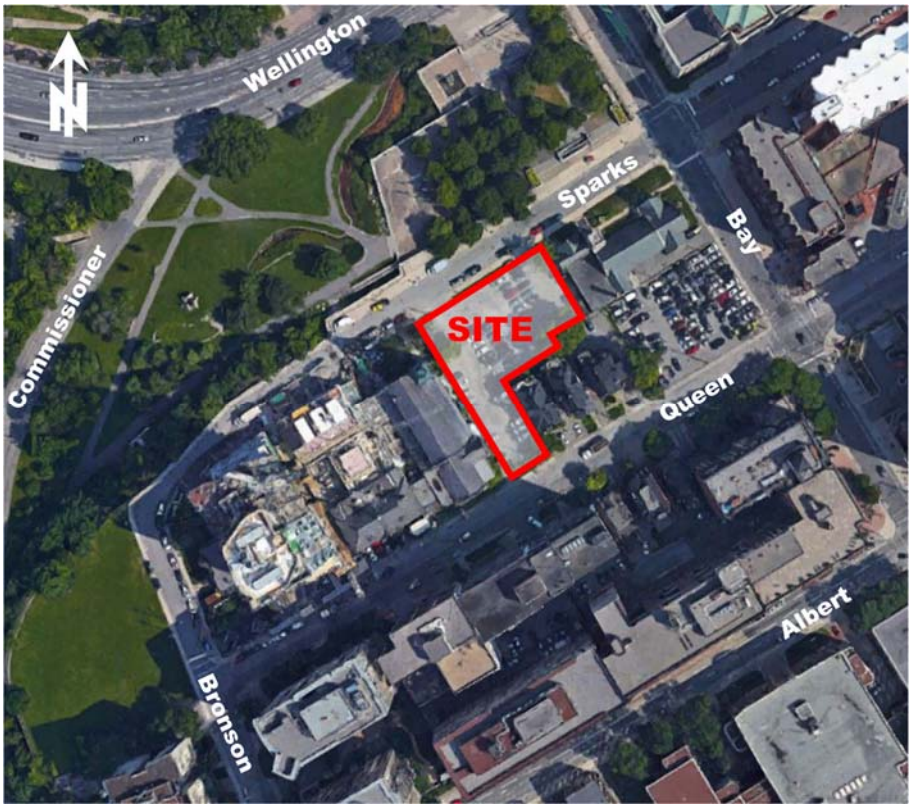
2. SCOPING REPORT

2.1. EXISTING AND PLANNED CONDITIONS

2.1.1. PROPOSED DEVELOPMENT

The proponent is preparing a Site Plan development application in support of a proposed retirement residence located at 412 Sparks Street. This development is expected to consist of 152 residential units, of which 22 are seniors' apartments, 119 are independent living suites, and 11 are assisted living units. There are expected to be 86 underground parking spaces provided. The site is currently occupied by a surface parking lot. The local context of the site is provided as Figure 1 and the proposed Site Plan is provided as Figure 2.

Figure 1: Local Context



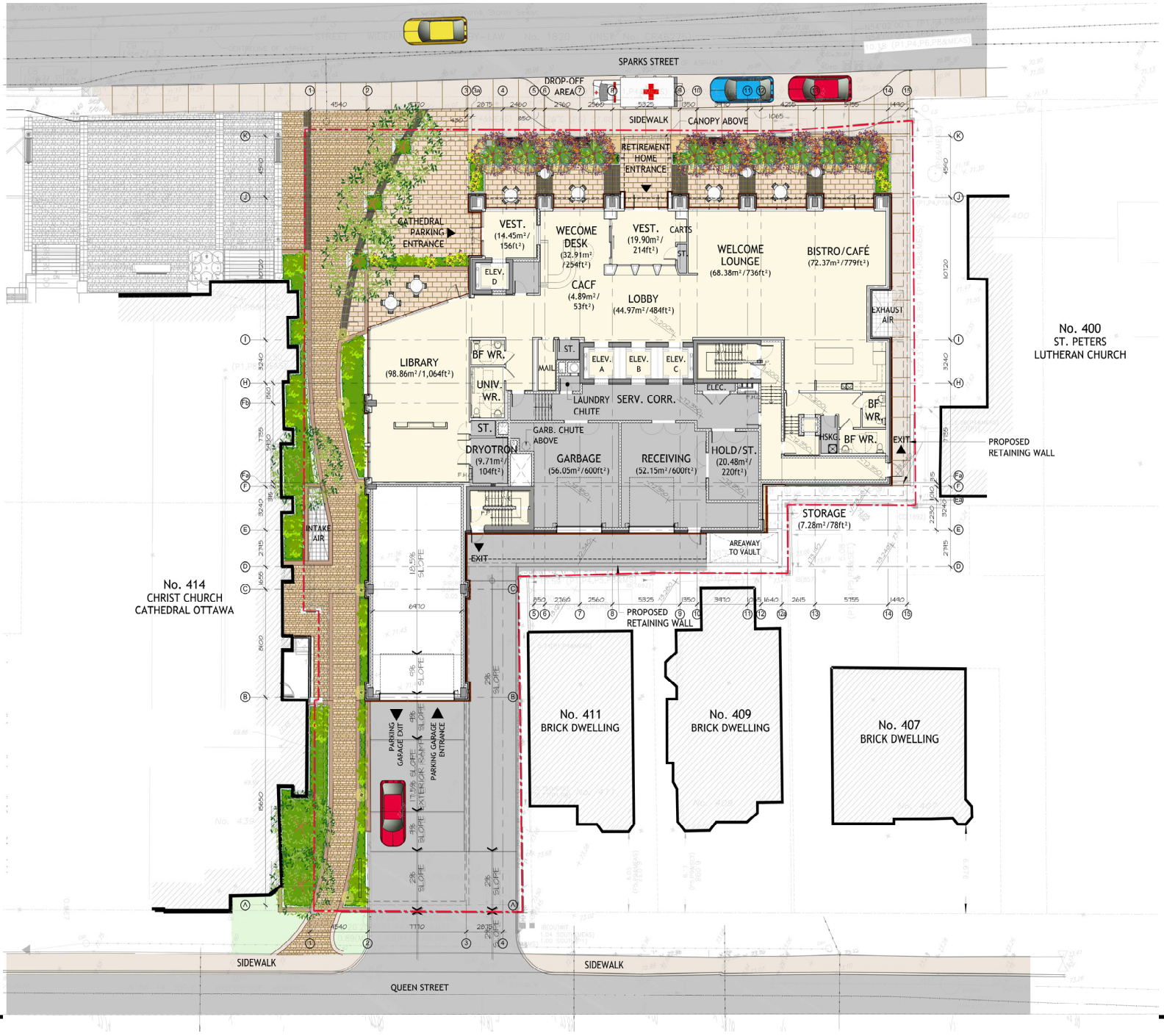


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Figure 2: Proposed Site Plan

2.1.2. EXISTING CONDITIONS

The TIA and ensuing analysis include the signalized Sparks/Bay and Queen/Bay intersections.

Area Road Network

Sparks Street is a local roadway that extends from Lyon Street to Bronson Avenue, east of Lyon Street, Sparks Street is a pedestrian boulevard that extends from Lyon Street to Elgin Street. Within the study area, Sparks Street operates as a one-way roadway in the westbound direction west of Bay Street and as a two-way roadway east of Bay Street. Adjacent to the proposed development, Sparks Street has a one-lane cross section with on-street parking provided along the north side of the roadway. The unposted speed limit is understood to be 50 km/h.

Queen Street is an east-west local roadway, which extends from Bronson Avenue in the west to Elgin Street in the east. Within the study area, Queen Street has a two-lane cross section with on-street parking provided along the south side of the roadways. The posted speed limit is 50 km/h.

Bay Street is a local roadway that operates as a one-way in the northbound direction. Within the study area, Bay Street has a two-lane cross section. It extends from Catherine Street in the south to Wellington Street in the north. The unposted speed limit is understood to be 50 km/h.

Pedestrian/Cycling Network

With respect to pedestrians, sidewalk facilities near the site are provided along both sides of Sparks Street, Queen Street, Bay Street and Bronson Avenue.

With respect to cyclists, according to the Ottawa Cycling Plan, Bay Street is classified as a Spine Route and Queen Street and Bronson Avenue (south of Queen Street) are classified as Local Routes. Northbound bicycle lanes are currently provided along the east side of Bay Street.

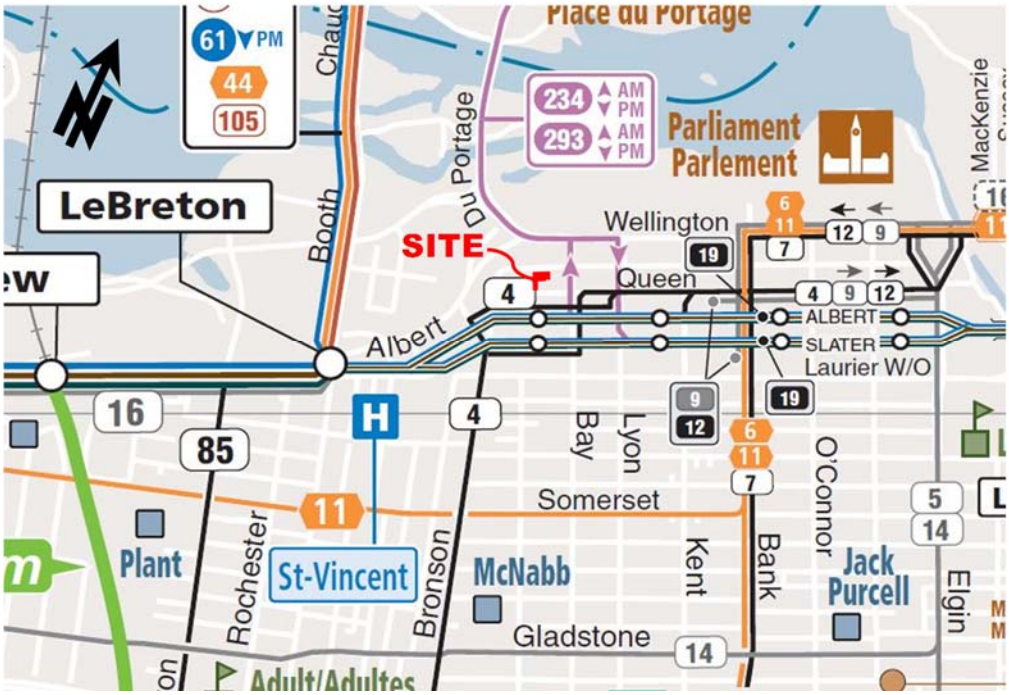
Transit Network

Transit service within the vicinity of the site is currently provided along Albert Street and Slater Street. These streets are the primary corridors for Bus Rapid Transit (BRT) through the downtown core, accommodating 16 all-day bus routes, 26 express routes and 9 peak hour routes. These routes are listed below:

- Black Regular/All-Day Routes
  - Routes 4, 8, 16, 85, 86, 87, 91, 92, 94, 95, 96, 97, 98, 99, 106, 176
- Green Express/Rural Express Routes
  - Routes 38, 64, 221, 222, 228, 231, 232, 233, 234, 235, 237, 252, 256, 261, 262, 263, 265, 267, 268, 269, 270, 271, 272, 273, 277, 283
- Red Peak Hours Routes
  - Routes 22, 30, 33, 34, 63, 224, 264, 282, 293

The closest westbound transit station is located on Albert Street approximately 290m walking distance south of the site and the closest eastbound transit station is on Slater Street approximately 390m walking distance south of the site.

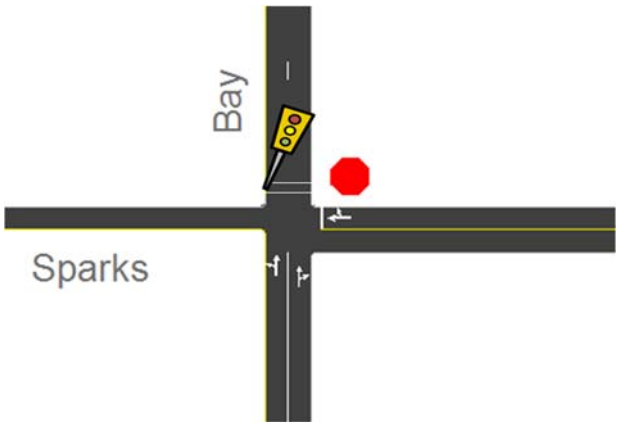
Figure 3: Area Transit Network



Existing Study Area Intersection

Sparks/Bay

The Spark/Bay intersection is a partial signalized four-legged intersection with STOP control on the minor approach only (Sparks). The westbound approach consists of shared through/right-turn lane. The northbound approach consists of a shared through/left-turn lane and a shared through/right-turn lane. As Sparks Street, west of Bay Street, operates as a one-way in the westbound direction, and as Bay Street operates as a one-way in the northbound direction, the eastbound and southbound movements are prohibited at this location. There is a pedestrian signal located directly adjacent to the north of this intersection.



Bay/Queen

The Bay/Queen intersection is a signalized four-legged intersection. The westbound approach consists of a through/right-turn lane. The eastbound approach consists of a shared through/left-turn lane. The northbound approach consists of a shared through/left-turn lane and a shared through/right-turn lane. Southbound movements are prohibited at this location as Bay Street operates as a one-way in the northbound direction.

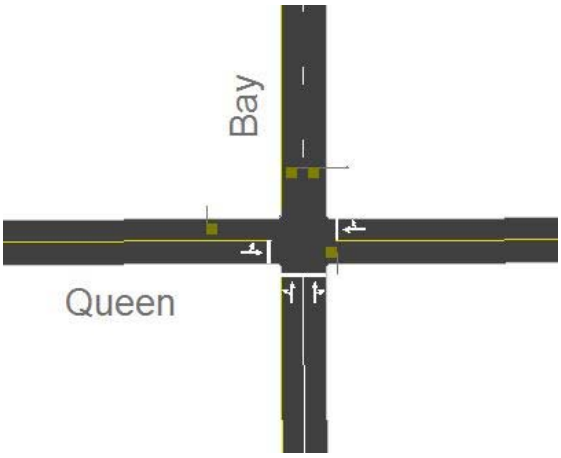
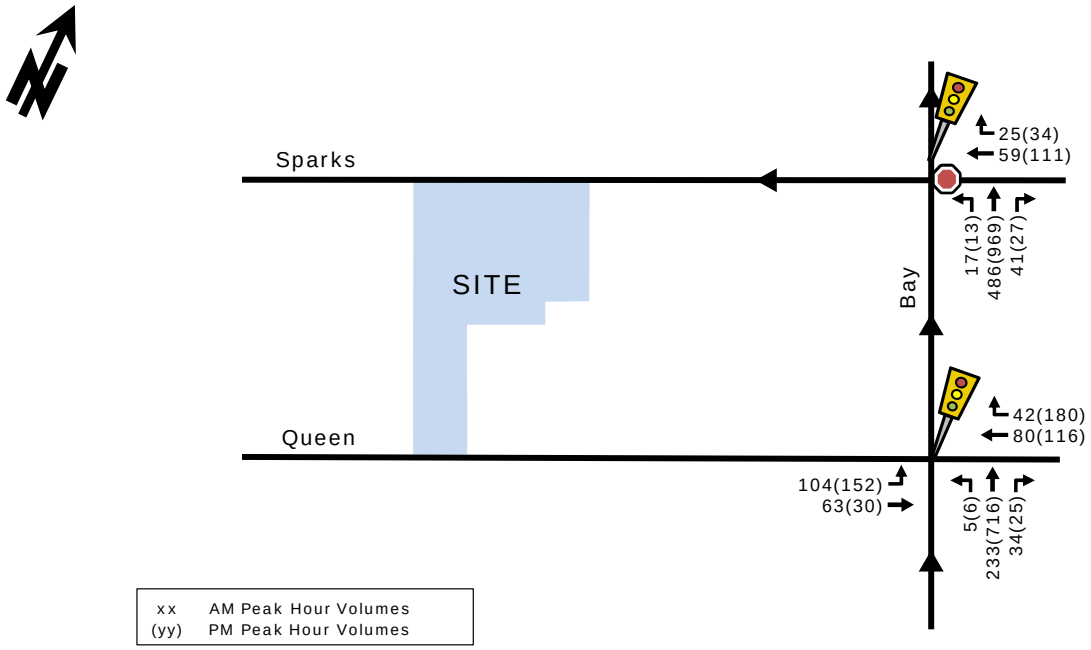


Figure 4 shows the most recent weekday morning and afternoon peak hour traffic volumes obtained from the City of Ottawa at the study area intersections. These peak hour traffic volumes are included as Appendix B.

Figure 4: Existing Peak Hour Traffic Volumes



Existing Road Safety Conditions

Collision history for the study area intersections (2012 to 2016, inclusive) was obtained from the City of Ottawa and most collisions (80%) involved only property damage, indicating low impact speeds, and 20% involved personal injuries. The primary causes of collisions cited by police include; turning movement (27%), single vehicle (unattended) (20%), sideswipe (13%) and angle (13%) type collisions.

A standard unit of measure for assessing collisions at an intersection is based on the number collisions per million entering vehicles (MEV). At intersections within the study area, reported collisions have historically take place at a rate of:

- 0.53/MEV at the Sparks/Bay intersection (representing 9 collisions);
- 0.65/MEV at the Queen/Bay intersection (representing 11 collisions); and
- 0.26/MEV at the Bronson/Queen intersection (representing 1 collision).

It is noteworthy that within the 5-years of recorded collision data there were no collisions involving pedestrians and 2 collisions involving cyclists. Both collisions involving cyclists occurred at the Sparks/Bay intersection and resulted in non-fatal injuries. The source collision data as provided by the City of Ottawa and related analysis is provided as Appendix C.

2.1.3. PLANNED CONDITIONS

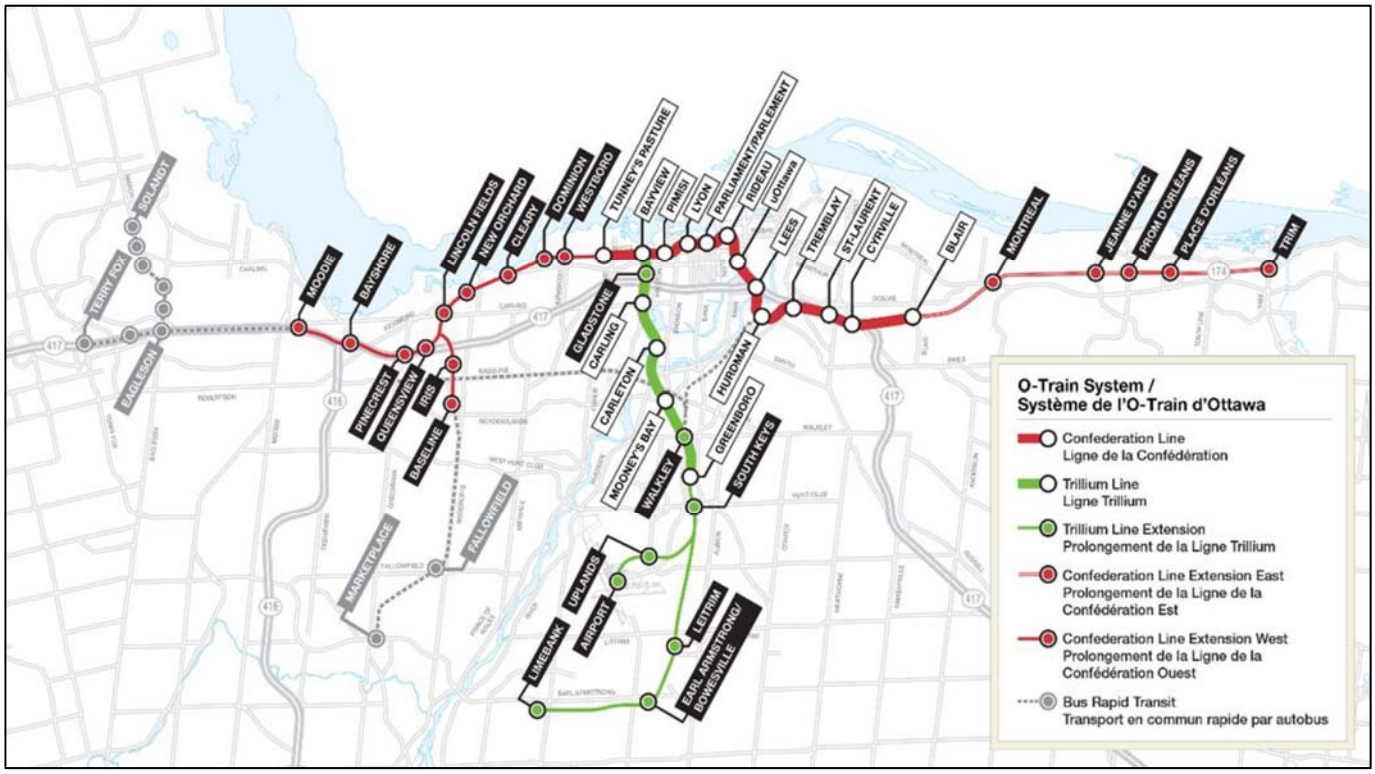
LRT Phase II Construction

A notable transportation network change within the study area is the Phase I construction of the east-west LRT, which is the conversion of the City's existing BRT corridor to LRT between the current Blair transit station and the Tunney's Pasture station which includes a tunnel through the City's Downtown. Currently, this phase of construction is underway and is expected to be completed by 2018.

Phase II of the LRT construction, which will extend the City's LRT further east, west and south (further improving transit within the vicinity of the site), is expected to begin by 2019 and be completed by 2023. The following Figure 5 illustrates

the planned Phases I and II of the future Confederation/Trillium Lines. The proposed site is approximately 330 m walking distance from the closest future Lyon LRT station.

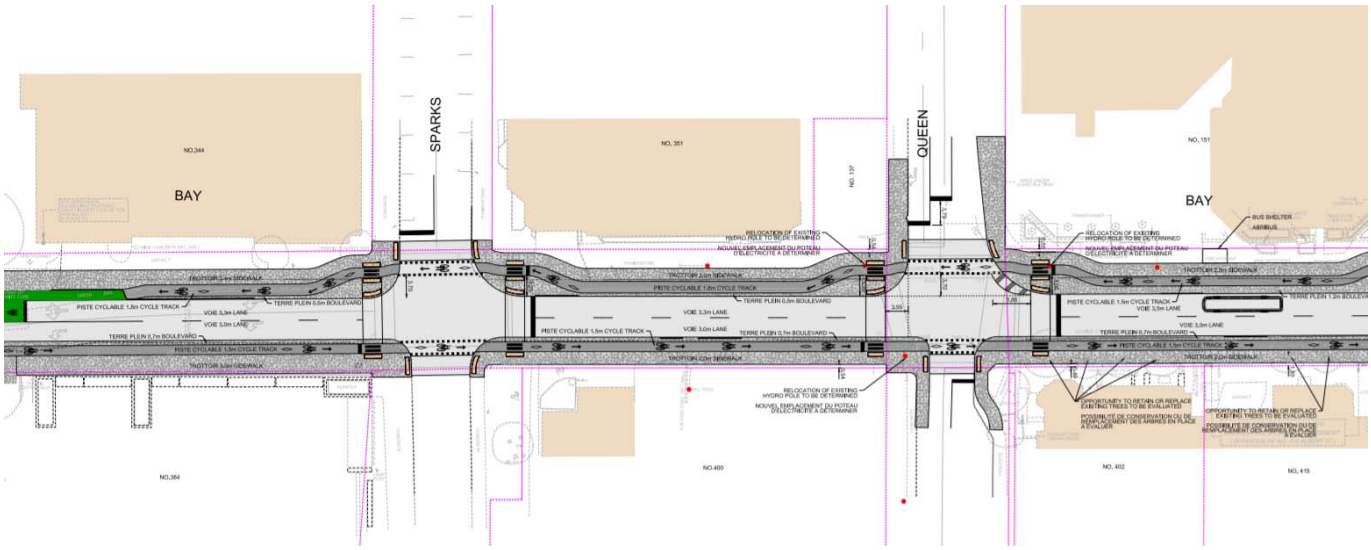
Figure 5: Planned LRT System



Bay Street Cycling Facility

The City of Ottawa is planning on upgrading the existing cycling facilities on Bay Street from Laurier Avenue to Wellington Street. A northbound cycle track is provided on the east side of the roadway and a southbound cycle track is provided on the west side of the roadway. Construction is expected to start in Summer 2019 and be completed by 2020. Figure 6 below shows the preliminary design within the study area.

Figure 6: Bay Street Cycling Facility



Source: https://ottawa.ca/en/city-hall/public-engagement/projects/bay-street-cycling-facility-wellington-street-laurier-avenue-west#, Accessed 4-Feb-19

2.1.4. OTHER AREA DEVELOPMENT

According to the City's development application search tool, the following developments are planned within the vicinity of the subject site.

350 Sparks Street
Morguard Real Estate Investment Trust is proposing the construction of a hotel and residential development at the above-noted address, which is located approximately 135 m northeast of the subject development. The Transportation Brief Update (prepared by BA Group) projected an increase in vehicle traffic of approximately 220 veh/h during the morning and afternoon peak hours.

383 Slater Street
Broccolini is proposing the construction of a multi-use development consisting of approximately 300 residential units and 8,000 ft^2 of retail development, located at the above-noted address, which is located approximately 250 m southeast of the subject development. The Transportation Brief (prepared by Parsons) projected an increase in vehicle traffic of approximately 40 to 50 veh/h during the morning and afternoon peak hours.

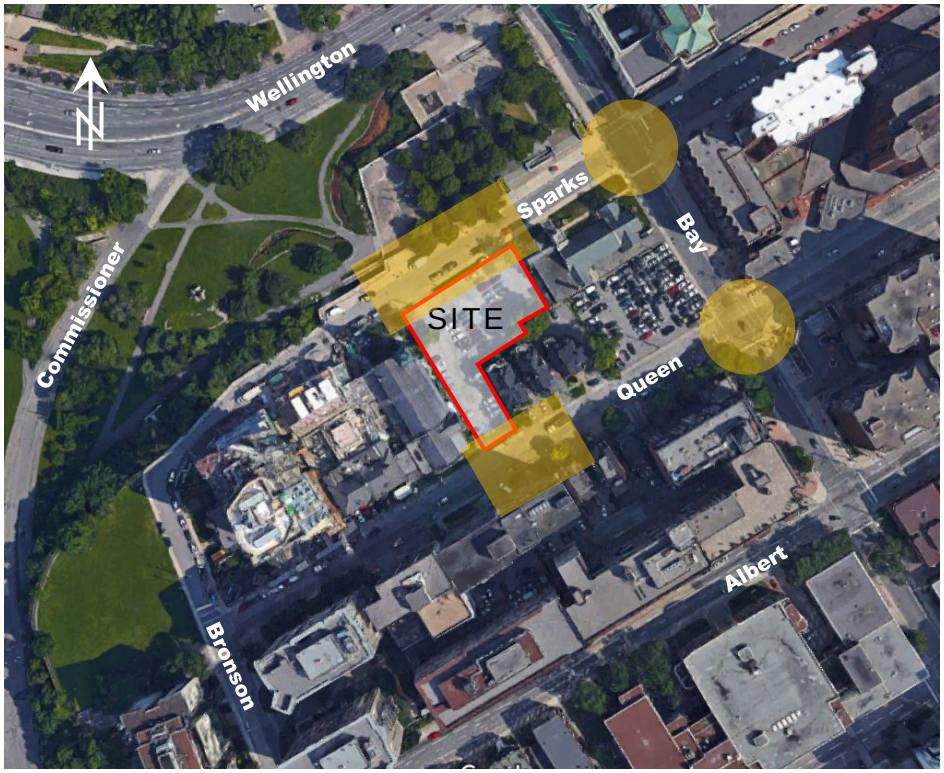
2.2. STUDY AREA AND TIME PERIODS

2.2.1. STUDY AREA

The proposed study area is outlined below and highlighted in Figure 7.

- Sparks/Bay intersection;
- Bay/Queen intersection;
- Sparks Street – adjacent to the site; and
- Queen Street – adjacent to the site.

Figure 7: Study Area



2.2.2. TIME PERIODS

Given the trips expected to be generated by this development will be residential trips, the time periods to be assessed are the weekday morning and afternoon commuter peak hours.

2.2.3. HORIZON YEARS

Only the existing horizon will be analyzed in this report, as agreed to by City staff. As noted in the Screening Form, the trip generation estimates for the proposed development are not expected to exceed 60 person-trips during the peak hour, and traffic in the Central Area is expected plateau or decrease over time when the Confederation Line LRT opens in 2019. Therefore, traffic analysis in future horizons were exempted.

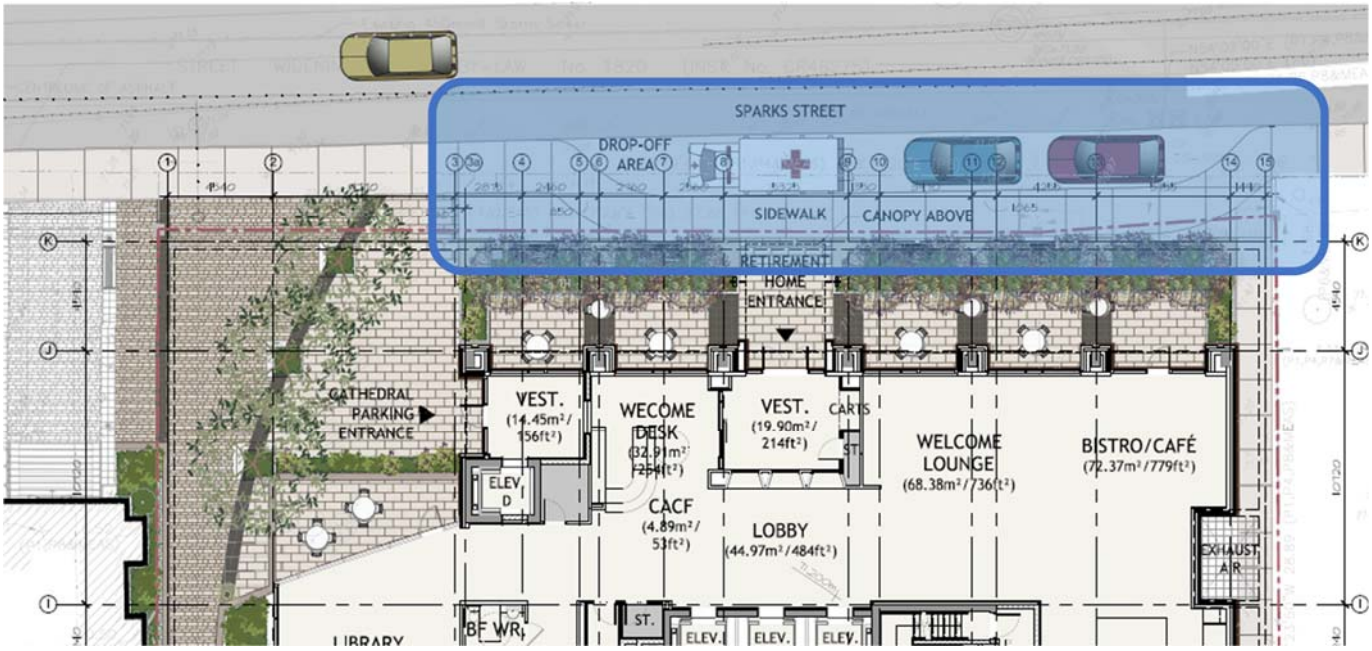
2.3. KEY SITE PLAN CONSIDERATIONS

2.3.1. SPARK STREET LAYBY AREA

As part of the Site Plan Application, the proponent is seeking approval for a drop-off/pick-up area along the City's right-of-way. Given the tenants and use of the building, it is expected that there will be several drop-off/pick-ups along Sparks Street. As such, the proponent is proposing a layby area along Sparks Street near the front entrance of the building to accommodate pick-up/drop-offs, as shown in Figure 8.

Further discussion on the need and justification for the layby will be presented in Step 4: Analysis.

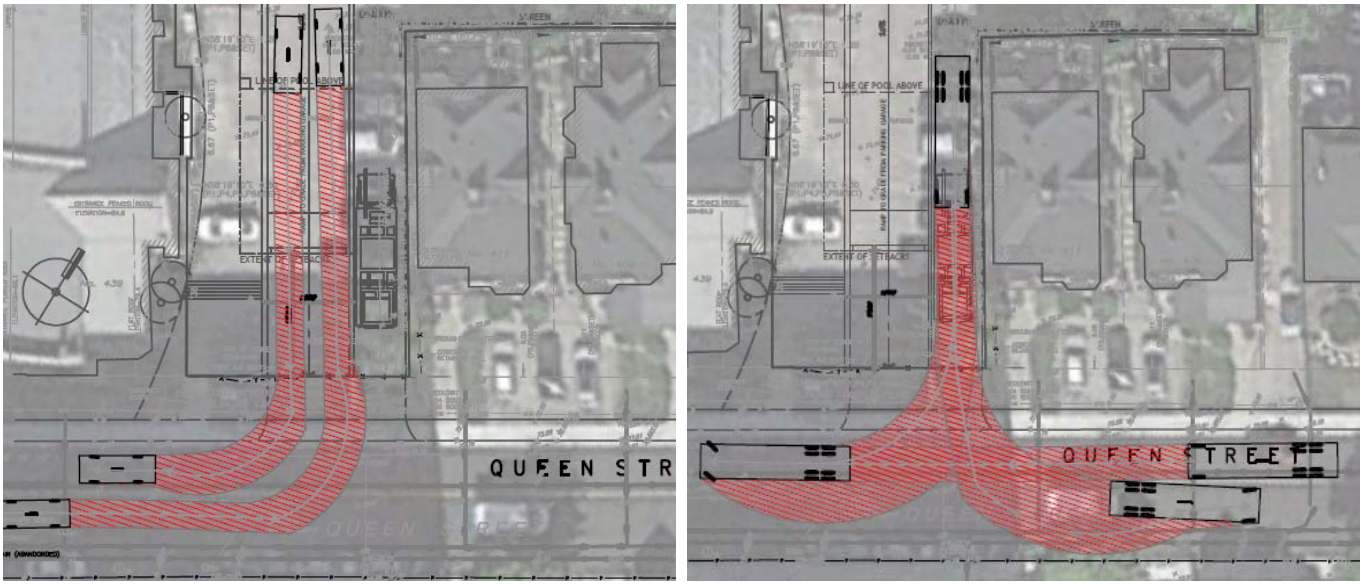
Figure 8: Proposed Layby



2.3.2. QUEEN STREET DRIVEWAY AND RECEIVING AREA

Vehicle access and a receiving area access are proposed to Queen Street, as shown on Figure 2: Site Plan. The passenger vehicle and HSU truck turn templates were confirmed and have been provided in Figure 9.

Figure 9: Passenger Vehicle and HSU Turn Templates at Site Driveway to Queen Street



2.4. EXEMPTION REVIEW

Based on the City's TIA guidelines and the subject site, the following sections of the TIA process will be exempt, unless otherwise directed.

Module	Element	Exemption Consideration
4.1 Development Design	4.1.3 New Streets Network	Not required for applications involving site plans.
4.2 Parking	4.2.2 Spill-over Parking	The proposed number of parking stalls is expected to meet the parking demand.
4.8 Review of Network Concept	All elements	This development is not expected to generate 200 person-trips more than the permitted zoning for the site.

3. FORECASTING REPORT

3.1. DEVELOPMENT-GENERATED TRAVEL DEMAND

3.1.1. TRIP GENERATION AND MODE SHARES

Appropriate trip generation rates for the proposed Retirement Residence, consisting of Assisted Living units (11) and Independent Living units (141), were obtained from the ITE Trip Generation Manual (9th Edition). These rates are summarized in the form of fitted curve equations as shown in Table 1. The calculated vehicle trip generation rates based on the number of units can be found in Table 2.

Table 1: ITE Trip Generation Rates

Land Use	ITE Land Use Code	Trip Rates	
		AM Peak	PM Peak
Senior Adult Housing - Attached	ITE 252	T = 0.20(X) – 0.13	T = 0.24(X) + 1.64
Assisted Living	ITE 254	T = 0.14(X)	T = 0.22(X)

Notes: X = Number of Dwelling Units (ITE 252), Number of Beds (ITE 254)
T = Average Vehicle Trip Ends

Table 2: Calculated Vehicle Trip Generation Rates

Land Use	Number of Units	AM Peak (vph)			PM Peak (vph)		
		In	Out	Total	In	Out	Total
Senior Adult Housing - Attached	141	10	18	28	19	17	36
Assisted Living	11	1	1	2	1	1	2
Total Vehicle Trips		**11**	**19**	**30**	**20**	**18**	**38**

As ITE trip generation surveys only record vehicle trips and typically reflect highly suburban locations (with little to no access by travel modes other than private automobiles), adjustment factors appropriate to the more urban study area context were applied to attain estimates of person trips for the proposed development.

To convert ITE vehicle trip rates to person trips, an auto occupancy factor and a non-auto trip factor were applied to the ITE vehicle trip rates. Based on the TIA Guidelines, the average vehicle occupancy factor is 1.15 and the default non-auto mode share is 10%. As such, a combined factor of approximately 1.28 can be used to convert ITE's vehicle trip rates to person-trip rates. The person-trip generation for the proposed Retirement Residence is summarized in Table 3.

Table 3: Modified Person Trip Generation

Land Use	Number of Units	AM Peak (Person Trip/h)			PM Peak (Person Trip/h)		
		In	Out	Total	In	Out	Total
Senior Adult Housing - Attached	141	13	23	36	24	22	46
Assisted Living	11	2	1	3	1	2	3
Total Person Trips		**15**	**24**	**39**	**25**	**24**	**49**

Mode Shares

The mode shares used are taken from the 2011 OD Survey Data for the Ottawa Inner Area traffic zone. Table 4 below provides the percentages for each mode of travel as given by the OD Survey. The table also provides the average percentages to be used for the purposes of analysis.

Table 4: OD Survey Trips by Primary Travel Mode – Ottawa Inner Area

Mode	24 Hours			AM Peak Hour			PM Peak Hour			Average
	From District	To District	Within District	From District	To District	Within District	From District	To District	Within District	
Driver	44%	44%	22%	40%	41%	20%	45%	43%	21%	36%
Passenger	12%	12%	8%	7%	9%	9%	11%	11%	8%	10%
Transit	28%	28%	10%	25%	41%	13%	33%	22%	10%	23%
Bike/Walk	13%	14%	58%	25%	7%	52%	10%	22%	60%	29%
Other	2%	3%	2%	4%	2%	6%	2%	2%	2%	3%

The person trips shown in Table 3 for the proposed development were then reduced by modal share values. Table 5 provides a summary of potential two-way vehicle trips to/from the proposed development.

Table 5: Total Retirement Residence Modal Site Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	36%	5	9	14	9	9	18
Auto Passenger	10%	2	2	4	3	2	5
Transit	23%	3	6	9	6	5	11
Non-motorized	32%	5	7	12	8	8	16
Total Person Trips	100%	15	24	39	25	24	49
Total 'New' Auto Trips		**5**	**9**	**14**	**9**	**9**	**18**

As shown in Table 5, the resulting number of potential 'new' two-way vehicle trips for the proposed development is approximately 14 and 18 veh/h during the weekday morning and afternoon peak hours, respectively. This results in approximately 1 vehicle every 3 to 4 minutes which is considered negligible. As such, no future intersection analysis was needed.

3.1.2. TRIP DISTRIBUTION

This section of the TIA process is exempt from a need for completion since the proposed development generates less than 60 person-trips during weekday peak hours.

3.1.3. TRIP ASSIGNMENT

As previously discussed, no future horizons were analyzed in this TIA since the proposed development is expected to generate fewer than 60 person-trips during weekday peak hours. Therefore, this section was exempt.

3.2. BACKGROUND NETWORK TRAVEL DEMANDS

3.2.1. TRANSPORTATION NETWORK PLANS

Refer to Section 2.1.3 Planned Conditions – Planned Study Area Transportation Network Changes.

3.2.2. BACKGROUND GROWTH

The following background traffic growth (summarized in Table 6) was calculated based on historical traffic count data (years 2007, 2011 and 2015) provided by the City of Ottawa at the Bay/Albert intersection. Detailed background traffic growth analysis is included as Appendix D.

Table 6: Bay/Albert Historical Background Growth (2007 – 2015)

Time Period	Percent Annual Change				
	North Leg	South Leg	East Leg	West Leg	Overall
8 hrs	-1.75%	-1.57%	-2.03%	-1.90%	-1.82%
AM Peak	-3.70%	-4.26%	-2.19%	-2.67%	-3.19%
PM Peak	-2.53%	-2.41%	-1.67%	-1.41%	-2.00%

As shown in Table 6, Bay Street, at the Bay/Albert intersection, has experienced approximately 1.57 to 4.26% annual decrease within recent years during the weekday morning and afternoon peak hours and over an 8-hour count. This is consistent with the decline in vehicular traffic outline in the TMP. Therefore, the was expected to be no background traffic growth within the study area.

3.2.3. OTHER DEVELOPMENTS

Refer to Section 2.1.4 Planned Conditions – Other Area Developments.

3.3. DEMAND RATIONALIZATION

As previously discussed, the trip generation estimates for the proposed development are not expected to exceed 60 person-trips during the peak hour. Vehicular traffic in the Central Area is also expected plateau or decrease over time when the Confederation Line LRT opens in 2019. Therefore, there are no concerns with network capacity and traffic demand related to or associated with the proposed development.

4. STRATEGY REPORT

4.1. DEVELOPMENT DESIGN

4.1.1. DESIGN FOR SUSTAINABLE MODES

Vehicle and Bicycle Parking Amenities
Refer to Section 4.2.

Transit Amenities
Refer to Section 4.7 for Transit.

Pedestrians Amenities
The proponent has provided an attractive pathway from Sparks Street to Queen Street on the west side of the site. Refer to Section 2.1.2 for the Pedestrian/Cycling Network.

4.1.2. CIRCULATION AND ACCESS

Access Locations
The primary vehicle access is a proposed new driveway connection to Queen Street. It will provide access to the underground parking garage. Adjacent to the parking garage access is the access to the receiving area and garbage room. The primary pedestrian access is located on Sparks Street.

The underground parking garage is noted to have drive aisle widths ranging from 6.0 to 7.0m meeting the minimum Bylaw requirement of 6.0m for an underground parking garage.

Layby Rationale
One of the key issues City staff had with the proposed layby was its location within City right-of-way on a local road. The City requested justification for a private layby on a local road. The option of moving the layby within the property was ruled out early in the design process in favour of investing in urban landscaping and the public realm; a major priority for City planning staff due to the venerable buildings and landscape surrounding the subject site. There is limited space within the property to fit these competing priorities and it was decided that focusing on the urban design requirements and expectations set by City planning staff was ultimately more beneficial to the surrounding area. Therefore, the layby was proposed within the City ROW.

The City requested justification for the layby, which has been provided below. A layby vehicle demand utilization analysis was completed using data from two similar facilities owned by the same operators in the Greater Toronto Area. The layby demand utilization at both facilities were recorded earlier this year, between 8am an 6pm on the following dates: Tuesday Jan 8, Wednesday Jan 9 and Thursday Jan 10. This data was used to extrapolate pick up/drop off activity at the proposed development to determine if a layby may be justified based on usage and potential adjacent street traffic impacts.

The key characteristics of these two facilities and extrapolated results for the proposed development are as follows:

Table 7: Layby Usage at Similar Retirement Facilities

Retirement Residence	Number of Suites	3-Day Layby Statistics			
		Average Arrivals 3PM – 6PM	Average Arrivals PM PK HR	Max Arrivals PM PK HR	Average Dwell Time* 3PM-6PM
The Russell Hill, Toronto	70	8	3	6	8m 45s
Pearl & Pine, Burlington	125	9	3	6	6m 14s
Extrapolated Ottawa RR, Ottawa	**152**	**11 to 17**	**4 to 6**	**7 to 13**	-
*Average Dwell Time does not include emergency or utility vehicles, which had exceedingly higher dwell times					

A summary of findings has been provided below:

- The Cathedral Hills site plan shows there is 65m between the main entrance and the upstream Bay/Sparks stop bar. If one vehicle is completing a pickup/dropoff, the effective storage is approximately 58m, which fits **8 vehicles** (assuming average 7m spacing per vehicle)
- There is a tour bus staging area on the north side of Sparks Street. If buses are parked while a pickup/drop off is occurring, there is limited space for general traffic to pass.
- The City count at Bay/Sparks showed afternoon peak hour traffic is approximately 125 vph – occurring between 3:45pm and 4:45pm – which equates to **2 veh/min** on average
- The afternoon peak layby demand at both GTA facilities occurred between **4pm-5pm** – which coincides with the traffic peak hour noted above
- The average number of vehicles using the layby in the PM period at the two GTA facilities is approximately **3 veh/hr.** The max observed in the PM period at both facilities was **6 veh/hr.**
- Extrapolating the average layby usage rate for Cathedral Hills (based on # of units) – the anticipated average number of vehicles using the layby in the PM period ranges from **4 veh/hr** to **6 veh/hr**. The extrapolated max usage is **7 veh/hr** to **14 veh/hr**.
- The average dwell time at the layby of the two buildings is between **6 and 9 minutes**. This does NOT include service vehicles (utility vans, cable vans etc.) or emergency vehicles, which in more than one occasion exceeded an hour.
- The dwell time equates to an average of **12** to **18 vehicles** queued during the afternoon peak, potentially more than double the available storage

Based on the above, pick up/drop off maneuvers are expected to occur frequently during the PM peak. There is a strong likelihood of overlapping layby activity while tour buses are staging in the PM peak. In such occurrences, there is a definite risk, even in ideal conditions, that existing traffic on Sparks St will spill back to Bay St without a layby.

The risk of queue spillback on Sparks St would be further exacerbated during the winter season due to unavoidable snow accumulation along the street edges/curbs that reduce the effective road width. An example of this is shown below, taken in February 2019, where snow along the proposed frontage and within the bus layby to the north while a tour bus is staged greatly reduced available road space.

Figure 10: Sparks Street Bus Staging in Winter Conditions

It is clear from the above photos that oncoming vehicles would be forced to stop, creating a blockage in the roadway, if a layby is not provided to accommodate pick-up/drop-off activity.

Additionally, the expected demographic within the proposed development would highly favour a layby for **safety**. A layby reduces the walking distance to the main entrance for retirement residents, which is particularly important in wet and winter environments. The proposed layby is also planned to integrate with the public realm; the sidewalk will be kept continuous to reduce impacts on pedestrians and the client team is working extensively with City staff to ensure the best urban design principles are adhered to.

Finally, it was acknowledged that maintaining a layby in the winter season requires specialized snow clearing equipment. The City may not be amenable to providing this service for a private development layby. To address this issue, the owner may consider entering an agreement with the City to be responsible for maintaining the layby on City property.

Overall, the above analysis demonstrates the need for and viability of the layby within City ROW. Furthermore, due to the type of use, frequency and intended demographic of the proposed development, it is recommended the layby be regulated to prohibit long-term public parking and be signed as a loading zone.

4.2. PARKING

Parking Restrictions

The following are parking restrictions currently in effect along the north side Spark Street west of Bay Street (parking is prohibited on the south side of the street):

- No stopping 7am – 7pm, Monday – Friday
- 2h parking permitted for tour buses 7am – 7pm, Monday – Friday

Vehicle Parking

According to the City's By-Law requirements, the subject site is located within Area Z of Schedule 1A (Near Major LRT Stations). According to the City's By-Law, there is no minimum requirement for parking in this area, except for visitor parking. The proponent is proposing a total of 86 underground parking spaces. Of the 86 parking spaces, 14 are proposed as visitor parking spaces which meets the minimum outlined in the By-laws. Additionally, 20 of the 86 parking spaces are designated for small cars and are noted to be 2.4m in width 4.6m in length. This is below the maximum 40% permitted

compact spaces as outlined in the City's By-Law requirements. Note that the 86 vehicle parking spaces may change as the proponent is in the process of integrating the structure into the floor plans to ensure they can achieve this number.

Bicycle Parking

Based on the City's By-Law requirements, a minimum of 0.25 bicycle parking spaces per unit is required for retirement homes. For 141 units, this means 35 bicycle parking spaces are required. Additionally, the By-Law state no more than 50% of spaces can be vertical. However, only 18 bicycle parking spaces are to be provided, 12 spaces in the parking garage and 6 spaces at street level. Based on the proponent's other similar retirement facilities, the bicycle parking spaces are under-utilized as employees and visitors use other modes of transportation when travelling to their sites. As shown in Table 8 below, a maximum of 5 bicycle spaces are used at one time. Therefore, 18 bicycle spaces were considered appropriate for this development.

Table 8: Bicycle Usage Comparison Requirements

Retirement Community	Number of Suites	Overall Resident Population	Average Resident Age	Number of Staff (at peak time)	Number of Bicycle Spaces Provided	Number of Bicycle Spaces Used	Age of Property (years)
The Russell Hill Retirement Residence (Toronto)	70	72	90.5	29	0	5	10
Pearl & Pine Retirement Residence (Burlington)	125	146	86	39	6	2	4
Walden Circle Retirement Community (Mississauga)	121	128	89	30	0	1	7
Royal Henley Retirement Community (St. Catharines)	118	132	86	29	0	3	9

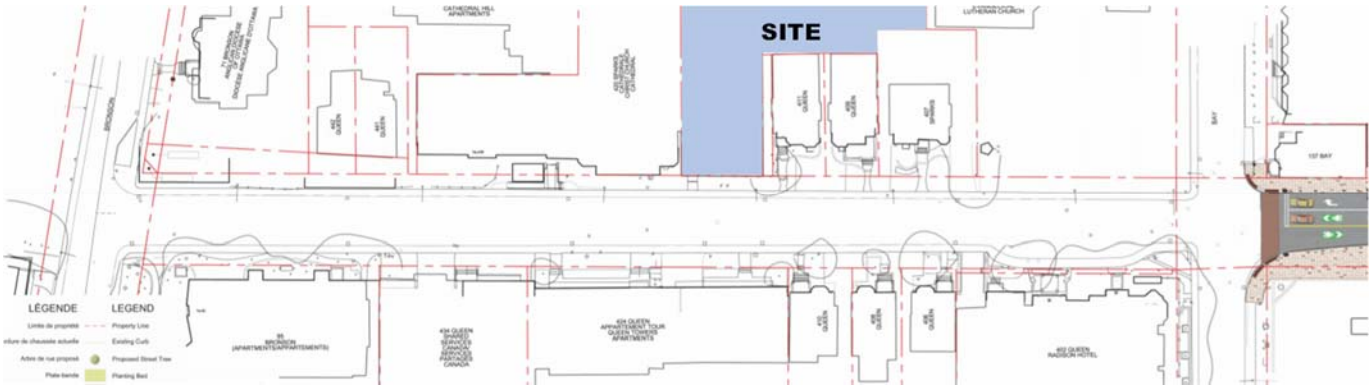
4.3. BOUNDARY STREET DESIGN

The boundary streets of the proposed development are Queen Street and Sparks Street.

Queen Street

The City of Ottawa has prepared a "complete street" concept for Queen Street from Bronson Avenue to Elgin Street which is attached as Appendix E and the section directly adjacent to the site is shown as Figure 11. The subject development is not expected to have any significant impact on the design as the proponent is using the existing driveway connection to Queen Street.

Figure 11: Queen Street Complete Street Concept Adjacent to Site



Sparks Street

At this time, there has not been any complete street concept prepared for Sparks Street. The multi-modal level of service analysis for the road segments along the boundary street is provided in Table 9, with detailed analyses provided in Appendix F.

Table 9: MMLOS – Existing Boundary Road Segments

Road Segment	Level of Service							
	Pedestrian (PLoS)		Bicycle (BLoS)		Transit (TLoS)		Truck (TkLoS)	
	PLoS	Target	BLoS	Target	TLoS	Target	TkLoS	Target
Sparks Street	B	A	B	D	D	No Target	A	No Target

Given the development's proximity to the future Lyon LRT Station, the target level of service for pedestrians is high ('A'). As there are no transit or truck routes on Sparks Street, there are no target levels of service for transit or trucks. The target bicycle level of service is exceeded as Sparks Street is only two lanes wide. With regard to pedestrians, the small boulevard width results in a level of service 'B'. Providing a boulevard greater than 0.5m would improve the level of service to PLoS 'A', achieving the target for this location. This boulevard treatment could be considered at the time of road reconstruction.

4.4. ACCESS INTERSECTION DESIGN

The primary vehicle access is a proposed new driveway connection to Queen Street. It will provide access to the underground parking garage. Adjacent to the parking garage access is the access to the receiving area and garbage room. The primary pedestrian access is located on Sparks Street. Both these accesses are proposed as STOP control on the minor roadway (the site). These driveways are approximately 90m west of the signalized Queen/Bay intersection, meeting the City of Ottawa's By-laws.

4.5. TRANSPORTATION DEMAND MANAGEMENT

The proposed development is located adjacent to both active and transit facilities. It is within walking distance to the future Lyon LRT Station, sidewalks are provided along the boundary roads and there are cycle lanes/tracks along both sides of Bay Street. The Transportation Demand Management checklist is provided as Appendix G and highlighted below:

- Sidewalks along the Sparks Street and Queen Street frontages;
- Building located adjacent to streets;
- Designated drop-off area provided for carpool drivers (proposed layby); and,
- Safe connections for pedestrians to nearby transit stops.

4.6. NEIGHBOURHOOD TRAFFIC MANAGEMENT

The following section discusses the development's impact on the surrounding neighbourhood and local and collector access routes. Table 10 summarizes each roadway's classification, the TIA Guideline's roadway threshold (in the peak direction), and the approximate existing and projected traffic on main access routes to the site.

Table 10: Roadway Thresholds

Roadway	Classification	Daily Threshold (veh/day)	Peak Hour Threshold (veh/h)	Peak hour volumes AM Peak (PM Peak)	
				Existing	Projected
Sparks Street	Local	1,000	120	75 (125)	80 (135)
Queen Street	Local			175 (180)	188 (193)

As shown in Table 10, the existing volumes exceed the suggested thresholds on Queen Street during both peak hours and on Sparks Street in the afternoon peak hour. The addition of development related traffic does not increase the peak hour volume such that it would exceed the roadway threshold where it is currently below capacity.
It is important to note that both Queen Street and Sparks Street are urban local roadways, which are designed for a different environment than suburban local roads that may not be represented in the TIA threshold. Sidewalks and parking are

provided along both roadways and high-frequency transit is provided within short walking distance to the area. Therefore, the road design suits the environment, despite exceeding the base threshold.

4.7. TRANSIT

Total "new" two-way transit trips for the proposed development are approximately 9 to 11 persons/h during the weekday peak hours. This amount of person trips can be accommodated by the existing Transitways located on Albert Street and Slater Street and the future Lyon LRT Station.

4.8. REVIEW OF NETWORK CONCEPT

Exempt – See Section 2.4.

4.9. INTERSECTION DESIGN

4.9.1. EXISTING CONDITIONS

The following Table 11 provides a summary of the existing traffic operations at the study area intersections based on the SYNCHRO (V10) traffic analysis software and the existing traffic volumes (Figure 4). The SYNCHRO model output of existing conditions is provided within Appendix G.

Table 11: Existing Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Sparks/Bay (unsignalized)	B(D)	14.6(27.7)	WBT(WBT)	2.2(3.6)	A(A)	-
Queen/Bay	B(D)	0.61(0.86)	EBT(EBT)	14.3(17.8)	A(A)	0.33(0.55)
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

As shown in Table 11, the study area intersections 'as a whole' currently operate at an excellent LoS 'A' during the morning and afternoon peak hours. With regard to 'critical movements,' they are also operating at an acceptable LoS 'D' or better during peak hours with regard to City of Ottawa operating standards. These results indicate that there is spare vehicle capacity at these intersections.

Multi-Modal Level of Service – Existing Conditions

The MMLoS analysis for the Queen/Bay signalized study area intersection is summarized in Table 12. The existing detailed MMLoS analysis is provided as Appendix F.

Table 12: MMLoS – Signalized Queen/Bay Intersection, Existing Conditions

Intersection	Level of Service									
	Pedestrian (PLoS)		Bicycle (BLoS)		Transit (TLoS)		Truck (TkLoS)		Vehicles (LoS)	
	PLoS	Target	BLoS	Target	TLoS	Target	TkLoS	Target	LoS	Target
Queen/Bay	B	A	D	B	C	No target	F	No target	A	E

The letters identified in red text in Table 12 do not meet the MMLoS targets for their designated area (Within 600m of a rapid transit station). Within the study area there are no existing transit priority measures, as such, there is no target TLoS for this intersection. Queen Street and Bay Street do not form part of the truck route and as such, there is no TkLoS target for the Queen/Bay intersection.

At the study area intersection, the pedestrian and bicycle target levels of service are not met. The following discussion regarding these modes is provided:

- Pedestrian – At the Queen/Bay intersection, the PLoS target is not met due to pedestrian delay and north and west crossing side PETSI scores. Providing high-vis crosswalk markings or advance pedestrian walk phases will also help to improve the pedestrian experience but may decrease the transit and vehicle levels of service. However, these methods will not increase the overall PLoS as the limiting factor is pedestrian delay.

- Bicycles – There are no cycling facilities on Queen Street and as such, cyclists travel in mixed traffic. This results in a BLoS 'D' on Queen Street. It is should be noted that on Bay Street the BLoS achieved is BLoS 'C' and is expected to improve with the implementation of the Bay Street Cycling Facility.

4.9.2. TOTAL PROJECTED 2023 CONDITIONS – FULL BUILD-OUT

Given there is no projected background growth, the total projected 2023 intersection analysis is expected to be similar to existing, outlined in Table 11.

Multi-Modal Level of Service – Projected 2023, Full Build-Out

The Bay Street Cycling Facility project outlines the construction of north and southbound cycle tracks on Bay Street (Figure 6). This is expected to improve the BLoS on Bay Street from a 'C' to an 'A'. As no cycling facilities are provided on Queen Street, the bicycle level of service is projected to still be a 'D'. The pedestrian, transit, truck, and vehicle levels of service for the 2023 horizon year are expected to be the same as reported in Table 12. The projected 2023 MMLoS analysis is provided as Appendix F.

4.9.3. TOTAL PROJECTED 2028 CONDITIONS – FULL BUILD-OUT + 5 YEARS

Given there is no projected background growth, the total projected 2028 intersection analysis is expected to be similar to existing, outlined in Table 11.

Multi-Modal Level of Service – Projected 2028, Full Build-Out + 5 Years

Given there are no significant proposed geometric changes to the Queen/Bay intersection for the 2028 conditions, the multi-model level of service for these intersections remains the same as the 2023 conditions.

5. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis herein, the following conclusions are provided:

Proposed Site

- The proposed single-phase development will consist of 152 residential units, of which 22 are seniors' apartments, 119 are independent living suites, and 11 are assisted living units, with construction expected to be completed by 2023;
- A total of 86 vehicle parking spaces and 18 bicycle parking spaces are proposed to service the development. Vehicle parking will be provided in an underground parking structure;
  - Note that the 86 vehicle parking spaces may change as the proponent is in the process of integrating the structure into the floor plans to ensure they can achieve this number; and,
- The proposed development is projected to generate 'new' two-way vehicle volumes of approximately 15 to 20 veh/h during the weekday morning and afternoon peak hours.

Existing and Background Conditions

- The existing Sparks/Bay and Queen/Bay study area intersections are currently operating overall at an excellent level of service 'A' during peak hours;
- The projected background growth was assumed to be 0% at study area intersections;
- At the signalized Queen/Bay intersection, the vehicle MMLoS targets was met and the pedestrian and bicycle MMLoS targets were not met; and,
- The Bay Street Cycling Facility is planned along Bay Street from Laurier Avenue to Wellington Street adjacent to the site. The functional plan shows a northbound cycle track on the east side of Bay Street and a southbound cycle-track on the west side of Bay Street.

Projected Conditions

- The overall levels of service for pedestrians, transit and trucks are projected to remain the same as existing given there are no proposed changes to the signalized intersection's geometry. The bicycle level of service is expected to increase from a BLoS 'C' to a BLoS 'A' on Bay Street with the implementation of the Bay Street Cycling Facility; and,
- The projected intersection operations are expected to be similar to existing conditions.

Site Plan

- The number of vehicle parking spaces is less than the City's maximum By-Law requirement for residents.
- The number of bicycle parking spaces is deficient by 23 spaces; however, this number was shown to be appropriate for this development, as outlined in Section 4.2.
- Vehicle access to the development is proposed via a new full-movement driveway connection to Queen Street. A receiving area and garbage room access is also proposed to Queen Street via an adjacent driveway.
- The analysis demonstrated the need and viability of a layby within the City right-of-way to avoid potential queue spillback, to improve safety of future retirement residents and to adhere to the best urban design practices expected by City staff.
- Based on the type of use, expected pickup/drop-off frequency and demographic of local residents, it is recommended the layby be regulated to prohibit long-term public parking and be signed as a loading zone.
- The City confirmed an RMA is required for the layby, which is in the process of being completed and will provided once available.

Based on the foregoing, the proposed development fits well into the context of the surrounding area. Therefore, approval from a transportation perspective of the proposed 412 Sparks Street development is recommended.

Prepared By:

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Reviewed By:

Austin Shih, M.A.Sc., P.Eng.
Senior Transportation Engineer

Appendix A

Screening Form

PARSONS

1223 Michael Street, Suite 100, Ottawa, Ontario, K1J 7T2
P: +1 613.738.4160 | F: +1 613.739.7105 | www.parsons.com

City of Ottawa 2017 TIA Guidelines

TIA Screening Form

Date	Nov 20 2017
Project	Cathedral Hill
Project Number	476520-1000

Results of Screening	Yes/No
Development Satisfies the Trip Generation Trigger	Yes
Development Satisfies the Location Trigger	Yes
Development Satisfies the Safety Trigger	No

Module 1.1 - Description of Proposed Development	
Municipal Address	412 Sparks Street
Description of location	Mid-block along Sparks Street between Bay Street and Bronson Ave.
Land Use	Retirement residential
Development Size	148 retirement residential units
Number of Accesses and Locations	One full-movement access to Sparks Street
Development Phasing	none
Buildout Year	Assumed 2020
Sketch Plan / Site Plan	See attached

Module 1.2 - Trip Generation Trigger		
Land Use Type	Townhomes or Apartments	
Development Size	148	Units
Trip Generation Trigger Met?	Yes	

Module 1.3 - Location Triggers		
Development Proposes a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit, or Spine Bicycle Networks (See Sheet 3)	No	
Development is in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone. (See Sheet 3)	Yes	DPA
Location Trigger Met?	Yes	

Module 1.4 - Safety Triggers		
Posted Speed Limit on any boundary road	<80	km/h
Horizontal / Vertical Curvature on a boundary street limits sight lines at a proposed driveway	No	
A proposed driveway is 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) or within auxiliary lanes of an intersection;	No	
A proposed driveway makes use of an existing median break that serves an existing site	No	
There is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development	No	
The development includes a drive-thru facility	No	
Safety Trigger Met?	No	

Appendix B

Traffic Count Data

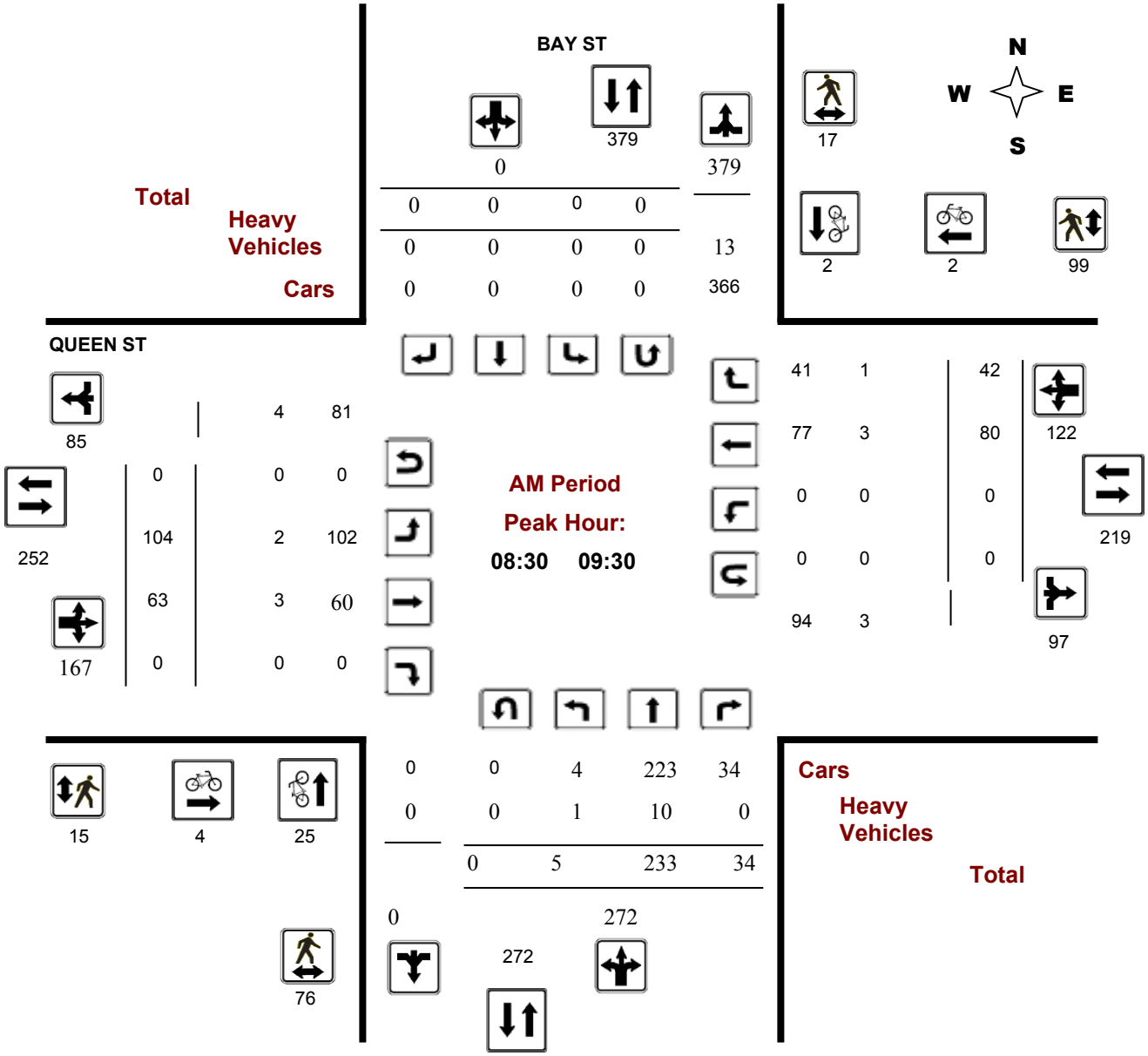
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

BAY ST @ QUEEN ST

Survey Date: Thursday, August 20, 2015
Start Time: 07:00

WO No: 35271
Device: Jamar Technologies, Inc



Comments

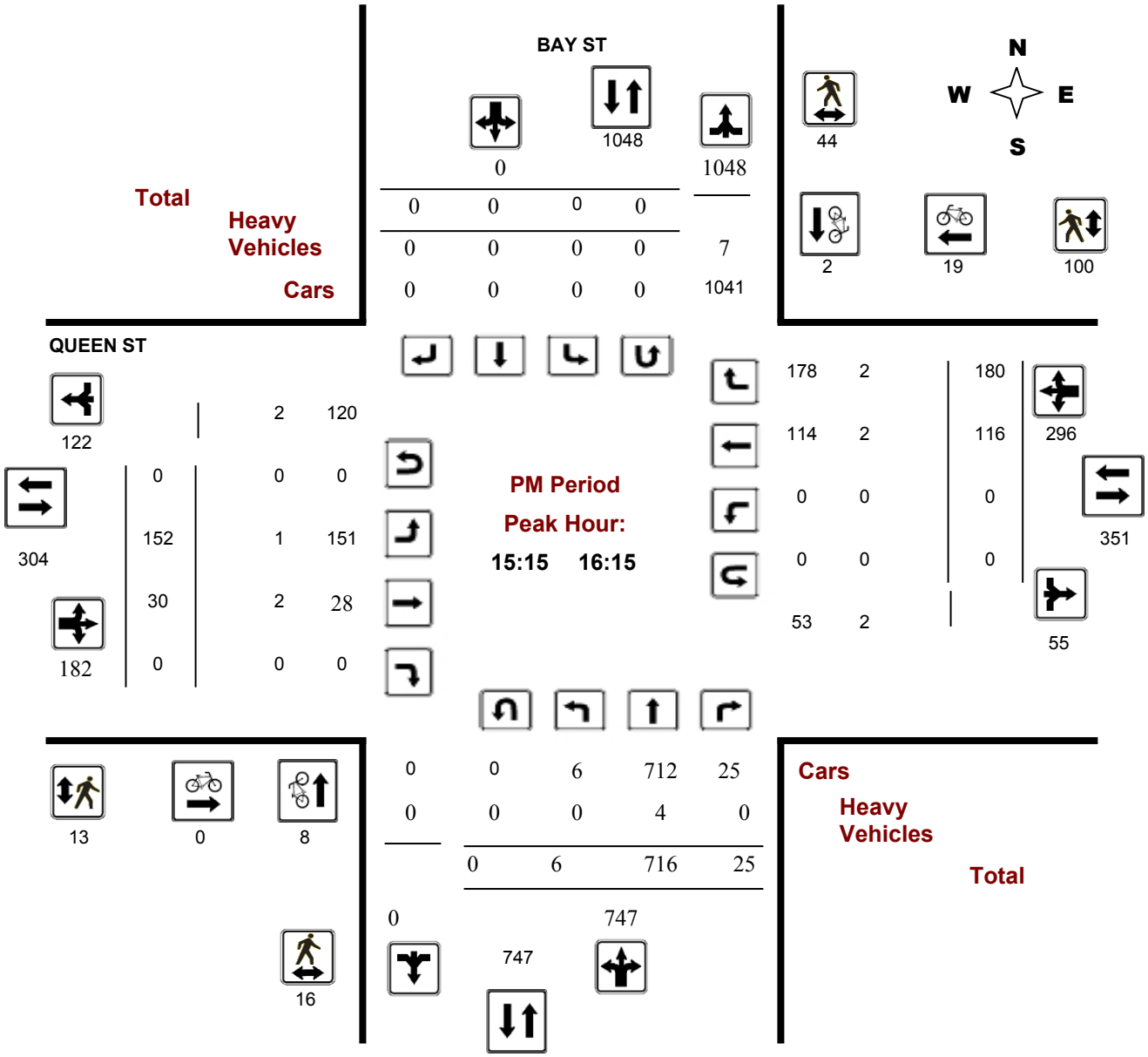
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

BAY ST @ QUEEN ST

Survey Date: Thursday, August 20, 2015
Start Time: 07:00

WO No: 35271
Device: Jamar Technologies, Inc



Comments

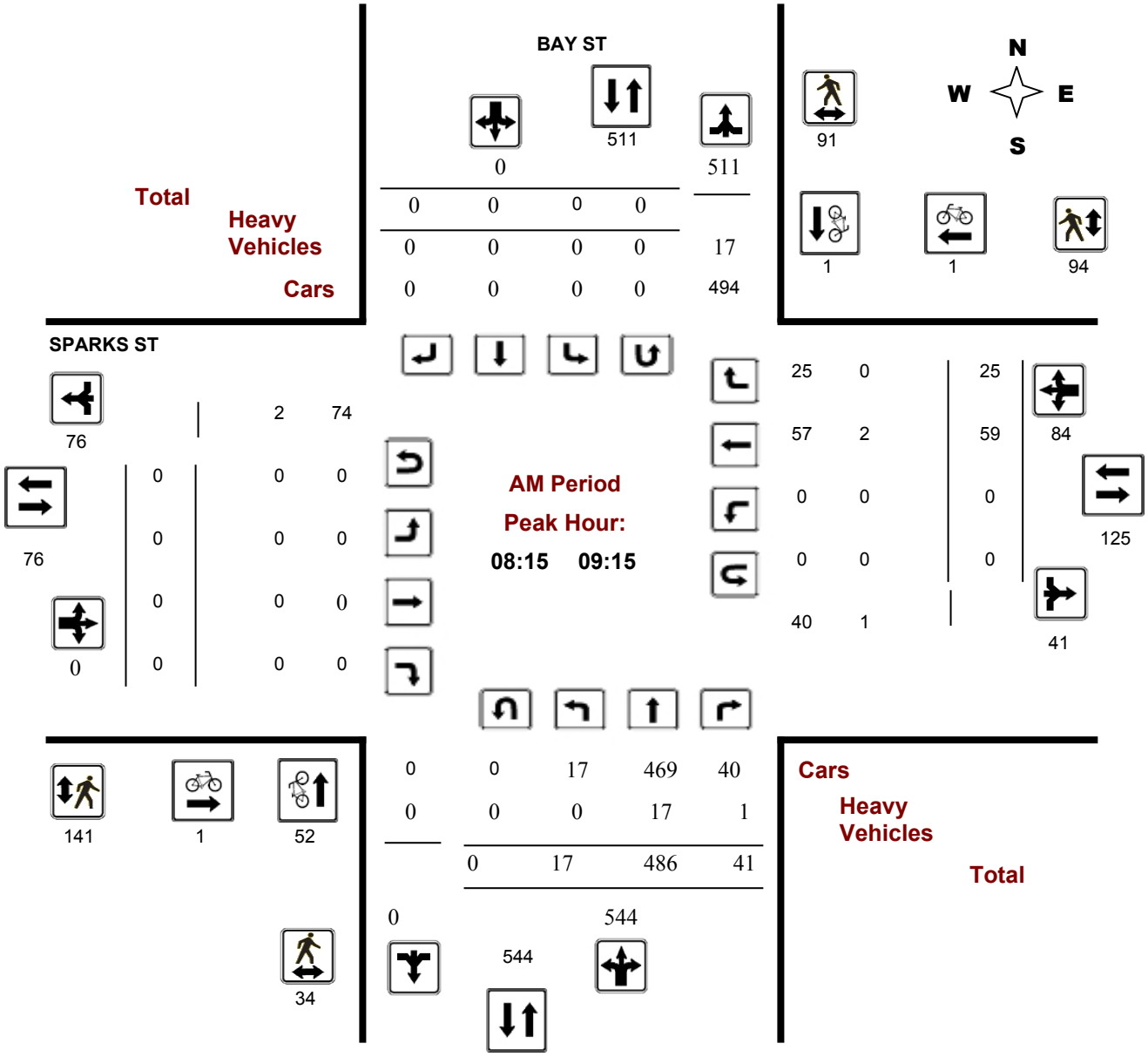
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

BAY ST @ SPARKS ST

Survey Date: Thursday, November 23, 2017 **WO No:** 37339

Start Time: 07:00 **Device:** Miovision



Comments

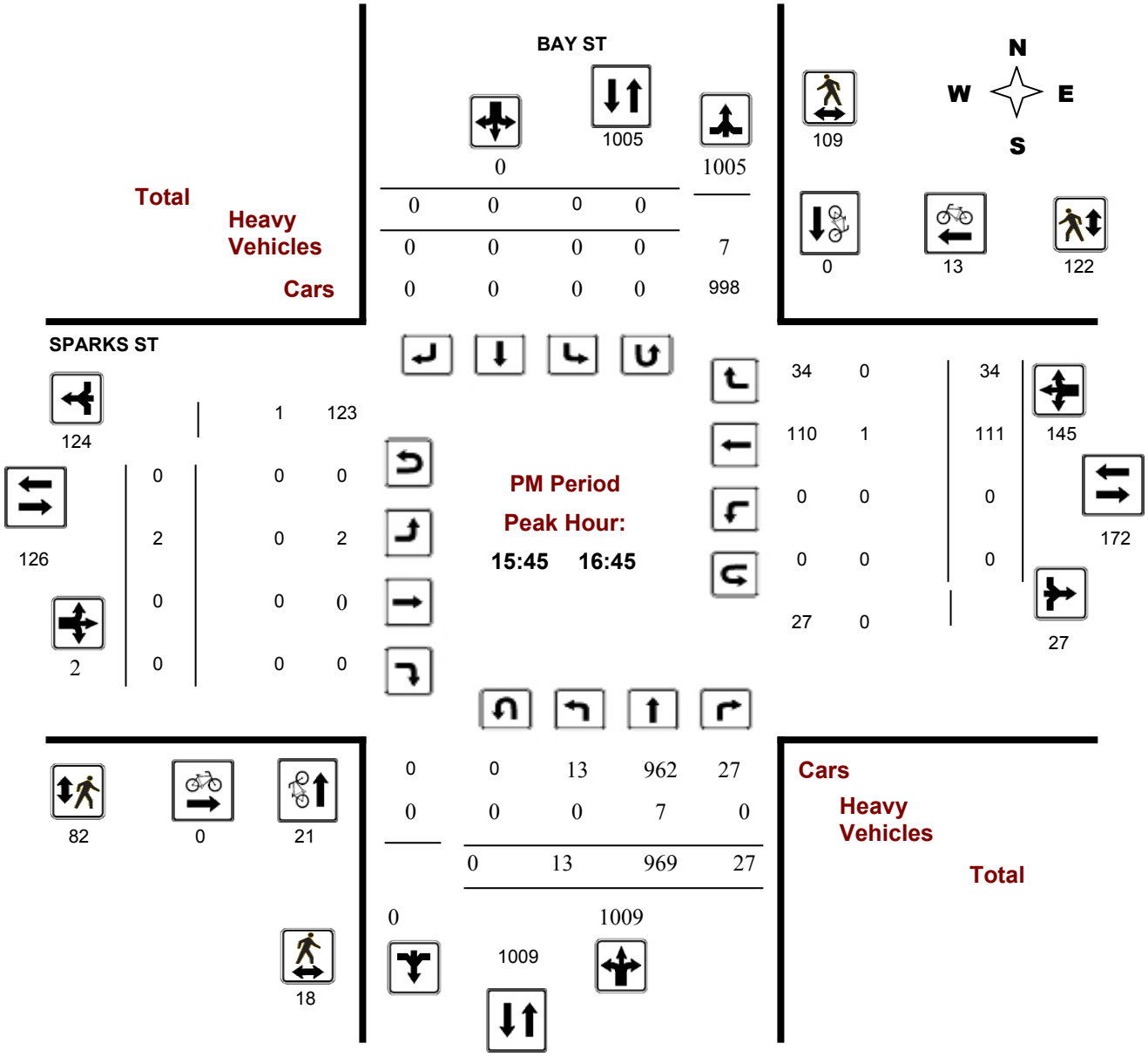
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

BAY ST @ SPARKS ST

Survey Date: Thursday, November 23, 2017
Start Time: 07:00

WO No: 37339
Device: Miovision



Comments

Appendix C

Collision Data and Analysis

Total Area

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total	
P.D. only	2	6	3	2	0	2	6	3	24	80%
Non-fatal injury	1	2	1	2	0	0	0	0	6	20%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**3**	**8**	**4**	**4**	**0**	**2**	**6**	**3**	**30**	100%
	#5 or 10%	#1 or 27%	#3 or 13%	#3 or 13%	#8 or 0%	#7 or 7%	#2 or 20%	#5 or 10%		

QUEEN ST, BAY ST to BRONSON AVE

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2012-2016	8	n/a	1825	**n/a**

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total	
P.D. only	0	1	0	0	0	1	5	1	8	100%
Non-fatal injury	0	0	0	0	0	0	0	0	0	0%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**0**	**1**	**0**	**0**	**0**	**1**	**5**	**1**	**8**	100%
	0%	13%	0%	0%	0%	13%	63%	13%		

BAY ST / QUEEN ST

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2012-2016	11	9,331	1825	**0.65**

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total	
P.D. only	2	3	3	1	0	0	0	1	10	91%
Non-fatal injury	0	0	1	0	0	0	0	0	1	9%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**2**	**3**	**4**	**1**	**0**	**0**	**0**	**1**	**11**	100%
	18%	27%	36%	9%	0%	0%	0%	9%		

BAY ST / SPARKS ST

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2012-2016	9	9,338	1825	**0.53**

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total	
P.D. only	0	2	0	1	0	0	0	1	4	44%
Non-fatal injury	1	2	0	2	0	0	0	0	5	56%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**1**	**4**	**0**	**3**	**0**	**0**	**0**	**1**	**9**	100%
	11%	44%	0%	33%	0%	0%	0%	11%		

BRONSON AVE / QUEEN ST

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2012-2016	1	2,085	1825	**0.26**

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total	
P.D. only	0	0	0	0	0	1	0	0	1	100%
Non-fatal injury	0	0	0	0	0	0	0	0	0	0%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	100%
	0%	0%	0%	0%	0%	100%	0%	0%		

SPARKS ST, BAY ST to BRONSON AVE

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2012-2016	1	n/a	1825	**n/a**

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total	
P.D. only	0	0	0	0	0	0	1	0	1	100%
Non-fatal injury	0	0	0	0	0	0	0	0	0	0%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	100%
	0%	0%	0%	0%	0%	0%	100%	0%		

Collision Main Detail Summary

OnTRAC Reporting System

FROM: 2012-01-01 TO: 2014-01-01

BAY ST & QUEEN ST

Former Municipality: **Ottawa** Traffic Control: **Traffic signal** Number of Collisions: **4**

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR	SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED
1	2012-01-16	Mo	16:51	Clear	Dusk	Rear end	P.D. only	V1 E	Loose snow	Going ahead	Construction	Other motor vehicle	0
								V2 E	Loose snow	Stopped	Pick-up truck	Other motor vehicle	
2	2012-07-05	Thu	17:15	Clear	Daylight	Turning	P.D. only	V1 N	Dry	Turning left	Automobile, station	Other motor vehicle	0
								V2 N	Dry	Going ahead	Automobile, station	Other motor vehicle	
3	2012-07-06	Fri	15:40	Clear	Daylight	Angle	P.D. only	V1 N	Dry	Going ahead	Passenger van	Other motor vehicle	0
								V2 W	Dry	Going ahead	Automobile, station	Other motor vehicle	
4	2013-02-14	Thu	10:21	Clear	Daylight	Sideswipe	P.D. only	V1 N	Wet	Changing lanes	Automobile, station	Other motor vehicle	0
								V2 N	Wet	Going ahead	Automobile, station	Other motor vehicle	

QUEEN ST, BAY ST to BRONSON AVE

Former Municipality: **Ottawa** Traffic Control: **No control** Number of Collisions: **5**

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR	SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED
5	2012-03-10	Sat	16:22	Clear	Daylight	Other	P.D. only	V1 W	Dry	Reversing	Automobile, station	Other motor vehicle	0
								V2 E	Dry	Stopped	Automobile, station	Other motor vehicle	
6	2012-05-12	Sat	09:40	Clear	Daylight	Single vehicle	P.D. only	V1 U	Dry	Unknown	Unknown	Unattended vehicle	0
7	2012-08-20	Mo	18:21	Clear	Daylight	Single vehicle	P.D. only	V1 W	Dry	Unknown	Automobile, station	Ran off road	0
8	2013-03-12	Tue	00:00	Snow	Unknown	Single vehicle	P.D. only	V1 U	Wet	Unknown	Unknown	Unattended vehicle	0
9	2013-05-16	Thu	18:28	Clear	Daylight	Turning	P.D. only	V1 W	Dry	Making U-Turn	Pick-up truck	Other motor vehicle	0
								V2 W	Dry	Going ahead	Automobile, station	Other motor vehicle	

(Note: Time of Day = "00:00" represents unknown collision time

City Operations - Transportation Services

Collision Details Report - Public Version

From: January 1, 2014 **To:** January 1, 2017

Location: BAY ST @ QUEEN ST

Traffic Control: Traffic signal

Total Collisions: 7

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Jul-17, Thu,09:33	Clear	Turning movement	P.D. only	Dry	North	Turning left	Passenger van	Other motor vehicle	
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2015-Jun-18, Thu,07:05	Clear	Other	P.D. only	Dry	East	Reversing	Unknown	Other motor vehicle	
					West	Stopped	Automobile, station wagon	Other motor vehicle	
2015-Jan-13, Tue,10:21	Clear	Turning movement	P.D. only	Ice	East	Turning left	Pick-up truck	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2015-Feb-04, Wed,12:53	Snow	Sideswipe	P.D. only	Packed snow	North	Turning left	Pick-up truck	Other motor vehicle	
					North	Turning left	Automobile, station wagon	Other motor vehicle	
2015-Jun-15, Mon,07:33	Clear	Sideswipe	P.D. only	Dry	North	Changing lanes	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2016-Mar-16, Wed,15:30	Clear	Rear end	P.D. only	Wet	East	Going ahead	Pick-up truck	Other motor vehicle	

					East	Stopped	Pick-up truck	Other motor vehicle	
2016-Apr-14, Thu,06:33	Clear	Sideswipe	Non-fatal injury	Dry	East	Pulling away from shoulder or curb	Passenger van	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: BAY ST @ SPARKS ST

Traffic Control: Traffic signal **Total Collisions:** 9

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Jul-22, Tue,10:46	Clear	Other	P.D. only	Dry	South	Reversing	Truck and trailer	Other motor vehicle	
					North	Stopped	Pick-up truck	Other motor vehicle	
2014-Aug-01, Fri,17:15	Clear	Turning movement	P.D. only	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Sep-12, Fri,10:44	Clear	Angle	Non-fatal injury	Dry	East	Going ahead	Unknown	Cyclist	
					North	Going ahead	Bicycle	Other motor vehicle	
2015-Feb-25, Wed,08:43	Snow	Rear end	Non-fatal injury	Loose snow	North	Going ahead	Automobile, station wagon	Other motor vehicle	
					North	Stopped	Passenger van	Other motor vehicle	
2015-Jul-17, Fri,23:16	Rain	Angle	P.D. only	Wet	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Automobile, station wagon	Other motor vehicle	

2015-Jun-19, Fri,19:40	Clear	Turning movement	Non-fatal injury	Dry	North	Turning right	Unknown	Cyclist
					North	Going ahead	Bicycle	Other motor vehicle
2015-Aug-14, Fri,16:11	Clear	Turning movement	Non-fatal injury	Dry	West	Turning left	Truck - closed	Other motor vehicle
					East	Stopped	Pick-up truck	Other motor vehicle
2016-Jul-25, Mon,00:37	Clear	Angle	Non-fatal injury	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Oct-08, Sat,20:58	Clear	Turning movement	P.D. only	Dry	North	Overtaking	Passenger van	Other motor vehicle
					North	Turning left	Automobile, station wagon	Other motor vehicle

Location: BRONSON AVE @ QUEEN ST

Traffic Control: Stop sign

Total Collisions: 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2015-Nov-23, Mon,02:32	Clear	SMV other	P.D. only	Dry	West	Turning left	Automobile, station wagon	Ran off road	

Location: QUEEN ST btwn BRONSON AVE & BAY ST

Traffic Control: No control

Total Collisions: 3

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Mar-25, Tue,00:00	Clear	SMV unattended vehicle	P.D. only	Dry	Unknown	Unknown	Unknown	Unattended vehicle	
2014-Jul-27, Sun,01:00	Clear	SMV unattended vehicle	P.D. only	Dry	East	Pulling onto shoulder or toward curb	Automobile, station wagon	Unattended vehicle	

2015-Apr-12, Sun,14:45	Clear	SMV unattended vehicle	P.D. only	Dry	South	Reversing	Automobile, station wagon	Unattended vehicle	

Location: SPARKS ST btwn BRONSON AVE & BAY ST

Traffic Control: No control

Total Collisions: 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2015-Mar-14, Sat,00:00	Snow	SMV unattended vehicle	P.D. only	Slush	Unknown	Unknown	Unknown	Unattended vehicle	

Appendix D

Background Traffic Analysis

Bay / Albert Traffic Growth Analysis

Time Period	Percent Annual Change				
	North Leg	South Leg	East Leg	West Leg	Overall
8 hrs	-1.75%	-1.57%	-2.03%	-1.90%	-1.82%
AM Peak	-3.70%	-4.26%	-2.19%	-2.67%	-3.19%
PM Peak	-2.53%	-2.41%	-1.67%	-1.41%	-2.00%

8 hrs

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2007	Thursday May 10		4249	3598		4751			4100	16698
2011	Thursday 11 August		3670	3363		3720			3413	14166
2015	Thursday June 18		3702	3172		4067			3537	14478

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2007	4249			16698				
2011	3670			14166	-13.6%			-15.2%
2015	3702			14478	0.9%			2.2%

Regression Estimate 2007 4147
Regression Estimate 2015 3600
Average Annual Change -1.75%

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2007		4100		16698				
2011		3413		14166		-16.8%		-15.2%
2015		3537		14478		3.6%		2.2%

Regression Estimate 2007 3965
Regression Estimate 2015 3402
Average Annual Change -1.90%

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2007		4751		16698				
2011		3720		14166		-21.7%		-15.2%
2015		4067		14478		9.3%		2.2%

Regression Estimate 2007 4521
Regression Estimate 2015 3837
Average Annual Change -2.03%

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2007	3598			16698				
2011	3363			14166	-6.5%			-15.2%
2015	3172			14478	-5.7%			2.2%

Regression Estimate 2007 3591
Regression Estimate 2015 3165
Average Annual Change -1.57%

Bay / Albert Traffic Growth Analysis
AM Peak

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2007	Thursday May 10		592	551		562			521	2226
2011	Thursday 11 August		492	479		403			390	1764
2015	Thursday June 18		440	388		477			425	1730

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2007	592			2226				
2011	492			1764	-16.9%			-20.8%
2015	440			1730	-10.6%			-1.9%

Regression Estimate 2007 584
Regression Estimate 2015 432
Average Annual Change **-3.70%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2007		521		2226				
2011		390		1764		-25.1%		-20.8%
2015		425		1730		9.0%		-1.9%

Regression Estimate 2007 493
Regression Estimate 2015 397
Average Annual Change **-2.67%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2007		562		2226				
2011		403		1764		-28.3%		-20.8%
2015		477		1730		18.4%		-1.9%

Regression Estimate 2007 523
Regression Estimate 2015 438
Average Annual Change **-2.19%**

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2007	551			2226				
2011	479			1764	-13.1%			-20.8%
2015	388			1730	-19.0%			-1.9%

Regression Estimate 2007 554
Regression Estimate 2015 391
Average Annual Change **-4.26%**

Bay / Albert Traffic Growth Analysis
PM Peak

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2007	Thursday May 10		883	723		914			754	3274
2011	Thursday 11 August		677	621		640			584	2522
2015	Thursday June 18		727	597		808			678	2810

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2007	883			3274				
2011	677			2522	-23.3%			-23.0%
2015	727			2810	7.4%			11.4%

Regression Estimate 2007 840
Regression Estimate 2015 684
Average Annual Change -2.53%

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2007		754		3274				
2011		584		2522		-22.5%		-23.0%
2015		678		2810		16.1%		11.4%

Regression Estimate 2007 710
Regression Estimate 2015 634
Average Annual Change -1.41%

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2007		914		3274				
2011		640		2522		-30.0%		-23.0%
2015		808		2810		26.3%		11.4%

Regression Estimate 2007 840
Regression Estimate 2015 734
Average Annual Change -1.67%

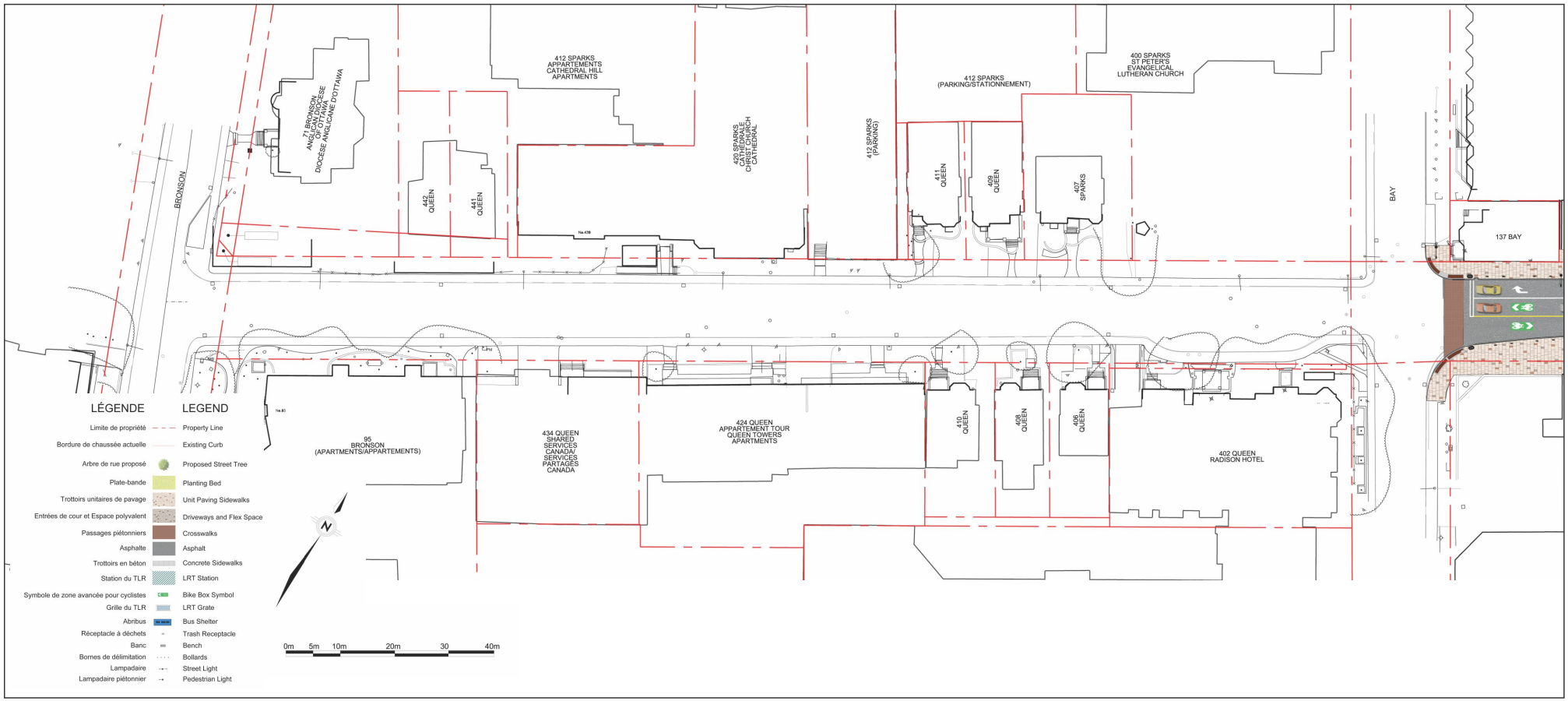
South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2007	723			3274				
2011	621			2522	-14.1%			-23.0%
2015	597			2810	-3.9%			11.4%

Regression Estimate 2007 710
Regression Estimate 2015 584
Average Annual Change -2.41%

Appendix E

Queen Street Renewal Concept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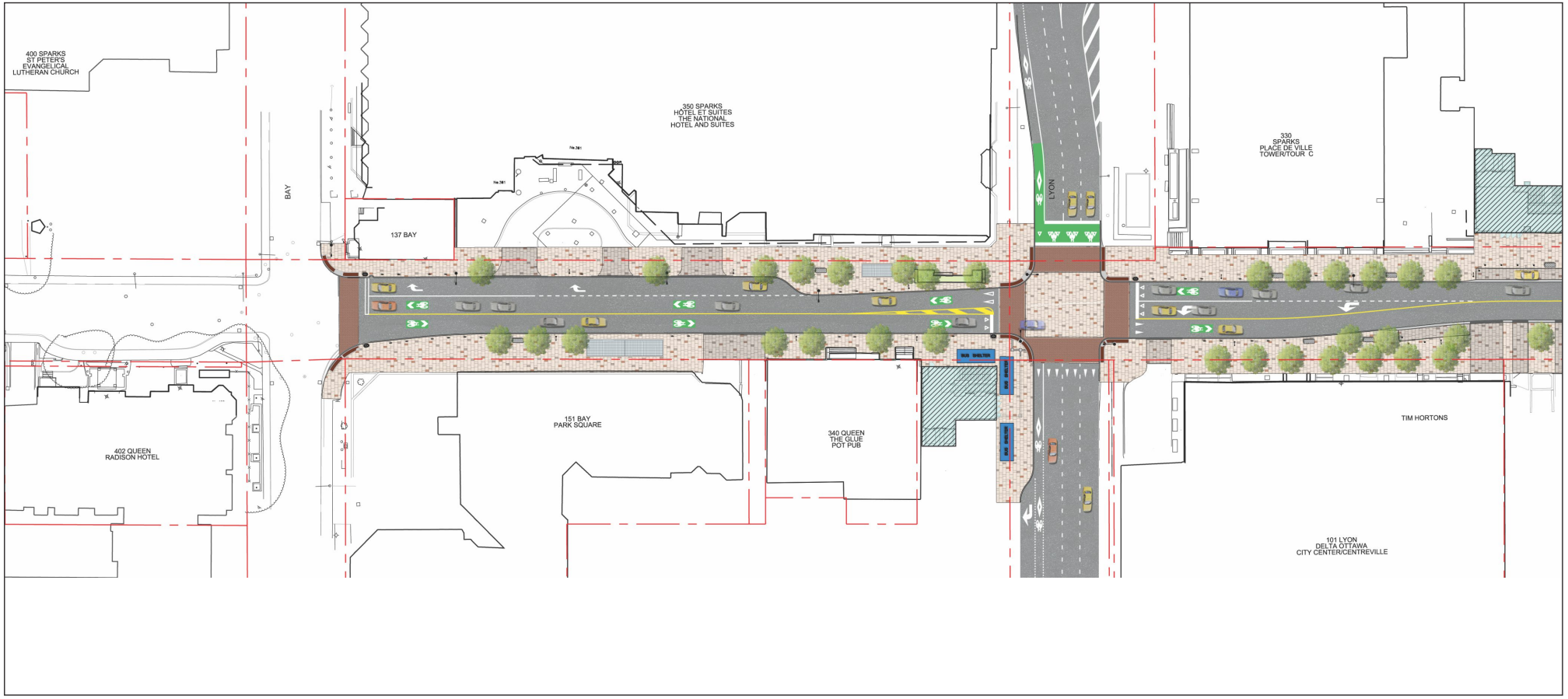
ANGLICAN DIOCESE OF OTTAWA
DIOCESE ANGLICANE D'OTTAWA
412 SPARKS
APPARTEMENTS
CATHEDRAL HILL
APARTMENTS
420 SPARKS
CHRIST CHURCH
CATHEDRAL
412 SPARKS
(PARKING)
412 SPARKS
(PARKING/STATIONNEMENT)
400 SPARKS
ST PETER'S
EVANGELICAL
LUTHERAN CHURCH
BRONSON
442
QUEEN
441
QUEEN
411
QUEEN
409
QUEEN
407
SPARKS
BAY
137 BAY
95
BRONSON
(APARTMENTS/APPARTEMENTS)
434 QUEEN
SHARED
SERVICES
CANADA/
SERVICES
PARTAGÉS
CANADA
424 QUEEN
APPARTEMENT TOUR
QUEEN TOWERS
APARTMENTS
410
QUEEN
408
QUEEN
406
QUEEN
402 QUEEN
RADISON HOTEL
LÉGENDE
LEGEND
Limite de propriété
Property Line
Bordure de chaussée actuelle
Existing Curb
Arbre de rue proposé
Proposed Street Tree
Plate-bande
Planting Bed
Trottoirs unitaires de pavage
Unit Paving Sidewalks
Entrées de cour et Espace polyvalent
Driveways and Flex Space
Passages piétonniers
Crosswalks
Asphalte
Asphalt
Trottoirs en béton
Concrete Sidewalks
Station du TLR
LRT Station
Symbole de zone avancée pour cyclistes
Bike Box Symbol
Grille du TLR
LRT Grate
Abribus
Bus Shelter
Réceptacle à déchets
Trash Receptacle
Banc
Bench
Bornes de délimitation
Bollards
Lampadaire
Street Light
Lampadaire piétonnier
Pedestrian Light
N
0m
5m
10m
20m
30
40m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ST PETER'S
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LUTHERAN CHURCH
BAY
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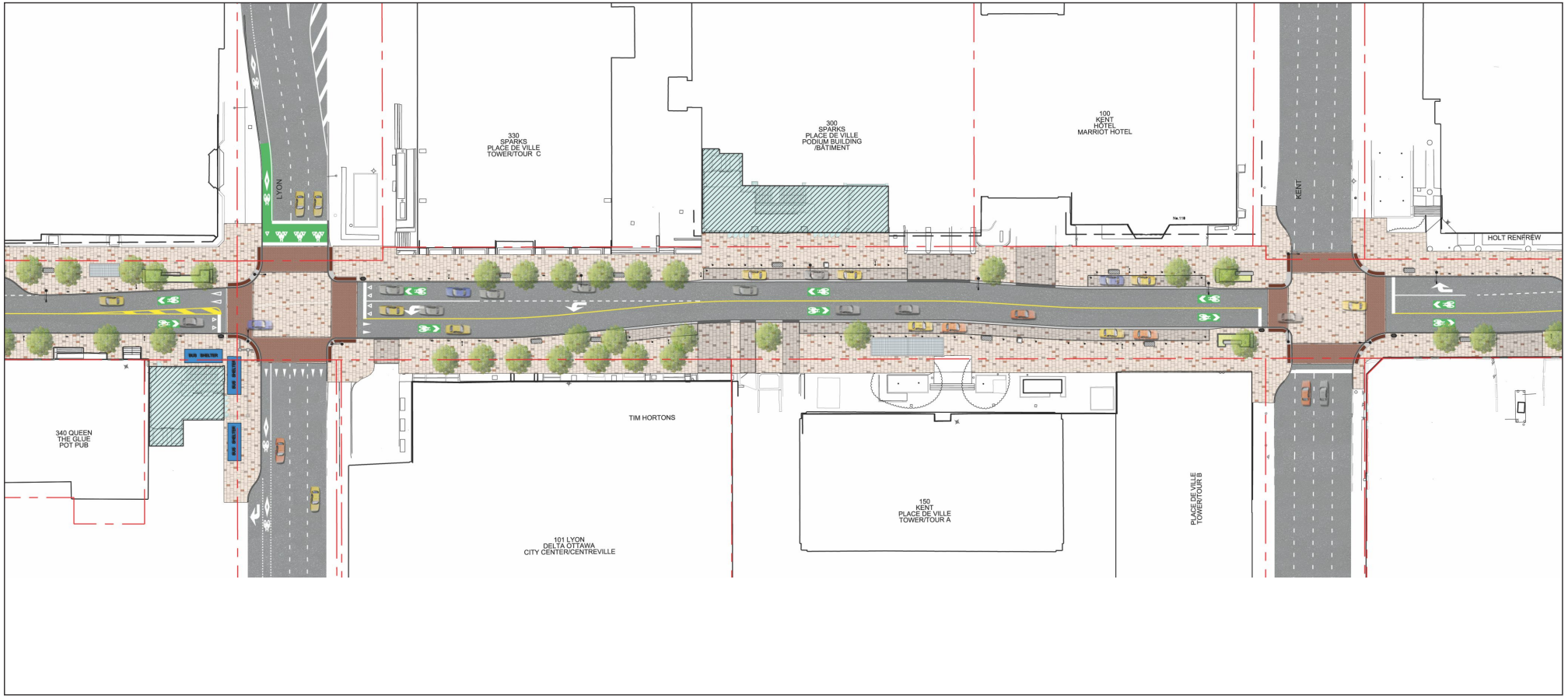
350 SPARKS
HÔTEL ET SUITES
THE NATIONAL
HOTEL AND SUITES
LYON
330
SPARKS
PLACE DE VILLE
TOWER/TOUR C
402 QUEEN
RADISON HOTEL
151 BAY
PARK SQUARE
340 QUEEN
THE GLUE
POT PUB
BUS SHELTER
TIM HORTONS
101 LYON
DELTA OTTAWA
CITY CENTER/CENTREVILLE


LYON
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SPARKS
PLACE DE VILLE
TOWER/TOUR C
300
SPARKS
PLACE DE VILLE
PODIUM BUILDING
/BÂTIMENT
100
KENT
HOTEL
MARRIOT HOTEL
KENT
HOLT RENFREW
BUS SHELTER
BUS SHELTER
BUS SHELTER
340 QUEEN
THE GLUE
POT PUB
TIM HORTONS
101 LYON
DELTA OTTAWA
CITY CENTER/CENTREVILLE
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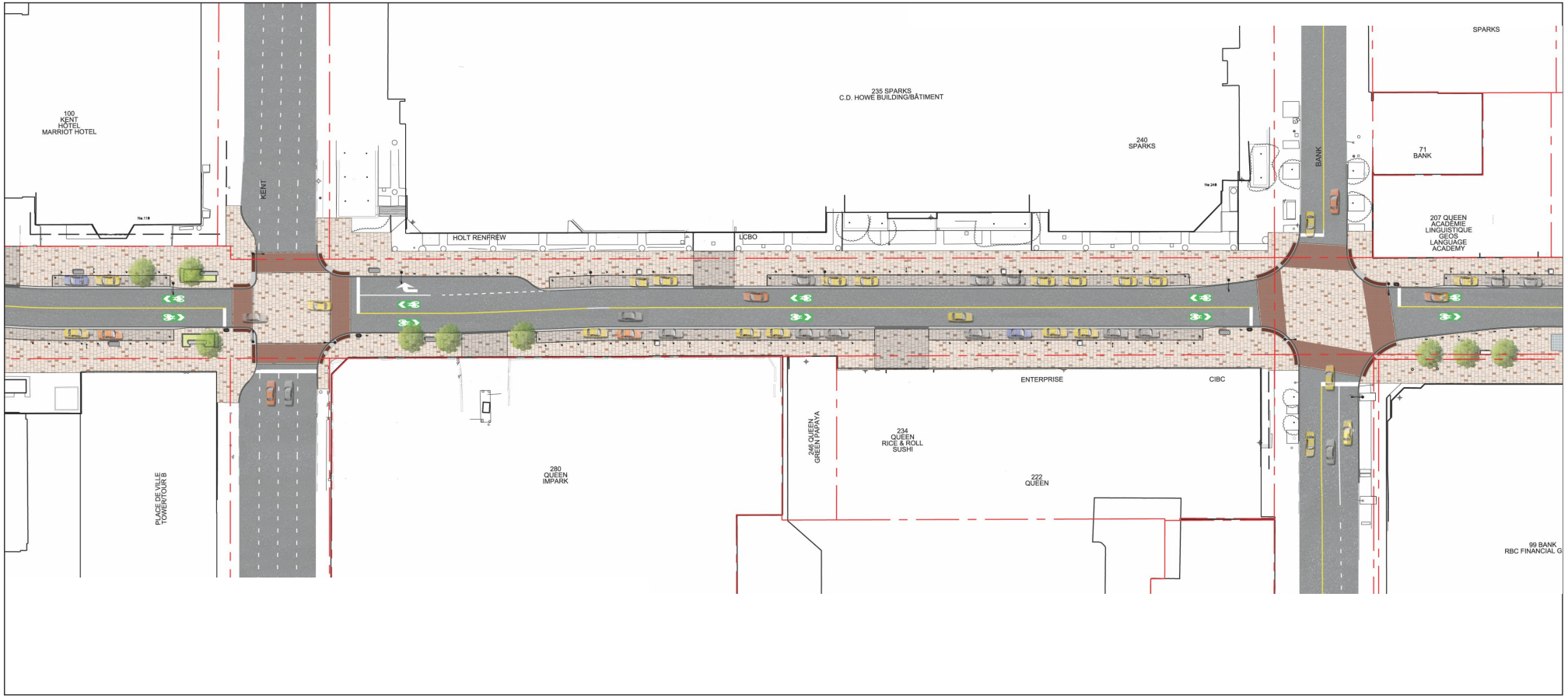
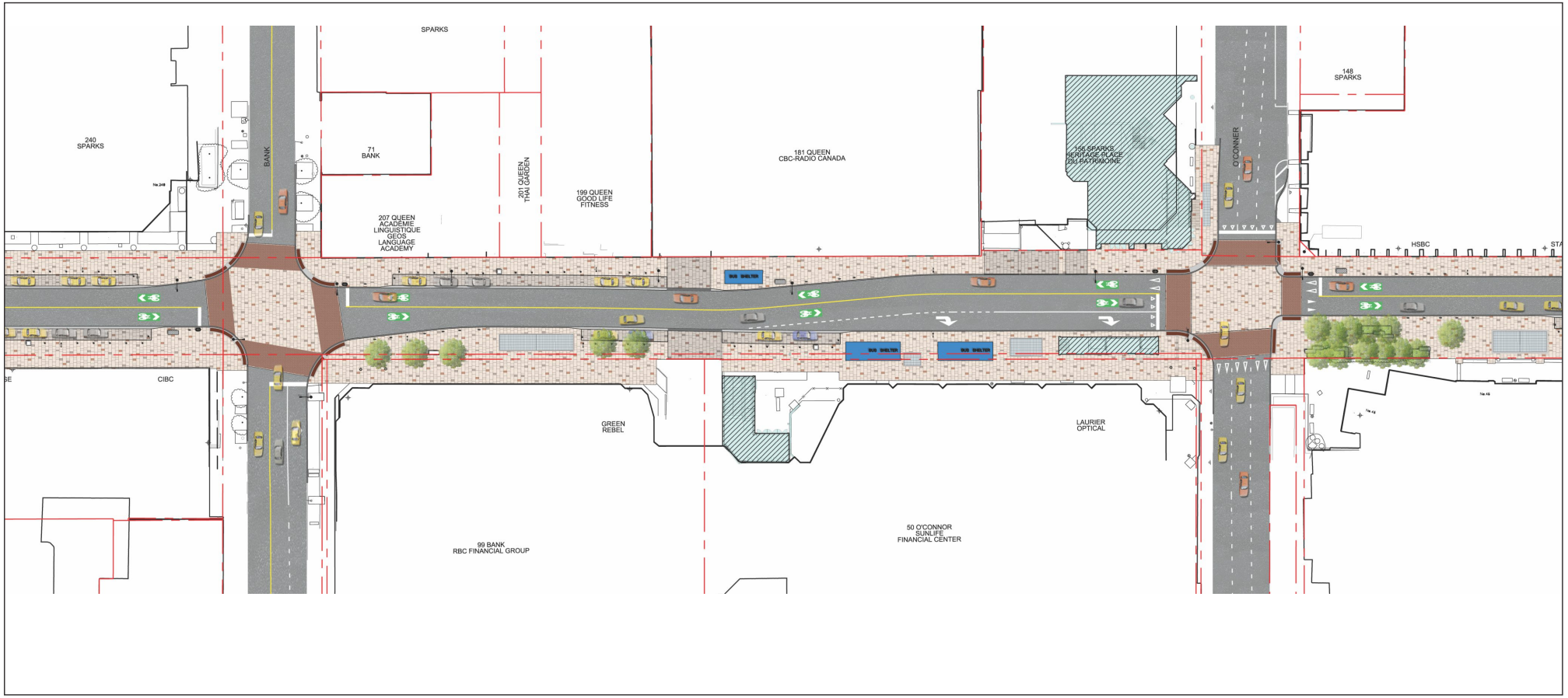
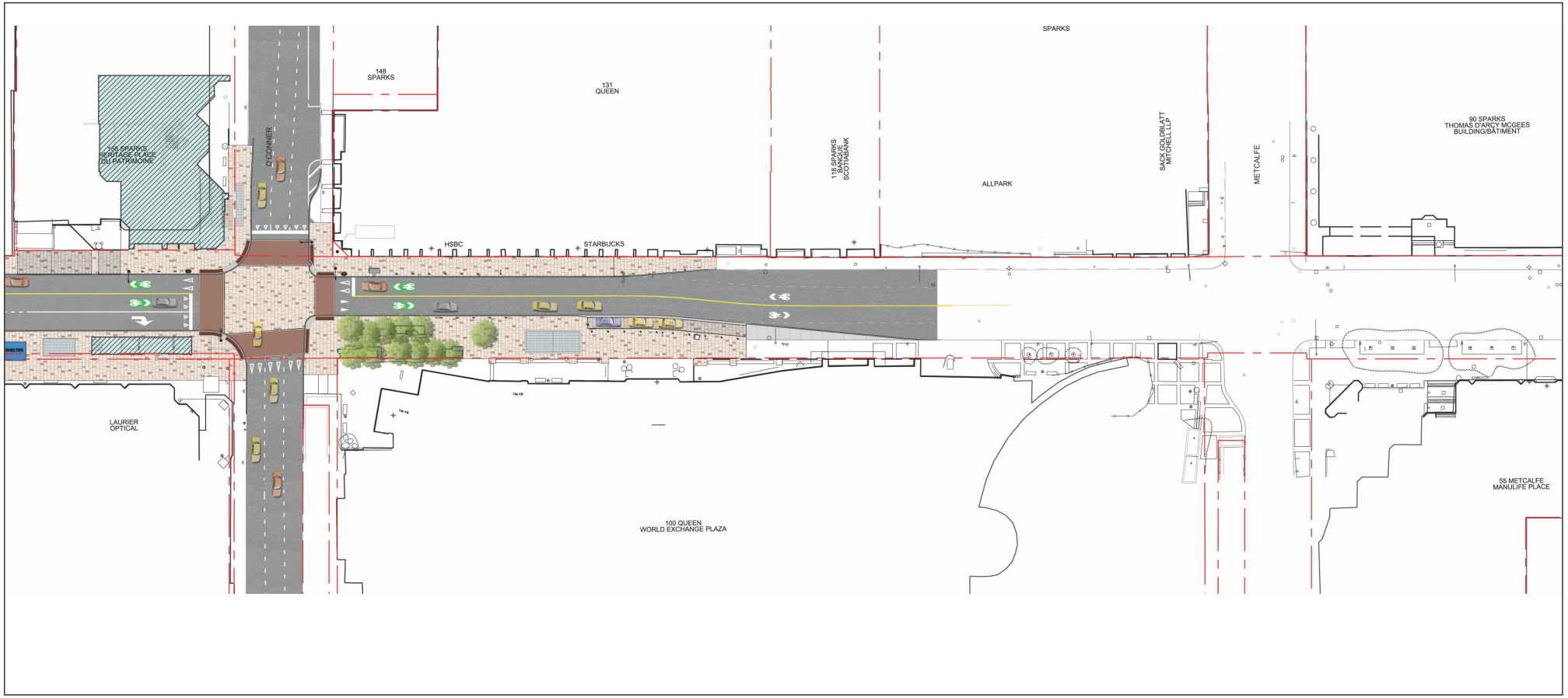
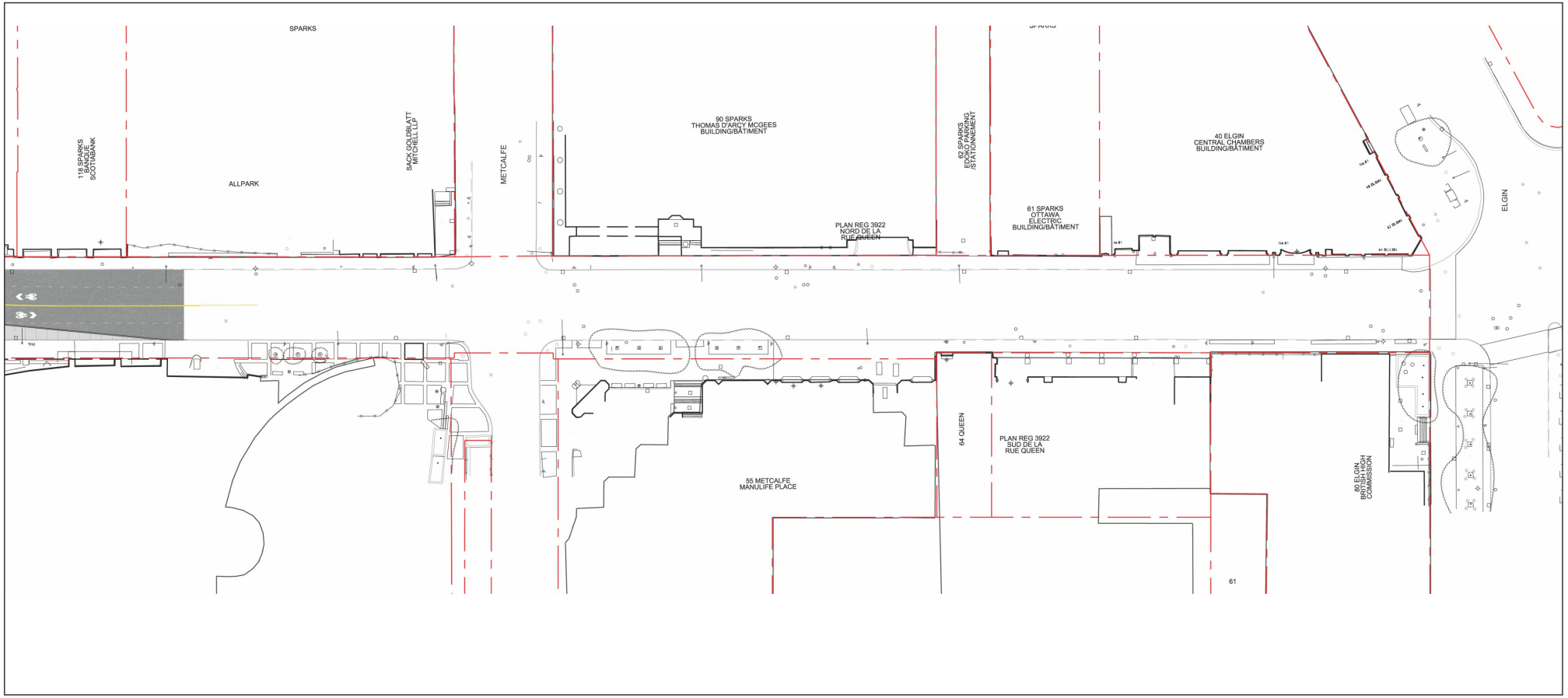
KENT
PLACE DE VILLE
TOWER/TOUR A
PLACE DE VILLE
TOWER/TOUR B


100
KENT
HOTEL
MARRIOT HOTEL
KENT
235 SPARKS
C.D. HOWE BUILDING/BÂTIMENT
240
SPARKS
HOLT RENFREW
LCBO
BANK
SPARKS
71
BANK
207 QUEEN
ACADÉMIE
LINGUISTIQUE
GEOS
LANGUAGE
ACADEMY
ENTERPRISE
CIBC
PLACE DE VILLE
TOWER/TOUR B
280
QUEEN
IMPARK
246 QUEEN
GREEN PAPAYA
234
QUEEN
RICE & ROLL
SUSHI
222
QUEEN
99 BANK
RBC FINANCIAL G


SPARKS
240
SPARKS
BANK
71
BANK
207 QUEEN
ACADEMIE
LINGUISTIQUE
GEOS
LANGUAGE
ACADEMY
201 QUEEN
THAI GARDEN
199 QUEEN
GOOD LIFE
FITNESS
181 QUEEN
CBC-RADIO CANADA
105 SPARKS
HERITAGE PLACE
DU PATRIMOINE
O'CONNER
148
SPARKS
HSBC
BUS SHELTER
BUS SHELTER
BUS SHELTER
CIBC
GREEN
REBEL
LAURIER
OPTICAL
99 BANK
RBC FINANCIAL GROUP
50 O'CONNOR
SUNLIFE
FINANCIAL CENTER


SPARKS
148
SPARKS
131
QUEEN
118 SPARKS
BANK OF
SCOTIABANK
SACK GOLDBLATT
MITCHELL LLP
METCALFE
90 SPARKS
THOMAS D'ARCY MCGEES
BUILDING/BATIMENT
108 SPARKS
HERITAGE PLACE
DU PATRIMOINE
O'CONNER
ALLPARK
HSBC
STARBUCKS
LAURIER
OPTICAL
100 QUEEN
WORLD EXCHANGE PLAZA
55 METCALFE
MANULIFE PLACE


SPARKS
118 SPARKS
BANK OF
SCOTIABANK
ALLPARK
SACK GOLDBLATT
MITCHELL LLP
METCALFE
90 SPARKS
THOMAS D'ARCY MCGEES
BUILDING/BÂTIMENT
PLAN REG 3922
NORD DE LA
RUE QUEEN
68 SPARKS
EDKO PARKING
/STATIONNEMENT
61 SPARKS
OTTAWA
ELECTRIC
BUILDING/BÂTIMENT
40 ELGIN
CENTRAL CHAMBERS
BUILDING/BÂTIMENT
ELGIN
55 METCALFE
MANULIFE PLACE
64 QUEEN
PLAN REG 3922
SUD DE LA
RUE QUEEN
80 ELGIN
BRITISH HIGH
COMMISSION
61

Appendix F

MMLoS Analysis

Multi-Modal Level of Service - Segments Form

Consultant	**PARSONS**	**Project**	**412 Sparks**
Scenario	**Boundary Street Conditions**	**Date**	**Feb-19**
Comments			

SEGMENTS		Street A	Sparks Street South Side	Sparks Street North Side	Section 3
Pedestrian	Sidewalk Width Boulevard Width	-	≥ 2 m < 0.5	≥ 2 m < 0.5	
	Avg Daily Curb Lane Traffic Volume		≤ 3000	≤ 3000	
	Operating Speed On-Street Parking		> 30 to 50 km/h no	> 30 to 50 km/h yes	
	Exposure to Traffic PLoS		**B**	**B**	**-**
	Effective Sidewalk Width				
	Pedestrian Volume				
	Crowding PLoS		-	-	-
	Level of Service		**-**	**-**	**-**
Bicycle	Type of Cycling Facility	-	Mixed Traffic		
	Number of Travel Lanes		≤ 2 (no centreline)		
	Operating Speed		>40 to <50 km/h		
	# of Lanes & Operating Speed LoS		**B**	**-**	**-**
	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	D	Mixed Traffic		
	Friction or Ratio Transit:Posted Speed		Vt/Vp ≥ 0.8		
	Level of Service		**D**	**-**	**-**
Truck	Truck Lane Width	A	≤ 3.5 m		
	Travel Lanes per Direction		> 1		
	Level of Service		**A**	**-**	**-**

Multi-Modal Level of Service - Intersections Form

Consultant	**PARSONS**	**Project**	**Cathedral Hill - Strategy Report**
Scenario	**Strategy Report**	**Date**	**Feb-19**
Comments			

Unlocked Rows for Replicating

INTERSECTIONS		Queen/Bay, Existing				Queen/Bay, 2020				Intersection C			
	Crossing Side	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	0 - 2	0 - 2	0 - 2	0 - 2								
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m								
	Conflicting Left Turns	Permissive	No left turn / Prohib.	No left turn / Prohib.	Permissive								
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control								
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed								
	Ped Signal Leading Interval?	No	No	No	No								
	Right Turn Channel	No Channel	No Channel	No Channel	No Channel								
	Corner Radius	3-5m	5-10m	5-10m	0-3m								
	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings								
	PETSI Score	**87**	**94**	**94**	**88**								
	Ped. Exposure to Traffic LoS	**B**	**A**	**A**	**B**	-	-	-	-	-	-	-	-
	Cycle Length	55	55	55	55								
	Effective Walk Time	10	10	19	19								
	Average Pedestrian Delay	**18**	**18**	**12**	**12**								
	Pedestrian Delay LoS	**B**	**B**	**B**	**B**	-	-	-	-	-	-	-	-
	Level of Service	**B**	**B**	**B**	**B**	-	-	-	-	-	-	-	-
		B				**-**				**-**			
	Direction of Travel	**NORTHBOUND**	**SOUTHBOUND**	**EASTBOUND**	**WESTBOUND**	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**
Bicycle	Bicycle Lane Arrangement on Approach	Curb Bike Lane, Cycletrack or MUP		Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Mixed Traffic				
	Right Turn Lane Configuration	Not Applicable		≤ 50 m	≤ 50 m			≤ 50 m	≤ 50 m				
	Right Turning Speed	Not Applicable		≤ 25 km/h	≤ 25 km/h			≤ 25 km/h	≤ 25 km/h				
	Cyclist relative to RT motorists	**Not Applicable**	**-**	**D**	**D**	**Not Applicable**	**Not Applicable**	**D**	**D**	**-**	**-**	**-**	**-**
	Separated or Mixed Traffic	**Separated**	**-**	**Mixed Traffic**	**Mixed Traffic**	**Separated**	**Separated**	**Mixed Traffic**	**Mixed Traffic**	**-**	**-**	**-**	**-**
	Left Turn Approach	1 lane crossed		No lane crossed	No lane crossed	2-stage, LT box	2-stage, LT box	No lane crossed	No lane crossed				
	Operating Speed	> 40 to ≤ 50 km/h		> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h				
	Left Turning Cyclist	**C**	**-**	**B**	**B**	**A**	**A**	**B**	**B**	**-**	**-**	**-**	**-**
	Level of Service	**C**	**-**	**D**	**D**	**A**	**A**	**D**	**D**	**-**	**-**	**-**	**-**
		D				**D**				**-**			
Transit	Average Signal Delay	≤ 20 sec											
	Level of Service	**C**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
		C				**-**				**-**			
Truck	Effective Corner Radius	< 10 m											
	Number of Receiving Lanes on Departure from Intersection	1											
	Level of Service	**F**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
		F				**-**				**-**			
Auto	Volume to Capacity Ratio	0.0 - 0.60											
	Level of Service	**A**				**-**				**-**			

Appendix G

TDM Checklist

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	☑
BASIC	1.1.2	Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	☑
BASIC	1.1.3	Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	☑
	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 Official Plan policy 4.3.3)*	☑
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 Official Plan policy 4.3.12)*	☑

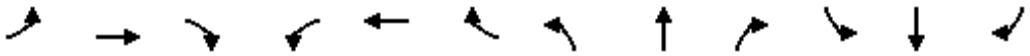
		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3	Provide sidewalks of smooth, well-drained walking surfaces of contrasting materials or treatments to differentiate pedestrian areas from vehicle areas, and provide marked pedestrian crosswalks at intersection sidewalks *(see Official Plan policy 4.3.10)*	☑
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 Official Plan policy 4.3.10)*	☑
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 Official Plan policy 4.3.11)*	☐
BASIC	1.2.6	Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	☑
BASIC	1.2.7	Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	☐
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	☐
	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	☑
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)	☐

		TDM-supportive design & infrastructure measures: *Residential developments*	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 Official Plan policy 4.3.6)*	☑
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 Zoning By-law Section 111)*	☐ To be confirmed in SPA
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 Zoning By-law Section 111)*	☑
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	☐
	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 Zoning By-law Section 111)*	☐ N/A
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to at least the number of units at condominiums or multi-family residential developments	☐
	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)	☐
	3.	**TRANSIT**	
	3.1	**Customer amenities**	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	☐ N/A
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	☐ N/A
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐ N/A

		TDM-supportive design & infrastructure measures: *Residential developments*	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	☑ Provided with the lay-by
	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 Zoning By-law Section 94)*	☐
	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	☐
	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	☐ To be confirmed in SPA
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	☐
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 Zoning By-law Section 104)*	☐ N/A
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 Zoning By-law Section 111)*	☐
	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)	☐

Appendix H

Synchro Analysis

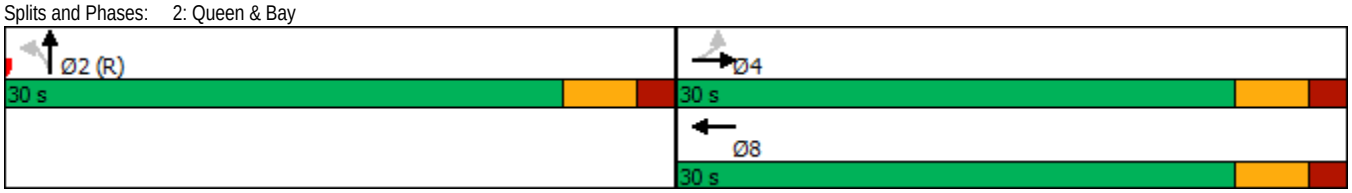


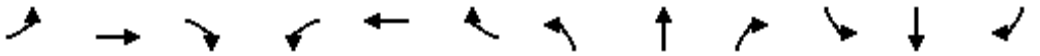
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	104	63	0	0	80	42	5	223	34	0	0	0
Future Volume (vph)	104	63	0	0	80	42	5	223	34	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Frt					0.953			0.980				
Flt Protected		0.970						0.999				
Satd. Flow (prot)	0	1731	0	0	1700	0	0	3319	0	0	0	0
Flt Permitted		0.731						0.999				
Satd. Flow (perm)	0	1304	0	0	1700	0	0	3319	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					47			34				
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		105.0			64.5			53.2			73.2	
Travel Time (s)		7.6			4.6			3.8			5.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	116	70	0	0	89	47	6	248	38	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	186	0	0	136	0	0	292	0	0	0	0
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4						2					
Detector Phase	4	4			8		2	2				
Switch Phase												
Minimum Initial (s)	10.0	10.0			10.0		10.0	10.0				
Minimum Split (s)	21.1	21.1			21.1		29.1	29.1				
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%				
Yellow Time (s)	3.3	3.3			3.3		3.3	3.3				
All-Red Time (s)	1.8	1.8			1.8		1.8	1.8				
Lost Time Adjust (s)		0.0			0.0			0.0				
Total Lost Time (s)		5.1			5.1			5.1				
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None			None		C-Max	C-Max				
Act Effct Green (s)		14.2			14.2			35.6				
Actuated g/C Ratio		0.24			0.24			0.59				
v/c Ratio		0.61			0.31			0.15				
Control Delay		28.3			13.7			5.8				
Queue Delay		0.0			0.0			0.0				
Total Delay		28.3			13.7			5.8				
LOS		C			B			A				
Approach Delay		28.3			13.7			5.8				
Approach LOS		C			B			A				
Queue Length 50th (m)		18.5			8.0			5.5				
Queue Length 95th (m)		31.2			17.4			12.9				
Internal Link Dist (m)		81.0			40.5			29.2			49.2	
Turn Bay Length (m)												
Base Capacity (vph)		541			732			1985				
Starvation Cap Reductn		0			0			0				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.34			0.19			0.15				

Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 31 (52%), Referenced to phase 2:NBTL and 6:, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.61	

Intersection Signal Delay: 14.3	Intersection LOS: B
Intersection Capacity Utilization 39.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Queen & Bay





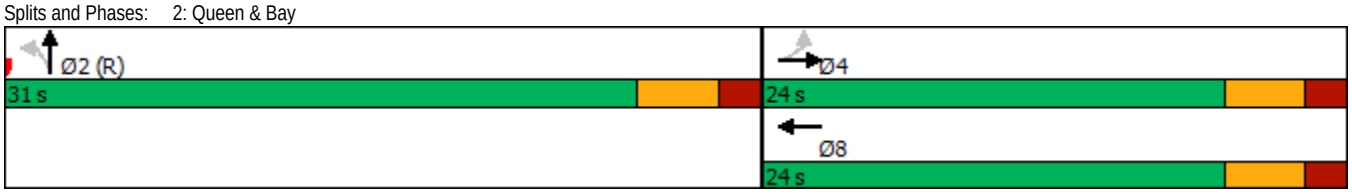
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	152	30	0	0	116	180	6	716	25	0	0	0
Future Volume (vph)	152	30	0	0	116	180	6	716	25	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Frt					0.918			0.995				
Flt Protected		0.960										
Satd. Flow (prot)	0	1713	0	0	1638	0	0	3373	0	0	0	0
Flt Permitted		0.440										
Satd. Flow (perm)	0	785	0	0	1638	0	0	3373	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					117			8				
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		105.0			64.5			53.2			73.2	
Travel Time (s)		7.6			4.6			3.8			5.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	169	33	0	0	129	200	7	796	28	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	202	0	0	329	0	0	831	0	0	0	0
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4						2					
Detector Phase	4	4			8		2	2				
Switch Phase												
Minimum Initial (s)	10.0	10.0			10.0		10.0	10.0				
Minimum Split (s)	21.1	21.1			21.1		29.1	29.1				
Total Split (s)	24.0	24.0			24.0		31.0	31.0				
Total Split (%)	43.6%	43.6%			43.6%		56.4%	56.4%				
Yellow Time (s)	3.3	3.3			3.3		3.3	3.3				
All-Red Time (s)	1.8	1.8			1.8		1.8	1.8				
Lost Time Adjust (s)		0.0			0.0			0.0				
Total Lost Time (s)		5.1			5.1			5.1				
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None			None		C-Max	C-Max				
Act Effct Green (s)		16.4			16.4			28.4				
Actuated g/C Ratio		0.30			0.30			0.52				
v/c Ratio		0.86			0.58			0.48				
Control Delay		53.1			14.0			10.3				
Queue Delay		1.1			0.1			0.0				
Total Delay		54.2			14.1			10.4				
LOS		D			B			B				
Approach Delay		54.2			14.1			10.4				
Approach LOS		D			B			B				
Queue Length 50th (m)		17.3			15.5			27.9				
Queue Length 95th (m)		#46.8			34.6			41.2				
Internal Link Dist (m)		81.0			40.5			29.2			49.2	
Turn Bay Length (m)												
Base Capacity (vph)		269			639			1744				
Starvation Cap Reductn		0			0			0				
Spillback Cap Reductn		10			29			73				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.78			0.54			0.50				

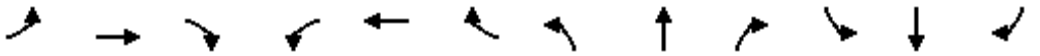
Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 55	
Offset: 3 (5%), Referenced to phase 2:NBTL and 6:, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.86	

Intersection Signal Delay: 17.8	Intersection LOS: B
Intersection Capacity Utilization 63.3%	ICU Level of Service B
Analysis Period (min) 15	

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

Splits and Phases: 2: Queen & Bay



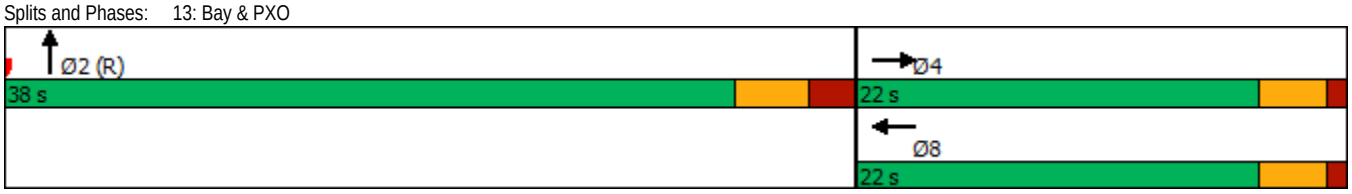


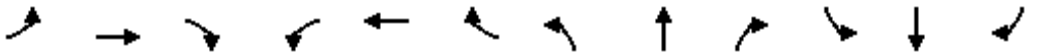
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	5	0	0	5	0	0	511	0	0	0	0
Future Volume (vph)	0	5	0	0	5	0	0	511	0	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Frt												
Flt Protected												
Satd. Flow (prot)	0	1784	0	0	1784	0	0	3390	0	0	0	0
Flt Permitted												
Satd. Flow (perm)	0	1784	0	0	1784	0	0	3390	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		25.5			32.1			18.8			17.5	
Travel Time (s)		1.8			2.3			1.4			1.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	6	0	0	6	0	0	568	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	6	0	0	6	0	0	568	0	0	0	0
Turn Type		NA			NA			NA				
Protected Phases		4			8			2				
Permitted Phases												
Detector Phase		4			8			2				
Switch Phase												
Minimum Initial (s)		10.0			10.0			10.0				
Minimum Split (s)		22.0			22.0			15.4				
Total Split (s)		22.0			22.0			38.0				
Total Split (%)		36.7%			36.7%			63.3%				
Yellow Time (s)		3.0			3.0			3.3				
All-Red Time (s)		1.0			1.0			2.1				
Lost Time Adjust (s)		0.0			0.0			0.0				
Total Lost Time (s)		4.0			4.0			5.4				
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode		None			None			C-Max				
Act Effct Green (s)		11.6			11.6			54.5				
Actuated g/C Ratio		0.19			0.19			0.91				
v/c Ratio		0.02			0.02			0.18				
Control Delay		17.6			17.6			3.4				
Queue Delay		0.0			0.0			0.0				
Total Delay		17.6			17.6			3.4				
LOS		B			B			A				
Approach Delay		17.6			17.6			3.4				
Approach LOS		B			B			A				
Queue Length 50th (m)		0.6			0.6			0.0				
Queue Length 95th (m)		2.6			2.6			28.3				
Internal Link Dist (m)		1.5			8.1			0.1			0.1	
Turn Bay Length (m)												
Base Capacity (vph)		535			535			3080				
Starvation Cap Reductn		0			0			0				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.01			0.01			0.18				

Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.18	

Intersection Signal Delay: 3.7	Intersection LOS: A
Intersection Capacity Utilization 31.1%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 13: Bay & PXO



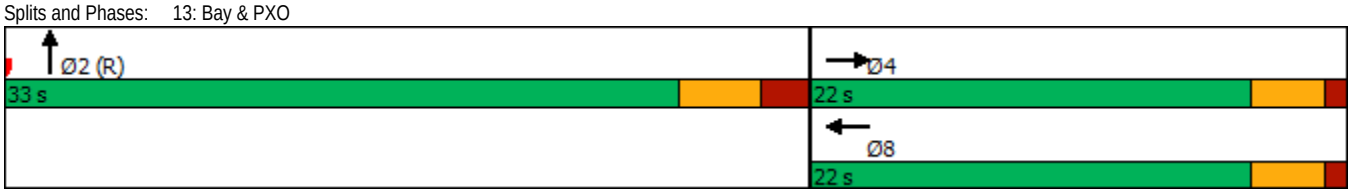


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑			↑↑				
Traffic Volume (vph)	0	5	0	0	5	0	0	1003	0	0	0	0
Future Volume (vph)	0	5	0	0	5	0	0	1003	0	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Frt												
Flt Protected												
Satd. Flow (prot)	0	1784	0	0	1784	0	0	3390	0	0	0	0
Flt Permitted												
Satd. Flow (perm)	0	1784	0	0	1784	0	0	3390	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		25.5			32.1			18.8			17.5	
Travel Time (s)		1.8			2.3			1.4			1.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	6	0	0	6	0	0	1114	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	6	0	0	6	0	0	1114	0	0	0	0
Turn Type		NA			NA			NA				
Protected Phases		4			8			2				
Permitted Phases												
Detector Phase		4			8			2				
Switch Phase												
Minimum Initial (s)		10.0			10.0			10.0				
Minimum Split (s)		22.0			22.0			15.4				
Total Split (s)		22.0			22.0			33.0				
Total Split (%)		40.0%			40.0%			60.0%				
Yellow Time (s)		3.0			3.0			3.3				
All-Red Time (s)		1.0			1.0			2.1				
Lost Time Adjust (s)		0.0			0.0			0.0				
Total Lost Time (s)		4.0			4.0			5.4				
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode		None			None			C-Max				
Act Effct Green (s)		11.6			11.6			49.5				
Actuated g/C Ratio		0.21			0.21			0.90				
v/c Ratio		0.02			0.02			0.37				
Control Delay		15.2			15.2			3.8				
Queue Delay		0.0			0.0			0.0				
Total Delay		15.2			15.2			3.8				
LOS		B			B			A				
Approach Delay		15.2			15.2			3.8				
Approach LOS		B			B			A				
Queue Length 50th (m)		0.5			0.5			0.0				
Queue Length 95th (m)		2.3			2.3			65.7				
Internal Link Dist (m)		1.5			8.1			0.1			0.1	
Turn Bay Length (m)												
Base Capacity (vph)		583			583			3052				
Starvation Cap Reductn		0			0			135				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.01			0.01			0.38				

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 55	
Offset: 26 (47%), Referenced to phase 2:NBT and 6:, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.37	

Intersection Signal Delay: 3.9	Intersection LOS: A
Intersection Capacity Utilization 45.4%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 13: Bay & PXO



Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	59	25	17	486	41	0	0	0
Future Vol, veh/h	0	0	0	0	59	25	17	486	41	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	66	28	19	540	46	0	0	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	601	293	0	0	0
Stage 1	-	601	-	-	-	-
Stage 2	-	0	-	-	-	-
Critical Hdwy	-	6.54	6.94	4.14	-	-
Critical Hdwy Stg 1	-	5.54	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.02	3.32	2.22	-	-
Pot Cap-1 Maneuver	0	413	703	-	-	-
Stage 1	0	488	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	-	0	703	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	10.9	
HCM LOS	B	

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	-	703
HCM Lane V/C Ratio	-	-	-	0.133
HCM Control Delay (s)	-	-	-	10.9
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.5

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	111	34	13	969	27	0	0	0
Future Vol, veh/h	0	0	0	0	111	34	13	969	27	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	123	38	14	1077	30	0	0	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	1120	554	0	0	0
Stage 1	-	1120	-	-	-	-
Stage 2	-	0	-	-	-	-
Critical Hdwy	-	6.54	6.94	4.14	-	-
Critical Hdwy Stg 1	-	5.54	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.02	3.32	2.22	-	-
Pot Cap-1 Maneuver	0	205	476	-	-	-
Stage 1	0	280	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	-	0	476	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	16.4	
HCM LOS	C	

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	-	476
HCM Lane V/C Ratio	-	-	-	0.338
HCM Control Delay (s)	-	-	-	16.4
HCM Lane LOS	-	-	-	C
HCM 95th %tile Q(veh)	-	-	-	1.5