Transportation Impact Assessment – Step 4: Analysis

178-200 Isabella Street

Prepared for Minto Communities - Canada
by IBI Group
September 11, 2020

Document Control Page

CLIENT:	Minto Communities - Canada
PROJECT NAME:	178-200 Isabella Street
REPORT TITLE:	Transportation Impact Assessment
124875	124875
VERSION:	Draft
DIGITAL MASTER:	J:\124875_IsabellaSt\6.0_Technical\6.23_Traffic\03_Tech-Reports\TTR_178-200_isabella_MASTER_2020-08-12.docx
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HISTORY:	TIA Step 1 & 2 Submitted for City Review – June 30, 2020 TIA Step 3 Submitted for City Review – August 12, 2020 TIA Step 4 Submitted for City Review – September 11, 2020

TIA Plan Reports - Certification

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 associate 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[1] professional in good standing, whose field of expertise [check √ appropriate field(s)] is either transportation engineering □ or transportation planning □.

[1] **License or 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.**

Dated at Ottawa this 11 day of September, 2020.
(City)

Name: David Hook, P.Eng.

Professional Title: Project Engineer

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

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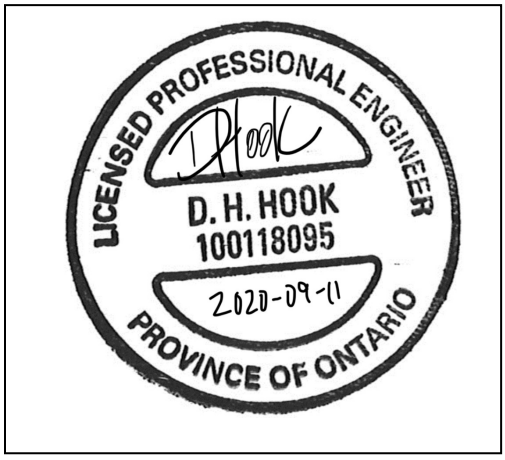

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Executive Summary

IBI Group (IBI) was retained by Minto Communities - Canada to undertake a Transportation Impact Assessment (TIA) in support of a Zoning By-law Amendment application for a proposed mixed-use residential building to be located at 178-200 Isabella Street in Ottawa.

The proposed development consists of a 16-storey mixed-use building with 251 dwelling units and approximately 355 square metres of ground floor commercial uses along the Isabella Street frontage. The subject lands are assumed to be built out in a single phase, with full occupancy expected by 2025. The horizon year of this study was therefore taken as 2030, representing 5 years beyond the expected full build-out of the site.

The site will provide a total of 176 vehicle parking spaces within the four-level underground parking facility. In terms of bicycle parking, a total of 130 spaces are proposed. Access to the proposed development will be provided via a right-in/ right-out private approach on Isabella Street.

A Functional Design Study has been undertaken for the downtown streets that parallel the Queensway, including Isabella Street within the study area. This study is now in its final stages and proposes significant improvements for active transportation users, including the replacement of the existing sidewalk on the south side of Isabella Street with a multi-use path, as well as the implementation of 'protected intersection' elements at all three study area intersections. Although the implementation of the Isabella Street reconstruction is not expected to occur until at least 2026, the proposed development is being coordinated with City technical staff to ensure that sufficient right-of-way is protected for the future redesign of Isabella Street along the site's frontage.

This high-density mixed-use development is well suited in its location, given its close proximity to the highly walkable communities of The Glebe and Centretown. Both communities are bisected by Bank Street, a Traditional Mainstreet within the vicinity of the proposed development which features a broad range of active and pedestrian-oriented uses at grade. Building entrances associated with the subject site's residential and commercial land uses have been strategically located to provide convenient and direct access to the future multi-use path proposed along the site's frontage as part of the Isabella Street redesign. A future mid-block pedestrian connection between Isabella Street and Pretoria Avenue is also being planned by the City immediately east of the subject lands and will help to further strengthen the network of active transportation facilities surrounding the site.

The proposed development is expected to generate up to 250 and 241 two-way person-trips during the weekday morning and afternoon peak hours, respectively. Travel demand was stratified by mode share from the Ottawa Inner Area Traffic Assessment Zone (TAZ) in the O-D Survey and divided amongst the numerous logical routes, based on the configuration of the adjacent regional road network. No alternations were made to the mode share for either the residential or commercial land uses beyond applying blended rates, which considered both internal trips (i.e. within the TAZ), as well as inter-zonal trips. The resulting two-way vehicular trip generation is, therefore, 83 and 78 vehicles per hour during the weekday morning and afternoon peak hours, respectively.

A multi-modal analysis of each study area intersection identified deficiencies in the existing road network and potential remediation measures have been suggested in which the City could consider in order to meet the prescribed targets. These remediation measures would improve mobility and comfort for all transportation modes but are not required to safely accommodate the proposed development.

Based on the analysis conducted for this study, all three study area intersections and the proposed site access intersection are expected to operate at acceptable levels of service (i.e. LOS 'D' or better) during the weekday peak hours under 2025 background and total traffic conditions. By the 2030 study horizon year, the intersection of Isabella & Metcalfe may approach its theoretical capacity and operate at an overall LOS 'E' during the weekday afternoon peak hour, however this is expected to be primarily due to an existing

heavy northbound right-turn movement, as well as growth in background traffic and not as a direct consequence of site-generated traffic.

The results of the queuing analyses indicate that no additional auxiliary lanes are required at any of the study area intersections to accommodate future background or total traffic volumes beyond the 2030 study horizon year. It is possible, however, that the northbound right-turn movement at the intersection of Isabella & Metcalfe may occasionally spillback further south of Pretoria Avenue. This represents an existing issue and the proposed development is not expected to contribute additional traffic to this critical movement. It is recommended that the City monitor this heavy movement to help mitigate any potential impacts to the residential community to the south.

Site-generated traffic volumes are expected to minimally impact the adjacent road network, including critical movements at the study area intersections. As such, a post-development monitoring plan is not a requirement of this study. Further, the analysis indicates that no off-site intersection improvements are required as a direct consequence of the proposed development, therefore an RMA will not be conducted for this study. It is expected that the Isabella Street reconstruction will be undertaken within the timeframe of this study, however the renewal of this corridor is not required to safely accommodate the proposed development.

Based on the findings of this study, it is the overall opinion of IBI Group that the proposed development will integrate well with and can be safely accommodated by the adjacent transportation network.

1 Introduction

IBI Group (IBI) was retained by Minto Communities - Canada to undertake a Transportation Impact Assessment (TIA) in support of a Zoning By-law Amendment application for a proposed mixed-use residential building to be located at 178-200 Isabella Street in Ottawa.

In accordance with the City of Ottawa's Transportation Impact Assessment Guidelines, published in June 2017, the following report is divided into four major components:

- **Screening** – Prior to the commencement of a TIA, an initial assessment of the proposed development is undertaken to establish the need for a comprehensive review of the site based on three triggers: Trip Generation, Location and Safety.
- **Scoping** – This component of the TIA report describes both the existing and planned conditions in the vicinity of the development and defines study parameters such as the study area, analysis periods and analysis years of the development. It also provides an opportunity to identify any scope exemptions that would eliminate elements of scope described in the TIA Guidelines that are not relevant to the development proposal, based on consultation with City staff.
- **Forecasting** – The Forecasting component of the TIA is intended to review both the development-generated travel demand and the background network travel demand and provides an opportunity to rationalize this demand to ensure projections are within the capacity constraints of the transportation network.
- **Analysis** – This component documents the results of any analyses undertaken to ensure that the transportation related features of the proposed development are in conformance with prescribed technical standards and that its impacts on the transportation network are both sustainable and effectively managed. It also identifies a development strategy to ensure that what is being proposed is aligned with the City of Ottawa's city-building objectives, targets and policies.

Throughout the development of a TIA report, each of the four study components above are submitted in draft form to the City of Ottawa and undergo a review by a designated Transportation Project Manager. Any comments received are addressed to the satisfaction of the City's Transportation Project Manager before proceeding with subsequent components of the study. All technical comments and responses throughout this process are included in **Appendix A**.

2 TIA Screening

An initial screening was completed to confirm the need for a Transportation Impact Assessment by reviewing the following three triggers:

- **Trip Generation**: Based on the proposed number of apartment dwelling units, the minimum development size threshold has been exceeded and therefore the Trip Generation trigger is satisfied.
- **Location**: The proposed development is not located within a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone. Further, the development does not propose a driveway on a Rapid Transit route or Spine Bicycle Network. As such, the Location trigger is not satisfied.
- **Safety**: Boundary street conditions were reviewed to determine if there is an elevated potential for safety concerns adjacent the site. As the development is located within 150m of a signalized intersection (i.e. Bank & Chamberlain/ Isabella), the Safety Trigger is satisfied.

As the proposed development meets the Trip Generation and Safety triggers, the need to undertake a Transportation Impact Assessment is confirmed.

A copy of the Screening Form is provided in **Appendix B**.

3 Project Scoping

3.1 Description of Proposed Development

3.1.1 Site Location

The proposed development is located near the northern boundary of Ottawa's Glebe community and is approximately 0.24 hectares in size. The site is bound by Isabella Street and Highway 417 to the north, an existing office complex to the east, a commercial business (i.e. Randall's Home Improvement) to the west and low-density residential to the south.

The site location and its surrounding context is illustrated in **Exhibit 1**.

3.1.2 Land Use Details

The subject site is currently undeveloped and is zoned GM4 F(3.0) General Mixed-Use, based on GeoOttawa.

The proposed development consists of a 16-storey mixed-use residential building with ground floor commercial and underground parking. **Table 1** below summarizes the proposed land uses included in this development.

Table 1 - Land Use Statistics

LAND USE	SIZE [1]
High-Rise Condominium	251 dwelling units
Ground-Floor Commercial	355m^2

Access to the proposed development will be provided via a right-in/ right-out private approach near the eastern property boundary of the site. The parking garage entrance will be accessed internally via a drive aisle connection with this private approach.

The configuration of the proposed development is illustrated in **Exhibit 2**.

3.1.3 Development Phasing & Date of Occupancy

It is expected that the proposed development will be constructed and fully occupied in a single phase by 2025.

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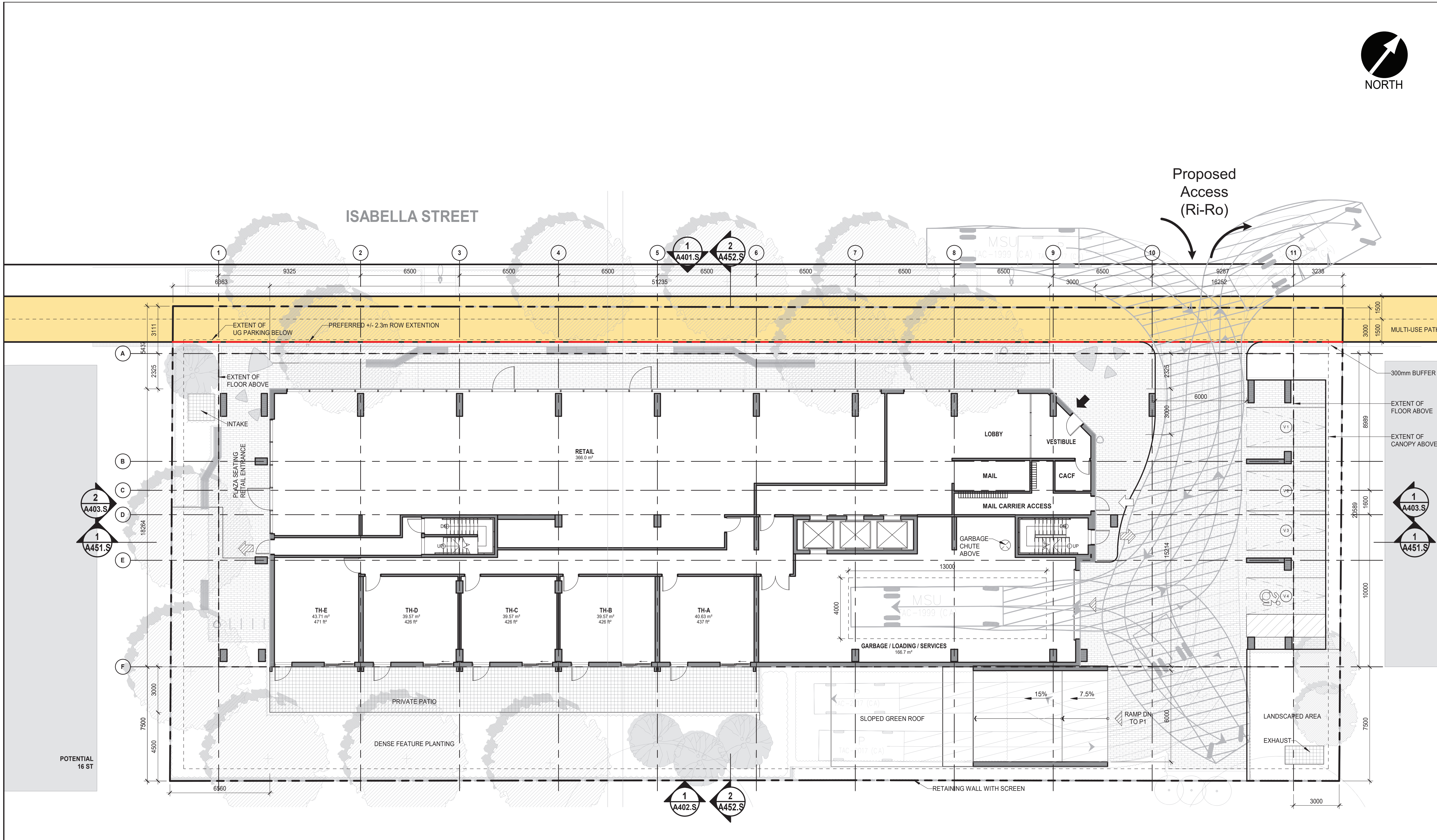
178-200 Isabella Street
Transportation Impact Assessment

Exhibit 1: Site Location

PROJECT No. 124875
DATE: September 2020
SCALE: 50m 0m 100m


NORTH
Proposed
Access
(Ri-Ro)
ISABELLA STREET
EXTENT OF
UG PARKING BELOW
PREFERRED +/- 2.3m ROW EXTENTION
MULTI-USE PATH
300mm BUFFER
EXTENT OF
FLOOR ABOVE
EXTENT OF
CANOPY ABOVE
INTAKE
PLAZA SEATING
RETAIL ENTRANCE
RETAIL
LOBBY
VESTIBULE
MAIL
CACF
MAIL CARRIER ACCESS
GARBAGE
CHUTE
ABOVE
TH-E
TH-D
TH-C
TH-B
TH-A
GARBAGE / LOADING / SERVICES
PRIVATE PATIO
DENSE FEATURE PLANTING
SLOPED GREEN ROOF
RAMP DN
TO P1
LANDSCAPED AREA
EXHAUST
RETAINING WALL WITH SCREEN
POTENTIAL
16 ST

178-200 Isabella Street
Transportation Impact Assessment

Exhibit 2: Proposed Development

PROJECT No. 124875
DATE: September 2020
SCALE: 0m 2.5m 5m

3.2 Existing Conditions

3.2.1 Existing Road Network

3.2.1.1 Roadways

The proposed development is bound by the following street(s):

- **Isabella Street** is an urban arterial road under the jurisdiction of the City of Ottawa that extends from Bank Street in the west to Elgin Street in the east. The road consists of a two-lane cross-section along the development's frontage, with vehicular travel limited to the eastbound direction. According to the Official Plan, the segment of Isabella Street within the context area generally consists of a 23m right-of-way and has a posted speed limit of 50km/h. It shall be noted the current right-of-way along Isabella Street within the development's frontage is restricted to approximately 13m as a result of the Highway 417 O'Connor Street off-ramp immediately to the north.

Other streets within the context area of the proposed development are as follows:

- **Bank Street** is classified as an urban arterial road under the jurisdiction of the City of Ottawa that extends from Wellington Street in the north to Ottawa City Limits in the south, where it transitions to Country Road 31. Within the vicinity of the context area it is classified as a Traditional Mainstreet and maintains a four-lane, undivided cross-section. According to the Official Plan, this segment of Bank Street generally consists of a 20-metre right-of-way and has a posted speed limit of 50km/h.
- **O'Connor Street** is classified as an urban arterial road under the jurisdiction of the City of Ottawa that extends from Wellington Street in the north to Isabella Street in the south, and transitions to a local road further south within the Glebe community. The arterial portion generally consists of a three-lane cross-section that restricts vehicular travel to southbound direction (i.e. away from downtown). The east vehicle travel lane was replaced with a bi-directional cycling facility that was opened to the public in late 2016. The segment of O'Connor Street within the context area generally consists of a 20-metre right-of-way and has a posted speed limit of 50km/h. South of Isabella Street, the posted speed limit is reduced to 40km/h.
- **Metcalfe Street** is classified as an urban arterial road under the jurisdiction of the City of Ottawa that extends from Wellington Street in the north to Isabella Street in the south and transitions to a local road further south within the Glebe community. The arterial portion generally consists of a three-lane cross-section which limits vehicular travel to the northbound direction (i.e. towards downtown). The segment of Metcalfe Street within the study area consists of a 20m right-of-way and has a posted speed limit of 50km/h.

3.2.1.2 Driveways Adjacent to Development Access

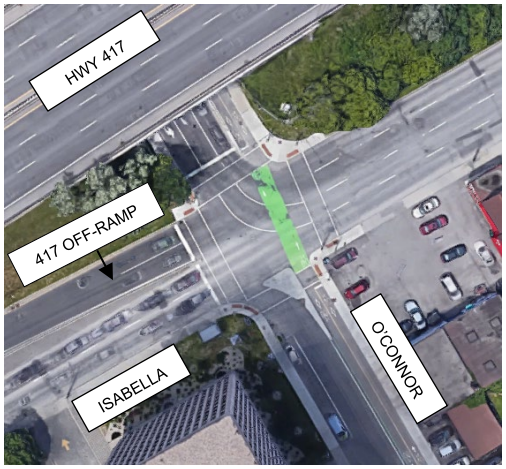
As discussed previously, a single two-way right-in/ right-out private approach will connect the proposed development to Isabella Street.

Existing driveways within 200m of the proposed development generally serve an office complex to the east of the site and a commercial business (i.e. Randall's Home Improvement) to the west. Similar to the site access, each of these driveways provide two-way right-in/ right-out access to the adjacent developments.

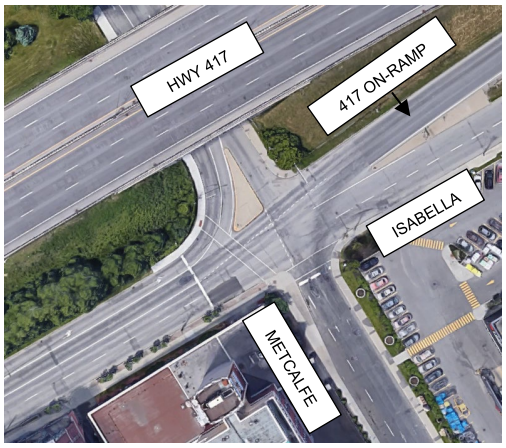
3.2.1.3 Intersections

The following intersections have the greatest potential to be impacted by the proposed development:

- **Bank St. & Isabella St. / Chamberlain Ave.** is a four-legged signalized intersection consisting of two through lanes on each approach, with the exception of the east leg which is configured with two receiving lanes only. A stop-controlled, channelized right-turn is provided on the eastbound approach as well. This intersection is located approximately 50 metres west of the site.



- **Isabella St. & O'Connor St./ 417 EB Off-Ramp** is a four-legged signalized intersection. The west leg consists of a convergence of two approach lanes from Isabella Street and two approach lanes from the Highway 417 O'Connor Street off-ramp. The east leg consists of four receiving lanes. No north-south through movements are permitted at this intersection. The north leg consists of a three-lane cross-section that is restricted to left-turn movements, while the south leg is restricted to right-in vehicle movements within a single travel lane. This intersection is located approximately 120 metres east of the site.



- **Isabella St. & Metcalfe St./ 417 EB On-Ramp** is a four-legged signalized intersection. The west leg provides a four-lane approach, with two through lanes, a shared through-left lane and a dedicated left-turn lane. The east leg consists of four receiving lanes which diverge immediately east of Metcalfe Street, splitting evenly to provide two lanes on Isabella Street and two lanes for the Highway 417 on-ramp. A single northbound through lane is provided on Metcalfe Street, along with a channelized double receiving lane on the north leg and a dedicated right-turn approach lane on the south leg. This intersection is located approximately 300 metres east of the site.

The intersection control and lane configurations for all intersections described above are shown in **Exhibit 3**.

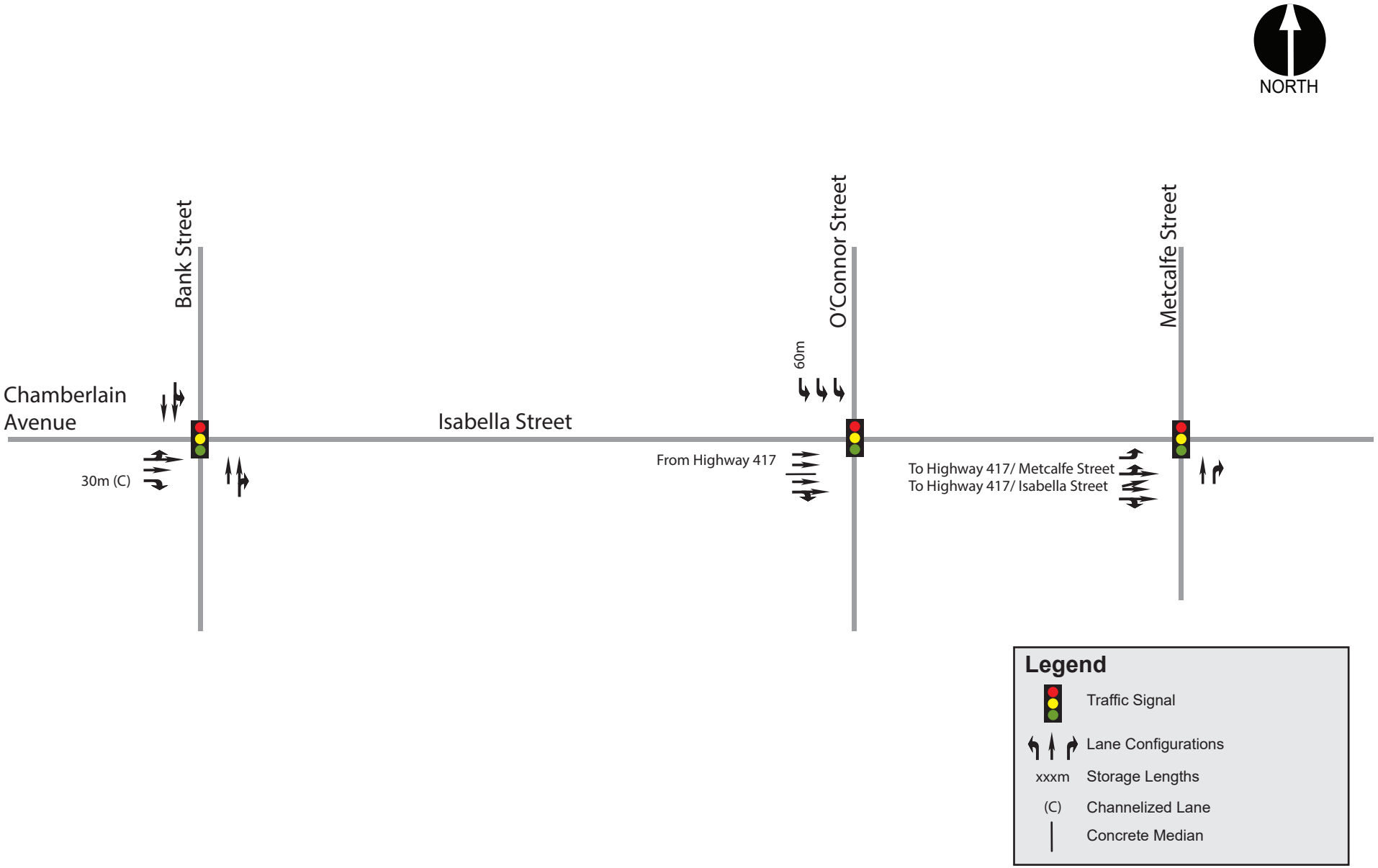


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Exhibit 3:
Exisitng Lane Configurations
& Intersection Control

PROJECT No. 124875
DATE: September 2020
SCALE: N.T.S.

3.2.1.4 Traffic Management Measures

As mentioned previously, a bi-directional cycling facility replaced the easternmost vehicular travel lane on O'Connor Street in late 2016. This facility integrates traffic calming measures such as flexible stakes, narrower vehicle travel lanes and a reduction in overall vehicular capacity along the corridor to create a safer and more comfortable environment for both pedestrians and cyclists.

No additional traffic calming measures were identified on any other streets included within the context area.

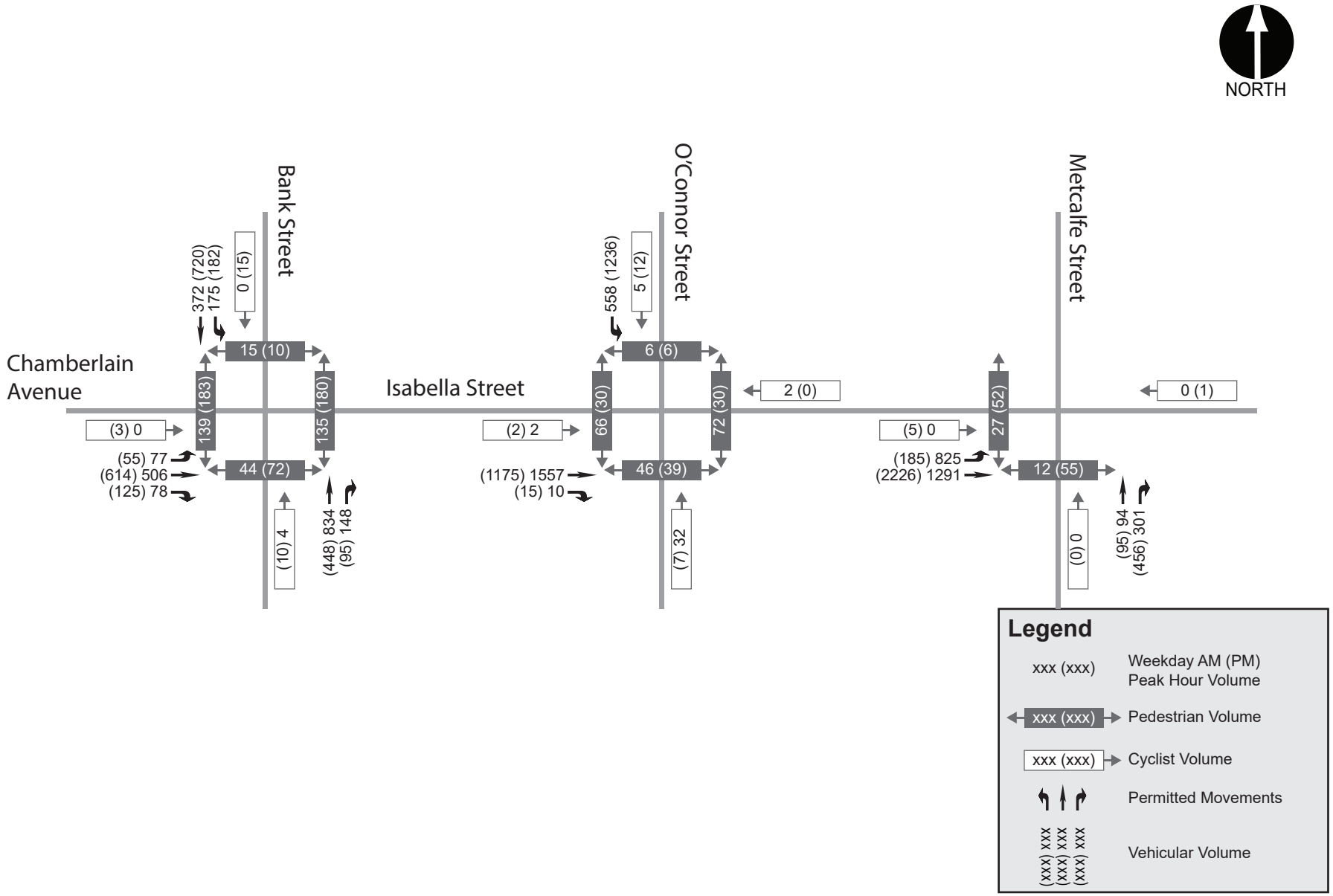
3.2.1.5 Existing Traffic Volumes

As the proposed development will consist primarily of residential land uses, the weekday peak hour traffic conditions will be most affected by any associated increase in traffic. Weekday morning and afternoon peak hour turning movement counts were therefore obtained from the City of Ottawa at the following intersections:

- Bank Street & Isabella Street/ Chamberlain Avenue (City of Ottawa, April 2018)
- Isabella Street & O'Connor Street/ Highway 417 EB Off-Ramp (City of Ottawa, April 2018)
- Isabella Street & Metcalfe Street/ Highway 417 EB On-Ramp (City of Ottawa, April 2018)

A growth rate was applied to the above noted turning movement count data where appropriate to approximate existing (2020) traffic volumes. Justification of the background growth rates is discussed further in the Forecasting section of the report.

Peak hour traffic volumes representative of existing conditions are shown in **Exhibit 4**. Traffic count data is provided in **Appendix C**.



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178-200 Isabella Street
Transportation Impact Assessment

Exhibit 4:
Existing (2020)
Traffic

PROJECT No. 124875
DATE: September 2020
SCALE: N.T.S.

3.2.2 Existing Bicycle and Pedestrian Facilities

Pedestrian facilities are provided on all roads within the context area including concrete sidewalks on both sides of Bank Street, O'Connor Street and Metcalfe Street. On Isabella Street, concrete sidewalks are provided on the south side of the road only.

Specific cycling facilities are provided on O'Connor Street and consist of bi-directional protected bike lanes separated from traffic by a pinned concrete curb. Regularly-spaced flexible posts are provided to provide additional comfort and safety for cyclists. All other roadways within the context area require cyclists to share the road with motorists.

3.2.3 Existing Transit Facilities and Service

The following transit route, operated by OC Transpo, exists within the vicinity of the site:

- **Route #6** provides regular, all-day service between Greenboro Station and Rockcliffe, generally operating on 12 and 15-minute headways during peak periods. On weekends, service is reduced to between 12- and 30-minute headways.
- **Route #7** provides regular, all-day service between St. Laurent Station and Carleton University, generally operates on 10- to 15-minute headways during peak periods. On weekends, service is reduced to between 12- and 30-minute headways.
- **Route #55** provides regular, all-day service between Bayshore Station and Elmvale Shopping Centre. This route generally operates on 15-minute headways towards Bayshore in the AM peak and towards Elmvale in the PM peak in the peak direction and 30-minute intervals in the off-peak direction. On weekends, service is reduced to 30-minute intervals.

The nearest bus stop serving Route #6 and Route #7 is located on Bank Street, approximately 65 metres west of the proposed development, while the bus stop serving Route #55 is located approximately 115 metres east of the nearest property boundary on Isabella Street.

Transit maps for the above noted transit routes are provided in **Appendix A**.

3.2.4 Collision History

A review of historical collision data has been undertaken for the boundary streets within the vicinity of the proposed development. The TIA Guidelines require a safety review if at least six collisions for any one movement or of a discernible pattern, have occurred over a five-year period. **Table 2** summarizes all reported collisions between January 1, 2014 and December 31, 2018.

Table 2 – Reported Collisions within Vicinity of Proposed Development

LOCATION	# OF REPORTED COLLISIONS
INTERSECTIONS	
Bank & Isabella/ Chamberlain	56
Isabella & O'Connor/ Highway 417 EB Off-Ramp	30
Isabella & Metcalfe/ Highway 417 EB On-Ramp	72
SEGMENTS	
Isabella Street – Chamberlain to O'Connor	8
Isabella Street – O'Connor to Metcalfe	10

Based on a preliminary review of the collision history noted above, intersection and road segments with more than six collisions over the five-year period may require further review.

Detailed collision records are provided in **Appendix D**.

Another method of evaluating the relative magnitude of collision frequency at one intersection compared to another is to quantify the average historical number of collisions against the daily volume of traffic entering the intersection. This is commonly expressed in terms of Million Vehicles Entering (MVE) and a rate of greater than 1.0 is considered significant. Daily intersection volumes can be roughly estimated as twice the 8-hour volume.

The above noted intersections are therefore calculated as having average collision frequencies per MVE values:

- Bank & Isabella/ Chamberlain – 0.98
- Isabella & O'Connor/ Highway 417 EB Off-Ramp – 0.52
- Isabella & Metcalfe/ Highway 417 EB On-Ramp – 1.04

Of the three intersections evaluated above, the latter has a collision frequency in excess of 1.0 and may be considered significant.

3.3 Planned Conditions

3.3.1 Transportation Network

3.3.1.1 Future Road Network Projects

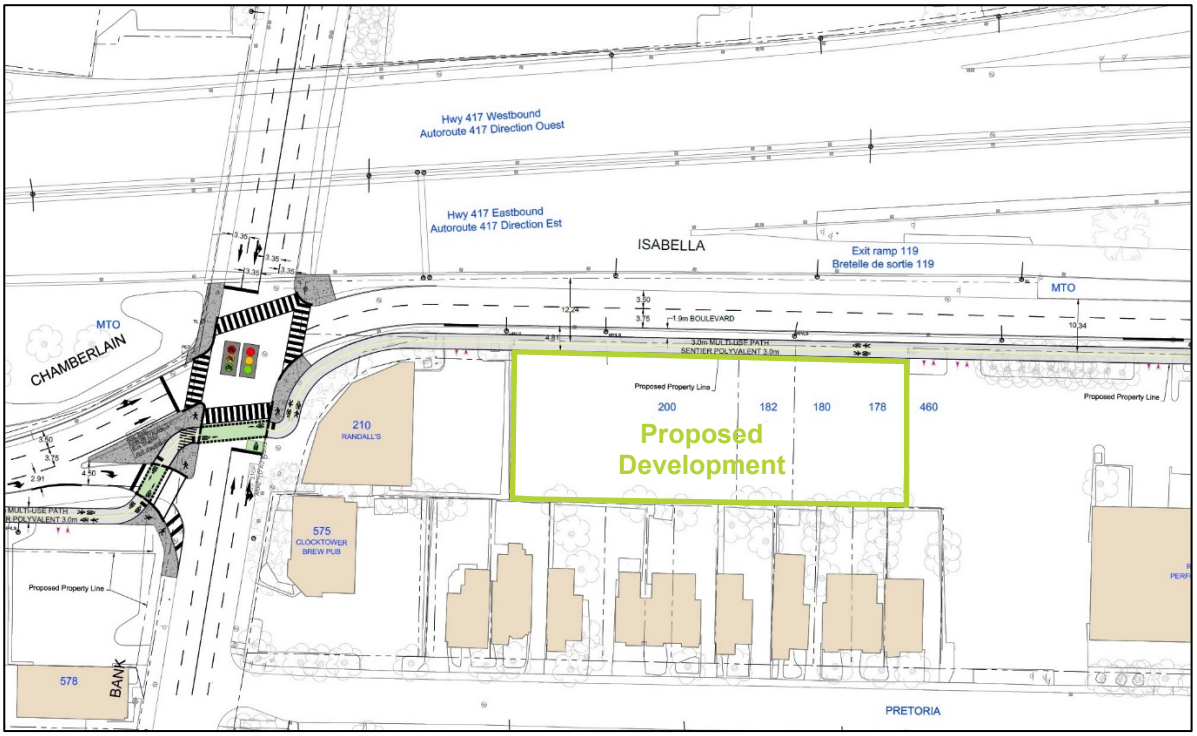
The 2013 Transportation Master Plan (TMP) outlines future road network modifications required in the 2031 'Affordable Network'. A review of the TMP Affordable Plan indicates that there are no planned changes to the arterial road network within the broader area surrounding the proposed development.

Since the development of the TMP, a Functional Design Study has been undertaken for the downtown streets that parallel the Queensway including Chamberlain Avenue, Isabella Street and Catherine Street. The renewal of these corridors has been guided by the Complete Streets philosophy with the primary objective of improving safety and comfort for sustainable forms of transportation within this auto-centric portion of Ottawa's downtown. This study is currently in its final stages, and proposes the following key improvements for active transportation users:

- Replacing existing sidewalk on south side of Isabella Street with a 3.0m wide multi-use path;
- Providing a 1.9m wide boulevard separating the MUP and curbside lane to increase comfort and safety for pedestrians and cyclists and accommodate utility poles and streetlighting; and
- Implementing 'protected intersection' elements at all three key context area intersections.

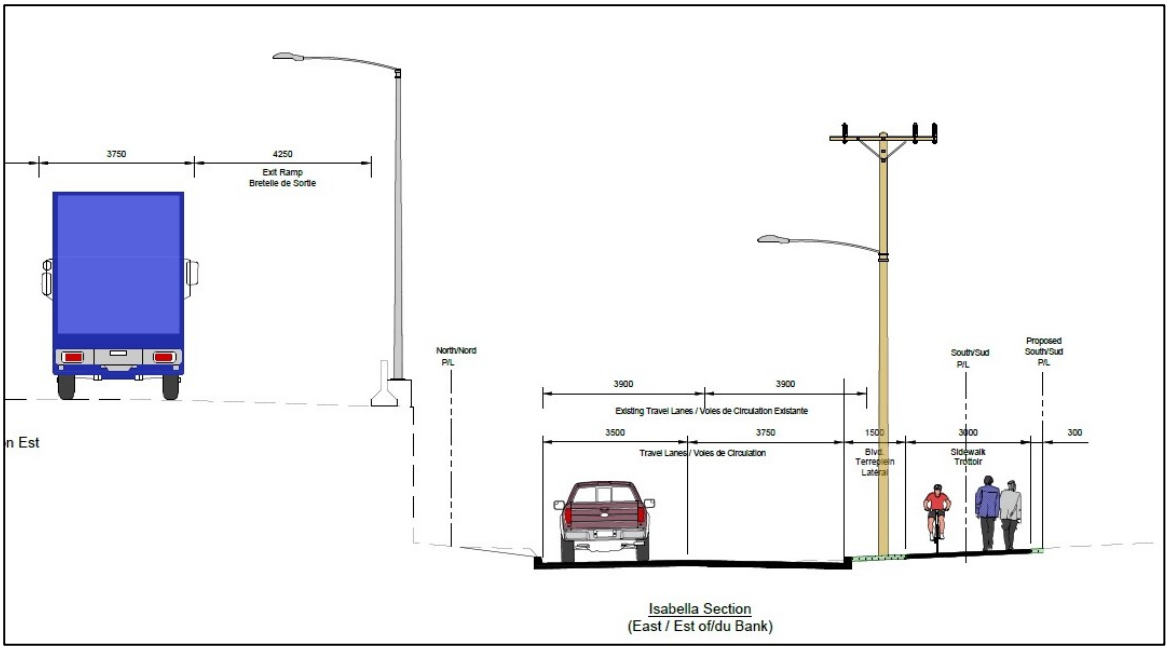
A preliminary version of the Isabella Street functional design plan with respect to the proposed development is shown in **Figure 1**, along with the typical cross-section plans within the subject site's frontage in **Figure 2** below. The City of Ottawa has noted that the Isabella Street improvements are not planned for implementation for at least 6 to 9 years (i.e. 2026-2029), following the completion of adjacent bridge replacements on Highway 417 by the Ontario Ministry of Transportation.

Figure 1 – Isabella Street Renewal – Preliminary Functional Design



Source: City of Ottawa (October 28, 2019 DRAFT)

Figure 2 – Typical Cross-section – Isabella Street Renewal (East of Bank Street)



Source: City of Ottawa (October 28, 2019 DRAFT)

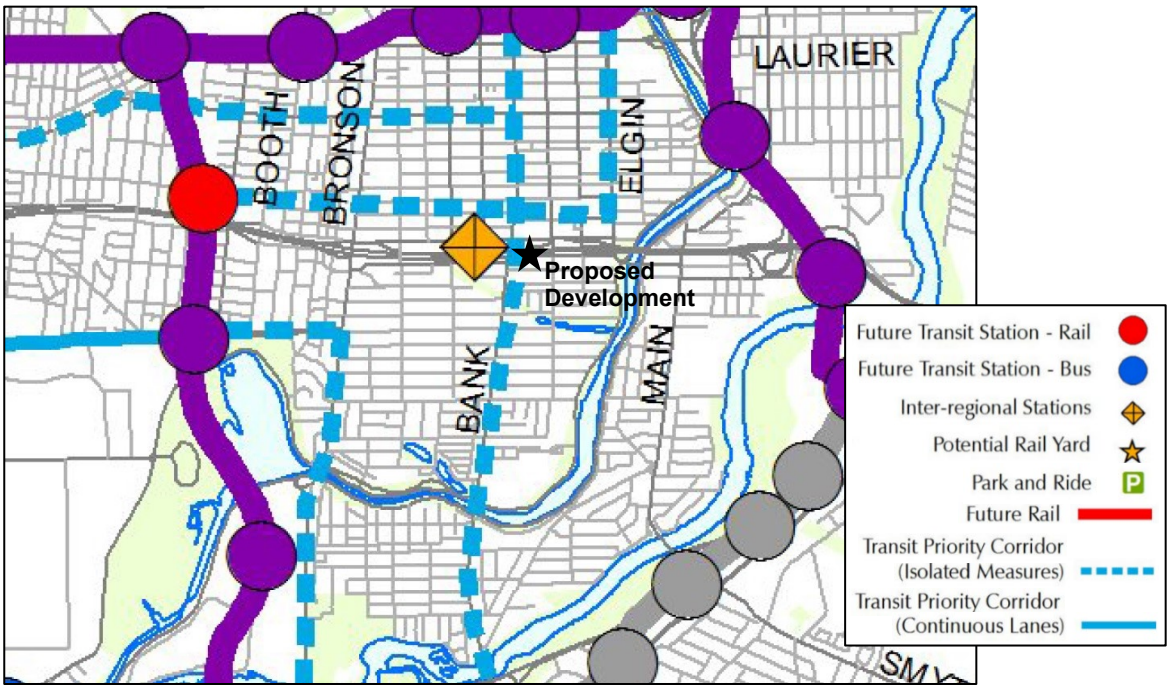
3.3.1.2 Future Transit Facilities and Services

The 2013 TMP indicates that the following future rapid transit or transit priority (RTTP) network modifications are proposed as part of the 'Affordable Network' that may have a significant impact on future travel demand within the vicinity of the proposed development:

- **Bank Street Transit Priority Corridor (Isolated Measures)**: Based on the TMP, transit signal priority measures are planned between Wellington Street and Billings Bridge Station. The TMP notes that the implementation of limited queue jump lanes are also a possibility at select intersections between Highway 417 and Billings Bridge Station. The overall objective of introducing these transit priority measures is to reduce travel times and improve reliability on OC Transpo's utilizing this section of the Bank Street.

Figure 3 illustrates the transit infrastructure projects in the vicinity of the proposed development that are part of the TMP's 2031 Affordable Network.

Figure 3 - Future 'Affordable RTTP Network Projects'



Source: 2013 Transportation Master Plan – Map 5 '2031 Affordable Network'

3.3.1.3 Future Cycling and Pedestrian Facilities

The 2013 Ottawa Cycling Plan (OCP) designates O'Connor Street and Metcalfe Street through the context area as 'Spine Routes', which form part of a system linking the commercial, employment, institutional, residential and educational nodes throughout the City, as shown in **Figure 4** below.

As discussed previously, segregated cycling facilities were implemented on O'Connor Street through the context area, in late 2016. The OCP also indicates that Bank Street is designated as a 'local route'.

As discussed previously, a functional design study is currently underway for the future redevelopment of Isabella Street using the Complete Streets methodology. Once implemented, this project is expected to significantly increase comfort and safety for pedestrians and cyclists,

including a multi-use path proposed along the site's frontage and the integration of 'protected intersection' elements into the three context area intersections including bicycle signals, cross-rides and two-stage left-turn bike boxes.

Figure 4 – Future Cycling Facilities within Context Area

Source: GeoOttawa

According to the *Bank Street in the Glebe: Height and Character Study* currently being undertaken by the City of Ottawa, a future mid-block pedestrian connection is proposed on the abutting lands to the east of the proposed development at 460 O'Connor Street, on the western portion of the site. This pedestrian connection will be constructed in coordination with the City through future development plans for that site.

The City of Ottawa has also recently initiated the design process for the reconstruction of Pretoria Avenue between Bank Street and Metcalfe Street. The reconfiguration of Pretoria Avenue will include a parking lane, a 4.0m vehicular lane and a 1.8m bike lane and will maintain its current westbound unidirectional flow.

3.3.2 Future Adjacent Developments

The City of Ottawa Transportation Impact Assessment (TIA) Guidelines specify that all significant developments proposed within the surrounding area which are likely to occur within the study's horizon year must be identified and taken into consideration in the development of future background traffic projections.

There are currently no known significant development applications within the context area that are either in the development application approval process, have already been approved and in pre-construction or are currently under construction.

3.3.3 Network Concept Screenline

A network screenline analysis is not expected to be necessary for this development, as it does not trigger the threshold prescribed by the TIA of 200 person-trips during the peak hour beyond what is otherwise permitted by zoning. Detailed trip generation will be provided in the Forecasting section of this report.

3.4 Study Area

With consideration of the information presented thus far, the following intersections have been identified as being most impacted by the proposed development and will be assessed for vehicular capacity as part of this study:

- Bank Street & Isabella Street/ Chamberlain Avenue
- Isabella Street & O'Connor Street/ Highway 417 EB Off-Ramp
- Isabella Street & Metcalfe Street/ Highway 417 EB On-Ramp

Beyond the bounds of the above-noted study area intersections, site-generated traffic impacts are expected to be minimal. Motorists have a variety of options to access the broader arterial road network surrounding the site, resulting in a dispersion of vehicular demand within the periphery of the context area. Furthermore, sustainable transportation modes are expected to represent a significant proportion of the overall site generation due to the proximity of this development to Ottawa's downtown core and Glebe communities. Both neighbourhoods are considered to be highly walkable and bikable.

Multi-Modal Level of Service (MMLOS) will be conducted for all intersections listed above under existing and future conditions, with the future Complete Streets redesign. As specified in the TIA Guidelines, however, since a Complete Street concept exists for the development's only boundary street (i.e. Isabella Street), segment-based MMLOS will not be required as part of this study.

3.5 Time Periods

As the proposed development will consist of primarily residential dwelling units with only a small commercial component, traffic generated during the weekday morning and afternoon peak hour is expected to result in the most significant impact to traffic operations on the adjacent road network in terms of combined development-generated and background traffic. These two time periods will therefore be considered for operational analysis in this study.

3.6 Study Horizon Year

Traffic analyses associated with TIA's typically involve a review of existing conditions, as well as the anticipated future conditions, both with and without the proposed development, at the opening year as well as five years beyond. Phased developments will often require interim analysis years to provide a timeline for any necessary transportation infrastructure improvements.

As the proposed development is expected to be fully built out and occupied in a single phase by 2025, the horizon year for this study will therefore be 2030.

3.7 Exemptions Review

The TIA Guidelines provide exemption considerations for elements of the Design Review and Network Impact components. **Table 3** summarizes the TIA modules that are not applicable to this study.

Table 3 - Exemptions Review

TIA MODULE	ELEMENT	EXEMPTION CONISDERATIONS	REQUIRED
DESIGN REVIEW COMPONENT			
4.1 Development Design	4.1.2 Circulation and Access	• Only required for site plans	✓
	4.1.3 New Street Networks	• Only required for plans of subdivision	✗
4.2 Parking	4.2.1 Parking Supply	• Only required for site plans	✓
	4.2.2 Spillover Parking	• Only required for site plans where parking supply is 15% below unconstrained demand	✗
NETWORK IMPACT COMPONENT			
4.5 Transportation Demand Management	All Elements	• Not required for site plans expected to have fewer than 60 employees and/or students on location at any given time	✓
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	• Only required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds	✗
4.8 Network Concept	n/a	• Only required when proposed development generates more than 200 person-trips during the peak hour in excess of the equivalent volume permitted by established zoning	✗

4 Forecasting

4.1 Development Generated Traffic

4.1.1 Trip Generation Methodology

Peak hour site-generated traffic volumes were developed using the 2009 TRANS Trip Generation Residential Trip Rates Study Report. The TRANS trip generation rates are based on a blended rate derived from 17 trip generation studies undertaken in 2008, the Institute of Transportation Engineers (ITE) Trip Generation Manual and the 2005 TRANS Origin-Destination (O-D) Travel Survey. Separate trip generation rates exist for each of the four general geographic areas in Ottawa: Core, Urban (Inside the Greenbelt), Suburban (Outside the Greenbelt) and Rural. These trip generation rates reflect existing travel behavior by dwelling type and geographic area. The TIA Guidelines recommend that the TRANS trip generation rates be converted to person-trips based on the vehicular mode share proportions detailed in the TRANS Trip Generation study.

Peak hour site-generated traffic volumes for the commercial component were developed using the ITE Trip Generation Manual (10th Edition). The TIA Guidelines indicate that vehicle-trip generation rates from the ITE Trip Generation Manual should be converted to person-trips through the application of a 1.28 vehicle-to-person-trip conversion factor.

Person-trips for both the residential and commercial components of the proposed development were then subdivided based on representative mode share percentages applicable to the study area to determine the number of auto driver, auto passenger, transit, pedestrian, cycling and 'other' trip types.

4.1.2 Trip Generation Results

4.1.2.1 Vehicle Trip Generation

Weekday peak hour vehicular traffic volumes associated with the residential portion of the proposed development were determined using the trip generation rates published in the TRANS Trip Generation report. The ground floor commercial component was determined using appropriate rates from the ITE Trip Generational Manual.

The base vehicular trip generation results for the proposed development have been summarized in **Table 4** below.

Table 4 - Base Vehicular Trip Generation Results

LAND USE	SIZE	PERIOD	GENERATED TRIPS (VPH)		
			IN	OUT	TOTAL
High-Rise Condominium (TRANS Study)	255 units	AM	18	48	66
		PM	30	21	51
Shopping Centre (ITE – 820)	355m^2	AM	2	1	3
		PM	7	8	15

Note: vph = Vehicles per hour; GLA = Gross Leasable Area

4.1.2.2 Person Trip Generation

For the residential land use, person-trip to vehicle-trip conversion factors for TRANS trip generation rates vary depending on the peak hour, geographic location and land use considered.

The base vehicular trip generation results from the previous section were divided by the vehicle mode shares to determine the number of person-trips generated. It should be noted that TRANS does not differentiate between 'apartment' and 'condominium' uses with respect to mode share.

For the commercial component, the base vehicular trip generation values were translated to person-trips through the use of a 1.28 vehicle-to-person-trip conversion factor, as prescribed in the TIA Guidelines.

The resulting number of person-trips have been summarized in **Table 5** below.

Table 5 - Person-Trip Generation

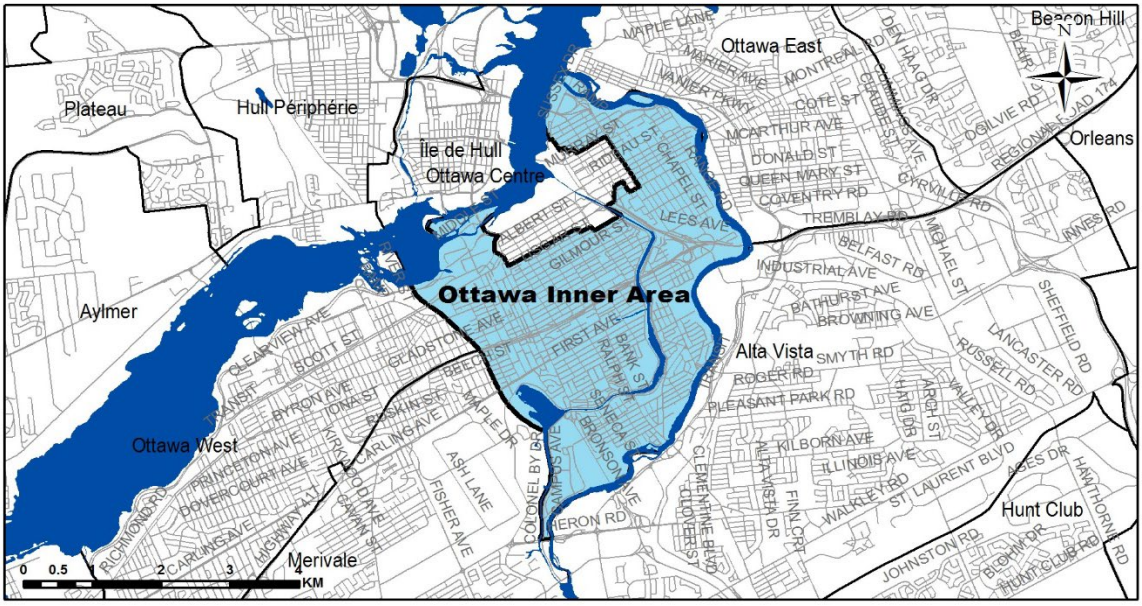
LAND USE	AUTO MODE SHARE OR CONVERSION FACTOR	PERIOD	PERSON TRIPS (PPH)		
			IN	OUT	TOTAL
Apartment/ Condominium	27%	AM	66	179	245
	23%	PM	129	93	222
Shopping Centre	1.28	AM	3	2	5
	1.28	PM	9	10	19

Notes: pph = persons per hour

4.1.2.3 Mode Share Proportions

The 2011 TRANS Origin-Destination (O-D) Survey provides approximations of the existing modal share within the Ottawa Inner Area Traffic Assessment Zone (TAZ). The extents of the Ottawa Inner Area Traffic Assessment Zone (TAZ) are illustrated in **Figure 5** below. Relevant extracts from the 2011 O-D Survey are provided in **Appendix F**.

Figure 5 – Ottawa Inner Area TAZ



Source: 2011 TRANS O-D Survey

The proposed weekday morning and afternoon mode share targets for the residential and commercial portions of the development were derived using a weighted averages of mode share distributions from the Ottawa Inner Area TAZ. The use of distinctive mode share distributions for

each component of the development is intended to capture the specific characteristics associated with each land use type. Given that the O-D Survey data indicates a substantial proportion of trips within the TAZ presently use sustainable modes, no alterations to these mode shares were applied.

The existing mode share and the mode share targets for the residential and commercial components of the proposed development are outlined below in **Table 6**, respectively.

Table 6 - Proposed Mode Share Targets

TRAVEL MODE	EXISTING MODE SHARE						MODE SHARE TARGETS	
	AM FROM	AM TO	AM WITHIN	PM FROM	PM TO	PM WITHIN	RESIDENTIAL[1]	COMMERCIAL[2]
Auto Driver	40%	41%	20%	45%	43%	21%	33%	21%
Auto Passenger	7%	9%	9%	11%	11%	8%	9%	8%
Transit	25%	41%	13%	33%	22%	10%	19%	11%
Cycling	6%	4%	8%	5%	6%	7%	7%	7%
Walking	19%	3%	44%	3%	16%	53%	30%	48%
Other	4%	2%	6%	2%	2%	2%	3%	4%

Notes:

[1] Assumed a weighted average of AM 'From', AM 'Within', PM 'To' and PM 'Within' from the 2011 TRANS O-D Survey, Ottawa Inner Area TAZ

[2] Assumed a weighted average of AM 'Within' and PM 'Within' from the 2011 TRANS O-D Survey, Ottawa Inner Area TAZ

4.1.2.4 Trip Reduction Factors

Deduction of Existing Development Trips

Not Applicable: The subject lands are currently undeveloped and do not generate any traffic.

Pass-by Traffic

Based on ITE Trip Generation Handbook (3rd Edition), approximately 66% of vehicular trips generated by the commercial component of the development are expected to be from pass-by traffic, or in other words, traffic that is already present on the adjacent roadway. As the commercial component of the development is not expected to generate a significant amount of traffic, the resulting volume of new commercial trips would be nominal.

Synergy/ Internalization

Synergy or internalization is typically applied to developments with two or more land uses to prevent double counting of trips with multiple intermediate destinations within the same site. With respect to this site, the interaction between the residential and commercial land uses as the primary trip purpose is not expected to be significant. As such, no internalization has been considered in the analysis.

4.1.2.5 Trip Generation by Mode

The mode share targets presented above were applied to the number of development-generated person-trips to establish the number of trips per travel mode, as summarized in **Table 7** below.

Table 7 – Peak Hour Person-Trips by Mode

MODE	AM PEAK HOUR			PM PEAK HOUR		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Auto Driver	23	60	83	45	33	78
Auto Passenger	6	16	22	12	9	21
Transit	13	33	46	25	18	43
Walking	21	55	76	43	33	76
Cycling	5	12	17	9	7	16
Other	2	6	8	4	3	7
Total	**70**	**182**	**252**	**138**	**103**	**241**

Based on the above, the proposed development is expected to generate up to 83 two-way vehicular trips and 46 two-way transit trips during the weekday peak hours.

4.1.3 Trip Distribution and Assignment

Route selection and weighting for the proposed development distribution was developed based on a review of travel patterns from Ottawa Inner Area Traffic Assessment Zone (TAZ), the configuration of the road network within the vicinity of the site and the concentration of employment nodes within adjacent TAZs. Consideration was also given to Google Maps travel times during peak hour conditions, as well as intersection-level turning movement counts at each study area intersection.

Distinct distributions are provided for inbound and outbound site-generated volumes in each cardinal direction, as there are numerous one-way arterial roads present within the study area.

Based on the above, distribution of site-generated traffic has been assumed will use the following primary routes:

35% to/from the North

- 100% to the North via Metcalfe Street
- 60% from the North via Bank Street
- 40% from the North via Bronson Avenue/ Chamberlain Avenue

20% to/from the South

- 50% to the South via Queen Elizabeth Drive
- 50% to the South on Main St. via Isabella Street, Hawthorne Avenue
- 60% from the South via Bank Street
- 40% from the South via Bronson Avenue/ Chamberlain Avenue

15% to/from the East

- 100% to the East via Highway 417/ Metcalfe On-Ramp
- 100% from the East via Catherine Street/ Bank Street, Highway 417

30% to/from the West

- 100% to the West via Metcalfe Street/ Highway 417 O'Connor On-Ramp
- 100% from the West via Chamberlain Avenue/ Highway 417 Bronson Off-Ramp

Utilizing the estimated number of new auto trips and applying the above distributions, future site-generated traffic volumes are illustrated for each of the study area intersections in **Exhibit 5** below.

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Transportation Impact Assessment

Exhibit 5:
Site-Generated Traffic

PROJECT No. 124875
DATE: September 2020
SCALE: N.T.S.

4.2 Background Network Traffic

4.2.1 Changes to the Background Transportation Network

To properly assess future traffic conditions, planned modifications to the transportation network that may impact travel patterns or demand within the study area have been considered. The Scoping section of this report reviewed the anticipated changes to the study area transportation network, including a review of the Transportation Master Plan (TMP).

As discussed previously, the background transportation network is expected to undergo significant changes that will integrate 'protected intersection' elements into all three study area intersections, as well as a multi-use path along the site's frontage on Isabella Street. According to City staff, these modifications are expected to be in place sometime between 2026 and 2029. Additionally, a new westbound bicycle lane is proposed on Pretoria Avenue between Metcalfe Street and Bank Street, however the implementation timing of this is not currently known.

4.2.2 General Background Growth Rates

The background growth rate is intended to represent regional growth from outside the study area that will travel along the adjacent road network. The arterial road network included in the study area is well connected to Highway 417 on and off-ramps both upstream and downstream of the site. The majority of regional growth experienced along this corridor is expected to be a result of trips to/from Highway 417. Based on a review of traffic data collected by the Ministry of Transportation (MTO) of Highway 417 within the study area, it is estimated that the arterial road network experiences a linear growth rate of 2% per year. As such, a linear 2% growth rate has been applied to through movements on arterial roads and all movements at arterial-to-arterial intersections, with the exception of Bank Street.

On well-established Traditional Mainstreets, such as Bank Street through Centretown and The Glebe, it is not uncommon for traffic volumes to experience very little growth or even decline. A high degree of commuter friction caused by frequent signalized intersections and high volumes of pedestrian traffic often results in commuter/through-traffic using alternative routes. It is therefore assumed that through movements on Bank Street will experience no growth in traffic volumes within the study area.

4.2.3 Other Area Development

As identified in the Scoping section of this TIA, there are presently no development applications of significance within the study area.

4.3 Demand Rationalization

The purpose of this section is to rationalize future travel demands within the study area to account for potential capacity limitations in the transportation network and its ability to effectively accommodate the additional demand generated by a new development.

4.3.1 Description of Capacity Issues

There has been little development activity within the context area of the subject site in recent years and therefore there are no records of documented capacity issues in the study area.

Based on the existing turning movement count data obtained for this study, there appears to be spare capacity on all arterial roads within the study area. It is generally accepted that the capacity of an arterial road is 800-1,000 vehicles per hour per lane (vphpl). A review of the existing (2020) traffic volumes presented in **Exhibit 4** above indicates that weekday morning and afternoon peak hour traffic volumes on Isabella Street are in the order of 900 vehicles per hour, which is well

below the capacity for the two lanes provided in the peak direction. Similarly, weekday peak hour traffic volumes on O'Connor and Metcalfe north of Isabella are in the order of 1,240 and 920 vehicles per hour distributed across three-lane cross-sections, respectively. Metcalfe Street and O'Connor Street are restricted to one-way vehicle traffic, entering and exiting Ottawa's downtown core, respectively. As such, Metcalfe Street experiences its weekday peak period in the morning, whereas O'Connor Street experiences its weekday peak period in the afternoon. Lastly, Bank Street presently experiences peak hour traffic volumes of up to 1,000 vehicles per hour spread across two lanes. Given the above, future background traffic demands and the addition of development-generated traffic are not expected to exceed the capacities of the existing road network. These above noted assumptions will be confirmed through intersection capacity analysis, which will be conducted as part of the Analysis component of this TIA.

4.3.2 Adjustment to Development-Generated Demands

Development-generated demands were determined based on travel patterns for the Ottawa Inner Area TAZ in the O-D Survey. No alternations were made to the mode share beyond the use of a blended rate, which considered both internal trips (i.e. within the TAZ), as well as inter-zonal trips.

Given the lack of documented capacity issues within the study area and the relatively low volume of site-generated traffic expected, no adjustments have been applied to development-generated traffic demand.

4.3.3 Adjustment to Background Network Demands

Similarly, recognizing the lack of documented capacity issues at any of the study area intersections and the unknown timeline for the implementation of network improvements on roads parallel to Highway 417 within the study area, no adjustments have been made to future background traffic volumes.

As prescribed in the TIA Guidelines, the effects of peak-hour spreading have been considered in in future analysis years of this study. It is anticipated that as traffic volumes continue to gradually increase, traffic volumes will have a natural tendency to be more evenly distributed across the peak hour (PHF = 1.0) and eventually increase demands in the shoulders of the peak as well. The impacts of peak hour spreading are accounted for in the Synchro modelling, completed as part of the Analysis component of this study.

4.4 Traffic Volume Summary

4.4.1 Future Background Traffic Volumes

Future background traffic volumes have been established by applying a linear background growth rate to the existing (2020) traffic volumes, as described in previous sections of this report.

Exhibit 6 and **Exhibit 7** present the future background traffic volumes anticipated for the 2025 and 2030 analysis years, respectively.

4.4.2 Future Total Traffic Volumes

Future total traffic volumes have been established by combining the site-generated traffic volumes with the future background traffic volumes.

Exhibit 8 and **Exhibit 9** present the future total traffic volumes anticipated for the 2025 and 2030 analysis years, respectively.

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Exhibit 6:
Future (2025)
Background Traffic

PROJECT No. 124875
DATE: September 2020
SCALE: N.T.S.

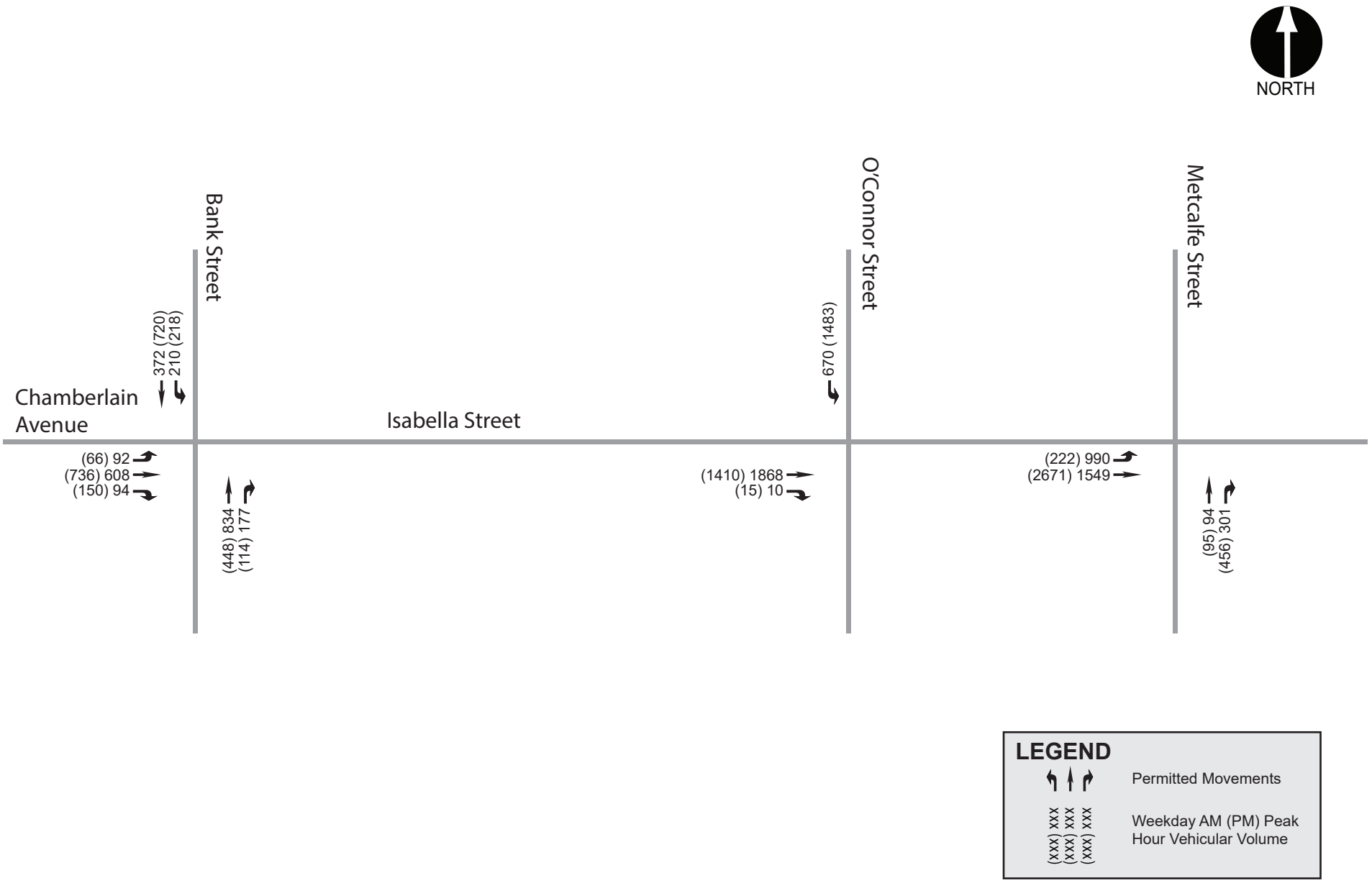

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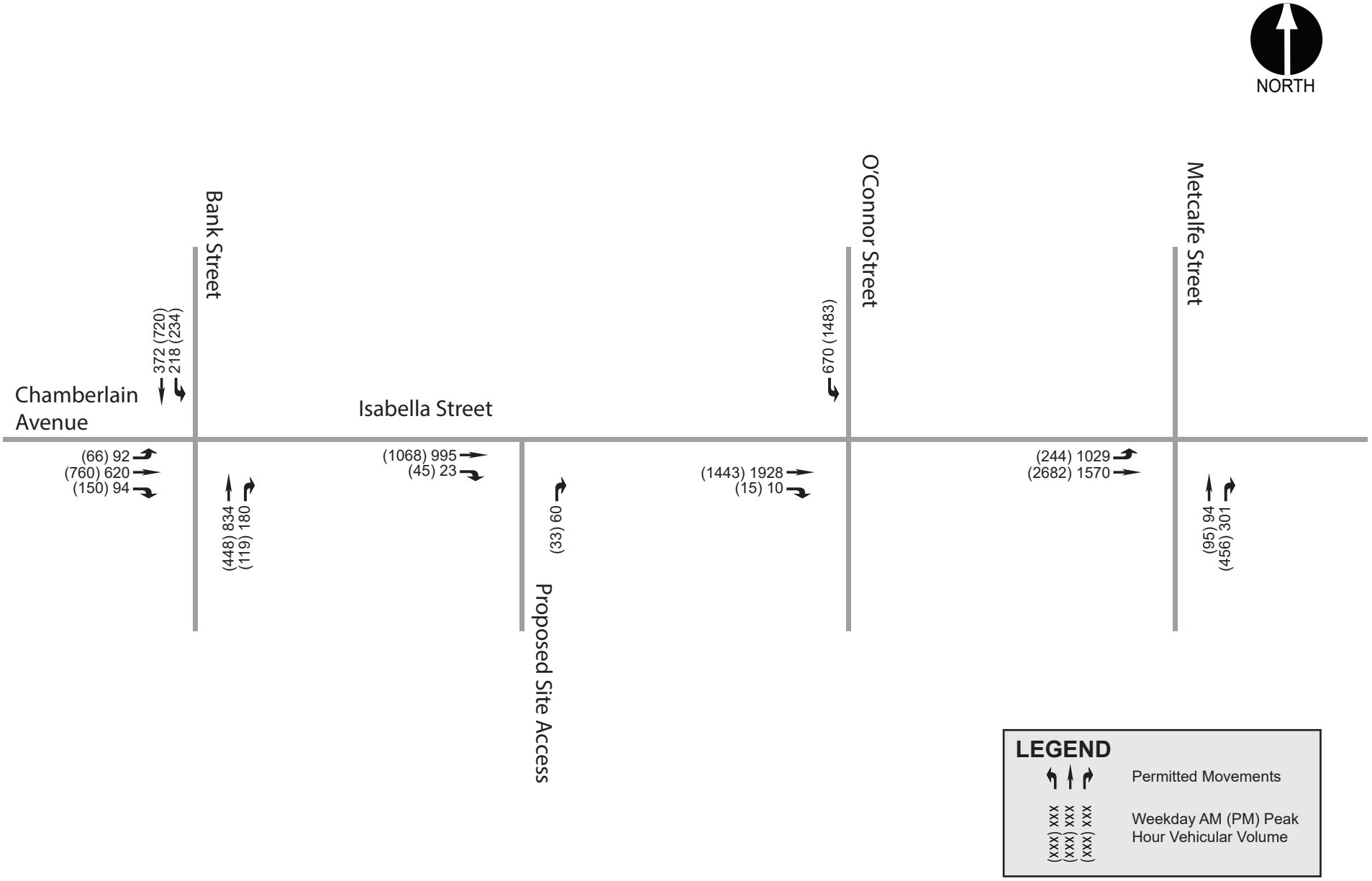
Exhibit 7:
Future (2030)
Background Traffic

PROJECT No. 124875
DATE: September 2020
SCALE: N.T.S.

178-200 Isabella Street
Transportation Impact Assessment

Exhibit 8:
Future (2025)
Total Traffic

PROJECT No. 124875
DATE: September 2020
SCALE: N.T.S.



178-200 Isabella Street
Transportation Impact Assessment

Exhibit 9:
Future (2030)
Total Traffic

PROJECT No. 124875
DATE: September 2020
SCALE: N.T.S.

5 Analysis

5.1 Development Design

5.1.1 Design for Sustainable Modes

For consistency with the City of Ottawa's Urban Design Guidelines and transportation policies, new developments shall provide safe and efficient access for all users, while creating an environment that encourages walking, cycling and transit use.

The study area is served by three transit routes, with the proposed development located entirely within the minimum-prescribed distance of 400m to public transportation.

This high-density mixed-use development is well suited in this context, given its close proximity to the highly walkable communities of The Glebe and Centretown. Both communities are bisected by Bank Street, a Traditional Mainstreet featuring a broad range of active and pedestrian-oriented uses at grade.

Building entrances associated with the residential and commercial land uses have been strategically located to provide convenient and direct access to the future multi-use path proposed along the site's frontage as part of the Isabella Street redesign. A future mid-block pedestrian connection between Isabella Street and Pretoria Avenue is also proposed immediately east of the subject lands and will help to further strengthen the network of active transportation facilities surrounding the site.

Short-term parking for pick-up/drop-off activity is located directly adjacent to the main building entrance, while access to the secure, indoor bicycle parking has also been integrated into the design of this development.

The above design and infrastructure elements contribute to a development that significantly reduces dependence on private automobile usage by integrating well with the existing and future sustainable transportation infrastructure planned adjacent to the site.

The TDM-Supportive Development Design and Infrastructure Checklist was completed and is provided in **Appendix G**. This checklist identifies specific measures that are being considered in association with the proposed development to offset the vehicular impact on the adjacent road network.

5.1.2 Circulation and Access

All site traffic will access the proposed development via a two-way private approach restricted to right-in/ right-out movements. Within the underground parking garage, all drive aisles will be 6.0 metres wide.

A designated loading and waste collection area is proposed adjacent to but segregated from the parking garage entrance. The waste collection area has been designed with sufficient width and height to accommodate a front-loading Garbage Truck. Garbage and recycling is collected in a single designated area located adjacent to the parking garage entrance, eliminating the need for these trucks to maneuver through the parking garage.

The vehicle turning templates for front- and rear-loading garbage trucks and medium single-unit trucks accessing the loading/ waste collection area are presented in **Appendix H.** Vehicle turning templates for passenger vehicles entering and exiting the underground parking garage have been provided as well.

5.1.3 New Street Networks

Not Applicable: The New Street Networks element is exempt from this TIA, as defined in the study scope. This element is not required for development applications involving site plans.

5.2 Parking

5.2.1 Total Parking Supply

Vehicle parking spaces for the proposed development will be housed within a four-level underground parking garage, along with a designated pick-up/drop-off area adjacent to the main entrance.

The Zoning By-law indicates that a total of 153 parking spaces, including 125 resident, 26 visitor and 3 spaces for commercial uses are required to accommodate the proposed development. These parking space rates were determined based on Area X in Schedule 1A of the Official Plan. A total of 176 vehicle parking spaces will be provided, including 148 resident, 26 visitor and 3 spaces for commercial uses, therefore the proposed parking supply is within the permissible range.

The Zoning By-law also indicates that the proposed development must provide at least 0.5 bicycle parking spaces per unit and at least 1 space for 500m^2 for the ground floor commercial land use. A total of 130 bicycle parking spaces will be provided, exceeding the 126 spaces required to support both the residential and commercial land uses within the proposed development.

5.2.2 Spillover Parking

The minimum parking supply requirements from the Zoning By-law have been met, therefore no further review of parking will be necessary for the purposes of this study.

5.3 Boundary Streets

5.3.1 Mobility

As discussed in the study scope, segment-based Multi-Modal Level of Service (MMLOS) is not required for this study, as a Complete Street concept plan exists for the development's only existing boundary street (i.e. Isabella Street).

The proposed development is being coordinated with City technical staff to ensure that sufficient right-of-way is protected for the future redesign of Isabella Street along the site's frontage. Further, the future multi-use path will be depressed and continuous across the site access driveway to minimize the impacts of the development on the Isabella Street design.

5.3.2 Road Safety

A summary of all reported collisions within the study period over the past five years was presented in the Scoping section of this TIA. The City requires a safety review if at least six collisions for any one movement or of a discernible pattern have occurred over a five-year period. Preliminary analysis identified some intersections and road segments of potential concern, therefore further review was conducted, as summarized below:

Bank Street & Isabella Street/ Chamberlain Avenue

In the past five years, there have been a total of 56 collisions reported at this intersection. This translates to 0.98 collisions per Million Vehicles Entering (MVE) which is considered within the normal operating threshold of 1.0.

A total of 3 collisions occurred at this intersection involved pedestrians, all of which occurred during dark conditions and involved vehicles turning from Bank Street onto Isabella Street, which suggests that improved lighting to increase visibility of vulnerable road users should be considered at this intersection. A 'sideswipe' collision involving a cyclist and a motorist occurred while both were travelling in the northbound direction during the weekday morning peak hour. This collision was considered minor in nature, resulting in 'property damage only' and likely occurred due to congested conditions on Bank Street.

The majority of collisions (33/56) observed at this intersection are classified as either 'sideswipe' or 'angle' collisions, both of which have been declining since 2016. In 2018, just 3 'sideswipe' and 'angle' collisions were observed. Further, most of these collision types can be considered minor, with the vast majority being reported as causing 'property damage only' (28/33). Just over half (17/33) collisions occurred during either peak hour traffic conditions or adverse weather/ pavement conditions.

'Protected intersection' elements have been proposed at this intersection, which is expected to help increase comfort and safety among vulnerable road users including pedestrians and cyclists, while also contributing to a further reduction in the frequency of 'sideswipe' and 'angle' collisions.

Isabella Street/ O'Connor Street/ Highway 417 EB Off-Ramp

In the past five years, there have been a total of 30 collisions reported at this intersection. This translates to 0.52 collisions per Million Vehicles Entering (MVE) which is within the normal operating threshold of 1.0.

Further review of the collision data indicates that there have been 11 'sideswipe' and 9 'rear end' collisions reported at this intersection, with the vast majority of these collisions reported as minor and resulting in 'property damage only' (17/20). Details of these collisions were reviewed to determine if there is any probable cause for these repeated events. Based on the collision data, a variety of environmental factors are likely contributing to an increased likelihood of these collisions types occurring at this intersection, with roughly 75% of collisions reported during unfavourable weather conditions, poor roadway conditions or under peak hour traffic conditions.

Isabella Street & Metcalfe Street/ Highway 417 EB On-Ramp

In the past five years, there have been a total of 72 collisions reported at this intersection. This translates to 1.04 collisions per Million Vehicles Entering (MVE) which is slightly above the normal operating threshold of 1.0.

Further review indicates that the majority of collisions which occurred at this intersection over the 5 year period were either 'sideswipe' or 'rear end' collisions (59/72). Nearly all of the 'sideswipe' collisions (39/40) were classified as 'property damage only'. More than half of these collisions (21/40) occurred during either weekday or Saturday peak period traffic conditions or under adverse weather conditions. Similarly, the majority of 'rear end' collisions (12/19) occurred during peak hour conditions or during unfavourable weather conditions or poor roadway conditions. Given that traffic volumes passing through this intersection during the weekday peak hours are typically in the order of 2,500 to 3,000 vehicles per hour, it is expected that a higher frequency of minor collisions such as rear end and sideswipe collisions would be observed. Furthermore, it is expected that the reconstruction of this intersection with 'protected intersection' elements will help to reduce the frequency of collisions by creating a safer operating environment for all road users.

Isabella Street – Bank Street to O'Connor Street

No significant collision patterns have been observed. Overall, the majority of the collisions appear to be weather-related or as a result of congested conditions during either the weekday morning or afternoon peak periods.

Isabella Street – O'Connor Street to Metcalfe Street

In the past 5 years, there were 6 'sideswipe' collisions reported at this intersection. All of these collisions were considered to be minor in nature, resulting in 'property damage only'.

5.4 Access Intersections

5.4.1 Location and Design of Access

The proposed development proposes a single two-way private approach on Isabella Street that will be restricted to right-in/ right-out movements. The proposed site access driveway is in conformance with the City of Ottawa Private Approach By-law 2003-447, with particular confirmation of the following items:

- Width: A private approach shall have a minimum width of 2.4m and a maximum width of 9.0m.
    - The site access driveway will be 6.0m wide. ✓
- Quantity and Spacing of Private Approaches: For sites with frontage between 46 and 150 metres, one (1) two-way and two (2) one-way, or two (2) two-way private approaches are permitted. Any two private approaches must be separated by at least 9.0m and can be reduced to 2.0m in the case of two one-way driveways. On lots that abut more than one roadway, these provisions apply to each frontage separately.
    - The frontage on Isabella Street is approximately 77 metres, therefore a single two-way private approach is compliant with the by-law. ✓
- Distance from Property Line: Private approaches must be at least 3.0m from the abutting property line, however this requirement can be reduced to 0.3m provided that the access is a safe distance from the access serving the adjacent property, sight lines are adequate and that it does not create a traffic hazard.
    - The private approach serving the development is approximately 6.2m from the property line. ✓
- Grade of Private Approach: The grade of a private approach serving a parking area of more than 50 spaces must not exceed 2% within the private property for a distance of 9m from the highway/curb line.
    - The grade of all three private approaches will not exceed 2% within 9m of the curb line. ✓

5.4.2 Access Intersection Control

It is expected that the site access driveway will operate acceptably as an unsignalized intersection.

5.4.3 Access Intersection Design (MMLOS)

Not Applicable – The proposed site access driveway will be unsignalized, therefore MMLOS analysis is not required.

5.5 Transportation Demand Management (TDM)

The City of Ottawa is committed to implementing Transportation Demand Management (TDM) measures on a City-wide basis in an effort to reduce automobile dependence, particularly during the weekday peak travel periods. TDM initiatives are aimed at encouraging individuals to use non-auto modes of travel during the peak periods.

5.5.1 Context for TDM

As discussed previously, the proposed development is located between two of Ottawa's most walkable neighbourhoods: The Glebe and Centretown. This development therefore aligns with the City's policy objectives, which encourages intensification within mature neighbourhoods through compact and high-density infill developments. The planned unit breakdown for the proposed development is as follows: 35.5% One-Bedroom, 27.9% One-Bedroom Plus Den, 5.2% Two-Bedroom, 31.5% Two-Bedroom Plus Den.

5.5.2 Need and Opportunity

With the planned Isabella Street reconstruction to accommodate enhanced active transportation facilities, including the introduction of a multi-use path along the site's frontage, there is an opportunity to increase the overall proportion of sustainable transportation trips within the surrounding community. As indicated through intersection capacity analyses (see Section 5.9), however, with no capacity issues expected at any study area intersections as a direct result of site-generated traffic, a more conservative approach was assumed in which site-generated trips would follow a blended mode share distribution from the 2011 O-D Survey. No alternations were made to the mode share distributions derived from the O-D Survey to account for future transportation-related infrastructure improvements.

5.5.3 TDM Program

The proposed development conforms to the City's TDM principles by providing convenient and direct connections to adjacent pedestrian, cycling and transit facilities, as well as numerous amenities on nearby Bank Street. A future mid-block pedestrian connection between Isabella Street and Pretoria Avenue is planned by the City immediately east of the site, which will allow the development to more seamlessly integrate within the existing urban fabric.

The City of Ottawa's TDM Measures Checklist was completed for the proposed development and is provided in **Appendix G**.

The following TDM Measures are being contemplated as part of this development:

- Conduct periodic travel surveys;
- Display local area active transportation maps at building entrances;
- Display relevant transit schedules and route maps at building entrances;
- Unbundle parking cost from purchase price of dwelling units; and
- Provide a multi-modal travel option information package to new residents.

5.6 Neighbourhood Traffic Management

5.6.1 Adjacent Neighbourhoods

Not Applicable – The Neighbourhood Traffic Management element is exempt from this TIA, as defined in the study scope. The proposed development will not rely on local or collector roads for access.

5.7 Transit

5.7.1 Route Capacity

The estimated Future (2030) total transit passenger demand within the study area was provided in Section 4.1.2.5. The results have been summarized in **Table 8** below.

Table 8 – 2030 Development Generated Transit Demand

PERIOD	PEAK PERIOD DEMAND	
	IN	OUT
AM	13	33
PM	25	18

As indicated above, site-generated two-way transit ridership volumes of up to 46 passengers are expected during the weekday morning and afternoon peak hours. With consideration that the study area is served by three all-day transit routes with average headways of 15 minutes during the peak hours, these transit trips are expected to be easily accommodated. As such, no additional transit capacity will be required to accommodate the proposed development.

5.7.1 Transit Priority Measures

Based on the above, the expected increase in transit ridership associated with the proposed development is not expected to trigger the need for any isolated transit priority measures within the study area to offset any transit delays.

5.8 Review of Network Concept

Not Applicable – The Network Concept element is exempt from this TIA, as defined in the study scope. This element is not required for proposed developments expected to generate less than 200 person-trips beyond what is otherwise permitted by zoning during the weekday morning and afternoon peak hours.

5.9 Intersection Design

The following sections summarize the methodology and results of the multi-modal intersection capacity analysis conducted within the study area:

5.9.1 Intersection Control

The following section evaluates the need to conduct traffic signal warrant analyses and roundabout analyses at any applicable study area intersections.

Traffic signal warrants and roundabout analyses for the proposed site access driveway was discussed previously in **Section 5.4**.

5.9.1.1 Traffic Signal Warrants

Not Applicable – All study area intersections are presently signalized and thus do not require traffic signal warrant analysis. As discussed previously, intersection capacity analyses presented in **Section 5.9.3** of this report indicates that the site access driveway is expected to operate at an acceptable level of service (i.e. LOS 'D' or better) with a stop-controlled configuration throughout the timeframe of this study. As such, no traffic signal warrant analysis is required for this study.

5.9.1.2 Roundabout Analysis

Not Applicable - As per the City's Roundabout Implementation Policy, intersections that satisfy any of the following criteria should be screened utilizing the Roundabout Initial Feasibility Screening Tool:

- At any new City intersection;

- Where traffic signals are warranted; or
- At intersections where capacity or safety problems are being experienced.

None of the study area intersections meet any of the above criteria, therefore no roundabout analysis is required for this study.

5.9.2 Intersection Analysis Criteria (Automobile)

The following section outlines the City of Ottawa's methodology for determining motor vehicle Level-of-Service (LOS) at signalized and unsignalized intersections.

5.9.2.1 Signalized Intersections

In qualitative terms, the Level of Service (LOS) defines operational conditions within a traffic stream and their perception by motorists. A LOS definition generally describes these conditions in terms of such factors as delay, speed and travel time, freedom to manoeuvre, traffic interruptions, safety, comfort and convenience. LOS can also be related to the ratio of the volume to capacity (v/c) which is simply the relationship of the traffic volume (either measured or forecast) to the capability of the intersection or road section to accommodate a given traffic volume. This capability varies depending on the factors described above. LOS are given letter designations from 'A' to 'F'. LOS 'A' represents the best operating conditions and LOS 'E' represents the level at which the intersection or an approach to the intersection is carrying the maximum traffic volume that can, practicably, be accommodated. LOS 'F' indicates that the intersection is operating beyond its theoretical capacity.

The City of Ottawa has developed criteria as part of the Transportation Impact Assessment Guidelines, which directly relate the volume to capacity (v/c) ratio of a signalized intersection to a LOS designation. These criteria are presented in **Table 9** as follows:

Table 9 - LOS Criteria for Signalized Intersections

LOS	VOLUME TO CAPACITY RATIO (v/c)
A	0 to 0.60
B	0.61 to 0.70
C	0.71 to 0.80
D	0.81 to 0.90
E	0.91 to 1.00
F	> 1.00

The intersection capacity analysis technique provides an indication of the LOS for each movement at the intersection under consideration and for the intersection as a whole. The overall v/c ratio for an intersection is defined as the sum of equivalent volumes for all critical movements at the intersection divided by the sum of capacities for all critical movements.

The Level of Service calculation is based on locally-specific parameters as described in the TIA Guidelines and incorporates existing signal timing plans obtained from the City of Ottawa. The analysis existing conditions utilized a Peak Hour Factor (PHF) of 0.90, while future conditions considers optimized signal timing plans and use of a Peak Hour Factor (PHF) of 1.0 to recognize peak spreading beyond a 15-minute period in congested conditions.

5.9.2.2 Unsignalized Intersections

The capacity of an unsignalized intersection can also be expressed in terms of the LOS it provides. For an unsignalized intersection, the Level of Service is defined in terms of the average movement delays at the intersection. This is defined as the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line; this includes the time required for a vehicle to travel from the last-in-queue position to the first-in-queue position. The average delay for any particular minor movement at the un-signalized intersection is a function of the capacity of the approach and the degree of saturation.

The Highway Capacity Manual 2010 (HCM), prepared by the Transportation Research Board, includes the following Levels of Service criteria for un-signalized intersections, related to average movement delays at the intersection, as indicated in **Table 10** below.

Table 10 - LOS Criteria for Unsignalized Intersections

LOS	DELAY (seconds)
A	<10
B	>10 and <15
C	>15 and <25
D	>25 and <35
E	>35 and <50
F	>50

The unsignalized intersection capacity analysis technique included in the HCM and used in the current study provides an indication of the Level of Service for each movement of the intersection under consideration. By this technique, the performance of the unsignalized intersection can be compared under varying traffic scenarios, using the Level of Service concept in a qualitative sense. One unsignalized intersection can be compared with another unsignalized intersection using this concept. Level of Service 'E' represents the capacity of the movement under consideration and generally, in large urban areas, Level of Service 'D' is considered to represent an acceptable operating condition. Level of Service 'E' is considered an acceptable operating condition for planning purposes for intersections located within Ottawa's Urban Core the downtown and its vicinity). Level of Service 'F' indicates that the movement is operating beyond its design capacity.

5.9.3 Intersection Capacity Analysis

Following the established intersection capacity analysis criteria described above, the existing and future conditions are analyzed during the weekday peak hour traffic volumes derived in this study.

The following section presents the results of the intersection capacity analysis. All tables summarize study area intersection LOS results during the weekday morning and afternoon peak hour periods.

The Synchro output files have been provided in **Appendix J**.

5.9.3.1 Existing (2020) Traffic

An intersection capacity analysis has been undertaken using the Existing (2020) Traffic volumes presented in **Exhibit 4. Table 11** summarizes the results of the intersection capacity analysis.

Table 11 - Intersection Capacity Analysis: Existing (2020) Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Bank & Isabella / Chamberlain	Signalized	B (0.64)	EBT (0.73)	C (0.78)	SBTL (0.81)
Isabella & O'Connor/ Highway 417 EB Off-Ramp	Signalized	D (0.81)	EBTR (0.81)	A (0.58)	EBTR (0.71)
Isabella & Metcalfe/ Highway 417 EB On-Ramp	Signalized	B (0.66)	NBR (0.83)	**E (0.93)**	**NBR (1.16)**

Based on the results of the analysis, all study area intersections are presently operating at an acceptable level of service (i.e. LOS 'D' or better) under existing traffic conditions, with the exception of Isabella & Metcalfe. This intersection is presently approaching its theoretical capacity (i.e. LOS 'E'), and is experiencing a v/c ratio of 1.16 on the critical northbound right-turn movement during the weekday afternoon peak hour.

5.9.3.2 Future (2025) Background Traffic

An intersection capacity analysis has been undertaken using the Future (2025) Background Traffic volumes presented in **Exhibit 6**, yielding the following results:

Table 12 - Intersection Capacity Analysis: Future (2025) Background Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Bank & Isabella/ Chamberlain	Signalized	A (0.59)	EBT (0.73)	C (0.73)	EBT (0.74)
Isabella & O'Connor/ Highway 417 EB Off-Ramp	Signalized	C (0.80)	EBTR (0.80)	A (0.58)	EBTR (0.71)
Isabella & Metcalfe/ Highway 417 EB On-Ramp	Signalized	B (0.64)	NBR (0.79)	D (0.90)	**NBR (1.04)**

Based on the results of the analysis, all study area intersections are expected to operate at an overall acceptable level of service (i.e. LOS 'D' or better) under Future (2025) Background Traffic conditions. The Isabella & Metcalfe intersection, however, will continue to exceed its theoretical capacity on the northbound right-turn movement, operating with a v/c ratio of 1.04, during the weekday peak hour. It shall be noted that any improved results over existing (2020) conditions are

a result of the 1.0 peak hour factor and the assumed distribution of demand equally over the entire hour.

5.9.3.3 Future (2030) Background Traffic

An intersection capacity analysis has been undertaken using the Future (2030) Background Traffic volumes presented in **Exhibit 7**, yielding the following results:

Table 13 - Intersection Capacity Analysis: 2030 Background Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Bank & Isabella / Chamberlain	Signalized	B (0.63)	EBT (0.73)	C (0.78)	EBT (0.78)
Isabella & O'Connor/ Highway 417 EB Off-Ramp	Signalized	D (0.87)	EBTR (0.87)	B (0.63)	EBTR (0.74)
Isabella & Metcalfe/ Highway 417 EB On-Ramp	Signalized	B (0.69)	NBR (0.80)	**E (0.97)**	**NBR (1.04)**

Based on the results of the analysis, all study area intersections are expected to operate at an overall acceptable level of service (i.e. LOS 'D' or better) under Future (2030) Background Traffic conditions, apart from Isabella & Metcalfe. This intersection is expected to approach its theoretical capacity (i.e. LOS 'E') and continue to exceed its theoretical capacity on the northbound right-turn movement during the weekday afternoon peak hour.

5.9.3.4 Future (2025) Total Traffic

An intersection capacity analysis has been undertaken using the Future (2025) Total Traffic volumes presented in **Exhibit 8**, yielding the following results:

Table 14 - Intersection Capacity Analysis: 2025 Total Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Bank & Isabella / Chamberlain	Signalized	A (0.60)	EBT (0.73)	C (0.76)	SBTL (0.76)
Isabella & O'Connor/ Highway 417 EB Off-Ramp	Signalized	D (0.82)	EBTR (0.82)	A (0.59)	EBTR (0.71)
Isabella & Metcalfe/ Highway 417 EB On-Ramp	Signalized	B (0.64)	NBR (0.80)	D (0.90)	**NBR (1.04)**
Isabella & Site Access	Unsignalized	B (12.4s)	NBR (12.4s)	B (12.5s)	NBR (12.5s)

Based on the results of the analysis, all study area intersections are expected to operate at an overall acceptable level of service (i.e. LOS 'D' or better) under Future (2025) Total Traffic conditions. The intersection of Isabella & Metcalfe will continue to experience a LOS 'F' on northbound right-turn movement during the weekday afternoon peak hour, however it should be noted that the inclusion of site-generated traffic volumes at each of the study area intersections results in a negligible impact on the overall intersection level of service and critical movements in comparison with Future (2025) Background Traffic conditions.

5.9.3.5 Future (2030) Total Traffic

An intersection capacity analysis has been undertaken using the Future (2030) Total Traffic volumes presented in **Exhibit 9**, yielding the following results:

Table 15 - Intersection Capacity Analysis: 2030 Total Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Bank & Isabella / Chamberlain	Signalized	B (0.63)	EBT (0.73)	C (0.80)	SBTL (0.81)
Isabella & O'Connor/ Highway 417 EB Off-Ramp	Signalized	D (0.90)	EBTR (0.90)	B (0.64)	EBTR (0.76)
Isabella & Metcalfe/ Highway 417 EB On-Ramp	Signalized	B (0.70)	NBR (0.80)	**E (0.97)**	**NBR (1.04)**
Isabella & Site Access	Unsignalized	B (12.9s)	NBR (12.9s)	B (13.1s)	NBR (13.1s)

Based on the results of the analysis, all study area intersections presently operate at an acceptable level of service (i.e. LOS 'D' or better) under Future (2030) Total Traffic conditions, apart from Isabella & Metcalfe. This intersection is expected to approach its theoretical capacity (LOS 'E'), experiencing a critical v/c ratio of 1.04 on the northbound right-turn during the weekday afternoon peak hour. The proposed development will not contribute any traffic volumes to this critical movement, and as such a comparison of the 2030 background and total traffic capacity results indicates a negligible difference in operating conditions with and without the inclusion of site-generated traffic.

5.9.4 Intersection Design (MMLOS)

5.9.4.1 Intersection MMLOS Methodology

Analysis criteria for each of the four non-auto modes are briefly described as follows:

Intersection Pedestrian Level of Service (PLOS)

The PLOS at intersections is based on several factors including the number of traffic lanes that pedestrians must cross, corner radii, and whether the crossing allows for permissive or protective right or left turns, among others. The City of Ottawa PLOS targets for the General Urban Area and a Traditional Mainstreet (i.e. Bank Street) are 'C' and 'B', respectively.

Intersection Bicycle Level of Service (BLOS)

The BLOS at intersections is dependent on several factors: the number of lanes that the cyclist is required to cross to make a left-turn; the presence of a dedicated right-turn lane on the approach; and the operating speed of each approach. The City BLOS target for spine routes in the General Urban Area (i.e. O'Connor and Metcalfe) and local routes on a Traditional Mainstreet is 'C'.

Intersection Transit Level of Service (TLOS)

Intersection TLOS is based on the average signal delay experienced by transit vehicles at each intersection. The City Target TLOS in the General Urban Area or on a Traditional Mainstreet is 'D'.

Intersection Truck Level of Service (TkLOS)

The Truck LOS (TkLOS) is based on the right-turn radii, as well as the number of receiving lanes for vehicles making a right-turn from the traffic lane being analysed. The City of Ottawa target for TkLOS is 'D' for truck routes. Right-turn movements at the intersections of Isabella Street with O'Connor and Metcalfe would involve the usage of local roads and non-truck routes. As such, it was deemed unnecessary to conduct TkLOS analysis for either location.

5.9.4.2 Intersection MMLOS Results

An analysis of the existing and future conditions for each mode has been conducted based on the methodology prescribed in the City of Ottawa Multi-Modal Level of Service (MMLOS) Guidelines. The Level of Service (LOS) for each mode has been calculated for each intersection where signals exist or are anticipated.

The intersection MMLOS results for Existing and Future conditions have been summarized in **Table 16** below.

Detailed intersection MMLOS analysis results are provided **Appendix F**.

Table 16 - Intersection MMLOS – Existing & Future Conditions

LOCATION	SCENARIO	LEVEL OF SERVICE BY MODE			
		PEDESTRIAN (PLOS)	BICYCLE (BLOS)	TRANSIT (TLOS)	TRUCK (TkLOS)
INTERSECTIONS					
Bank & Isabella / Chamberlain	Existing Conditions	**D** (Target: B)	**F** (Target: C)	**D** (Target: D)	**D** (Target: D)
	Future Conditions	**D** (Target: B)	**A** (Target: C)	**D** (Target: D)	**B** (Target: D)
Isabella & O'Connor/ Highway 417 EB Off-Ramp	Existing Conditions	**E** (Target: C)	**D** (Target: C)	**E** (Target: D)	N/A
	Future Conditions	**E** (Target: C)	**A** (Target: C)	**E** (Target: D)	N/A
Isabella & Metcalfe/ Highway 417 EB On-Ramp	Existing Conditions	**E** (Target: C)	**F** (Target: C)	**F** (Target: D)	N/A
	Future Conditions	**E** (Target: C)	**F** (Target: C)	**F** (Target: D)	N/A

5.9.4.3 Summary of Potential Improvements

Based on the MMLOS results outlined in **Table 16**, the following measures have been identified that could improve conditions for each travel mode:

Pedestrians

- The analysis indicates that all study area intersections are presently operating below their respective PLOS targets. These poor results are primarily associated with the short pedestrian walk times or the number of lanes required to cross the intersection. In

circumstances where the Pedestrian Delay Evaluation governs the intersection, there may be opportunities to adjust cycle lengths to improve the PLOS. The Isabella Street redesign includes enhancements to pedestrian crossing facilities including zebra-stripe high-visibility markings at each intersection, which will help to improve overall comfort and safety for these vulnerable road users.

Cyclists

- Based on the analysis, none of the study area intersections meet their respective BLOS targets under existing conditions, with all study area intersection presently experiencing a Level of Service 'F'. As part of the Isabella Street redesign, it is expected that two-stage left-turn bike boxes will be implemented at the intersections of Isabella/ Bank and Isabella/ O'Connor to help facilitate increased comfort and safety for cyclists, and allow the BLOS targets to be met at these intersections. Based on the Isabella Street functional design plans, the intersection of Isabella & Metcalfe, however, will continue to experience a poor BLOS, unless two-stage left-turn bike boxes or north-south cycling facilities on Metcalfe Street are implemented to reduce the level of traffic stress for cyclists making an eastbound left-turn. It is recognized, however, that O'Connor Street serves as the primary north-south cycling route and therefore such mitigation measures may not be appropriate at this intersection.

Automobile

- The vehicular Level of Service at all study area intersections is within the target of 'D', as summarized previously in Section 5.9.3.

Transit

- The results of the analysis indicate that the intersection of Bank & Isabella/ Chamberlain is meeting its TLOS target of 'D', while the remaining study area intersections are not achieving this target. The TLOS results remain unchanged under existing and future traffic conditions, indicating that any delays to transit service associated with the proposed development are expected to be negligible.

Truck

- The intersection of Bank & Isabella/ Chamberlain presently meets its respective TkLOS target of 'D'. All right-turn movements at the intersections of Isabella & O'Connor and Isabella & Metcalfe involve local roads, for which TkLOS is not applicable. As such, no TkLOS is provided for these two intersections.

The recommended measures listed above are intended only as suggestions to the City on how the MMLOS within the study area could be improved and do not identify measures to be implemented as a direct consequence of this development. The MMLOS analysis identifies existing deficiencies in the study area and are not expected to be exacerbated by the proposed development.

5.10 Geometric Review

The following section reviews all geometric requirements for the study area intersections.

5.10.1 Sight Distance and Corner Clearances

The proposed site access driveway is located on Isabella approximately 110 metres downstream of its intersection with Bank Street. This approximate location served as the site's former access and provides the maximum possible separation from Bank Street. Despite the presence of the downstream horizontal curve associated with the Bank Street intersection, sufficient visibility of approximately 90 metres is still provided at the proposed access, exceeding the 85m sightline

distance and the 70m corner clearance recommended in TAC. Intersection sight distance and corner clearances are therefore not expected to be a concern for the subject development's proposed site access driveway.

5.10.2 Auxiliary Lane Analysis

Auxiliary turning lane requirements for all intersections within the study area are described as follows:

5.10.2.1 Signalized Auxiliary Left-Turn Requirements

A review of auxiliary left-turn lane storage requirements was completed at all signalized intersections within the study area under Future (2030) Total Traffic conditions. The review compared the projected 95th percentile queue lengths from Synchro operational results, and the standard queue length calculation based on the following equation:

$$Storage\ Length = \frac{NL}{C} \times 1.5$$

Where:
N = number of vehicles per hour
L = Length occupied by a vehicle in the queue = 7 m
C = number of traffic signal cycles per hour

The results of the auxiliary left-turn lane analysis are summarized below in **Table 17**.

Table 17 - Auxiliary Left-Turn Storage Analysis at Signalized Intersections

INTERSECTION	APPROACH	95TH %ILE QUEUE LENGTH / CALCULATED QUEUE (M)		EXISTING PARALLEL LANE LENGTH (M)	STORAGE DEFICIENCY (M)
		AM PEAK HR	PM PEAK HR		
Isabella & Metcalfe/ Hwy 417 On-Ramp	EB	m150.1 / 300.1	m26.0 / 71.2	- [1]	-

Notes:
1. Two through lanes transition to a dedicated left-turn lane and a shared through-left lane

Based on the results of the left-turn lane analysis presented in **Table 17** above and confirmed through intersection capacity analysis, no storage deficiencies are anticipated under Future (2030) Total traffic conditions.

5.10.2.2 Unsignalized Auxiliary Right-Turn Lane Requirements

The Transportation Association of Canada (TAC) suggests that auxiliary right-turn lanes be considered "when the volume of decelerating or accelerating vehicles compared with through vehicles causes undue hazard." Consideration for auxiliary right-turn lanes is typically given when the right-turning traffic exceeds 10% of the through volume and is at least 60 vehicles per hour.

Peak hour volumes at the proposed site access driveway are not expected to exceed these thresholds under Future (2030) Total Traffic conditions, therefore a right turn lane is not necessary to accommodate site-generated traffic. All other study area intersections are presently signalized. As such, these intersections are exempt from this analysis.

5.10.2.3 Signalized Auxiliary Right-Turn Lane Requirements

Similarly for signalized intersections, Section 9.14 of TAC suggests that auxiliary right-turn lanes shall be considered when more than 10% of vehicles on an approach are turning right and when the peak hour demand exceeds 60 vehicles. The purpose of this guideline is to mitigate operational impacts to through-traffic, particularly on high-speed arterial roadways, and may not be applicable in all circumstances.

The results of the auxiliary right-turn lane analysis are summarized below in **Table 18** below:

Table 18 – Auxiliary Right-Turn Lane Storage Analysis at Signalized Intersections

INTERSECTION	APPROACH	NUMBER OF RIGHT-TURNS / % RIGHT-TURNS		95TH %ILE QUEUE (M) AM/ PM	EXISTING PARALLEL LANE LENGTH (M)	STORAGE DEFICIENCY (M)
		AM PEAK HOUR	PM PEAK HOUR			
Bank & Chamberlain/ Isabella	EB	94 / 12%	150 / 15%	8.3 / 14.4	30	-
	NB	180 / 18%	119 / 21%	- [1]	-	-
Isabella & O'Connor/ Hwy 417 Off-Ramp	EB	10 / 1%	15 / 1%	- [1]	-	-
Isabella & Metcalfe/ Hwy 417 On-Ramp	NB	301 / 76%	456 / 83%	67.7 / #152.0	- [2]	-

Notes:
1. Synchro queue length results reported with shared through-right configuration
2. Through lane transitions to dedicated right-turn lane

Based on the results of the right-turn lane analysis presented in **Table 18** above and confirmed through intersection capacity analysis, no storage deficiencies are anticipated at any of the study area intersections under 2030 total traffic projections. Although a northbound right-turn lane is warranted at the intersection of Bank Street & Chamberlain Avenue / Isabella Street, the intersection capacity analysis indicates that it is not operationally required.

5.11 Summary of Improvements Indicated and Modification Options

Based on the intersection capacity, auxiliary lane and Multi-Modal Level of Service analysis results presented above, no off-site improvements to the adjacent road network are required as a direct consequence of the proposed development in order to accommodate multi-modal transportation demands generated by the site.

As indicated by the capacity analyses undertaken for this study, all three study area intersections and the proposed site access intersection are shown to operate at acceptable levels of service (i.e. LOS 'D' or better) during the weekday morning and afternoon peak hours under 2025 traffic conditions with and without the inclusion of site-generated traffic. By the 2030 study horizon year, the intersection of Isabella & Metcalfe may approach its theoretical capacity and operate at an overall LOS 'E' during the weekday afternoon peak hour, however this is expected to be primarily due to an existing heavy northbound right-turn movement, as well as growth in background traffic and not as a direct consequence of site-generated traffic.

The results of the queuing analyses indicated that no additional auxiliary lanes are required at any of the study area intersections to accommodate future background or total traffic volumes beyond the 2030 study horizon year. It is possible, however, that the northbound right-turn movement at the intersection of Isabella & Metcalfe may occasionally spillback further south of Pretoria Avenue. This represents an existing issue and the proposed development is not expected to contribute additional traffic to this critical movement. It is recommended that the City monitor this heavy movement to help mitigate any potential impacts to the residential community to the south.

The MMLOS analysis indicated existing deficiencies with respect to user comfort that could be considered for implementation by the City but are not required to safely accommodate the proposed development.

The Safety Review conducted as part of this study helped to highlight the intersection of Isabella & Metcalfe/ Highway 417 EB On-Ramp as having a relatively high crash rate, experiencing 72 collisions over the 5-year period and a million-vehicle entering (MVE) value of 1.04. Upon further review of the collision data, however, it was evident that nearly all collisions were minor in nature and most could be categorized as ‘rear end’ or ‘sideswipe’ collisions that resulted in property damage only. Given that traffic volumes passing through this intersection during the weekday peak hours are typically in the order of 2,500 to 3,000 vehicles per hour, it is expected that a higher frequency of minor collisions such as rear end and sideswipe collisions would be observed. Furthermore, it is expected that the reconstruction of this intersection with ‘protected intersection’ elements will help to reduce the frequency of collisions by creating a safer operating environment for all road users.

6 Conclusion

The proposed mixed-use residential development at 178-200 Isabella Street is expected to generate up to 250 and 241 two-way person-trips during the weekday morning and afternoon peak hours, respectively. Travel demand was stratified by mode share from the Ottawa Inner Area Traffic Assessment Zone (TAZ) in the O-D Survey and divided amongst the numerous logical routes, based on the configuration of the adjacent regional road network. No alternations were made to the mode share for either the residential or commercial land uses beyond applying blended rates, which considered both internal trips (i.e. within the TAZ), as well as inter-zonal trips. The resulting two-way vehicular trip generation is, therefore, 83 and 78 vehicles per hour during the weekday morning and afternoon peak hours, respectively.

A Functional Design Study has been undertaken for the downtown streets that parallel the Queensway, including Isabella Street within the study area. This study is now in its final stages and proposes significant improvements for active transportation users, including the replacement of the existing sidewalk on the south side of Isabella Street with a multi-use path, as well as the implementation of 'protected intersection' elements at all three study area intersections. The proposed development is being coordinated with City technical staff to ensure that sufficient right-of-way is protected for the future redesign of Isabella Street along the site's frontage.

A multi-modal analysis of each study area intersection identified deficiencies in the existing road network and potential remediation measures have been suggested in which the City could consider to meet the prescribed targets. These remediation measures would improve mobility and comfort for all transportation modes but are not required to safely accommodate the proposed development.

Based on the analysis conducted for this study, all three study area intersections and the proposed site access intersection are expected to operate at acceptable levels of service (i.e. LOS 'D' or better) during the weekday peak hours under 2025 background and total traffic conditions. By the 2030 study horizon year, the intersection of Isabella & Metcalfe may approach its theoretical capacity and operate at an overall LOS 'E' during the weekday afternoon peak hour, however this is expected to be primarily due to an existing heavy northbound right-turn movement, as well as growth in background traffic and not as a direct consequence of site-generated traffic.

The results of the queuing analyses indicate that no additional auxiliary lanes are required at any of the study area intersections to accommodate future background or total traffic volumes beyond the 2030 study horizon year. It is possible, however, that the northbound right-turn movement at the intersection of Isabella & Metcalfe may occasionally spillback further south of Pretoria Avenue. This represents an existing issue and the proposed development is not expected to contribute additional traffic to this critical movement. It is recommended that the City monitor this heavy movement to help mitigate any potential impacts to the residential community to the south.

Site-generated traffic volumes are expected to minimally impact the adjacent road network, including critical movements at the study area intersections. As such, a post-development monitoring plan is not a requirement of this study. Further, the analysis indicates that no off-site intersection improvements are required as a direct consequence of the proposed development, therefore an RMA will not be conducted for this study. It is expected that the Isabella Street redesign will be undertaken within the timeframe of this study, however the renewal of this corridor is not required to safely accommodate the proposed development.

Based on the findings of this study, it is the overall opinion of IBI Group that the proposed development will integrate well with and can be safely accommodated by the adjacent transportation network.

Appendix A – City Circulation Comments

Step 2 Submission (Scoping) – Circulation Comments & Response

Report Submitted: June 30, 2020
Comments Received: July 10, 2020
Transportation Project Manager: Neeti Paudel

Transportation

For the study area, please include the Bank and Catherine intersection. Traffic coming west bound from the highway will likely make a left here to access the development. So, traffic from the development will be assigned to WBL movement at this intersection.

- **Based on a logical distribution of site-generated traffic and stratification by mode share from the Ottawa Inner TAZ, the proposed development is expected to contribute at most 10 vehicle trips to the westbound left-turn movement at the intersection of Bank/ Catherine during the weekday peak hours. The overall impacts to the Bank/ Catherine intersection are therefore expected to be negligible and it is considered by IBI Group unnecessary to include this intersection in the scope of this TIA.**

Step 3 Submission (Forecasting) – Circulation Comments & Response

Report Submitted: August 12, 2020
Comments Received: August 21, 2020
Transportation Project Manager: Neeti Paudel

Transportation Engineering Services

Section 4.1.3 Trip Distribution and Assignment

Ensure that Table 7 values are reflected in Exhibits 5, 8 and 9 at the access.

- **IBI Response: Exhibits 5, 8 and 9 have been updated to reflect the corresponding values in Table 7.**

In the future, consult with Tim Wei (tim.wei@ottawa.ca) to obtain a snapshot of the Long-Range Transportation Model in order to help inform the background growth rate for subject developments.

- **IBI Response: Acknowledged.**

The study area intersections should be reviewed to ensure that they are operating appropriately under existing and future conditions for all modes, as well as, to determine if the site generated person trips impact the intersections. See Module 4.9 in the TIA Guidelines for further details.

- **IBI Response: Acknowledged. Multi-modal level of service (MMLOS) results for each study area intersection are included in Section 5.9 of this TIA report.**

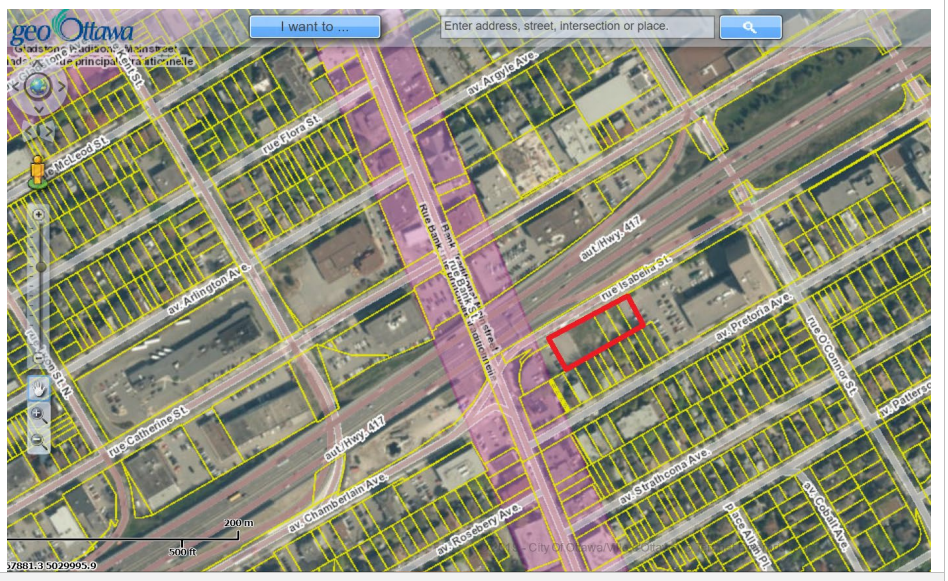
Traffic Signal Operations

No comments.

Appendix B – Screening Form

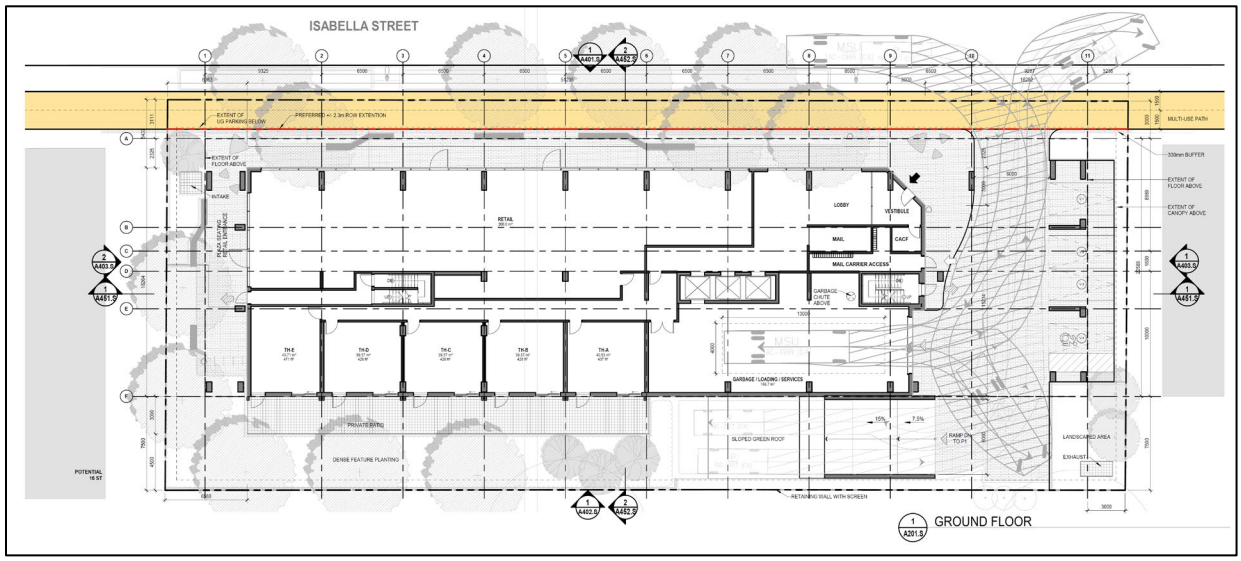
City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Municipal Address	178-200 Isabella Street
Description of Location	South of Highway 417 on Isabella Street between Bank Street and O'Connor Street 
Land Use Classification	16-storey mixed-use building
Development Size (units)	251 units
Development Size (m^2)	355m^2 ground-floor commercial
Number of Accesses and Locations	One (1) right-in/right-out access on Isabella Street
Phase of Development	Single Phase
Buildout Year	2025

If available, please attach a sketch of the development or site plan to this form.

Proposed Development:



2. Trip Generation Trigger

Considering the Development's Land Use type and Size (as filled out in the previous section), please refer to the Trip Generation Trigger checks below.

Land Use Type	Minimum Development Size
Single-family homes	40 units
Townhomes or apartments	90 units ✓
Office	3,500 m^2
Industrial	5,000 m^2
Fast-food restaurant or coffee shop	100 m^2
Destination retail	1,000 m^2
Gas station or convenience market	75 m^2

** If the development has a land use type other than what is presented in the table above, estimates of person-trip generation may be made based on average trip generation characteristics represented in the current edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual.*

Based on the results above, the Trip Generation Trigger is satisfied.

3. Location Triggers

	Yes	No
Does the development propose a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine Bicycle Networks?		✓
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?*		✓

**DPA and TOD are identified in the City of Ottawa Official Plan (DPA in Section 2.5.1 and Schedules A and B; TOD in Annex 6). See Chapter 4 for a list of City of Ottawa Planning and Engineering documents that support the completion of TIA).*

Based on the results above, the Location Trigger is <u>not</u> satisfied.

4. Safety Triggers

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

Based on the results above, the Safety Trigger is satisfied.

5. Summary

	Yes	No
Does the development satisfy the Trip Generation Trigger?	✓	
Does the development satisfy the Location Trigger?		✓
Does the development satisfy the Safety Trigger?	✓	

CONCLUSION: As one or more of the above triggers has been satisfied, a TIA will be required.

Appendix C – Traffic Count Data

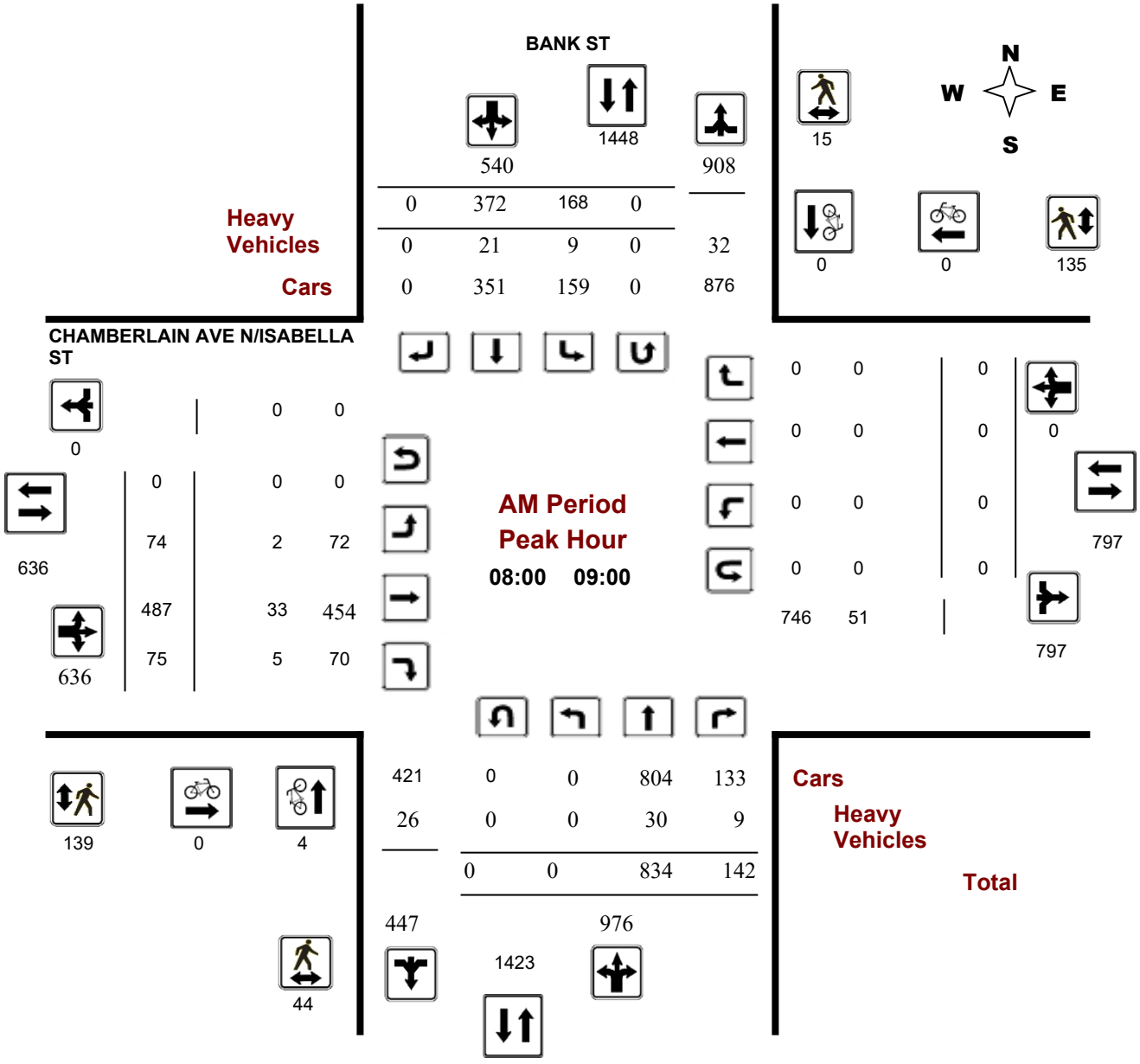
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 39632

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



Comments W.O. 5365004 - WED APR 18TH - CONSULTANT - (8HR REIMPORT)

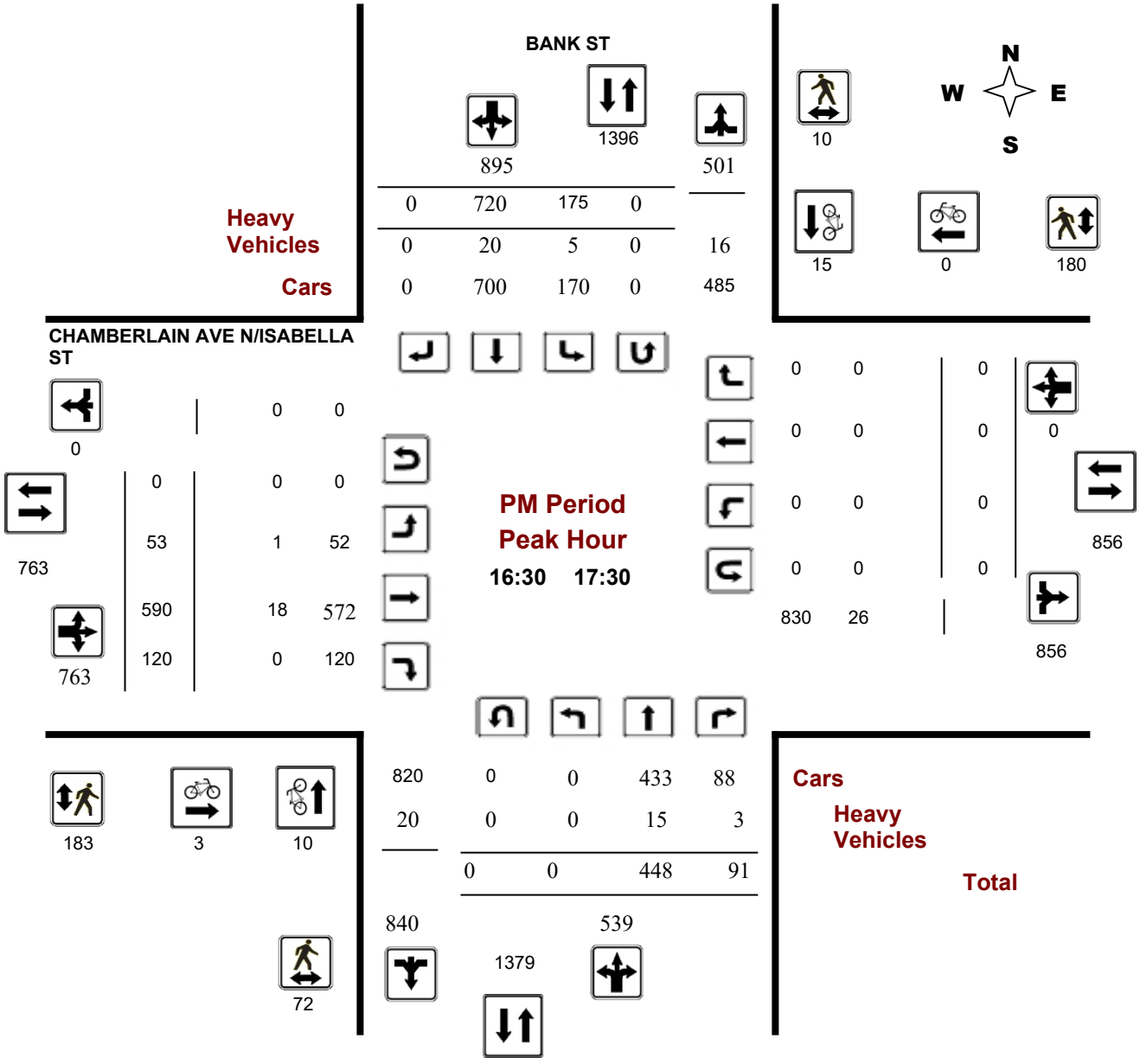
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 39632

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



Comments W.O. 5365004 - WED APR 18TH - CONSULTANT - (8HR REIMPORT)

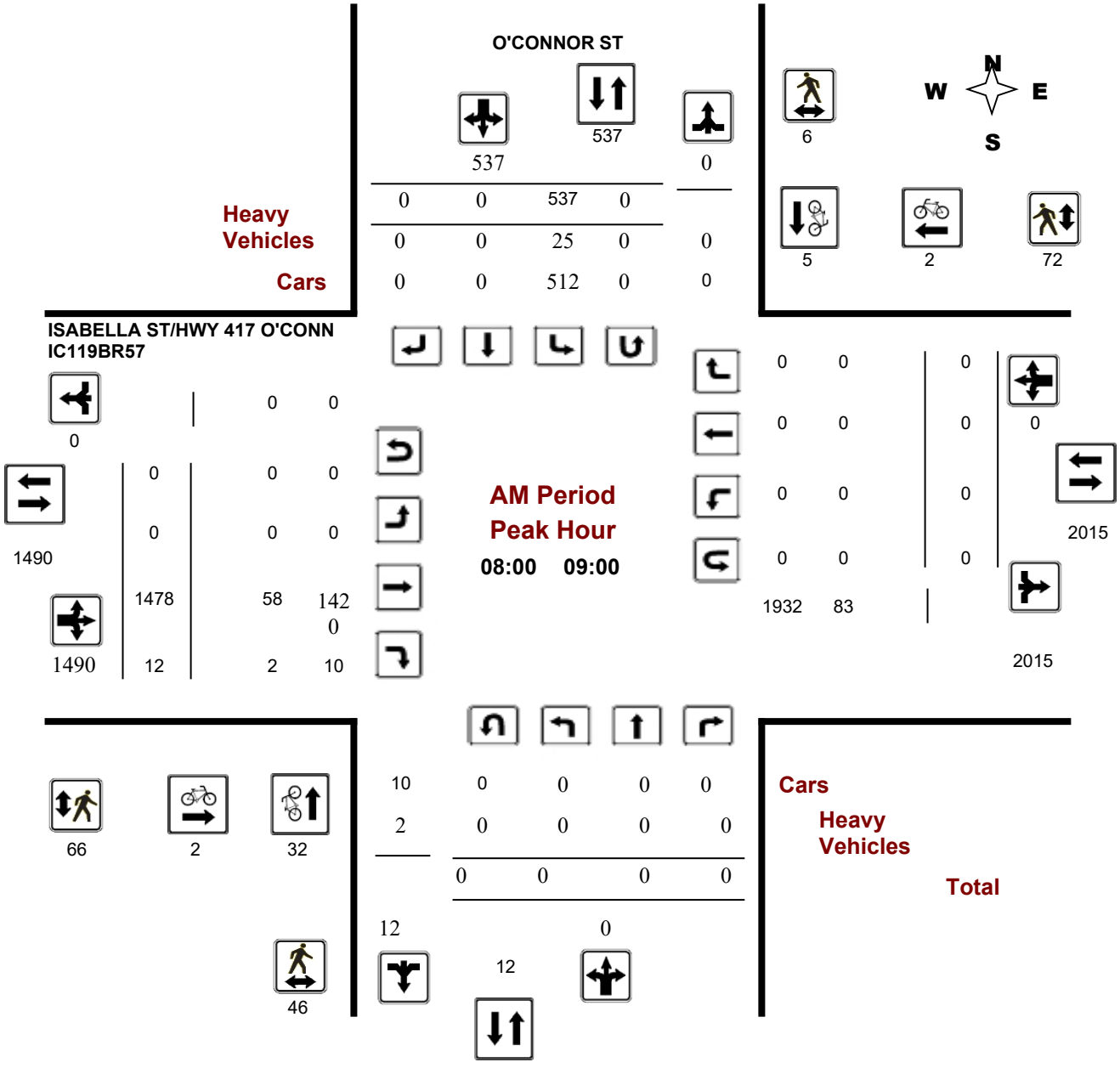
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

ISABELLA ST/HWY 417 O'CONN IC119BR57 @ O'CONNO

Survey Date: Wednesday, April 18, 2018 **WO No:** 39633

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



Comments W.O. 5365004 - WED APR 18TH - CONSULTANT - 8HR REIMPORT

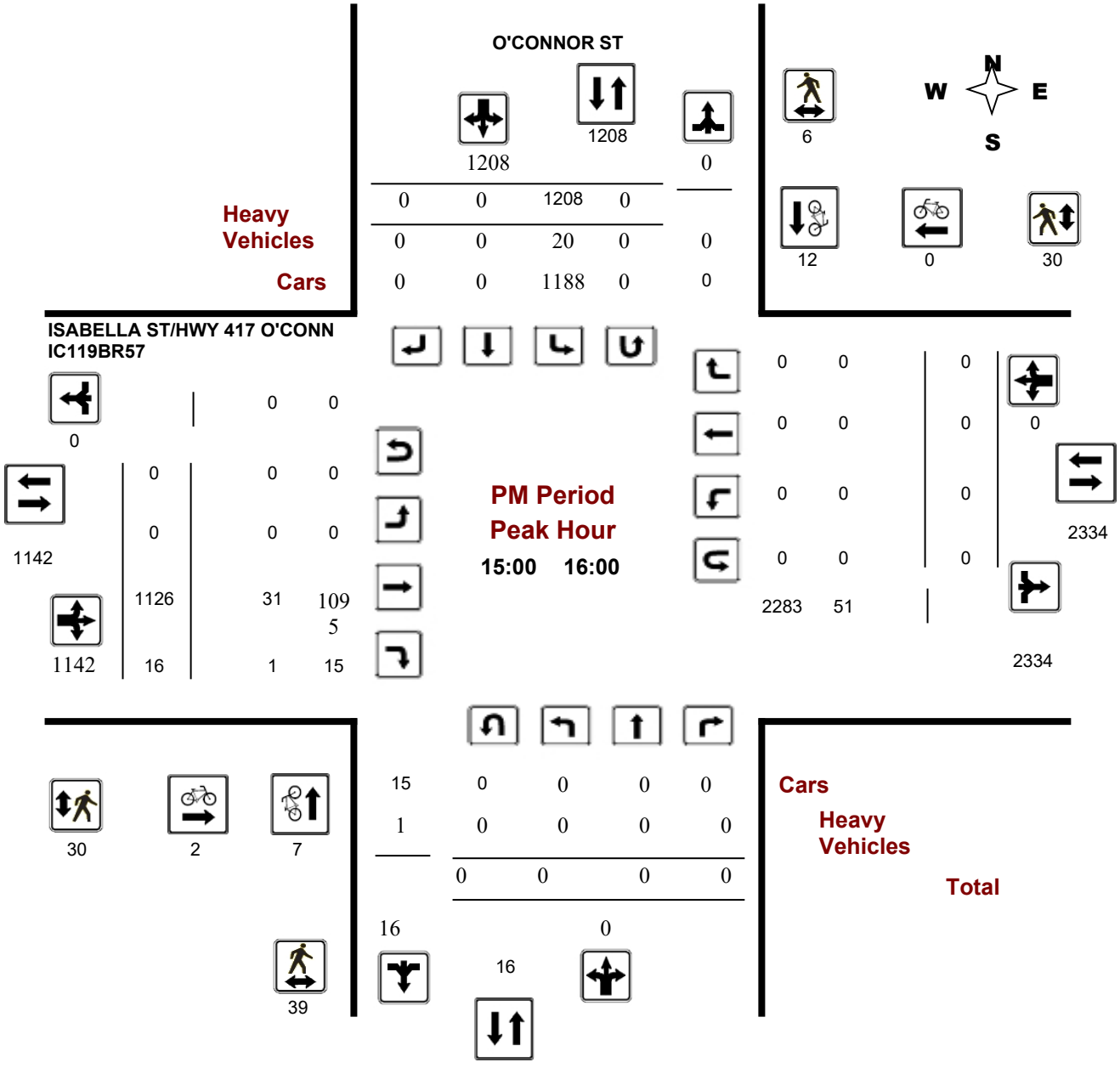
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

ISABELLA ST/HWY 417 O'CONN IC119BR57 @ O'CONNO

Survey Date: Wednesday, April 18, 2018 **WO No:** 39633

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



Comments W.O. 5365004 - WED APR 18TH - CONSULTANT - 8HR REIMPORT

Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

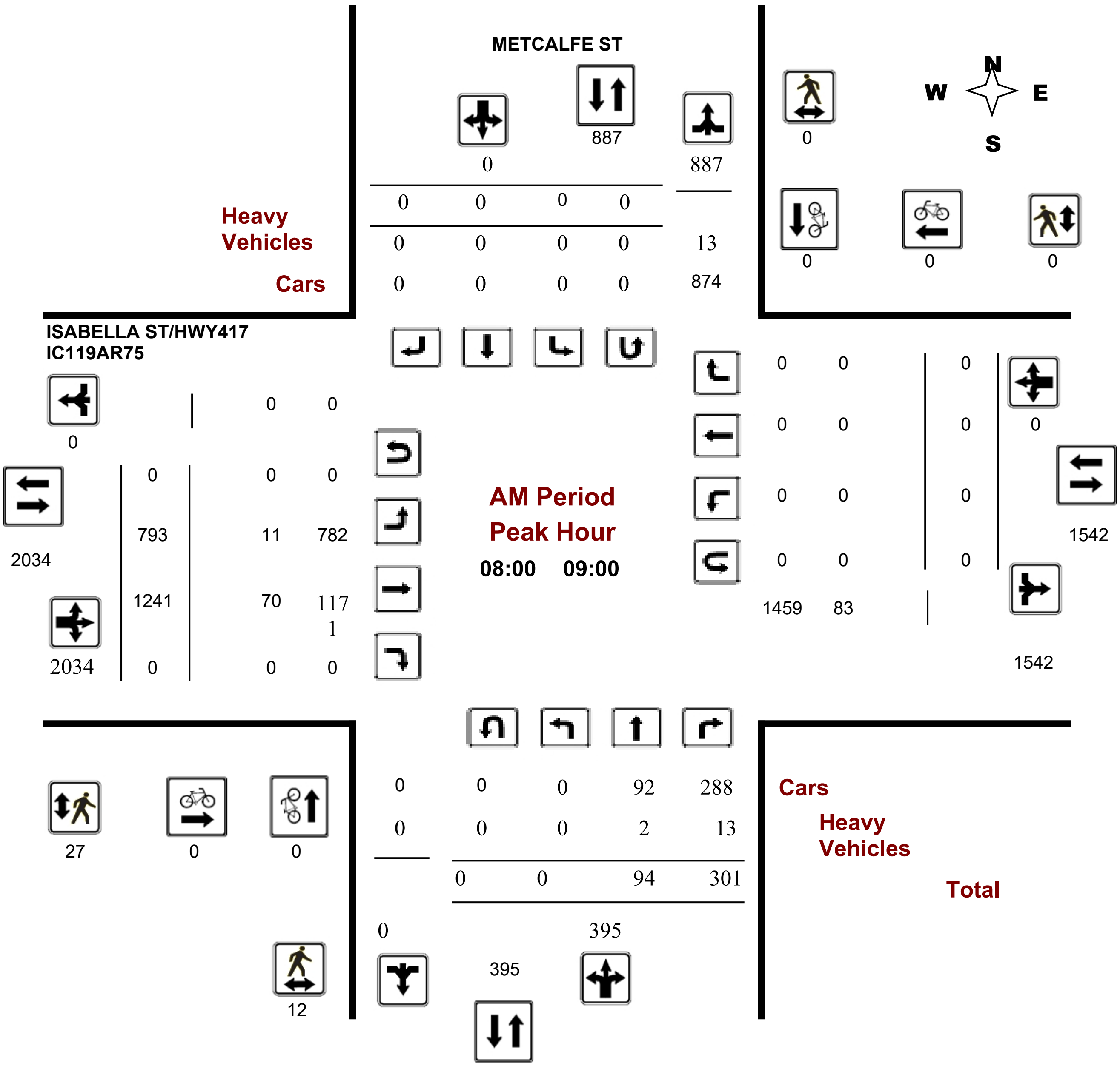
ISABELLA ST/HWY417 IC119AR75 @ METCALFE ST

Survey Date: Wednesday, April 18, 2018

Start Time: 07:00

WO No: 39634

Device: Miovision



Comments W.O. 5365004 - WED APR 18TH - CONSULTANT - 8HR REIMPORT

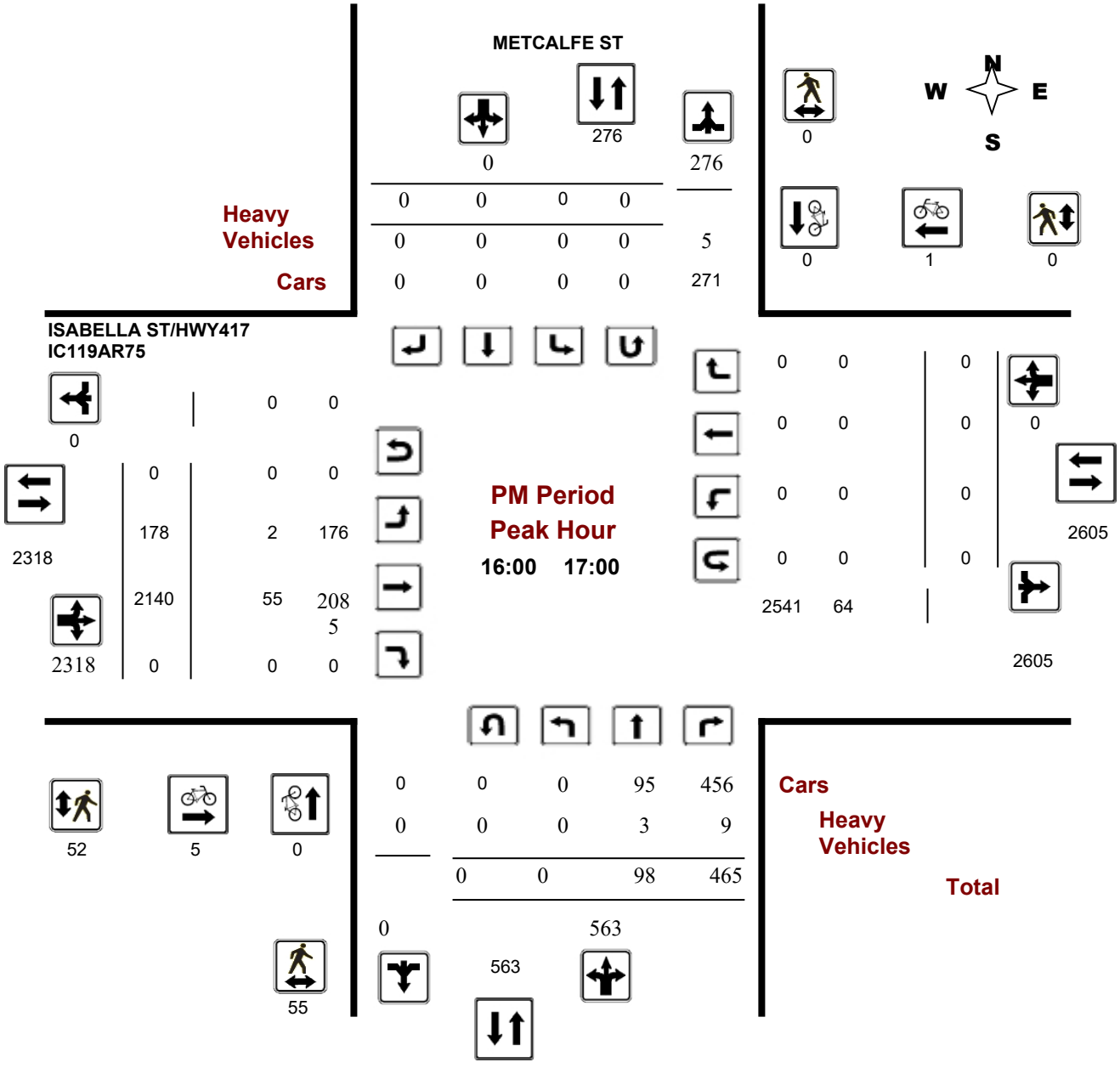
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

ISABELLA ST/HWY417 IC119AR75 @ METCALFE ST

Survey Date: Wednesday, April 18, 2018 **WO No:** 39634

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



Comments W.O. 5365004 - WED APR 18TH - CONSULTANT - 8HR REIMPORT

Appendix D – OC Transpo Routes

6

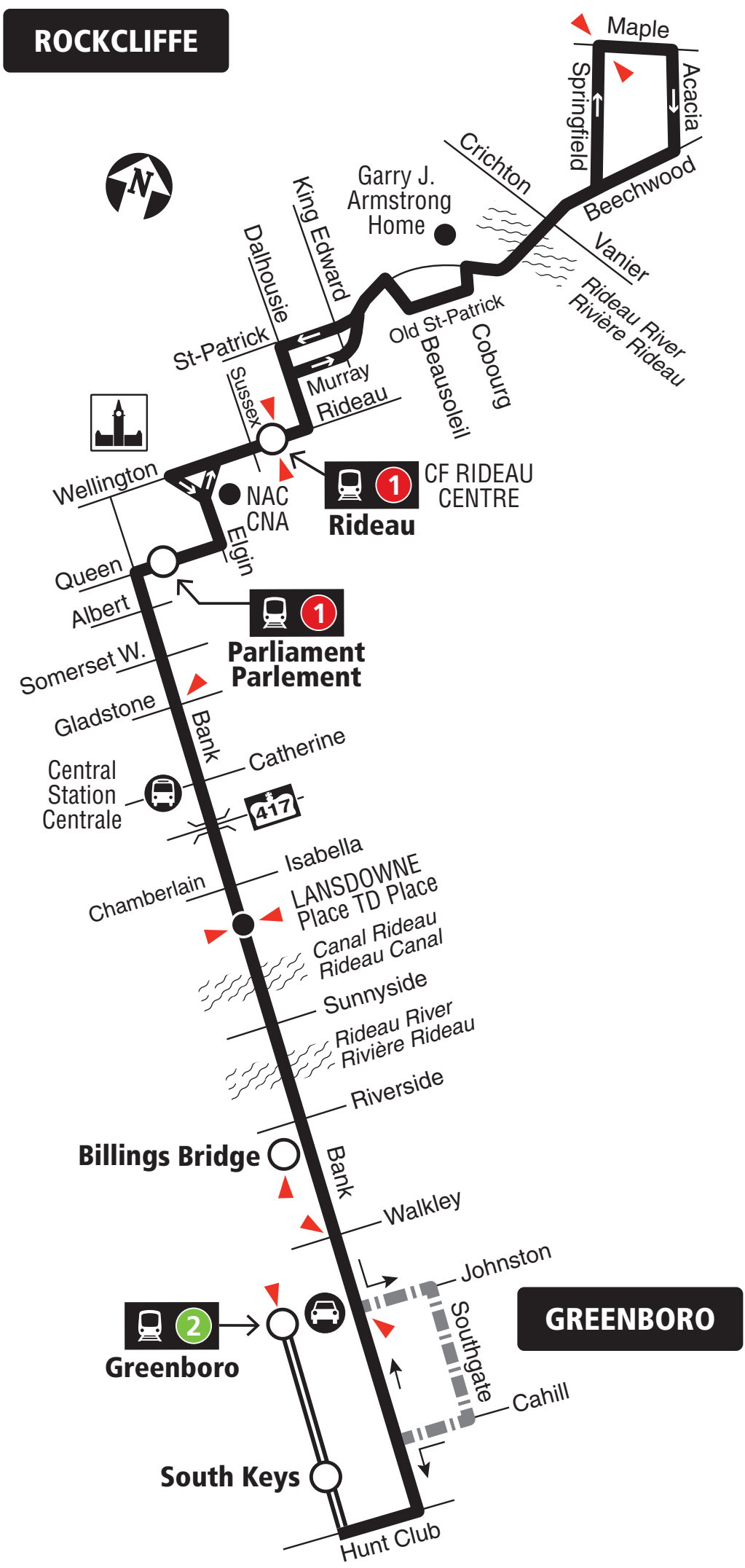
ROCKCLIFFE
GREENBORO

Fréquent

7 days a week / 7 jours par semaine

All day service

Service toute la journée



Transitway & Station

No early morning service / Aucun service matinal

Park & Ride / Parc-o-Bus

Timepoint / Heures de passage

2019.06

Schedule / Horaire.....613-560-1000

Text / Texto 560560

plus your four digit bus stop number / *plus* votre numéro d'arrêt à quatre chiffres

Customer Service
Service à la clientèle **613-741-4390**

Lost and Found / Objets perdus..... **613-563-4011**

Security / Sécurité **613-741-2478**

Effective September 2, 2018
En vigueur 2 septembre 2018

OC Transpo

INFO 613-741-4390
octranspo.com

7

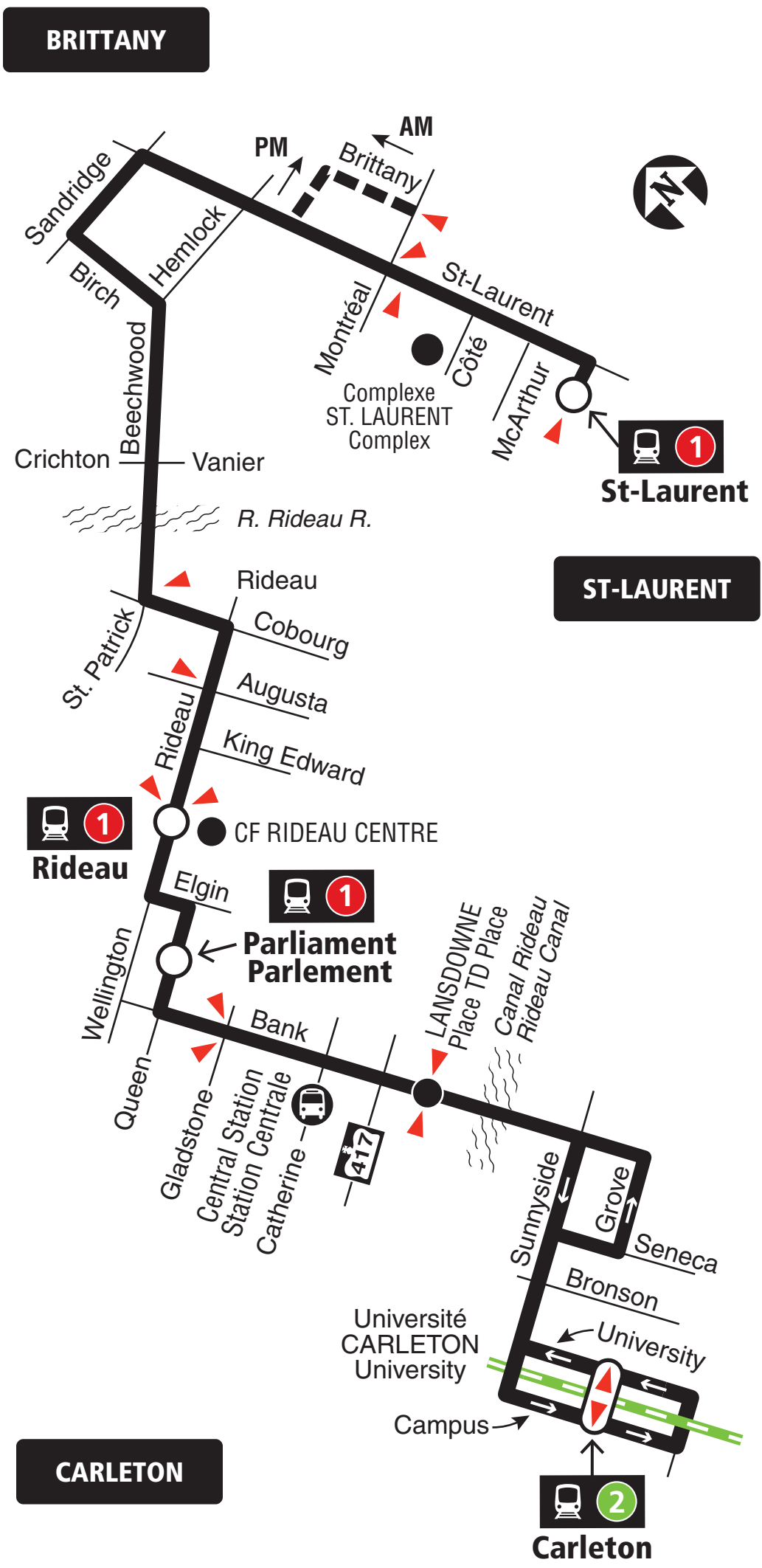
CARLETON
ST-LAURENT

Fréquent

7 days a week / 7 jours par semaine

All day service

Service toute la journée



Station

Peak periods only / Périodes de pointe seulement

Timepoint / Heures de passage

2019.06

Schedule / Horaire.....613-560-1000

Text / Texto 560560

plus your four digit bus stop number / *plus* votre numéro d'arrêt à quatre chiffres

Customer Service
Service à la clientèle **613-741-4390**

Lost and Found / Objets perdus..... **613-563-4011**

Security / Sécurité **613-741-2478**

Effective September 2, 2018
En vigueur 2 septembre 2018

OC Transpo

INFO 613-741-4390
octranspo.com

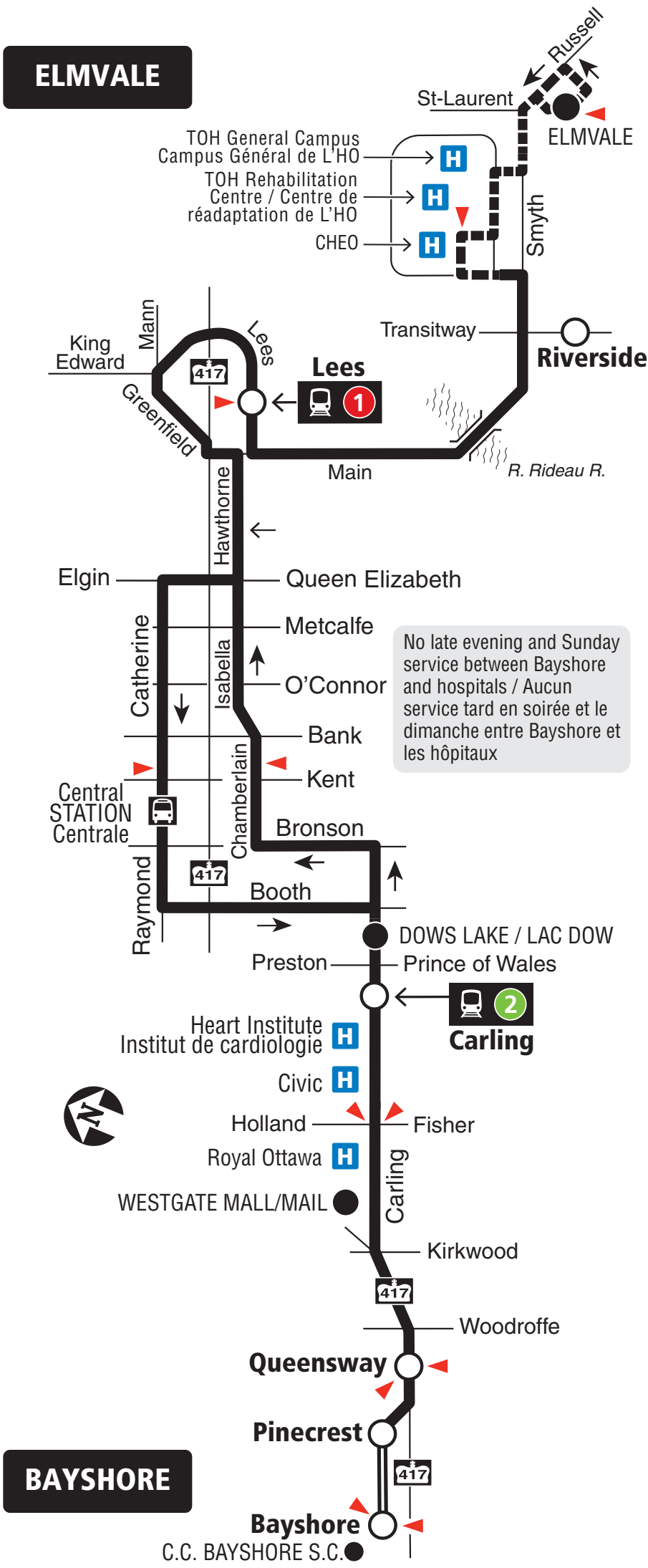
55

ELMVALE
BAYSHORE

Local

7 days a week / 7 jours par semaine

On Sundays and evenings, service only between Elmvale and General campus of the Ottawa Hospital / Service le dimanche et en soirée seulement entre Elmvale et le campus Général de l'Hôpital d'Ottawa



No late evening and Sunday service between Bayshore and hospitals / Aucun service tard en soirée et le dimanche entre Bayshore et les hôpitaux

Transitway & Station

Late evenings and Sundays: service only between Elmvale and the Ottawa Hospital, General Campus

Service tard en soirée et le dimanche: seulement entre Elmvale et le campus Général de l'Hôpital d'Ottawa

Timepoint / Heures de passage

2020.01

Schedule / Horaire.....613-560-1000
Text / Texto 560560

plus your four digit bus stop number / *plus* votre numéro d'arrêt à quatre chiffres

Customer Service
Service à la clientèle **613-741-4390**

Lost and Found / Objets perdus..... **613-563-4011**

Security / Sécurité **613-741-2478**

Effective January 5, 2020
En vigueur 5 janvier 2020

OC Transpo

INFO 613-741-4390
octranspo.com

Appendix E – Collision Data

City Operations - Transportation Services

Collision Details Report - Public Version

From: January 1, 2014 **To:** December 31, 2018

Location: BANK ST @ CHAMBERLAIN AVE N/ISABELLA ST

Traffic Control: Traffic signal **Total Collisions:** 56

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Oct-18, Thu,14:13	Clear	Rear end	P.D. only	Dry	East	Going ahead	Pick-up truck	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2018-Aug-30, Thu,13:20	Clear	Turning movement	P.D. only	Dry	East	Turning left	Delivery van	Other motor vehicle	
					East	Turning left	Passenger van	Other motor vehicle	
2018-Jul-27, Fri,14:15	Clear	Rear end	P.D. only	Dry	North	Unknown	Unknown	Other motor vehicle	
					North	Stopped	Automobile, station wagon	Other motor vehicle	
2018-May-26, Sat,11:40	Clear	Angle	Non-fatal injury	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-May-14, Mon,10:32	Clear	Angle	Non-fatal injury	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-May-11, Fri,15:08	Clear	Sideswipe	P.D. only	Dry	East	Overtaking	Automobile, station wagon	Other motor vehicle	

					East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2018-Feb-06, Tue,20:50	Clear	Turning movement	P.D. only	Wet	South	Turning left	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2018-Jan-16, Tue,20:05	Clear	Turning movement	P.D. only	Slush	South	Turning left	Pick-up truck	Other motor vehicle
					North	Going ahead	Pick-up truck	Other motor vehicle
2017-Dec-15, Fri,16:39	Snow	Sideswipe	P.D. only	Wet	East	Changing lanes	Pick-up truck	Other motor vehicle
					East	Turning left	Truck and trailer	Other motor vehicle
2017-Sep-23, Sat,14:50	Clear	Angle	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Sep-13, Wed,05:30	Clear	Angle	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle
2017-Aug-24, Thu,20:58	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle

2017-Jul-16, Sun,10:56	Clear	Angle	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Jul-16, Sun,08:49	Clear	Angle	Non-fatal injury	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Jul-11, Tue,17:16	Rain	Rear end	P.D. only	Wet	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					East	Stopped	Pick-up truck	Other motor vehicle
2017-Apr-29, Sat,13:25	Clear	Sideswipe	P.D. only	Dry	South	Changing lanes	Automobile, station wagon	Other motor vehicle
					South	Changing lanes	Automobile, station wagon	Other motor vehicle
2017-Apr-08, Sat,15:02	Clear	Turning movement	P.D. only	Dry	East	Turning left	Pick-up truck	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Feb-27, Mon,14:49	Clear	Angle	P.D. only	Dry	North	Turning right	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Dec-31, Sat,15:23	Snow	Rear end	P.D. only	Loose snow	North	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					North	Stopped	Pick-up truck	Other motor vehicle

2016-Nov-05, Sat,13:49	Clear	Angle	P.D. only	Dry	South	Going ahead	Pick-up truck	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Oct-30, Sun,15:08	Clear	Angle	Non-fatal injury	Dry	South	Going ahead	Pick-up truck	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Oct-13, Thu,10:56	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Pick-up truck	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle
2016-Oct-10, Mon,19:17	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Sep-20, Tue,18:46	Clear	Sideswipe	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle
2016-Aug-26, Fri,13:33	Clear	Rear end	P.D. only	Dry	North	Slowing or stopping	Pick-up truck	Other motor vehicle
					North	Slowing or stopping	Automobile, station wagon	Other motor vehicle
2016-Jul-04, Mon,00:24	Clear	Angle	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Pick-up truck	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle

2016-Jun-25, Sat,10:38	Clear	Angle	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2016-Jun-20, Mon,02:12	Clear	Angle	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Pick-up truck	Other motor vehicle	
2016-May-31, Tue,08:32	Clear	Sideswipe	P.D. only	Dry	North	Unknown	Bicycle	Other motor vehicle	
					North	Stopped	Automobile, station wagon	Cyclist	
2016-Apr-21, Thu,15:40	Clear	Rear end	P.D. only	Dry	East	Going ahead	Police vehicle	Other motor vehicle	
					East	Slowing or stopping	Passenger van	Other motor vehicle	
2016-Mar-21, Mon,11:12	Clear	Turning movement	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Pick-up truck	Other motor vehicle	
2016-Mar-04, Fri,14:55	Clear	Angle	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Turning left	Pick-up truck	Other motor vehicle	
2016-Jan-11, Mon,21:08	Clear	SMV other	Non-fatal injury	Wet	North	Turning right	Automobile, station wagon	Pedestrian	1
2016-Jan-11, Mon,01:39	Snow	Angle	P.D. only	Loose snow	East	Turning right	Pick-up truck	Other motor vehicle	

					South	Going ahead	Municipal transit bus	Other motor vehicle
2016-Jan-03, Sun,22:14	Clear	Angle	P.D. only	Wet	South	Going ahead	Pick-up truck	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle
2015-Dec-18, Fri,15:42	Clear	Sideswipe	P.D. only	Dry	South	Stopped	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Truck - dump	Other motor vehicle
2015-Oct-27, Tue,15:22	Clear	Sideswipe	P.D. only	Dry	South	Changing lanes	Pick-up truck	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Oct-14, Wed,17:01	Clear	Turning movement	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle
2015-Oct-12, Mon,17:00	Clear	Sideswipe	P.D. only	Dry	East	Unknown	Unknown	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Oct-12, Mon,14:45	Clear	Turning movement	P.D. only	Dry	East	Turning left	Pick-up truck	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle

2015-Sep-13, Sun,15:43	Clear	Turning movement	P.D. only	Wet	East	Turning left	Delivery van	Other motor vehicle	
					East	Going ahead	Pick-up truck	Other motor vehicle	
2015-Sep-12, Sat,16:42	Rain	Turning movement	P.D. only	Wet	East	Turning left	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Passenger van	Other motor vehicle	
2015-Sep-08, Tue,19:37	Clear	Angle	P.D. only	Dry	South	Turning left	Bicycle	Other motor vehicle	
					East	Turning left	Automobile, station wagon	Cyclist	
2015-Aug-06, Thu,20:59	Clear	SMV other	P.D. only	Dry	North	Turning left	Automobile, station wagon	Ran off road	
2015-May-09, Sat,20:05	Clear	Angle	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Pick-up truck	Other motor vehicle	
2015-Apr-29, Wed,10:54	Clear	Angle	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2015-Feb-08, Sun,08:48	Snow	Rear end	P.D. only	Loose snow	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2014-Oct-23, Thu,20:20	Clear	SMV other	Non-fatal injury	Dry	South	Turning left	Automobile, station wagon	Pedestrian	1

2014-Oct-14, Tue,06:30	Clear	Angle	Non-fatal injury	Dry	East	Slowing or stopping	Truck - dump	Other motor vehicle	
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Oct-11, Sat,06:51	Clear	Turning movement	Non-fatal injury	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Motorcycle	Other motor vehicle	
2014-Oct-08, Wed,13:59	Clear	Sideswipe	P.D. only	Dry	South	Changing lanes	Automobile, station wagon	Other motor vehicle	
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Aug-10, Sun,21:41	Clear	Rear end	Non-fatal injury	Dry	South	Unknown	Unknown	Cyclist	
					South	Turning left	Bicycle	Other motor vehicle	
2014-Jul-31, Thu,11:45	Clear	Sideswipe	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Jul-19, Sat,21:01	Clear	Rear end	P.D. only	Dry	South	Going ahead	Passenger van	Other motor vehicle	
					South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
2014-Jul-18, Fri,22:25	Clear	SMV other	P.D. only	Dry	South	Turning left	Automobile, station wagon	Pedestrian	1
2014-Mar-13, Thu,01:00	Snow	Angle	P.D. only	Loose snow	South	Unknown	Automobile, station wagon	Other motor vehicle	

					East	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: ISABELLA ST btwn CHAMBERLAIN AVE & O'CONNOR ST

Traffic Control: No control

Total Collisions: 8

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Dec-21, Fri,12:23	Rain	Rear end	P.D. only	Wet	East	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2018-Sep-05, Wed,15:14	Clear	Sideswipe	P.D. only	Dry	East	Overtaking	Automobile, station wagon	Other motor vehicle	
					East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
2017-Jun-03, Sat,14:01	Clear	Rear end	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Slowing or stopping	Passenger van	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2017-May-29, Mon,13:32	Rain	Sideswipe	P.D. only	Wet	East	Unknown	Unknown	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2016-Aug-18, Thu,12:05	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Pick-up truck	Other motor vehicle	
2015-Nov-18, Wed,15:52	Clear	Sideswipe	P.D. only	Dry	East	Unknown	Unknown	Other motor vehicle	

					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2015-Sep-03, Thu,16:44	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Pick-up truck	Other motor vehicle	
					East	Stopped	Pick-up truck	Other motor vehicle	
2015-Jan-05, Mon,19:15	Clear	Sideswipe	P.D. only	Wet	East	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: ISABELLA ST btwn O'CONNOR ST & METCALFE ST

Traffic Control: No control **Total Collisions:** 10

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Sep-14, Fri,18:45	Clear	Sideswipe	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Unknown	Unknown	Other motor vehicle	
2017-Feb-22, Wed,16:13	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Pick-up truck	Other motor vehicle	
					East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
2016-Jun-29, Wed,17:50	Clear	Rear end	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2016-May-13, Fri,20:57	Clear	Rear end	Non-fatal injury	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	

					East	Stopped	Automobile, station wagon	Other motor vehicle
2016-Mar-11, Fri,20:17	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Jan-06, Wed,15:35	Clear	Sideswipe	P.D. only	Dry	East	Unknown	Unknown	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle
2015-Sep-21, Mon,03:20	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Jun-12, Fri,13:16	Rain	Sideswipe	P.D. only	Wet	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle
2015-Jan-22, Thu,11:30	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					East	Stopped	Pick-up truck	Other motor vehicle
2014-Mar-06, Thu,18:00	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Truck and trailer	Other motor vehicle

Location: ISABELLA ST/HWY 417 O'CONN IC119BR57 @ O'CONNO

Traffic Control: Traffic signal **Total Collisions:** 30

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Dec-22, Sat,14:00	Clear	Angle	P.D. only	Wet	East	Going ahead	Automobile, station wagon	Other motor vehicle	
					South	Turning left	Automobile, station wagon	Other motor vehicle	
2018-Dec-08, Sat,14:29	Clear	Sideswipe	P.D. only	Wet	South	Turning left	Unknown	Other motor vehicle	
					South	Turning left	Automobile, station wagon	Other motor vehicle	
2018-Nov-30, Fri,03:00	Clear	Sideswipe	P.D. only	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle	
					South	Turning left	Automobile, station wagon	Other motor vehicle	
2018-Nov-24, Sat,14:06	Clear	Sideswipe	P.D. only	Dry	South	Turning left	Unknown	Other motor vehicle	
					South	Turning left	Automobile, station wagon	Other motor vehicle	
2018-Nov-05, Mon,18:26	Rain	Rear end	P.D. only	Wet	East	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2018-Jun-05, Tue,15:53	Clear	Rear end	Non-fatal injury	Wet	East	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Turning right	Automobile, station wagon	Other motor vehicle	
2018-Feb-25, Sun,00:30	Clear	Angle	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	

					South	Turning left	Automobile, station wagon	Other motor vehicle	
2018-Feb-01, Thu,18:20	Clear	Sideswipe	P.D. only	Loose snow	East	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Turning left	Automobile, station wagon	Other motor vehicle	
2017-Dec-18, Mon,18:59	Snow	SMV other	Non-fatal injury	Wet	West	Reversing	Automobile, station wagon	Pedestrian	1
2017-Dec-12, Tue,17:25	Snow	Rear end	P.D. only	Packed snow	East	Slowing or stopping	Automobile, station wagon	Skidding/sliding	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2017-Mar-02, Thu,10:04	Rain	Sideswipe	P.D. only	Wet	South	Unknown	Unknown	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2016-Dec-27, Tue,02:59	Rain	Rear end	P.D. only	Wet	East	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2016-Dec-02, Fri,14:26	Clear	Rear end	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2016-Nov-28, Mon,14:26	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Truck - dump	Other motor vehicle	

					East	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Jul-04, Mon,08:01	Clear	Turning movement	P.D. only	Dry	East	Turning right	Pick-up truck	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle
2016-Apr-08, Fri,14:30	Clear	Rear end	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2015-Nov-16, Mon,14:45	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
					East	Stopped	Pick-up truck	Other motor vehicle
2015-Nov-05, Thu,08:49	Clear	Angle	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Turning left	Automobile, station wagon	Other motor vehicle
2015-Nov-01, Sun,18:03	Clear	Turning movement	P.D. only	Wet	East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Oct-10, Sat,08:03	Clear	Turning movement	Non-fatal injury	Dry	East	Turning left	Passenger van	Other motor vehicle
					East	Going ahead	Police vehicle	Other motor vehicle

2015-Sep-11, Fri,16:21	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Pick-up truck	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Sep-07, Mon,20:44	Rain	SMV other	P.D. only	Wet	East	Going ahead	Automobile, station wagon	Ran off road
2015-Sep-04, Fri,15:00	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
2015-Jul-02, Thu,11:50	Clear	Sideswipe	Non-fatal injury	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Pick-up truck	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle
2015-Jun-19, Fri,17:24	Clear	Angle	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Turning left	Passenger van	Other motor vehicle
2015-May-20, Wed,16:55	Clear	Sideswipe	P.D. only	Dry	South	Turning left	Truck and trailer	Other motor vehicle
					South	Turning left	Automobile, station wagon	Other motor vehicle
2015-Mar-03, Tue,17:51	Snow	Rear end	Non-fatal injury	Wet	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle

2015-Feb-19, Thu,09:55	Clear	Sideswipe	P.D. only	Wet	South	Turning left	Truck and trailer	Other motor vehicle	
					South	Turning left	Automobile, station wagon	Other motor vehicle	
2015-Feb-13, Fri,16:46	Snow	Sideswipe	P.D. only	Slush	South	Turning left	Truck and trailer	Other motor vehicle	
					South	Turning left	Automobile, station wagon	Other motor vehicle	
2014-Aug-11, Mon,12:54	Clear	Rear end	P.D. only	Dry	East	Going ahead	Pick-up truck	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	

Location: ISABELLA ST/HWY417 IC119AR75 @ METCALFE ST

Traffic Control: Traffic signal

Total Collisions: 72

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Oct-27, Sat,21:00	Rain	Sideswipe	P.D. only	Wet	East	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Oct-21, Sun,12:15	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Sep-05, Wed,17:28	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	

2018-Jul-05, Thu,17:01	Clear	SMV other	Non-fatal injury	Dry	East	Going ahead	Motorcycle	Other
2018-May-05, Sat,18:03	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Unknown	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2018-Apr-17, Tue,18:53	Clear	Sideswipe	P.D. only	Wet	East	Unknown	Unknown	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Dec-29, Fri,07:47	Clear	Sideswipe	Non-fatal injury	Slush	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Dec-23, Sat,16:22	Snow	Sideswipe	P.D. only	Loose snow	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Dec-09, Sat,03:26	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Dec-06, Wed,12:50	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Turning left	Automobile, station wagon	Other motor vehicle
2017-Nov-30, Thu,16:10	Snow	Sideswipe	P.D. only	Wet	East	Changing lanes	Automobile, station wagon	Other motor vehicle

					East	Going ahead	Pick-up truck	Other motor vehicle
2017-Oct-21, Sat,18:10	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle
2017-Sep-29, Fri,22:00	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Sep-07, Thu,12:30	Rain	Rear end	P.D. only	Wet	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2017-Aug-31, Thu,13:40	Clear	Sideswipe	P.D. only	Dry	East	Going ahead	Municipal transit bus	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Aug-30, Wed,16:03	Clear	Rear end	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Passenger van	Other motor vehicle
2017-Aug-08, Tue,12:13	Clear	Turning movement	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Jul-27, Thu,11:15	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle

					East	Going ahead	Unknown	Other motor vehicle
2017-Jun-11, Sun,23:37	Clear	Angle	Non-fatal injury	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Passenger van	Other motor vehicle
2017-Jun-10, Sat,17:58	Clear	Angle	Non-fatal injury	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Jun-07, Wed,10:04	Clear	Sideswipe	P.D. only	Dry	East	Going ahead	Truck and trailer	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Jun-03, Sat,16:28	Clear	Angle	P.D. only	Dry	East	Turning right	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2017-May-18, Thu,11:13	Clear	Sideswipe	P.D. only	Dry	East	Unknown	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle
2017-May-17, Wed,20:03	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2017-May-12, Fri,23:37	Clear	Rear end	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle

					East	Stopped	Automobile, station wagon	Other motor vehicle
2017-Feb-28, Tue,20:07	Clear	Rear end	Non-fatal injury	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2017-Feb-21, Tue,11:50	Clear	Sideswipe	P.D. only	Dry	North	Changing lanes	Unknown	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Feb-07, Tue,14:12	Clear	Angle	P.D. only	Wet	North	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Passenger van	Other motor vehicle
2016-Dec-22, Thu,12:20	Clear	Sideswipe	P.D. only	Wet	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Nov-10, Thu,21:14	Clear	Rear end	Non-fatal injury	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2016-Oct-27, Thu,15:45	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Delivery van	Other motor vehicle
					East	Stopped	Pick-up truck	Other motor vehicle

2016-Oct-06, Thu,21:58	Clear	Sideswipe	P.D. only	Dry	East	Turning left	Pick-up truck	Other motor vehicle
					East	Turning left	Automobile, station wagon	Other motor vehicle
2016-Aug-02, Tue,17:07	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2016-Jun-29, Wed,17:20	Clear	Rear end	Non-fatal injury	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					East	Stopped	Pick-up truck	Other motor vehicle
2016-May-06, Fri,16:57	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle
					East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
2016-May-05, Thu,18:25	Clear	Turning movement	Non-fatal injury	Dry	North	Turning right	Unknown	Cyclist
					North	Going ahead	Bicycle	Other motor vehicle
2016-Apr-23, Sat,05:28	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Turning left	Pick-up truck	Other motor vehicle
2016-Apr-15, Fri,07:26	Clear	Rear end	P.D. only	Dry	North	Turning right	Automobile, station wagon	Other motor vehicle
					North	Turning right	Automobile, station wagon	Other motor vehicle

2016-Feb-26, Fri,13:55	Clear	Rear end	P.D. only	Dry	East	Going ahead	Pick-up truck	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2015-Dec-27, Sun,17:03	Clear	Sideswipe	P.D. only	Wet	East	Turning left	Pick-up truck	Other motor vehicle	
					East	Turning left	Pick-up truck	Other motor vehicle	
2015-Nov-02, Mon,16:35	Clear	Rear end	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Pick-up truck	Other motor vehicle	
2015-Oct-21, Wed,07:08	Clear	Sideswipe	P.D. only	Dry	East	Turning left	Truck and trailer	Other motor vehicle	
					East	Turning left	Pick-up truck	Other motor vehicle	
2015-Sep-08, Tue,20:21	Clear	SMV other	Non-fatal injury	Dry	East	Turning left	Automobile, station wagon	Pedestrian	1
2015-Sep-02, Wed,14:45	Clear	Turning movement	P.D. only	Dry	East	Going ahead	Municipal transit bus	Other motor vehicle	
					East	Turning left	Pick-up truck	Other motor vehicle	
2015-Aug-15, Sat,16:45	Clear	Sideswipe	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle	
					East	Turning left	Automobile, station wagon	Other motor vehicle	
2015-Aug-04, Tue,13:00	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle	

					East	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Jul-20, Mon,17:31	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Truck and trailer	Other motor vehicle
2015-Jul-17, Fri,12:00	Clear	Rear end	P.D. only	Dry	East	Going ahead	Pick-up truck	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2015-Jun-15, Mon,10:39	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2015-May-02, Sat,11:41	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Pick-up truck	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Apr-23, Thu,09:17	Clear	Rear end	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle
					East	Turning left	Automobile, station wagon	Other motor vehicle
2015-Apr-21, Tue,08:25	Clear	Angle	P.D. only	Wet	North	Turning right	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Apr-03, Fri,12:34	Clear	Turning movement	Non-fatal injury	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle

					East	Going ahead	Passenger van	Other motor vehicle
2015-Feb-01, Sun,13:31	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Jan-16, Fri,17:00	Clear	Rear end	P.D. only	Slush	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2014-Dec-22, Mon,12:33	Fog, mist, smoke, dust	Rear end	P.D. only	Wet	East	Going ahead	Pick-up truck	Other motor vehicle
					East	Stopped	Pick-up truck	Other motor vehicle
					East	Slowing or stopping	Passenger van	Other motor vehicle
2014-Dec-18, Thu,15:30	Clear	Sideswipe	P.D. only	Slush	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Truck - dump	Other motor vehicle
2014-Dec-12, Fri,11:00	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Police vehicle	Other motor vehicle
2014-Nov-28, Fri,11:59	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Pick-up truck	Other motor vehicle
					East	Slowing or stopping	Automobile, station wagon	Other motor vehicle

2014-Nov-27, Thu,16:07	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Truck - dump	Other motor vehicle
2014-Nov-20, Thu,09:35	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2014-Sep-23, Tue,13:00	Clear	Sideswipe	P.D. only	Dry	East	Turning left	Truck and trailer	Other motor vehicle
					East	Turning left	Automobile, station wagon	Other motor vehicle
2014-Aug-14, Thu,12:04	Clear	Rear end	Non-fatal injury	Dry	East	Slowing or stopping	Passenger van	Other motor vehicle
					East	Going ahead	Passenger van	Other motor vehicle
2014-Jul-08, Tue,18:00	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Pick-up truck	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2014-Jul-02, Wed,15:55	Clear	Rear end	P.D. only	Dry	East	Changing lanes	Passenger van	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2014-Jun-05, Thu,09:00	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle

2014-May-12, Mon,12:44	Clear	Sideswipe	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Tow truck	Other motor vehicle
2014-May-03, Sat,15:00	Rain	Sideswipe	P.D. only	Wet	East	Changing lanes	Unknown	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2014-Apr-26, Sat,16:00	Rain	Rear end	Non-fatal injury	Wet	East	Going ahead	Passenger van	Other motor vehicle
					East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
2014-Apr-13, Sun,00:45	Rain	Angle	P.D. only	Wet	East	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Pick-up truck	Other motor vehicle
2014-Mar-22, Sat,13:15	Snow	Sideswipe	P.D. only	Slush	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2014-Jan-23, Thu,18:45	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Changing lanes	Automobile, station wagon	Other motor vehicle

Appendix F – Trip Generation Data

Table 3.12: Person Trip Generation Rates – (all households with residents not older than 55 years of age)

Person Trip Generation Rates
All Households with persons 55 years of age or less
AM and PM Peak Hours

Dwelling Unit Types \ Geographic Areas		Core Area Person Trip Rate	Core Area %▽	Urban Area (Inside the greenbelt) Person Trip Rate	Urban Area %▽	Suburban (Outside the greenbelt) Person Trip Rate	Suburban %▽	Rural Person Trip Rate	Rural %▽	All Areas Person Trip Rate
Single detached:	AM	0.85	- 7%	0.99	+ 9%	0.94	+ 3%	0.78	- 14%	0.91
	PM	0.74	- 3%	0.75	- 1%	0.79	+ 4%	0.71	- 7%	0.76
Semi-detached:	AM	0.79	- 10%	0.97	10%	0.89	+ 1%	0.64	- 27%	0.88
	PM	0.74	- 1%	0.68	- 9%	0.82	+ 9%	0.60	- 20%	0.75
Row Townhouse:	AM	0.71	- 3%	0.78	+ 7%	0.67	- 8%	0.74	+ 1%	0.73
	PM	0.62	- 3%	0.60	- 6%	0.69	+ 8%	0.56	- 13%	0.64
Apartment:	AM	0.48	- 4%	0.51	+ 2%	0.53	+ 6%	0.36	- 28%	0.50
	PM	0.45	0%	0.42	- 7%	0.52	+ 16%	0.52	+ 16%	0.45
All Types:	AM	0.62	- 23%	0.82	+ 2%	0.86	+ 8%	0.76	- 5%	0.80
	PM	0.57	- 16%	0.63	- 7%	0.75	+ 10%	0.69	+ 1%	0.68

Note: 5 % (+ or -) represents the percentage delta change in trip rate when compared against the average trip rate across all geographic areas

Table 3.13: Mode Shares - (all households with residents not older than 55 years of age)

Reported Mode Shares
All Households with persons 55 years of age or less
AM and PM Peak Hours

Dwelling Unit Types \ Geographic Areas		Core Area Vehicle Trips	Core Area Transit Share	Core Area Non-Motorised	Urban Area (Inside the greenbelt) Vehicle Trips	Urban Area Transit Share	Urban Area Non-Motorised	Suburban (Outside the greenbelt) Vehicle Trips	Suburban Transit Share	Suburban Non-Motorised	Rural * Vehicle Trips	Rural * Transit Share	Rural * Non-Motorised	All Areas Vehicle Trips	All Areas Transit Share	All Areas Non-Motorised
Single - Detached:	AM	35%	20%	33%	51%	26%	11%	55%	25%	9%	60%	27%	4%	54%	25%	10%
	PM	45%	11%	32%	58%	19%	13%	64%	19%	6%	73%	13%	2%	63%	17%	8%
Semi-Detached:	AM	38%	30%	26%	44%	35%	10%	52%	24%	12%	64%	27%	5%	49%	28%	12%
	PM	36%	20%	34%	51%	27%	13%	62%	17%	7%	77%	12%	1%	58%	20%	10%
Row / Townhouse:	AM	33%	22%	40%	45%	34%	10%	55%	27%	8%	73%	15%	3%	49%	30%	11%
	PM	39%	15%	42%	53%	28%	8%	61%	22%	6%	74%	15%	1%	57%	24%	9%
Apartment:	AM	27%	27%	43%	37%	41%	14%	44%	34%	13%	76%	8%	16%	36%	35%	23%
	PM	23%	29%	42%	40%	37%	14%	44%	33%	9%	48%	4%	17%	35%	33%	23%
All Types:	AM	32%	24%	38%	47%	31%	11%	54%	26%	9%	61%	26%	4%	51%	27%	11%
	PM	34%	21%	38%	53%	24%	12%	62%	20%	6%	73%	13%	2%	59%	20%	10%

Note: Percentages do not necessarily sum to 100% as the proportion of automobile passengers have not been tabulated. Vehicle trips reflect the percentage of vehicle drivers.
* - Rural area sample size is extremely low and mode shares are highly influenced by school types where public transportation levels are high during the AM versus the PM peaks.

Table 6.1: Vehicle Trip Generation Rates

Vehicle Trip Generation Rates AM and PM Peak Hours						
ITE Land Use Code	Dwelling Unit Type / Data Source		Vehicle Trip Generation Rate			
			2008 Count Data	ITE	OD Survey	Blended Rate
210	Single-detached dwellings	AM	0.66	0.75	0.56	0.66
		PM	0.89	1.01	0.53	0.81
224	Semi-detached dwellings, townhouses, rowhouses	AM	0.40	0.70	0.46	0.52
		PM	0.64	0.72	0.46	0.61
231	Low-rise condominiums (1 or 2 floors)	AM	0.53	0.67	0.21	0.47
		PM	0.41	0.78	0.18	0.46
232	High-rise condominiums (3+ floors)	AM	0.53	0.34	0.21	0.36
		PM	0.41	0.38	0.18	0.32
233	Luxury condominiums	AM	0.53	0.56	0.21	0.43
		PM	0.41	0.55	0.18	0.38
221	Low-rise apartments (2 floors)	AM	0.19	0.46	0.21	0.29
		PM	0.21	0.58	0.18	0.32
223	Mid-rise apartments (3-10 floors)	AM	0.19	0.30	0.21	0.23
		PM	0.21	0.39	0.18	0.26
222	High-rise apartments (10+ floors)	AM	0.19	0.30	0.21	0.23
		PM	0.21	0.35	0.18	0.25

Table 6.2: Recommended Vehicle Trip Directional Splits

Comparison of Directional Splits (Inbound/Outbound) AM and PM Peak Hours								
ITE Land Use Code	Area Dwelling Unit Type / Data Source		2008 Count Data		ITE		Blended Rate	
			Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
210	Single-detached dwellings	AM	33%	67%	25%	75%	29%	71%
		PM	60%	40%	63%	37%	62%	39%
224	Semi-detached dwellings, townhouses, rowhouses	AM	40%	60%	33%	67%	37%	64%
		PM	55%	45%	51%	49%	53%	47%
231	Low-rise condominiums (1 or 2 floors)	AM	36%	64%	25%	75%	31%	70%
		PM	54%	46%	58%	42%	56%	44%
232	High-rise condominiums (3+ floors)	AM	36%	64%	19%	81%	28%	73%
		PM	54%	46%	62%	38%	58%	42%
233	Luxury condominiums	AM	36%	64%	23%	77%	30%	71%
		PM	54%	46%	63%	37%	59%	42%
221	Low-rise apartments (2 floors)	AM	22%	78%	21%	79%	22%	79%
		PM	62%	38%	65%	35%	64%	37%
223	Mid-rise apartments (3-10 floors)	AM	22%	78%	25%	75%	24%	77%
		PM	62%	38%	61%	39%	62%	39%
222	High-rise apartments (10+ floors)	AM	22%	78%	25%	75%	24%	77%
		PM	62%	38%	61%	39%	62%	39%

Table 6.3: Recommended Vehicle Trip Generation Rates for Residential Land Uses with Transit Bonus

Recommended Vehicle Trip Generation Rates with Transit Bonus AM and PM Peak Hours									
ITE Land Use Code	Dwelling Unit Type / Geographic Area		Vehicle Trip Rate						
			Core		Urban (Inside the Greenbelt)		Suburban (Outside the Greenbelt)		Rural
			Base Rate	< 600m to Rapid Transit	Base Rate	< 600m to Rapid Transit	Base Rate	< 600m to Rapid Transit	Base Rate
210	Single-detached dwellings	AM	0.40	0.31	0.67	0.50	0.70	0.49	0.62
		PM	0.60	0.33	0.76	0.57	0.90	0.63	0.92
224	Semi-detached dwellings, townhouses, rowhouses	AM	0.34	0.34	0.51	0.50	0.54	0.39	0.62
		PM	0.39	0.38	0.51	0.51	0.71	0.51	0.67
231	Low-rise condominiums (1 or 2 floors)	AM	0.34	0.34	0.50	0.50	0.60	0.60	0.71
		PM	0.29	0.29	0.49	0.49	0.66	0.66	0.72
232	High-rise condominiums (3+ floors)	AM	0.26	0.26	0.38	0.38	0.46	0.46	0.54
		PM	0.20	0.20	0.34	0.34	0.46	0.46	0.50
233	Luxury condominiums	AM	0.31	0.31	0.45	0.45	0.55	0.55	0.65
		PM	0.24	0.24	0.40	0.40	0.55	0.55	0.59
221	Low-rise apartments (2 floors)	AM	0.21	0.21	0.31	0.31	0.37	0.37	0.44
		PM	0.20	0.20	0.34	0.34	0.46	0.46	0.50
223	Mid-rise apartments (3-10 floors)	AM	0.17	0.17	0.24	0.24	0.29	0.29	0.35
		PM	0.16	0.16	0.28	0.28	0.37	0.37	0.41
222	High-rise apartments (10+ floors)	AM	0.17	0.17	0.24	0.24	0.29	0.29	0.35
		PM	0.16	0.16	0.27	0.27	0.36	0.36	0.39

Note: The transit bonus was only applied to geographic areas and dwelling unit types where the reported transit mode shares were less than the transit mode share reported for residential development located within the 600m proximity to a rapid transit station. It is noted that condominium and apartment housing categories reported similar levels of transit mode shares independent of location to rapid transit stations.

6.5 Future Data Collection

While the rates presented in were prepared by blending the vehicle trip rates from ITE, the OD Survey and the 2008 local trip generation studies, it is important to stress the importance and need for ongoing local trip generation surveys to monitor changes in travel behaviour. The 2008 trip generation studies undertaken to support this study provide insight into local travel patterns and a well organized ongoing annual data collection program aimed at trip generation surveys of key land uses or requirement for data collection by local developers will continue to provide recent and accurate local trip generation rates. For example the high-rise apartment category of dwelling units reported the lowest peak hour vehicle trip rates.

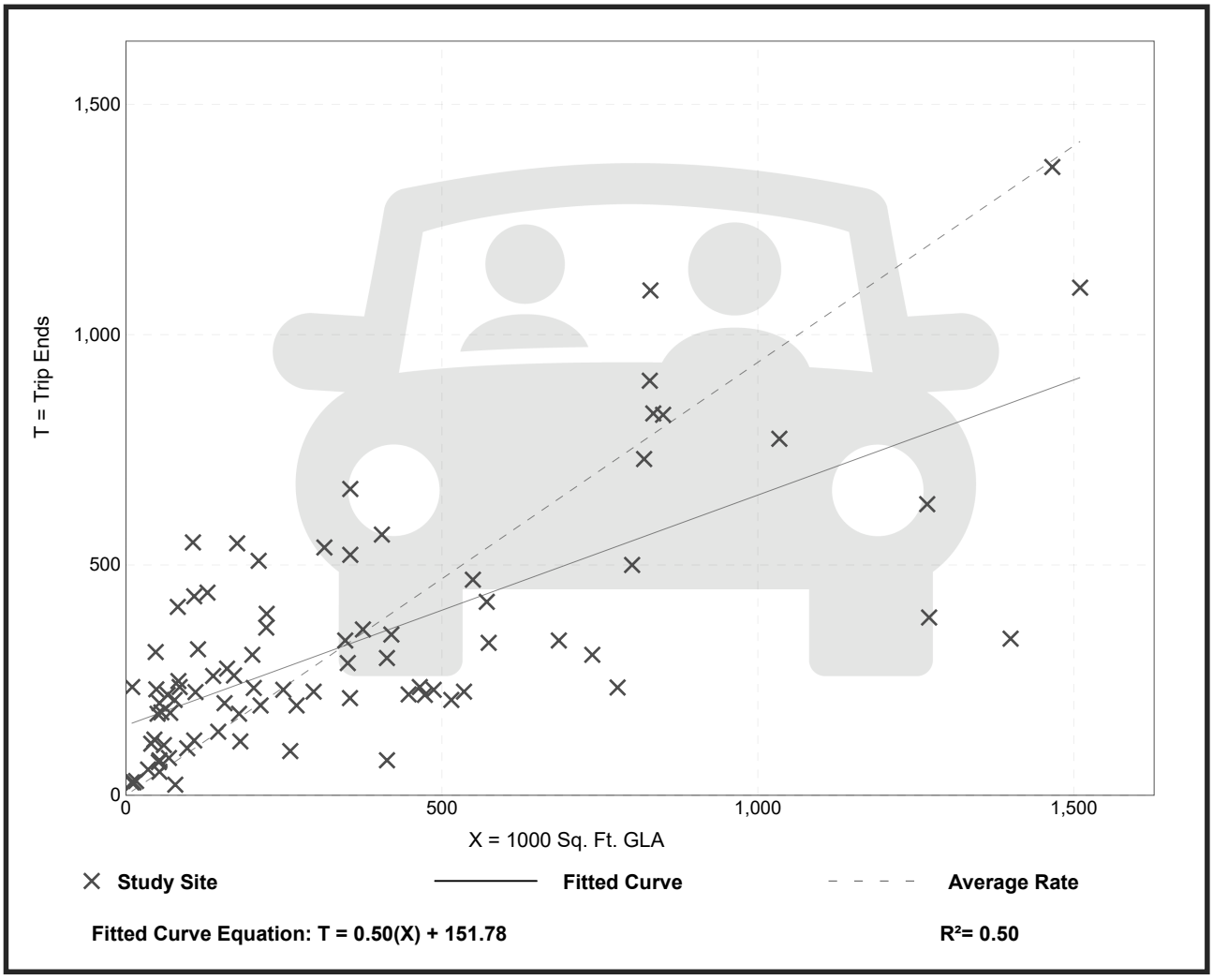
Shopping Center
(820)

Vehicle Trip Ends vs: **1000 Sq. Ft. GLA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 84
Avg. 1000 Sq. Ft. GLA: 351
Directional Distribution: 62% entering, 38% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
0.94	0.18 - 23.74	0.87

Data Plot and Equation



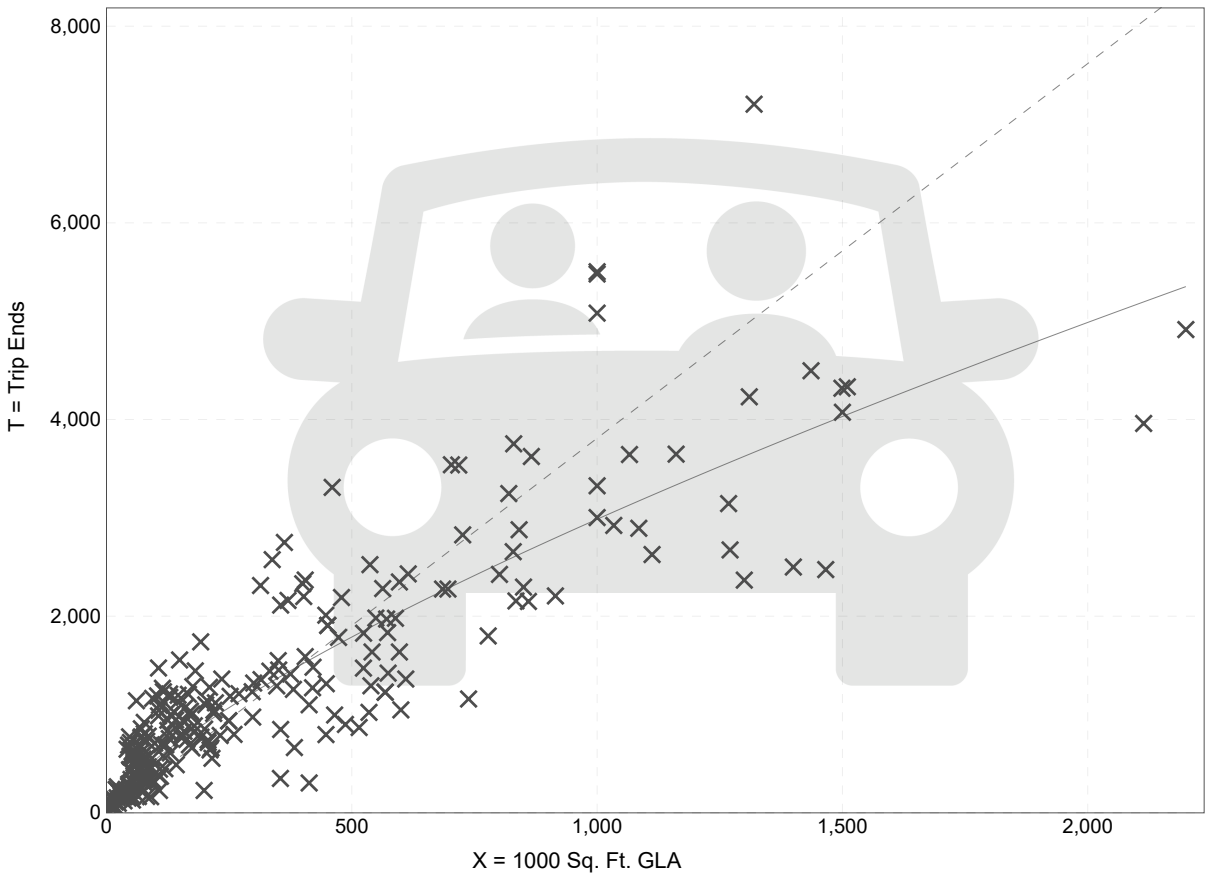
Shopping Center
(820)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GLA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	261
Avg. 1000 Sq. Ft. GLA:	327
Directional Distribution:	48% entering, 52% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
3.81	0.74 - 18.69	2.04

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.74 Ln(X) + 2.89

R^2= 0.82

Ottawa Inner Area

Demographic Characteristics

Population	86,790	Actively Travelled	72,340
Employed Population	45,370	Number of Vehicles	32,580
Households	45,430	Area (km^2)	16.4

Occupation

Status (age 5+)	Male	Female	Total
Full Time Employed	21,170	18,680	39,850
Part Time Employed	2,550	2,960	5,520
Student	8,310	9,560	17,870
Retiree	5,810	7,960	13,770
Unemployed	1,430	1,280	2,710
Homemaker	30	1,810	1,850
Other	1,030	1,030	2,050
Total:	40,340	43,290	83,630

Traveller Characteristics	Male	Female	Total
Transit Pass Holders	9,170	11,080	20,240
Licensed Drivers	28,610	29,590	58,200
Telecommuters	460	300	760
Trips made by residents	119,140	130,660	249,800

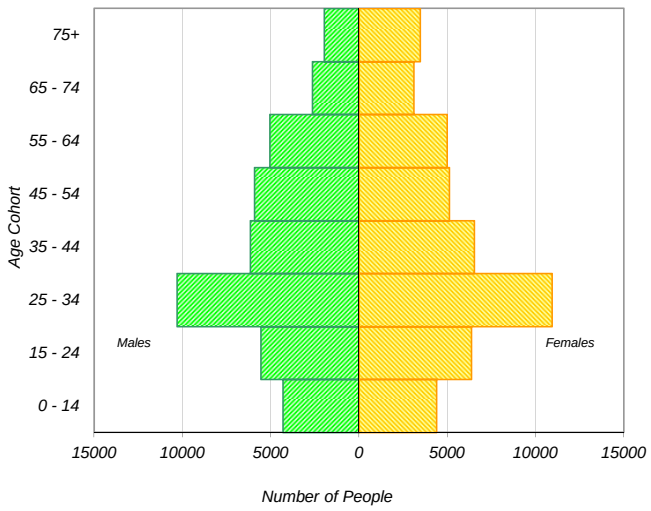
Selected Indicators	
Daily Trips per Person (age 5+)	2.99
Vehicles per Person	0.38
Number of Persons per Household	1.91
Daily Trips per Household	5.50
Vehicles per Household	0.72
Workers per Household	1.00
Population Density (Pop/km2)	5290

Household Size		
1 person	22,750	50%
2 persons	14,360	32%
3 persons	4,230	9%
4 persons	2,600	6%
5+ persons	1,480	3%
Total:	45,430	100%

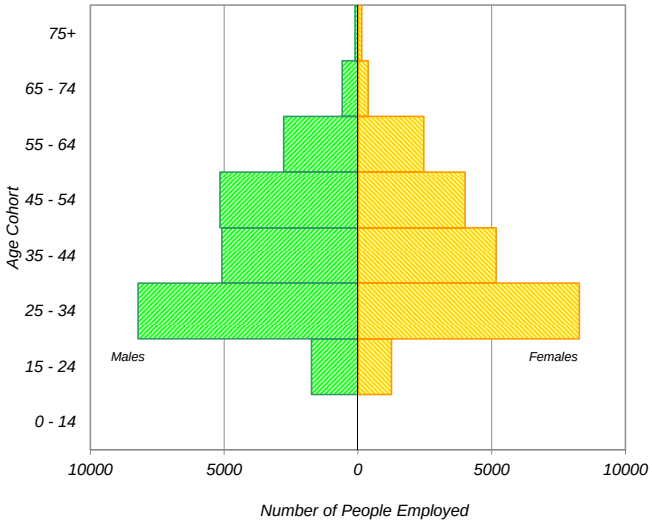
Households by Vehicle Availability		
0 vehicles	18,620	41%
1 vehicle	21,890	48%
2 vehicles	4,220	9%
3 vehicles	590	1%
4+ vehicles	120	0%
Total:	45,430	100%

Households by Dwelling Type		
Single-detached	6,530	14%
Semi-detached	2,860	6%
Townhouse	3,320	7%
Apartment/Condo	32,720	72%
Total:	45,430	100%

Population



Employed Population

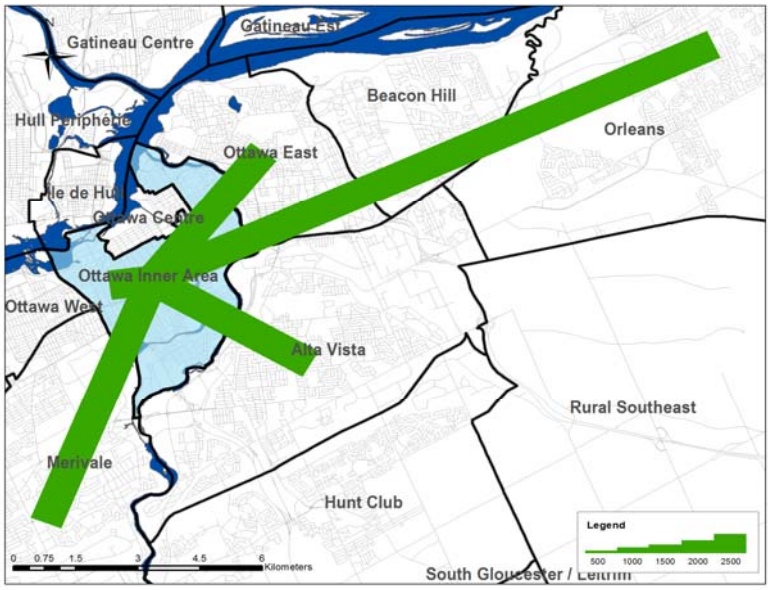


* In 2005 data was only collected for household members aged 11+ therefore these results cannot be compared to the 2011 data.

Travel Patterns

Top Five Origins of Trips to Ottawa Inner Area

AM Peak Period



Summary of Trips to and from Ottawa Inner Area

AM Peak Period (6:30 - 8:59) Districts	Destinations of Trips From District	% Total	Origins of Trips To District	% Total
Ottawa Centre	9,420	21%	1,160	2%
Ottawa Inner Area	17,180	37%	17,180	28%
Ottawa East	1,960	4%	3,670	6%
Beacon Hill	1,450	3%	1,380	2%
Alta Vista	4,270	9%	4,970	8%
Hunt Club	830	2%	3,060	5%
Merivale	3,260	7%	4,710	8%
Ottawa West	1,750	4%	3,080	5%
Bayshore / Cedarview	830	2%	2,860	5%
Orléans	630	1%	4,800	8%
Rural East	70	0%	250	0%
Rural Southeast	60	0%	830	1%
South Gloucester / Leitrim	250	1%	530	1%
South Nepean	340	1%	2,270	4%
Rural Southwest	150	0%	580	1%
Kanata / Stittsvile	970	2%	3,350	5%
Rural West	20	0%	380	1%
Île de Hull	1,330	3%	440	1%
Hull Périphérie	670	1%	1,350	2%
Plateau	0	0%	1,040	2%
Aylmer	200	0%	1,050	2%
Rural Northwest	40	0%	240	0%
Pointe Gatineau	130	0%	1,470	2%
Gatineau Est	110	0%	700	1%
Rural Northeast	0	0%	500	1%
Buckingham / Masson-Angers	10	0%	240	0%
Ontario Sub-Total:	43,440	95%	55,060	89%
Québec Sub-Total:	2,490	5%	7,030	11%
Total:	45,930	100%	62,090	100%

Trips by Trip Purpose

24 Hours	From District		To District		Within District	
Work or related	33,110	19%	37,330	21%	11,400	11%
School	4,810	3%	34,570	20%	10,560	10%
Shopping	19,380	11%	7,740	4%	11,860	11%
Leisure	15,940	9%	18,120	10%	16,560	15%
Medical	3,560	2%	4,220	2%	2,120	2%
Pick-up / drive passenger	7,310	4%	10,650	6%	5,660	5%
Return Home	84,260	48%	56,020	32%	44,570	41%
Other	6,860	4%	6,870	4%	5,630	5%
Total:	175,230	100%	175,520	100%	108,360	100%

AM Peak (06:30 - 08:59)	From District		To District		Within District	
Work or related	20,960	73%	23,220	52%	5,450	32%
School	3,200	11%	16,280	36%	6,270	37%
Shopping	440	2%	240	1%	290	2%
Leisure	790	3%	750	2%	940	5%
Medical	460	2%	500	1%	240	1%
Pick-up / drive passenger	1,120	4%	2,330	5%	1,490	9%
Return Home	1,180	4%	900	2%	1,170	7%
Other	590	2%	730	2%	1,320	8%
Total:	28,740	100%	44,950	100%	17,170	100%

PM Peak (15:30 - 17:59)	From District		To District		Within District	
Work or related	1,250	3%	880	2%	510	2%
School	90	0%	2,360	7%	770	3%
Shopping	4,250	9%	1,950	5%	3,320	13%
Leisure	3,140	7%	4,730	13%	3,240	13%
Medical	540	1%	490	1%	480	2%
Pick-up / drive passenger	2,490	5%	2,410	7%	1,560	6%
Return Home	32,930	71%	21,350	59%	14,280	56%
Other	1,690	4%	1,770	5%	1,350	5%
Total:	46,380	100%	35,940	100%	25,510	100%

Peak Period (%)	Total:	% of 24 Hours	Within District (%)
24 Hours	459,110		24%
AM Peak Period	90,860	20%	19%
PM Peak Period	107,830	23%	24%

Trips by Primary Travel Mode

24 Hours	From District		To District		Within District	
Auto Driver	76,930	44%	76,620	44%	23,390	22%
Auto Passenger	21,230	12%	21,160	12%	8,750	8%
Transit	49,630	28%	49,160	28%	10,530	10%
Bicycle	6,860	4%	6,780	4%	7,380	7%
Walk	16,280	9%	17,130	10%	55,680	51%
Other	4,280	2%	4,670	3%	2,640	2%
Total:	175,210	100%	175,520	100%	108,370	100%

AM Peak (06:30 - 08:59)	From District		To District		Within District	
Auto Driver	11,370	40%	18,290	41%	3,490	20%
Auto Passenger	2,040	7%	4,080	9%	1,520	9%
Transit	7,060	25%	18,340	41%	2,220	13%
Bicycle	1,780	6%	1,990	4%	1,400	8%
Walk	5,410	19%	1,160	3%	7,530	44%
Other	1,070	4%	1,060	2%	1,020	6%
Total:	28,730	100%	44,920	100%	17,180	100%

PM Peak (15:30 - 17:59)	From District		To District		Within District	
Auto Driver	20,690	45%	15,420	43%	5,250	21%
Auto Passenger	5,070	11%	3,950	11%	2,110	8%
Transit	15,190	33%	7,820	22%	2,430	10%
Bicycle	2,440	5%	2,130	6%	1,750	7%
Walk	2,100	5%	5,840	16%	13,460	53%
Other	900	2%	770	2%	480	2%
Total:	46,390	100%	35,930	100%	25,480	100%

Avg Vehicle Occupancy	From District	To District	Within District
24 Hours	1.28	1.28	1.37
AM Peak Period	1.18	1.22	1.44
PM Peak Period	1.25	1.26	1.40

Transit Modal Split	From District	To District	Within District
24 Hours	34%	33%	25%
AM Peak Period	34%	45%	31%
PM Peak Period	37%	29%	25%

Appendix G – TDM Checklists

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)*	☉
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)*	☉
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	☐
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	☐
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐

		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	☉
	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)*	☉ Under consideration
	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	☉
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)*	☉
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)	☉

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

Legend

BASIC — The measure is generally feasible and effective, and in most cases would benefit the development and its users

BETTER — The measure could maximize support for users of sustainable modes, and optimize development performance

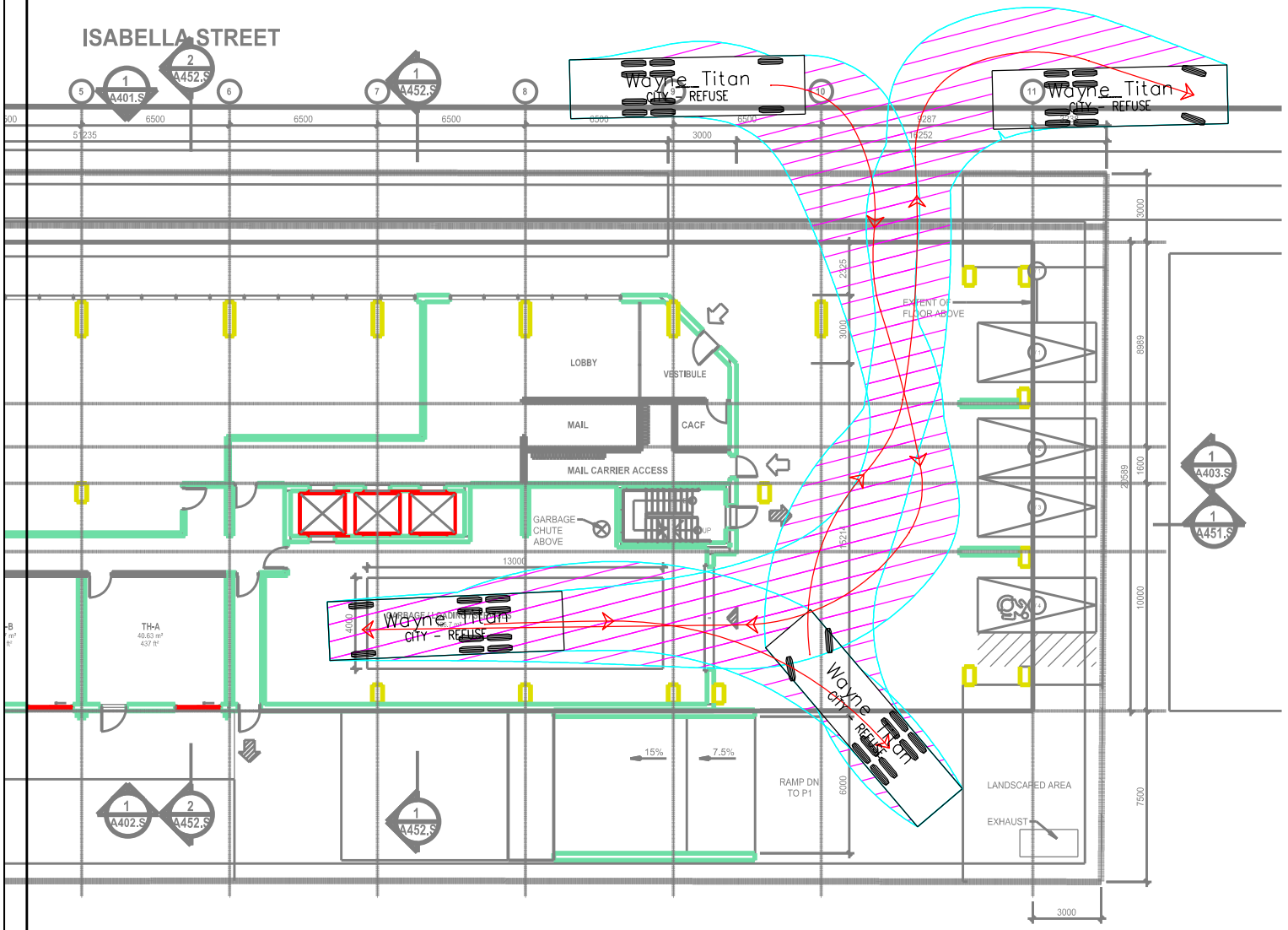
★ — The measure is one of the most dependably effective tools to encourage the use of sustainable modes

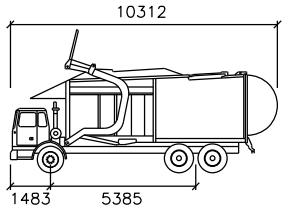
		TDM measures: *Residential developments*	Check if proposed & add descriptions
	1.	**TDM PROGRAM MANAGEMENT**	
	1.1	**Program coordinator**	
BASIC ★	1.1.1	Designate an internal coordinator, or contract with an external coordinator	☐
	1.2	**Travel surveys**	
BETTER	1.2.1	Conduct periodic surveys to identify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

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

			TDM measures: *Residential developments*	Check if proposed & add descriptions
		6.	**TDM MARKETING & COMMUNICATIONS**	
		6.1	**Multimodal travel information**	
BASIC	★	6.1.1	Provide a multimodal travel option information package to new residents	●
		6.2	**Personalized trip planning**	
BETTER	★	6.2.1	Offer personalized trip planning to new residents	☐

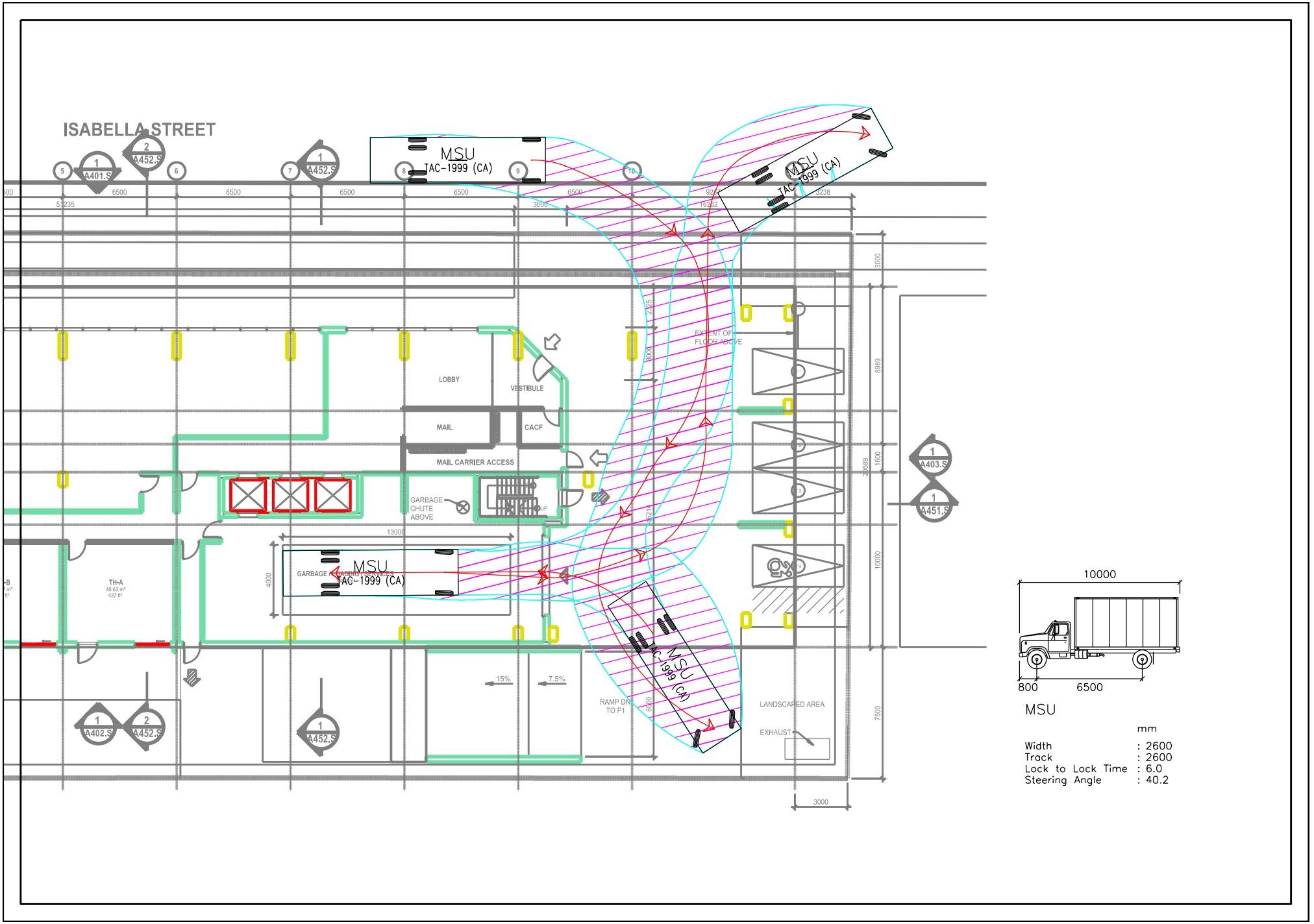
Appendix H – Swept Path Analysis





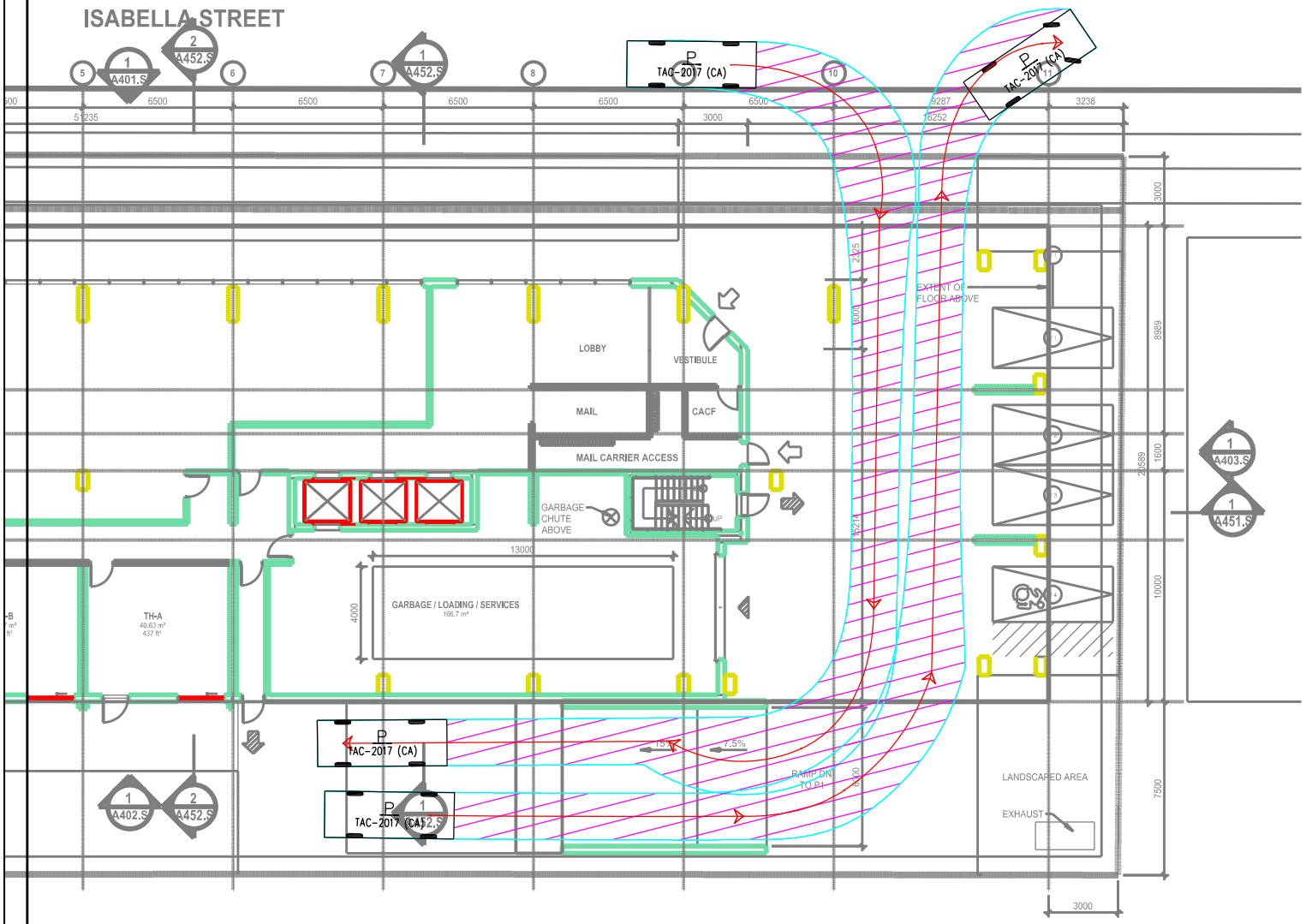
Wayne Titan

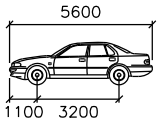
	mm
Width	: 2578
Track	: 2438
Lock to Lock Time	: 6.0
Steering Angle	: 45.0



MSU

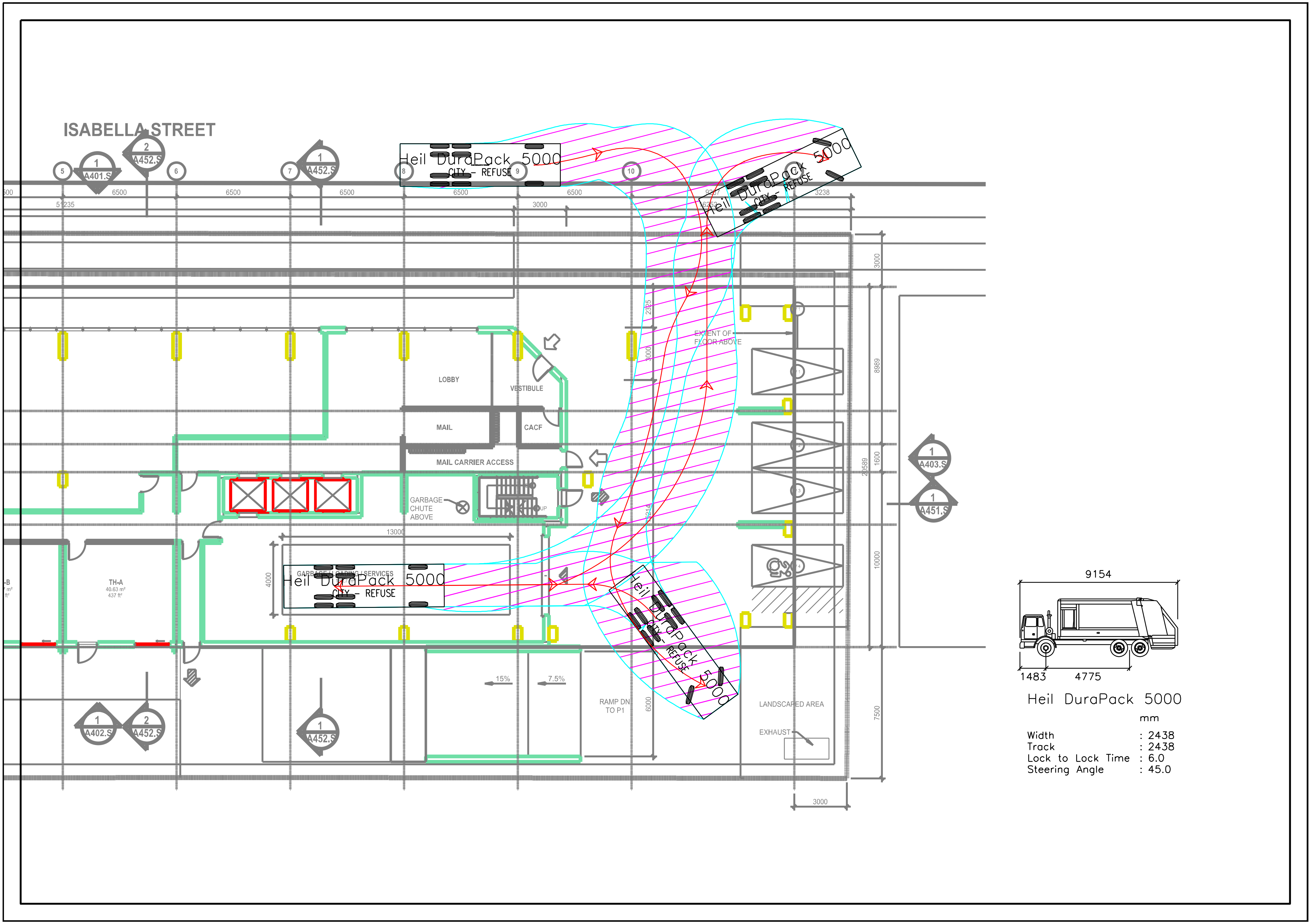
	mm
Width	: 2600
Track	: 2600
Lock to Lock Time	: 6.0
Steering Angle	: 40.2





P

	mm
Width	: 2000
Track	: 2000
Lock to Lock Time	: 6.0
Steering Angle	: 35.9


ISABELLA STREET
Heil DuraPack 5000
CITY - REFUSE
LOBBY
VESTIBULE
MAIL
CACF
MAIL CARRIER ACCESS
GARBAGE CHUTE ABOVE
GARBAGE / LOADING / SERVICES
EXTENT OF FLOOR ABOVE
RAMP DN TO P1
LANDSCAPED AREA
EXHAUST
15%
7.5%
TH-A
9154
1483
4775
Heil DuraPack 5000
mm
Width : 2438
Track : 2438
Lock to Lock Time : 6.0
Steering Angle : 45.0

Appendix I – MMLOS Analyses

Multi-Modal Level of Service
178-200 Isabella Street
Scenario: Existing Conditions

September 10, 2020

IBI

INTERSECTIONS		Bank & Isabella/ Chamberlain				Isabella & O'Connor/ Hwy 417 EB Off-Ramp				Isabella & Metcalfe/ Hwy 417 EB On-Ramp			
		NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	4	4	2	4	4	3	4	4				4
	Median	No Median	No Median	No Median	No Median	No Median	Median (>2.4m)	No Median	No Median				No Median
	Island Refuge												
	Conflicting Left Turns (from street to right)	Permissive	No left turn/prohibited	Protected/permissive	No left turn/prohibited	No left turn/prohibited	No left turn/prohibited	Protected	No left turn/prohibited				No left turn/prohibited
	Conflicting Right Turns (from street to left)	No right turn	Permissive or yield control	Permissive or yield control	No right turn	No right turn	Permissive or yield control	No right turn	No right turn				No right turn
	RTOR? (from street to left)	RTOR prohibited	RTOR allowed	RTOR allowed	RTOR prohibited	RTOR prohibited	RTOR allowed	RTOR prohibited	RTOR prohibited				RTOR prohibited
	Ped Leading Interval? (on cross street)	No	No	No	No	No	No	No	No				No
	Corner Radius	No right turn	> 5m to 10m	> 10m to 15m	No right turn	No right turn	> 5m to 10m	No right turn	No right turn				No right turn
	Right Turn Channel	No right turn channel	No right turn channel	No right turn channel	Conventional right turn channel without receiving lane	No right turn channel	No right turn channel	No right turn channel	No right turn channel				No right turn
	Crosswalk Type	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings				Standard transverse markings
	LOS (PETSI)	**67 C**	**62 C**	**85 B**	**79 B**	**75 B**	**79 B**	**75 B**	**75 B**				**79 B**
	Cycle Length (sec)	90	90	90	90	100	100	100	100				100
	Pedestrian Walk Time (solid white symbol) (sec)	7	7	7	7			7	12				7
	LOS (Delay,seconds)	**39.4 D**	**39.4 D**	**39.4 D**	**39.4 D**	**50.0 E**	**50.0 E**	**44.3 E**	**40.5 E**				**44.3 E**
	Overall Level of Service	**D**				**E**				**E**			
Cyclist	Type of Bikeway	Mixed Traffic	Mixed Traffic		Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Mixed Traffic	Mixed Traffic				Mixed Traffic
	Turning Speed (based on corner radius & angle)	Slow	Slow		Slow								
	Right Turn Storage Length				≤ 50m								
	Dual Right Turn?	No	No		No								
	Shared Through-Right?	No	Yes										
	Bike Box / Two-Stage Left-Turn?	No	No		No								
	Number of Lanes Crossed for Left Turns	1 Lane Crossed			1 Lane Crossed	No Lanes Crossed			No Lanes Crossed				2+ Lanes Crossed
	Operating Speed on Approach	50km/h	50km/h		50km/h								≥ 60km/h
	Dual Left Turn Lanes?	No	No		No	No	No	No	No				
	Level of Service	**F**			**F**	**C**			**D**				**F**
		F				**D**				**F**			
Transit	Average Signal Delay	≤20 sec	≤10 sec		≤30 sec	≤40 sec				≤20 sec	>40 sec		
	Level of Service	**C**	**B**		**D**	**E**				**C**	**F**		
		D				**E**				**F**			
Truck	Turning Radius (Right Turn)		10 to 15m		< 10m								
	Number of Receiving Lanes				2+								
			B		**D**								
		D											

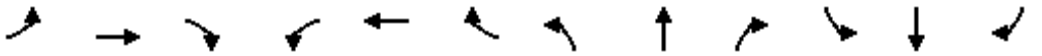
Multi-Modal Level of Service
178-200 Isabella Street
Scenario: Future Conditions

September 10, 2020

IBI

INTERSECTIONS		Bank & Isabella/ Chamberlain				Isabella & O'Connor/ Hwy 417 EB Off-Ramp				Isabella & Metcalfe/ Hwy 417 EB On-Ramp			
		NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	4	4	2	4	4	3	4	4				4
	Median	No Median	No Median	No Median	No Median	No Median	Median (>2.4m)	No Median	No Median				No Median
	Island Refuge												
	Conflicting Left Turns (from street to right)	Permissive	No left turn/prohibited	Protected/permissive	No left turn/prohibited	No left turn/prohibited	No left turn/prohibited	Protected	No left turn/prohibited				No left turn/prohibited
	Conflicting Right Turns (from street to left)	No right turn	Permissive or yield control	Permissive or yield control	No right turn	No right turn	Permissive or yield control	No right turn	No right turn				No right turn
	RTOR? (from street to left)	RTOR prohibited	RTOR allowed	RTOR allowed	RTOR prohibited	RTOR prohibited	RTOR allowed	RTOR prohibited	RTOR prohibited				RTOR prohibited
	Ped Leading Interval? (on cross street)	No	No	No	No	No	No	No	No				No
	Corner Radius	No right turn	> 5m to 10m	> 10m to 15m	No right turn	No right turn	> 5m to 10m	No right turn	No right turn				No right turn
	Right Turn Channel	No right turn channel	No right turn channel	No right turn channel	Conventional right turn channel without receiving lane	No right turn channel	No right turn channel	No right turn channel	No right turn channel				No right turn
	Crosswalk Type	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings				Zebra stripe hi-vis markings
	LOS (PETSI)	**70 C**	**65 C**	**88 B**	**82 B**	**78 B**	**82 B**	**78 B**	**78 B**				**82 B**
	Cycle Length (sec)	90	90	90	90	100	100	100	100				100
	Pedestrian Walk Time (solid white symbol) (sec)	7	7	7	7			7	12				7
	LOS (Delay,seconds)	**39.4 D**	**39.4 D**	**39.4 D**	**39.4 D**	**50.0 E**	**50.0 E**	**44.3 E**	**40.5 E**				**44.3 E**
	Overall Level of Service	**D**				**E**				**E**			
Cyclist	Type of Bikeway				Bike Lanes/Cycle Track	Bike Lanes/Cycle Track			Bike Lanes/Cycle Track				Mixed Traffic
	Turning Speed (based on corner radius & angle)				Slow								
	Right Turn Storage Length				≤ 50m								
	Dual Right Turn?				No								
	Shared Through-Right?												
	Bike Box / Two-Stage Left-Turn?	No		Yes	No	Yes			Yes				
	Number of Lanes Crossed for Left Turns	1 Lane Crossed		No Lanes Crossed	No Lanes Crossed	No Lanes Crossed			No Lanes Crossed		No Lanes Crossed		2+ Lanes Crossed
	Operating Speed on Approach	≥ 60km/h		50km/h	50km/h						≥ 60km/h		≥ 60km/h
	Dual Left Turn Lanes?					No	No	No	No				
	Level of Service	**F**		**A**	**A**	**A**			**A**		**D**		**F**
		F				**A**				**F**			
Transit	Average Signal Delay	≤20 sec	≤20 sec		≤30 sec	≤40 sec				≤30 sec	>40 sec		
	Level of Service	**C**	**C**		**D**	**E**				**D**	**F**		
		D				**E**				**F**			
Truck	Turning Radius (Right Turn)		10 to 15m		< 10m								
	Number of Receiving Lanes		2+		2+								
			B		**D**								
		D											

Appendix J – Intersection Capacity Analyses

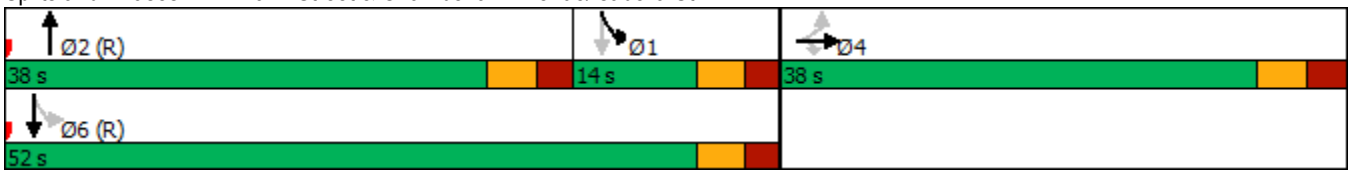


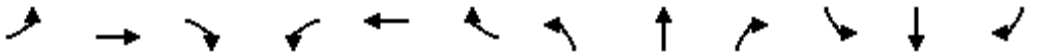
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	506	78	0	0	0	0	834	148	175	372	0
Future Volume (vph)	77	506	78	0	0	0	0	834	148	175	372	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		30.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Ped Bike Factor		1.00	0.93					0.97			0.98	
Frt			0.850					0.977				
Flt Protected		0.993									0.984	
Satd. Flow (prot)	0	3225	1446	0	0	0	0	3130	0	0	3220	0
Flt Permitted		0.993									0.455	
Satd. Flow (perm)	0	3216	1344	0	0	0	0	3130	0	0	1466	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			102					25				
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		340.2			147.7			337.2			403.0	
Travel Time (s)		24.5			10.6			24.3			29.0	
Confl. Peds. (#/hr)	15		44	44		15	139		135	135		139
Confl. Bikes (#/hr)									4			
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
Heavy Vehicles (%)	3%	7%	7%	0%	0%	0%	0%	4%	6%	5%	6%	0%
Adj. Flow (vph)	86	562	87	0	0	0	0	927	164	194	413	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	648	87	0	0	0	0	1091	0	0	607	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6	1	
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0					5.0		5.0	5.0	
Minimum Split (s)	26.1	26.1	26.1					22.7		10.7	22.7	
Total Split (s)	38.0	38.0	38.0					38.0		14.0	52.0	
Total Split (%)	42.2%	42.2%	42.2%					42.2%		15.6%	57.8%	
Maximum Green (s)	31.9	31.9	31.9					32.3		8.3	46.3	
Yellow Time (s)	3.3	3.3	3.3					3.3		3.3	3.3	
All-Red Time (s)	2.8	2.8	2.8					2.4		2.4	2.4	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		6.1	6.1					5.7			5.7	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Recall Mode	None	None	None					C-Min		None	C-Min	
Walk Time (s)	7.0	7.0	7.0					7.0			7.0	
Flash Dont Walk (s)	13.0	13.0	13.0					10.0			10.0	
Pedestrian Calls (#/hr)	0	0	0					0			0	
Act Effct Green (s)		24.9	24.9					53.3			53.3	
Actuated g/C Ratio		0.28	0.28					0.59			0.59	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.73	0.20					0.59			0.32	
Control Delay		34.2	4.6					13.7			10.6	
Queue Delay		0.0	0.0					0.0			0.0	
Total Delay		34.2	4.6					13.7			10.6	
LOS		C	A					B			B	
Approach Delay		30.7						13.7			10.6	
Approach LOS		C						B			B	
Queue Length 50th (m)		53.1	0.0					55.8			25.6	
Queue Length 95th (m)		64.4	7.5					89.3			42.4	
Internal Link Dist (m)		316.2			123.7			313.2			379.0	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		1139	542					1864			1907	
Starvation Cap Reductn		0	0					0			0	
Spillback Cap Reductn		0	0					0			0	
Storage Cap Reductn		0	0					0			0	
Reduced v/c Ratio		0.57	0.16					0.59			0.32	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 41 (46%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.73			
Intersection Signal Delay: 18.0		Intersection LOS: B	
Intersection Capacity Utilization 81.6%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 1: Bank Street & Chamberlain Avenue/Isabella St





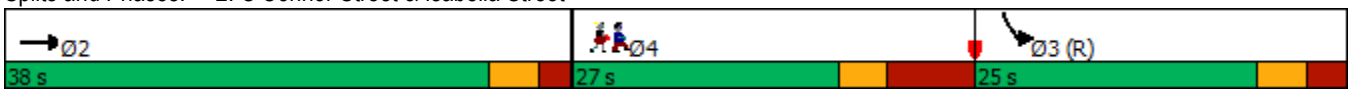
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1557	10	0	0	0	0	0	0	558	0	0
Future Volume (vph)	0	1557	10	0	0	0	0	0	0	558	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.00	1.00
Ped Bike Factor		1.00								0.90		
Frt		0.999										
Flt Protected										0.950		
Satd. Flow (prot)	0	6004	0	0	0	0	0	0	0	4644	0	0
Flt Permitted										0.950		
Satd. Flow (perm)	0	6004	0	0	0	0	0	0	0	4166	0	0
Right Turn on Red			Yes			Yes			Yes	No		Yes
Satd. Flow (RTOR)		1										
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		170.7			176.8			343.1			405.6	
Travel Time (s)		12.3			12.7			24.7			29.2	
Confl. Peds. (#/hr)	6		46	46		6	66		72	72		66
Confl. Bikes (#/hr)			2			2			32			5
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
Heavy Vehicles (%)	0%	4%	20%	0%	0%	0%	0%	0%	0%	5%	0%	0%
Adj. Flow (vph)	0	1730	11	0	0	0	0	0	0	620	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1741	0	0	0	0	0	0	0	620	0	0
Turn Type		NA								Prot		
Protected Phases		2								3		
Permitted Phases												
Detector Phase		2								3		
Switch Phase												
Minimum Initial (s)		5.0								5.0		
Minimum Split (s)		28.6								25.0		
Total Split (s)		38.0								25.0		
Total Split (%)		42.2%								27.8%		
Maximum Green (s)		32.4								18.9		
Yellow Time (s)		3.3								3.3		
All-Red Time (s)		2.3								2.8		
Lost Time Adjust (s)		0.0								0.0		
Total Lost Time (s)		5.6								6.1		
Lead/Lag										Lag		
Lead-Lag Optimize?										Yes		
Vehicle Extension (s)		3.0								3.0		
Recall Mode		Min								C-Max		
Walk Time (s)		12.0										
Flash Dont Walk (s)		11.0										
Pedestrian Calls (#/hr)		0										
Act Effct Green (s)		32.4								45.9		
Actuated g/C Ratio		0.36								0.51		
v/c Ratio		0.81								0.26		
Control Delay		29.5								12.8		
Queue Delay		0.0								0.0		

Lane Group	Ø4
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (k/h)	
Link Distance (m)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	27.2
Total Split (s)	27.0
Total Split (%)	30%
Maximum Green (s)	17.8
Yellow Time (s)	3.3
All-Red Time (s)	5.9
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		29.5								12.8		
LOS		C								B		
Approach Delay		29.5									12.8	
Approach LOS		C									B	
Queue Length 50th (m)		77.7								20.3		
Queue Length 95th (m)		91.9								27.1		
Internal Link Dist (m)		146.7			152.8			319.1			381.6	
Turn Bay Length (m)												
Base Capacity (vph)		2162								2368		
Starvation Cap Reductn		0								0		
Spillback Cap Reductn		0								0		
Storage Cap Reductn		0								0		
Reduced v/c Ratio		0.81								0.26		

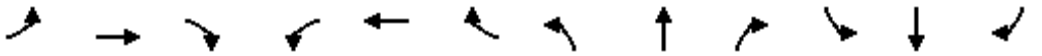
Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 31 (34%), Referenced to phase 3:SBL, Start of Green			
Natural Cycle: 85			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.81			
Intersection Signal Delay: 25.1		Intersection LOS: C	
Intersection Capacity Utilization 52.8%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 2: O'Connor Street & Isabella Street



Lane Group	Ø4
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



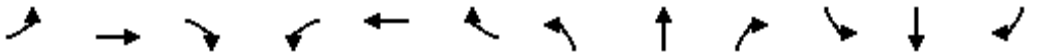
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	825	1291	0	0	0	0	0	94	301	0	0	0
Future Volume (vph)	825	1291	0	0	0	0	0	94	301	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt									0.850			
Flt Protected	0.950	0.990										
Satd. Flow (prot)	1472	4426	0	0	0	0	0	1784	1488	0	0	0
Flt Permitted	0.950	0.990										
Satd. Flow (perm)	1472	4426	0	0	0	0	0	1784	1488	0	0	0
Right Turn on Red	No		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									35			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		176.8			255.7			343.3			402.9	
Travel Time (s)		12.7			18.4			24.7			29.0	
Confl. Peds. (#/hr)			12	12			27					27
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
Heavy Vehicles (%)	1%	6%	0%	0%	0%	0%	0%	2%	4%	0%	0%	0%
Adj. Flow (vph)	917	1434	0	0	0	0	0	104	334	0	0	0
Shared Lane Traffic (%)	38%											
Lane Group Flow (vph)	569	1782	0	0	0	0	0	104	334	0	0	0
Turn Type	Perm	NA						NA	Perm			
Protected Phases		2						4				
Permitted Phases	2								4			
Detector Phase	2	2						4	4			
Switch Phase												
Minimum Initial (s)	5.0	5.0						5.0	5.0			
Minimum Split (s)	23.3	23.3						33.3	33.3			
Total Split (s)	57.0	57.0						33.0	33.0			
Total Split (%)	63.3%	63.3%						36.7%	36.7%			
Maximum Green (s)	51.7	51.7						27.7	27.7			
Yellow Time (s)	3.3	3.3						3.3	3.3			
All-Red Time (s)	2.0	2.0						2.0	2.0			
Lost Time Adjust (s)	0.0	0.0						0.0	0.0			
Total Lost Time (s)	5.3	5.3						5.3	5.3			
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0						3.0	3.0			
Recall Mode	C-Min	C-Min						None	None			
Walk Time (s)	7.0	7.0						7.0	7.0			
Flash Dont Walk (s)	8.0	8.0						21.0	21.0			
Pedestrian Calls (#/hr)	0	0						0	0			
Act Effct Green (s)	56.6	56.6						22.8	22.8			
Actuated g/C Ratio	0.63	0.63						0.25	0.25			
v/c Ratio	0.61	0.64						0.23	0.83			
Control Delay	11.7	9.6						26.3	45.6			
Queue Delay	0.2	0.0						0.0	0.0			
Total Delay	11.9	9.6						26.3	45.6			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	A						C	D			
Approach Delay		10.2						41.1				
Approach LOS		B						D				
Queue Length 50th (m)	95.4	101.4						14.1	48.5			
Queue Length 95th (m)	m146.3	117.5						25.1	75.5			
Internal Link Dist (m)		152.8			231.7			319.3			378.9	
Turn Bay Length (m)												
Base Capacity (vph)	926	2785						549	482			
Starvation Cap Reductn	53	0						0	0			
Spillback Cap Reductn	0	0						0	0			
Storage Cap Reductn	0	0						0	0			
Reduced v/c Ratio	0.65	0.64						0.19	0.69			

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 80 (89%), Referenced to phase 2:EBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.83			
Intersection Signal Delay: 15.0		Intersection LOS: B	
Intersection Capacity Utilization 61.5%		ICU Level of Service B	
Analysis Period (min) 15			

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

Splits and Phases: 3: Metcalfe Street & Isabella Street



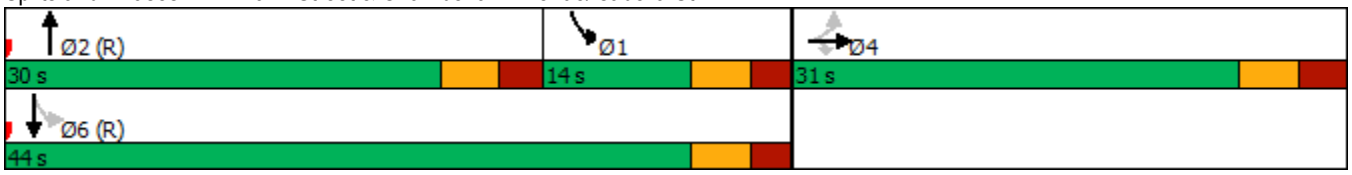
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	614	125	0	0	0	0	448	95	182	720	0
Future Volume (vph)	55	614	125	0	0	0	0	448	95	182	720	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		30.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Ped Bike Factor		1.00	0.91					0.96			0.98	
Frt			0.850					0.974				
Flt Protected		0.996									0.990	
Satd. Flow (prot)	0	3347	1547	0	0	0	0	3127	0	0	3324	0
Flt Permitted		0.996									0.692	
Satd. Flow (perm)	0	3343	1403	0	0	0	0	3127	0	0	2282	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			122					36				
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		340.2			147.7			337.2			403.0	
Travel Time (s)		24.5			10.6			24.3			29.0	
Confl. Peds. (#/hr)	10		72	72		10	183		180	180		183
Confl. Bikes (#/hr)			3						10			15
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
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%	0%	3%	3%	3%	3%	0%
Adj. Flow (vph)	61	682	139	0	0	0	0	498	106	202	800	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	743	139	0	0	0	0	604	0	0	1002	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0					5.0		5.0	5.0	
Minimum Split (s)	26.1	26.1	26.1					22.7		10.7	22.7	
Total Split (s)	31.0	31.0	31.0					30.0		14.0	44.0	
Total Split (%)	41.3%	41.3%	41.3%					40.0%		18.7%	58.7%	
Maximum Green (s)	24.9	24.9	24.9					24.3		8.3	38.3	
Yellow Time (s)	3.3	3.3	3.3					3.3		3.3	3.3	
All-Red Time (s)	2.8	2.8	2.8					2.4		2.4	2.4	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		6.1	6.1					5.7			5.7	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Recall Mode	None	None	None					C-Min		None	C-Min	
Walk Time (s)	7.0	7.0	7.0					7.0			7.0	
Flash Dont Walk (s)	13.0	13.0	13.0					10.0			10.0	
Pedestrian Calls (#/hr)	0	0	0					0			0	
Act Effct Green (s)		22.4	22.4					40.8			40.8	
Actuated g/C Ratio		0.30	0.30					0.54			0.54	

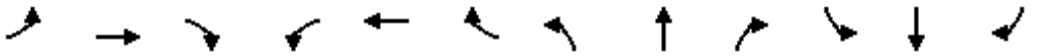
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.74	0.28					0.35			0.81	
Control Delay		28.5	6.5					10.2			21.6	
Queue Delay		0.0	0.0					0.0			0.0	
Total Delay		28.5	6.5					10.2			21.6	
LOS		C	A					B			C	
Approach Delay		25.0						10.2			21.6	
Approach LOS		C						B			C	
Queue Length 50th (m)		47.9	1.6					23.0			59.0	
Queue Length 95th (m)		65.0	12.7					34.4			#101.7	
Internal Link Dist (m)		316.2			123.7			313.2			379.0	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		1109	547					1715			1240	
Starvation Cap Reductn		0	0					0			0	
Spillback Cap Reductn		0	0					0			0	
Storage Cap Reductn		0	0					0			0	
Reduced v/c Ratio		0.67	0.25					0.35			0.81	

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 38 (51%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 20.1 Intersection LOS: C
Intersection Capacity Utilization 81.7% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Bank Street & Chamberlain Avenue/Isabella St





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1175	15	0	0	0	0	0	0	1236	0	0
Future Volume (vph)	0	1175	15	0	0	0	0	0	0	1236	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.00	1.00
Ped Bike Factor		1.00								0.97		
Frt		0.998										
Flt Protected										0.950		
Satd. Flow (prot)	0	6055	0	0	0	0	0	0	0	4780	0	0
Flt Permitted										0.950		
Satd. Flow (perm)	0	6055	0	0	0	0	0	0	0	4631	0	0
Right Turn on Red			Yes			Yes			Yes	No		Yes
Satd. Flow (RTOR)		2										
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		170.7			176.8			343.1			405.6	
Travel Time (s)		12.3			12.7			24.7			29.2	
Confl. Peds. (#/hr)	6		39	39		6	30		30	30		30
Confl. Bikes (#/hr)			2						7			12
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
Heavy Vehicles (%)	0%	3%	7%	0%	0%	0%	0%	0%	0%	2%	0%	0%
Adj. Flow (vph)	0	1306	17	0	0	0	0	0	0	1373	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1323	0	0	0	0	0	0	0	1373	0	0
Turn Type		NA								Prot		
Protected Phases		2								3		
Permitted Phases												
Detector Phase		2								3		
Switch Phase												
Minimum Initial (s)		5.0								5.0		
Minimum Split (s)		28.6								11.1		
Total Split (s)		38.0								35.0		
Total Split (%)		38.0%								35.0%		
Maximum Green (s)		32.4								28.9		
Yellow Time (s)		3.3								3.3		
All-Red Time (s)		2.3								2.8		
Lost Time Adjust (s)		0.0								0.0		
Total Lost Time (s)		5.6								6.1		
Lead/Lag										Lag		
Lead-Lag Optimize?										Yes		
Vehicle Extension (s)		3.0								3.0		
Recall Mode		Min								C-Max		
Walk Time (s)		12.0										
Flash Dont Walk (s)		11.0										
Pedestrian Calls (#/hr)		0										
Act Effct Green (s)		30.8								57.5		
Actuated g/C Ratio		0.31								0.58		
v/c Ratio		0.71								0.50		
Control Delay		32.8								13.7		
Queue Delay		0.3								0.0		

Lane Group	Ø4
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (k/h)	
Link Distance (m)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	27.2
Total Split (s)	27.0
Total Split (%)	27%
Maximum Green (s)	17.8
Yellow Time (s)	3.3
All-Red Time (s)	5.9
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	

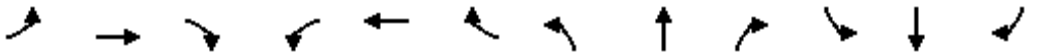
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		33.1								13.7		
LOS		C								B		
Approach Delay		33.1									13.7	
Approach LOS		C									B	
Queue Length 50th (m)		63.9								54.9		
Queue Length 95th (m)		76.2								66.3		
Internal Link Dist (m)		146.7			152.8			319.1			381.6	
Turn Bay Length (m)												
Base Capacity (vph)		1963								2746		
Starvation Cap Reductn		0								0		
Spillback Cap Reductn		174								0		
Storage Cap Reductn		0								0		
Reduced v/c Ratio		0.74								0.50		

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 74 (74%), Referenced to phase 3:SBL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 23.2		Intersection LOS: C	
Intersection Capacity Utilization 66.5%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 2: O'Connor Street & Isabella Street

Lane Group	Ø4
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

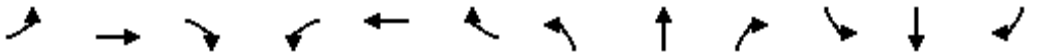


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	185	2226	0	0	0	0	0	95	456	0	0	0
Future Volume (vph)	185	2226	0	0	0	0	0	95	456	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt									0.850			
Flt Protected	0.950											
Satd. Flow (prot)	1472	4560	0	0	0	0	0	1767	1517	0	0	0
Flt Permitted	0.950											
Satd. Flow (perm)	1472	4560	0	0	0	0	0	1767	1517	0	0	0
Right Turn on Red	No		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									25			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		176.8			255.7			343.3			402.9	
Travel Time (s)		12.7			18.4			24.7			29.0	
Confl. Peds. (#/hr)			55	55			52					52
Confl. Bikes (#/hr)			5			1						
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
Heavy Vehicles (%)	1%	3%	0%	0%	0%	0%	0%	3%	2%	0%	0%	0%
Adj. Flow (vph)	206	2473	0	0	0	0	0	106	507	0	0	0
Shared Lane Traffic (%)	10%											
Lane Group Flow (vph)	185	2494	0	0	0	0	0	106	507	0	0	0
Turn Type	Perm	NA						NA	Perm			
Protected Phases		2						4				
Permitted Phases	2								4			
Detector Phase	2	2						4	4			
Switch Phase												
Minimum Initial (s)	5.0	5.0						5.0	5.0			
Minimum Split (s)	20.3	20.3						33.3	33.3			
Total Split (s)	67.0	67.0						33.0	33.0			
Total Split (%)	67.0%	67.0%						33.0%	33.0%			
Maximum Green (s)	61.7	61.7						27.7	27.7			
Yellow Time (s)	3.3	3.3						3.3	3.3			
All-Red Time (s)	2.0	2.0						2.0	2.0			
Lost Time Adjust (s)	0.0	0.0						0.0	0.0			
Total Lost Time (s)	5.3	5.3						5.3	5.3			
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0						3.0	3.0			
Recall Mode	C-Min	C-Min						None	None			
Walk Time (s)	7.0	7.0						7.0	7.0			
Flash Dont Walk (s)	8.0	8.0						21.0	21.0			
Pedestrian Calls (#/hr)	0	0						0	0			
Act Effct Green (s)	61.7	61.7						27.7	27.7			
Actuated g/C Ratio	0.62	0.62						0.28	0.28			
v/c Ratio	0.20	0.89						0.22	1.16			
Control Delay	8.1	16.4						29.3	126.7			
Queue Delay	0.0	2.6						0.0	0.0			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	8.1	18.9						29.3	126.7			
LOS	A	B						C	F			
Approach Delay		18.2						109.9				
Approach LOS		B						F				
Queue Length 50th (m)	12.7	157.9						15.8	~113.5			
Queue Length 95th (m)	m22.5	184.7						29.3	#175.2			
Internal Link Dist (m)		152.8			231.7			319.3			378.9	
Turn Bay Length (m)												
Base Capacity (vph)	908	2813						489	438			
Starvation Cap Reductn	0	213						0	0			
Spillback Cap Reductn	0	0						0	0			
Storage Cap Reductn	0	0						0	0			
Reduced v/c Ratio	0.20	0.96						0.22	1.16			

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 8 (8%), Referenced to phase 2:EBTL and 6:, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.16			
Intersection Signal Delay: 35.3		Intersection LOS: D	
Intersection Capacity Utilization 75.7%		ICU Level of Service D	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 3: Metcalfe Street & Isabella Street



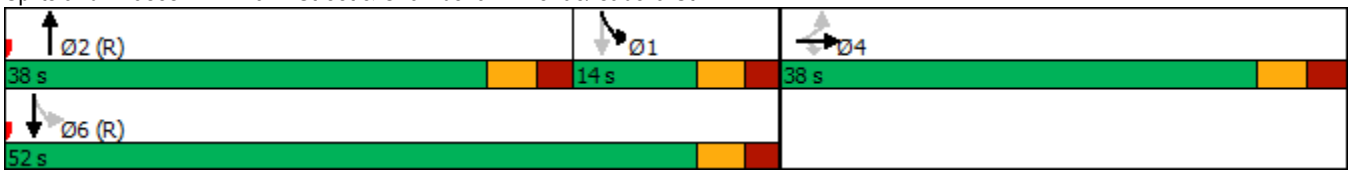
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	557	86	0	0	0	0	834	162	192	372	0
Future Volume (vph)	85	557	86	0	0	0	0	834	162	192	372	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		30.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Ped Bike Factor		1.00	0.93					0.96			0.98	
Frt			0.850					0.976				
Flt Protected		0.993									0.983	
Satd. Flow (prot)	0	3225	1446	0	0	0	0	3117	0	0	3217	0
Flt Permitted		0.993									0.455	
Satd. Flow (perm)	0	3216	1344	0	0	0	0	3117	0	0	1462	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			102					28				
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		340.2			147.7			337.2			403.0	
Travel Time (s)		24.5			10.6			24.3			29.0	
Confl. Peds. (#/hr)	15		44	44		15	139		135	135		139
Confl. Bikes (#/hr)									4			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	7%	7%	0%	0%	0%	0%	4%	6%	5%	6%	0%
Adj. Flow (vph)	85	557	86	0	0	0	0	834	162	192	372	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	642	86	0	0	0	0	996	0	0	564	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6	1	
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0					5.0		5.0	5.0	
Minimum Split (s)	26.1	26.1	26.1					22.7		10.7	22.7	
Total Split (s)	38.0	38.0	38.0					38.0		14.0	52.0	
Total Split (%)	42.2%	42.2%	42.2%					42.2%		15.6%	57.8%	
Maximum Green (s)	31.9	31.9	31.9					32.3		8.3	46.3	
Yellow Time (s)	3.3	3.3	3.3					3.3		3.3	3.3	
All-Red Time (s)	2.8	2.8	2.8					2.4		2.4	2.4	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		6.1	6.1					5.7			5.7	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Recall Mode	None	None	None					C-Min		None	C-Min	
Walk Time (s)	7.0	7.0	7.0					7.0			7.0	
Flash Dont Walk (s)	13.0	13.0	13.0					10.0			10.0	
Pedestrian Calls (#/hr)	0	0	0					0			0	
Act Effct Green (s)		24.7	24.7					53.5			53.5	
Actuated g/C Ratio		0.27	0.27					0.59			0.59	

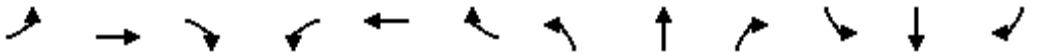
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.73	0.19					0.53			0.29	
Control Delay		34.2	4.5					12.7			10.3	
Queue Delay		0.0	0.0					0.0			0.0	
Total Delay		34.2	4.5					12.7			10.3	
LOS		C	A					B			B	
Approach Delay		30.7						12.7			10.3	
Approach LOS		C						B			B	
Queue Length 50th (m)		52.6	0.0					48.2			23.3	
Queue Length 95th (m)		63.7	7.2					77.6			39.0	
Internal Link Dist (m)		316.2			123.7			313.2			379.0	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		1139	542					1864			1912	
Starvation Cap Reductn		0	0					0			0	
Spillback Cap Reductn		0	0					0			0	
Storage Cap Reductn		0	0					0			0	
Reduced v/c Ratio		0.56	0.16					0.53			0.29	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 41 (46%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 17.8 Intersection LOS: B
Intersection Capacity Utilization 84.4% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: Bank Street & Chamberlain Avenue/Isabella St





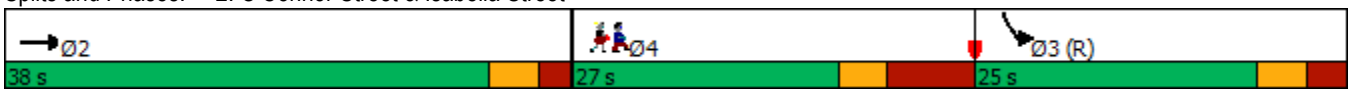
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1713	10	0	0	0	0	0	0	614	0	0
Future Volume (vph)	0	1713	10	0	0	0	0	0	0	614	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.00	1.00
Ped Bike Factor		1.00								0.90		
Frt		0.999										
Flt Protected										0.950		
Satd. Flow (prot)	0	6005	0	0	0	0	0	0	0	4644	0	0
Flt Permitted										0.950		
Satd. Flow (perm)	0	6005	0	0	0	0	0	0	0	4166	0	0
Right Turn on Red			Yes			Yes			Yes	No		Yes
Satd. Flow (RTOR)		1										
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		170.7			176.8			343.1			405.6	
Travel Time (s)		12.3			12.7			24.7			29.2	
Confl. Peds. (#/hr)	6		46	46		6	66		72	72		66
Confl. Bikes (#/hr)			2			2			32			5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	4%	20%	0%	0%	0%	0%	0%	0%	5%	0%	0%
Adj. Flow (vph)	0	1713	10	0	0	0	0	0	0	614	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1723	0	0	0	0	0	0	0	614	0	0
Turn Type		NA								Prot		
Protected Phases		2								3		
Permitted Phases												
Detector Phase		2								3		
Switch Phase												
Minimum Initial (s)		5.0								5.0		
Minimum Split (s)		28.6								25.0		
Total Split (s)		38.0								25.0		
Total Split (%)		42.2%								27.8%		
Maximum Green (s)		32.4								18.9		
Yellow Time (s)		3.3								3.3		
All-Red Time (s)		2.3								2.8		
Lost Time Adjust (s)		0.0								0.0		
Total Lost Time (s)		5.6								6.1		
Lead/Lag										Lag		
Lead-Lag Optimize?										Yes		
Vehicle Extension (s)		3.0								3.0		
Recall Mode		Min								C-Max		
Walk Time (s)		12.0										
Flash Dont Walk (s)		11.0										
Pedestrian Calls (#/hr)		0										
Act Effct Green (s)		32.4								45.9		
Actuated g/C Ratio		0.36								0.51		
v/c Ratio		0.80								0.26		
Control Delay		29.2								12.8		
Queue Delay		0.0								0.0		

Lane Group	Ø4
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (k/h)	
Link Distance (m)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	27.2
Total Split (s)	27.0
Total Split (%)	30%
Maximum Green (s)	17.8
Yellow Time (s)	3.3
All-Red Time (s)	5.9
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		29.2								12.8		
LOS		C								B		
Approach Delay		29.2									12.8	
Approach LOS		C									B	
Queue Length 50th (m)		76.4								20.2		
Queue Length 95th (m)		90.7								26.9		
Internal Link Dist (m)		146.7			152.8			319.1			381.6	
Turn Bay Length (m)												
Base Capacity (vph)		2162								2368		
Starvation Cap Reductn		0								0		
Spillback Cap Reductn		0								0		
Storage Cap Reductn		0								0		
Reduced v/c Ratio		0.80								0.26		

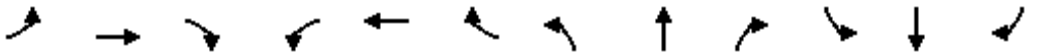
Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 31 (34%), Referenced to phase 3:SBL, Start of Green			
Natural Cycle: 85			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 24.9		Intersection LOS: C	
Intersection Capacity Utilization 55.2%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 2: O'Connor Street & Isabella Street



Lane Group	Ø4
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



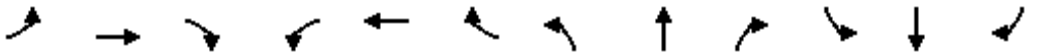
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	907	1420	0	0	0	0	0	94	301	0	0	0
Future Volume (vph)	907	1420	0	0	0	0	0	94	301	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt									0.850			
Flt Protected	0.950	0.990										
Satd. Flow (prot)	1472	4426	0	0	0	0	0	1784	1488	0	0	0
Flt Permitted	0.950	0.990										
Satd. Flow (perm)	1472	4426	0	0	0	0	0	1784	1488	0	0	0
Right Turn on Red	No		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									37			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		176.8			255.7			343.3			402.9	
Travel Time (s)		12.7			18.4			24.7			29.0	
Confl. Peds. (#/hr)			12	12			27					27
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	6%	0%	0%	0%	0%	0%	2%	4%	0%	0%	0%
Adj. Flow (vph)	907	1420	0	0	0	0	0	94	301	0	0	0
Shared Lane Traffic (%)	38%											
Lane Group Flow (vph)	562	1765	0	0	0	0	0	94	301	0	0	0
Turn Type	Perm	NA						NA	Perm			
Protected Phases		2						4				
Permitted Phases	2								4			
Detector Phase	2	2						4	4			
Switch Phase												
Minimum Initial (s)	5.0	5.0						5.0	5.0			
Minimum Split (s)	23.3	23.3						33.3	33.3			
Total Split (s)	57.0	57.0						33.0	33.0			
Total Split (%)	63.3%	63.3%						36.7%	36.7%			
Maximum Green (s)	51.7	51.7						27.7	27.7			
Yellow Time (s)	3.3	3.3						3.3	3.3			
All-Red Time (s)	2.0	2.0						2.0	2.0			
Lost Time Adjust (s)	0.0	0.0						0.0	0.0			
Total Lost Time (s)	5.3	5.3						5.3	5.3			
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0						3.0	3.0			
Recall Mode	C-Min	C-Min						None	None			
Walk Time (s)	7.0	7.0						7.0	7.0			
Flash Dont Walk (s)	8.0	8.0						21.0	21.0			
Pedestrian Calls (#/hr)	0	0						0	0			
Act Effct Green (s)	58.2	58.2						21.2	21.2			
Actuated g/C Ratio	0.65	0.65						0.24	0.24			
v/c Ratio	0.59	0.62						0.22	0.79			
Control Delay	10.4	8.5						27.1	43.2			
Queue Delay	0.0	0.0						0.0	0.0			
Total Delay	10.4	8.5						27.1	43.2			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	A						C	D			
Approach Delay		8.9						39.4				
Approach LOS		A						D				
Queue Length 50th (m)	90.9	96.8						13.1	43.0			
Queue Length 95th (m)	m144.6	116.4						23.2	66.0			
Internal Link Dist (m)		152.8			231.7			319.3			378.9	
Turn Bay Length (m)												
Base Capacity (vph)	951	2861						549	483			
Starvation Cap Reductn	0	0						0	0			
Spillback Cap Reductn	0	0						0	0			
Storage Cap Reductn	0	0						0	0			
Reduced v/c Ratio	0.59	0.62						0.17	0.62			

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 80 (89%), Referenced to phase 2:EBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 13.3		Intersection LOS: B	
Intersection Capacity Utilization 64.8%		ICU Level of Service C	
Analysis Period (min) 15			

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

Splits and Phases: 3: Metcalfe Street & Isabella Street



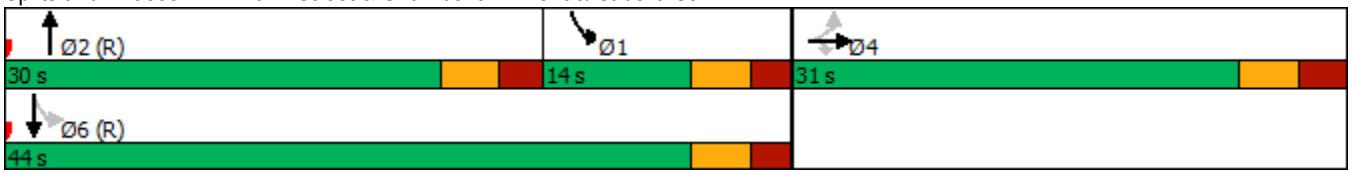
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	61	675	137	0	0	0	0	448	104	200	720	0
Future Volume (vph)	61	675	137	0	0	0	0	448	104	200	720	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		30.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Ped Bike Factor		1.00	0.91					0.95			0.98	
Frt			0.850					0.972				
Flt Protected		0.996									0.989	
Satd. Flow (prot)	0	3347	1547	0	0	0	0	3110	0	0	3320	0
Flt Permitted		0.996									0.703	
Satd. Flow (perm)	0	3343	1403	0	0	0	0	3110	0	0	2310	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			122					39				
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		340.2			147.7			337.2			403.0	
Travel Time (s)		24.5			10.6			24.3			29.0	
Confl. Peds. (#/hr)	10		72	72		10	183		180	180		183
Confl. Bikes (#/hr)			3						10			15
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%	0%	3%	3%	3%	3%	0%
Adj. Flow (vph)	61	675	137	0	0	0	0	448	104	200	720	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	736	137	0	0	0	0	552	0	0	920	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0					5.0		5.0	5.0	
Minimum Split (s)	26.1	26.1	26.1					22.7		10.7	22.7	
Total Split (s)	31.0	31.0	31.0					30.0		14.0	44.0	
Total Split (%)	41.3%	41.3%	41.3%					40.0%		18.7%	58.7%	
Maximum Green (s)	24.9	24.9	24.9					24.3		8.3	38.3	
Yellow Time (s)	3.3	3.3	3.3					3.3		3.3	3.3	
All-Red Time (s)	2.8	2.8	2.8					2.4		2.4	2.4	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		6.1	6.1					5.7			5.7	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Recall Mode	None	None	None					C-Min		None	C-Min	
Walk Time (s)	7.0	7.0	7.0					7.0			7.0	
Flash Dont Walk (s)	13.0	13.0	13.0					10.0			10.0	
Pedestrian Calls (#/hr)	0	0	0					0			0	
Act Effct Green (s)		22.4	22.4					40.8			40.8	
Actuated g/C Ratio		0.30	0.30					0.54			0.54	

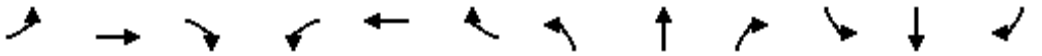
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.74	0.27					0.32			0.73	
Control Delay		28.4	6.4					9.8			18.1	
Queue Delay		0.0	0.0					0.0			0.0	
Total Delay		28.4	6.4					9.8			18.1	
LOS		C	A					A			B	
Approach Delay		24.9						9.8			18.1	
Approach LOS		C						A			B	
Queue Length 50th (m)		47.3	1.5					20.2			50.3	
Queue Length 95th (m)		64.2	12.3					31.0			76.7	
Internal Link Dist (m)		316.2			123.7			313.2			379.0	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		1109	547					1711			1257	
Starvation Cap Reductn		0	0					0			0	
Spillback Cap Reductn		0	0					0			0	
Storage Cap Reductn		0	0					0			0	
Reduced v/c Ratio		0.66	0.25					0.32			0.73	

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 38 (51%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 18.7 Intersection LOS: B
Intersection Capacity Utilization 84.6% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: Bank Street & Chamberlain Avenue/Isabella St





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1293	15	0	0	0	0	0	0	1359	0	0
Future Volume (vph)	0	1293	15	0	0	0	0	0	0	1359	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.00	1.00
Ped Bike Factor		1.00								0.97		
Frt		0.998										
Flt Protected										0.950		
Satd. Flow (prot)	0	6056	0	0	0	0	0	0	0	4780	0	0
Flt Permitted										0.950		
Satd. Flow (perm)	0	6056	0	0	0	0	0	0	0	4631	0	0
Right Turn on Red			Yes			Yes			Yes	No		Yes
Satd. Flow (RTOR)		2										
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		170.7			176.8			343.1			405.6	
Travel Time (s)		12.3			12.7			24.7			29.2	
Confl. Peds. (#/hr)	6		39	39		6	30		30	30		30
Confl. Bikes (#/hr)			2						7			12
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	3%	7%	0%	0%	0%	0%	0%	0%	2%	0%	0%
Adj. Flow (vph)	0	1293	15	0	0	0	0	0	0	1359	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1308	0	0	0	0	0	0	0	1359	0	0
Turn Type		NA								Prot		
Protected Phases		2								3		
Permitted Phases												
Detector Phase		2								3		
Switch Phase												
Minimum Initial (s)		5.0								5.0		
Minimum Split (s)		28.6								11.1		
Total Split (s)		38.0								35.0		
Total Split (%)		38.0%								35.0%		
Maximum Green (s)		32.4								28.9		
Yellow Time (s)		3.3								3.3		
All-Red Time (s)		2.3								2.8		
Lost Time Adjust (s)		0.0								0.0		
Total Lost Time (s)		5.6								6.1		
Lead/Lag										Lag		
Lead-Lag Optimize?										Yes		
Vehicle Extension (s)		3.0								3.0		
Recall Mode		Min								C-Max		
Walk Time (s)		12.0										
Flash Dont Walk (s)		11.0										
Pedestrian Calls (#/hr)		0										
Act Effct Green (s)		30.6								57.7		
Actuated g/C Ratio		0.31								0.58		
v/c Ratio		0.71								0.49		
Control Delay		32.8								13.6		
Queue Delay		0.0								0.0		

Lane Group	Ø4
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (k/h)	
Link Distance (m)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	27.2
Total Split (s)	27.0
Total Split (%)	27%
Maximum Green (s)	17.8
Yellow Time (s)	3.3
All-Red Time (s)	5.9
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	

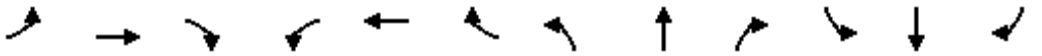
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		32.8								13.6		
LOS		C								B		
Approach Delay		32.8									13.6	
Approach LOS		C									B	
Queue Length 50th (m)		62.9								54.1		
Queue Length 95th (m)		75.3								65.5		
Internal Link Dist (m)		146.7			152.8			319.1			381.6	
Turn Bay Length (m)												
Base Capacity (vph)		1963								2757		
Starvation Cap Reductn		0								0		
Spillback Cap Reductn		0								0		
Storage Cap Reductn		0								0		
Reduced v/c Ratio		0.67								0.49		

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 1 (1%), Referenced to phase 3:SBL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 23.0		Intersection LOS: C	
Intersection Capacity Utilization 70.2%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 2: O'Connor Street & Isabella Street

Lane Group	Ø4
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

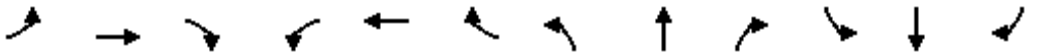


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	204	2448	0	0	0	0	0	95	456	0	0	0
Future Volume (vph)	204	2448	0	0	0	0	0	95	456	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt									0.850			
Flt Protected	0.950											
Satd. Flow (prot)	1472	4560	0	0	0	0	0	1767	1517	0	0	0
Flt Permitted	0.950											
Satd. Flow (perm)	1472	4560	0	0	0	0	0	1767	1517	0	0	0
Right Turn on Red	No		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									25			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		176.8			255.7			343.3			402.9	
Travel Time (s)		12.7			18.4			24.7			29.0	
Confl. Peds. (#/hr)			55	55			52					52
Confl. Bikes (#/hr)			5			1						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	3%	0%	0%	0%	0%	0%	3%	2%	0%	0%	0%
Adj. Flow (vph)	204	2448	0	0	0	0	0	95	456	0	0	0
Shared Lane Traffic (%)	10%											
Lane Group Flow (vph)	184	2468	0	0	0	0	0	95	456	0	0	0
Turn Type	Perm	NA						NA	Perm			
Protected Phases		2						4				
Permitted Phases	2								4			
Detector Phase	2	2						4	4			
Switch Phase												
Minimum Initial (s)	5.0	5.0						5.0	5.0			
Minimum Split (s)	20.3	20.3						33.3	33.3			
Total Split (s)	67.0	67.0						33.0	33.0			
Total Split (%)	67.0%	67.0%						33.0%	33.0%			
Maximum Green (s)	61.7	61.7						27.7	27.7			
Yellow Time (s)	3.3	3.3						3.3	3.3			
All-Red Time (s)	2.0	2.0						2.0	2.0			
Lost Time Adjust (s)	0.0	0.0						0.0	0.0			
Total Lost Time (s)	5.3	5.3						5.3	5.3			
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0						3.0	3.0			
Recall Mode	C-Min	C-Min						None	None			
Walk Time (s)	7.0	7.0						7.0	7.0			
Flash Dont Walk (s)	8.0	8.0						21.0	21.0			
Pedestrian Calls (#/hr)	0	0						0	0			
Act Effct Green (s)	61.7	61.7						27.7	27.7			
Actuated g/C Ratio	0.62	0.62						0.28	0.28			
v/c Ratio	0.20	0.88						0.19	1.04			
Control Delay	8.0	19.7						29.0	89.0			
Queue Delay	0.0	0.0						0.0	0.0			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	8.0	19.7						29.0	89.0			
LOS	A	B						C	F			
Approach Delay		18.9						78.7				
Approach LOS		B						E				
Queue Length 50th (m)	17.4	112.9						14.1	~92.4			
Queue Length 95th (m)	m30.6	134.4						26.7	#152.0			
Internal Link Dist (m)		152.8			231.7			319.3			378.9	
Turn Bay Length (m)												
Base Capacity (vph)	908	2813						489	438			
Starvation Cap Reductn	0	0						0	0			
Spillback Cap Reductn	0	0						0	0			
Storage Cap Reductn	0	0						0	0			
Reduced v/c Ratio	0.20	0.88						0.19	1.04			

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 8 (8%), Referenced to phase 2:EBTL and 6:, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.04			
Intersection Signal Delay: 29.2		Intersection LOS: C	
Intersection Capacity Utilization 79.4%		ICU Level of Service D	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 3: Metcalfe Street & Isabella Street



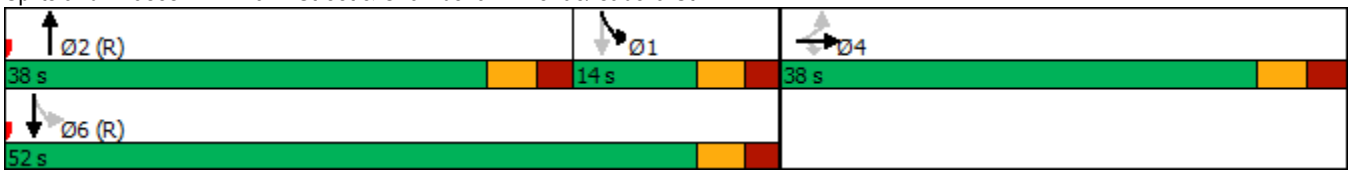
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	608	94	0	0	0	0	834	177	210	372	0
Future Volume (vph)	92	608	94	0	0	0	0	834	177	210	372	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		30.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Ped Bike Factor		1.00	0.93					0.96			0.98	
Frt			0.850					0.974				
Flt Protected		0.993									0.982	
Satd. Flow (prot)	0	3225	1446	0	0	0	0	3101	0	0	3214	0
Flt Permitted		0.993									0.455	
Satd. Flow (perm)	0	3216	1344	0	0	0	0	3101	0	0	1461	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			102					31				
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		340.2			147.7			337.2			403.0	
Travel Time (s)		24.5			10.6			24.3			29.0	
Confl. Peds. (#/hr)	15		44	44		15	139		135	135		139
Confl. Bikes (#/hr)									4			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	7%	7%	0%	0%	0%	0%	4%	6%	5%	6%	0%
Adj. Flow (vph)	92	608	94	0	0	0	0	834	177	210	372	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	700	94	0	0	0	0	1011	0	0	582	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6	1	
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0					5.0		5.0	5.0	
Minimum Split (s)	26.1	26.1	26.1					22.7		10.7	22.7	
Total Split (s)	38.0	38.0	38.0					38.0		14.0	52.0	
Total Split (%)	42.2%	42.2%	42.2%					42.2%		15.6%	57.8%	
Maximum Green (s)	31.9	31.9	31.9					32.3		8.3	46.3	
Yellow Time (s)	3.3	3.3	3.3					3.3		3.3	3.3	
All-Red Time (s)	2.8	2.8	2.8					2.4		2.4	2.4	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		6.1	6.1					5.7			5.7	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Recall Mode	None	None	None					C-Min		None	C-Min	
Walk Time (s)	7.0	7.0	7.0					7.0			7.0	
Flash Dont Walk (s)	13.0	13.0	13.0					10.0			10.0	
Pedestrian Calls (#/hr)	0	0	0					0			0	
Act Effct Green (s)		26.9	26.9					51.3			51.3	
Actuated g/C Ratio		0.30	0.30					0.57			0.57	

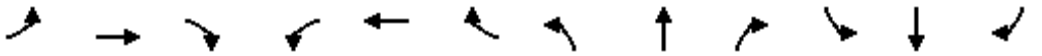
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.73	0.20					0.57			0.32	
Control Delay		32.6	4.8					14.4			11.6	
Queue Delay		0.0	0.0					0.0			0.0	
Total Delay		32.6	4.8					14.4			11.6	
LOS		C	A					B			B	
Approach Delay		29.3						14.4			11.6	
Approach LOS		C						B			B	
Queue Length 50th (m)		56.6	0.0					53.0			26.0	
Queue Length 95th (m)		67.8	8.4					83.8			42.7	
Internal Link Dist (m)		316.2			123.7			313.2			379.0	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		1151	546					1781			1843	
Starvation Cap Reductn		0	0					0			0	
Spillback Cap Reductn		0	0					0			0	
Storage Cap Reductn		0	0					0			0	
Reduced v/c Ratio		0.61	0.17					0.57			0.32	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 41 (46%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 18.7 Intersection LOS: B
Intersection Capacity Utilization 87.2% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: Bank Street & Chamberlain Avenue/Isabella St





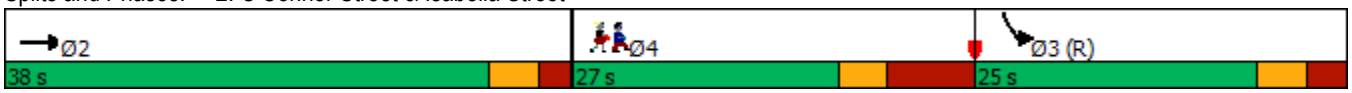
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1868	10	0	0	0	0	0	0	670	0	0
Future Volume (vph)	0	1868	10	0	0	0	0	0	0	670	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.00	1.00
Ped Bike Factor		1.00								0.90		
Frt		0.999										
Flt Protected										0.950		
Satd. Flow (prot)	0	6006	0	0	0	0	0	0	0	4644	0	0
Flt Permitted										0.950		
Satd. Flow (perm)	0	6006	0	0	0	0	0	0	0	4166	0	0
Right Turn on Red			Yes			Yes			Yes	No		Yes
Satd. Flow (RTOR)		1										
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		170.7			176.8			343.1			405.6	
Travel Time (s)		12.3			12.7			24.7			29.2	
Confl. Peds. (#/hr)	6		46	46		6	66		72	72		66
Confl. Bikes (#/hr)			2			2			32			5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	4%	20%	0%	0%	0%	0%	0%	0%	5%	0%	0%
Adj. Flow (vph)	0	1868	10	0	0	0	0	0	0	670	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1878	0	0	0	0	0	0	0	670	0	0
Turn Type		NA								Prot		
Protected Phases		2								3		
Permitted Phases												
Detector Phase		2								3		
Switch Phase												
Minimum Initial (s)		5.0								5.0		
Minimum Split (s)		28.6								25.0		
Total Split (s)		38.0								25.0		
Total Split (%)		42.2%								27.8%		
Maximum Green (s)		32.4								18.9		
Yellow Time (s)		3.3								3.3		
All-Red Time (s)		2.3								2.8		
Lost Time Adjust (s)		0.0								0.0		
Total Lost Time (s)		5.6								6.1		
Lead/Lag										Lag		
Lead-Lag Optimize?										Yes		
Vehicle Extension (s)		3.0								3.0		
Recall Mode		Min								C-Max		
Walk Time (s)		12.0										
Flash Dont Walk (s)		11.0										
Pedestrian Calls (#/hr)		0										
Act Effct Green (s)		32.4								45.9		
Actuated g/C Ratio		0.36								0.51		
v/c Ratio		0.87								0.28		
Control Delay		32.2								13.0		
Queue Delay		0.0								0.0		

Lane Group	Ø4
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (k/h)	
Link Distance (m)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	27.2
Total Split (s)	27.0
Total Split (%)	30%
Maximum Green (s)	17.8
Yellow Time (s)	3.3
All-Red Time (s)	5.9
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		32.2								13.0		
LOS		C								B		
Approach Delay		32.2									13.0	
Approach LOS		C									B	
Queue Length 50th (m)		86.4								22.3		
Queue Length 95th (m)		101.9								29.5		
Internal Link Dist (m)		146.7			152.8			319.1			381.6	
Turn Bay Length (m)												
Base Capacity (vph)		2162								2368		
Starvation Cap Reductn		0								0		
Spillback Cap Reductn		0								14		
Storage Cap Reductn		0								0		
Reduced v/c Ratio		0.87								0.28		

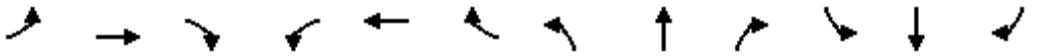
Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 31 (34%), Referenced to phase 3:SBL, Start of Green			
Natural Cycle: 85			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.87			
Intersection Signal Delay: 27.2		Intersection LOS: C	
Intersection Capacity Utilization 57.5%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 2: O'Connor Street & Isabella Street



Lane Group	Ø4
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



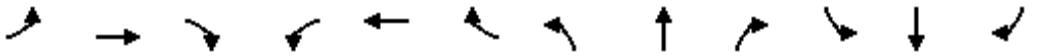
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	990	1549	0	0	0	0	0	94	301	0	0	0
Future Volume (vph)	990	1549	0	0	0	0	0	94	301	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt									0.850			
Flt Protected	0.950	0.990										
Satd. Flow (prot)	1472	4426	0	0	0	0	0	1784	1488	0	0	0
Flt Permitted	0.950	0.990										
Satd. Flow (perm)	1472	4426	0	0	0	0	0	1784	1488	0	0	0
Right Turn on Red	No		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									28			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		176.8			255.7			343.3			402.9	
Travel Time (s)		12.7			18.4			24.7			29.0	
Confl. Peds. (#/hr)			12	12			27					27
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	6%	0%	0%	0%	0%	0%	2%	4%	0%	0%	0%
Adj. Flow (vph)	990	1549	0	0	0	0	0	94	301	0	0	0
Shared Lane Traffic (%)	38%											
Lane Group Flow (vph)	614	1925	0	0	0	0	0	94	301	0	0	0
Turn Type	Perm	NA						NA	Perm			
Protected Phases		2						4				
Permitted Phases	2								4			
Detector Phase	2	2						4	4			
Switch Phase												
Minimum Initial (s)	5.0	5.0						5.0	5.0			
Minimum Split (s)	23.3	23.3						33.3	33.3			
Total Split (s)	57.0	57.0						33.0	33.0			
Total Split (%)	63.3%	63.3%						36.7%	36.7%			
Maximum Green (s)	51.7	51.7						27.7	27.7			
Yellow Time (s)	3.3	3.3						3.3	3.3			
All-Red Time (s)	2.0	2.0						2.0	2.0			
Lost Time Adjust (s)	0.0	0.0						0.0	0.0			
Total Lost Time (s)	5.3	5.3						5.3	5.3			
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0						3.0	3.0			
Recall Mode	C-Min	C-Min						None	None			
Walk Time (s)	7.0	7.0						7.0	7.0			
Flash Dont Walk (s)	8.0	8.0						21.0	21.0			
Pedestrian Calls (#/hr)	0	0						0	0			
Act Effct Green (s)	57.8	57.8						21.6	21.6			
Actuated g/C Ratio	0.64	0.64						0.24	0.24			
v/c Ratio	0.65	0.68						0.22	0.80			
Control Delay	11.5	9.3						26.8	44.3			
Queue Delay	0.3	0.1						0.0	0.0			
Total Delay	11.8	9.5						26.8	44.3			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	A						C	D			
Approach Delay		10.0						40.1				
Approach LOS		B						D				
Queue Length 50th (m)	103.4	110.4						13.0	44.4			
Queue Length 95th (m)	m150.1	141.7						23.2	67.7			
Internal Link Dist (m)		152.8			231.7			319.3			378.9	
Turn Bay Length (m)												
Base Capacity (vph)	945	2843						549	477			
Starvation Cap Reductn	61	182						0	0			
Spillback Cap Reductn	0	0						0	0			
Storage Cap Reductn	0	0						0	0			
Reduced v/c Ratio	0.69	0.72						0.17	0.63			

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 80 (89%), Referenced to phase 2:EBTL, Start of Green			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 14.1		Intersection LOS: B	
Intersection Capacity Utilization 68.1%		ICU Level of Service C	
Analysis Period (min) 15			

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

Splits and Phases: 3: Metcalfe Street & Isabella Street



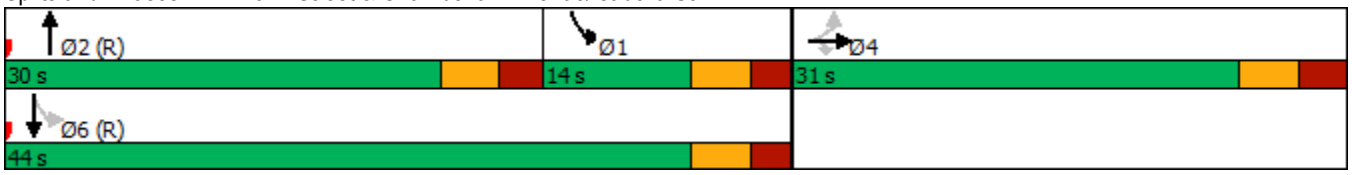
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	66	736	150	0	0	0	0	448	114	218	720	0
Future Volume (vph)	66	736	150	0	0	0	0	448	114	218	720	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		30.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Ped Bike Factor		1.00	0.91					0.95			0.98	
Frt			0.850					0.970				
Flt Protected		0.996									0.989	
Satd. Flow (prot)	0	3347	1547	0	0	0	0	3092	0	0	3320	0
Flt Permitted		0.996									0.689	
Satd. Flow (perm)	0	3343	1403	0	0	0	0	3092	0	0	2262	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			122					44				
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		340.2			147.7			337.2			403.0	
Travel Time (s)		24.5			10.6			24.3			29.0	
Confl. Peds. (#/hr)	10		72	72		10	183		180	180		183
Confl. Bikes (#/hr)			3						10			15
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%	0%	3%	3%	3%	3%	0%
Adj. Flow (vph)	66	736	150	0	0	0	0	448	114	218	720	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	802	150	0	0	0	0	562	0	0	938	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0					5.0		5.0	5.0	
Minimum Split (s)	26.1	26.1	26.1					22.7		10.7	22.7	
Total Split (s)	31.0	31.0	31.0					30.0		14.0	44.0	
Total Split (%)	41.3%	41.3%	41.3%					40.0%		18.7%	58.7%	
Maximum Green (s)	24.9	24.9	24.9					24.3		8.3	38.3	
Yellow Time (s)	3.3	3.3	3.3					3.3		3.3	3.3	
All-Red Time (s)	2.8	2.8	2.8					2.4		2.4	2.4	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		6.1	6.1					5.7			5.7	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Recall Mode	None	None	None					C-Min		None	C-Min	
Walk Time (s)	7.0	7.0	7.0					7.0			7.0	
Flash Dont Walk (s)	13.0	13.0	13.0					10.0			10.0	
Pedestrian Calls (#/hr)	0	0	0					0			0	
Act Effct Green (s)		23.2	23.2					40.0			40.0	
Actuated g/C Ratio		0.31	0.31					0.53			0.53	

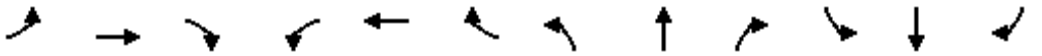
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.78	0.29					0.34			0.78	
Control Delay		29.1	7.2					10.2			20.5	
Queue Delay		0.0	0.0					0.0			0.0	
Total Delay		29.1	7.2					10.2			20.5	
LOS		C	A					B			C	
Approach Delay		25.7						10.2			20.5	
Approach LOS		C						B			C	
Queue Length 50th (m)		51.7	2.7					21.2			54.7	
Queue Length 95th (m)		71.2	14.4					31.3			#81.5	
Internal Link Dist (m)		316.2			123.7			313.2			379.0	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		1109	547					1668			1206	
Starvation Cap Reductn		0	0					0			0	
Spillback Cap Reductn		0	0					0			0	
Storage Cap Reductn		0	0					0			0	
Reduced v/c Ratio		0.72	0.27					0.34			0.78	

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 38 (51%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 20.1 Intersection LOS: C
Intersection Capacity Utilization 87.5% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

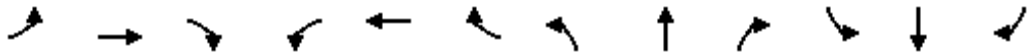
Splits and Phases: 1: Bank Street & Chamberlain Avenue/Isabella St





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1410	15	0	0	0	0	0	0	1483	0	0
Future Volume (vph)	0	1410	15	0	0	0	0	0	0	1483	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.00	1.00
Ped Bike Factor		1.00								0.97		
Frt		0.998										
Flt Protected										0.950		
Satd. Flow (prot)	0	6057	0	0	0	0	0	0	0	4780	0	0
Flt Permitted										0.950		
Satd. Flow (perm)	0	6057	0	0	0	0	0	0	0	4631	0	0
Right Turn on Red			Yes			Yes			Yes	No		Yes
Satd. Flow (RTOR)		2										
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		170.7			176.8			343.1			405.6	
Travel Time (s)		12.3			12.7			24.7			29.2	
Confl. Peds. (#/hr)	6		39	39		6	30		30	30		30
Confl. Bikes (#/hr)			2						7			12
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	3%	7%	0%	0%	0%	0%	0%	0%	2%	0%	0%
Adj. Flow (vph)	0	1410	15	0	0	0	0	0	0	1483	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1425	0	0	0	0	0	0	0	1483	0	0
Turn Type		NA								Prot		
Protected Phases		2								3		
Permitted Phases												
Detector Phase		2								3		
Switch Phase												
Minimum Initial (s)		5.0								5.0		
Minimum Split (s)		28.6								11.1		
Total Split (s)		38.0								35.0		
Total Split (%)		38.0%								35.0%		
Maximum Green (s)		32.4								28.9		
Yellow Time (s)		3.3								3.3		
All-Red Time (s)		2.3								2.8		
Lost Time Adjust (s)		0.0								0.0		
Total Lost Time (s)		5.6								6.1		
Lead/Lag										Lag		
Lead-Lag Optimize?										Yes		
Vehicle Extension (s)		3.0								3.0		
Recall Mode		Min								C-Max		
Walk Time (s)		12.0										
Flash Dont Walk (s)		11.0										
Pedestrian Calls (#/hr)		0										
Act Effct Green (s)		31.7								56.6		
Actuated g/C Ratio		0.32								0.57		
v/c Ratio		0.74								0.55		
Control Delay		33.2								14.7		
Queue Delay		0.1								0.0		

Lane Group	Ø4
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (k/h)	
Link Distance (m)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	27.2
Total Split (s)	27.0
Total Split (%)	27%
Maximum Green (s)	17.8
Yellow Time (s)	3.3
All-Red Time (s)	5.9
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	



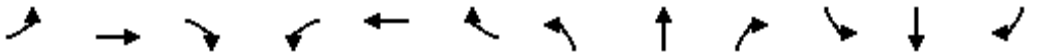
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		33.3								14.7		
LOS		C								B		
Approach Delay		33.3									14.7	
Approach LOS		C									B	
Queue Length 50th (m)		70.3								61.3		
Queue Length 95th (m)		83.3								73.7		
Internal Link Dist (m)		146.7			152.8			319.1			381.6	
Turn Bay Length (m)												
Base Capacity (vph)		1963								2707		
Starvation Cap Reductn		0								0		
Spillback Cap Reductn		48								0		
Storage Cap Reductn		0								0		
Reduced v/c Ratio		0.74								0.55		

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 1 (1%), Referenced to phase 3:SBL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 23.8		Intersection LOS: C	
Intersection Capacity Utilization 74.4%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 2: O'Connor Street & Isabella Street

Lane Group	Ø4
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

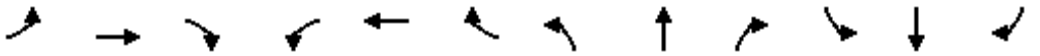


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	222	2671	0	0	0	0	0	95	456	0	0	0
Future Volume (vph)	222	2671	0	0	0	0	0	95	456	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt									0.850			
Flt Protected	0.950											
Satd. Flow (prot)	1472	4560	0	0	0	0	0	1767	1517	0	0	0
Flt Permitted	0.950											
Satd. Flow (perm)	1472	4560	0	0	0	0	0	1767	1517	0	0	0
Right Turn on Red	No		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									25			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		176.8			255.7			343.3			402.9	
Travel Time (s)		12.7			18.4			24.7			29.0	
Confl. Peds. (#/hr)			55	55			52					52
Confl. Bikes (#/hr)			5			1						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	3%	0%	0%	0%	0%	0%	3%	2%	0%	0%	0%
Adj. Flow (vph)	222	2671	0	0	0	0	0	95	456	0	0	0
Shared Lane Traffic (%)	10%											
Lane Group Flow (vph)	200	2693	0	0	0	0	0	95	456	0	0	0
Turn Type	Perm	NA						NA	Perm			
Protected Phases		2						4				
Permitted Phases	2								4			
Detector Phase	2	2						4	4			
Switch Phase												
Minimum Initial (s)	5.0	5.0						5.0	5.0			
Minimum Split (s)	20.3	20.3						33.3	33.3			
Total Split (s)	67.0	67.0						33.0	33.0			
Total Split (%)	67.0%	67.0%						33.0%	33.0%			
Maximum Green (s)	61.7	61.7						27.7	27.7			
Yellow Time (s)	3.3	3.3						3.3	3.3			
All-Red Time (s)	2.0	2.0						2.0	2.0			
Lost Time Adjust (s)	0.0	0.0						0.0	0.0			
Total Lost Time (s)	5.3	5.3						5.3	5.3			
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0						3.0	3.0			
Recall Mode	C-Min	C-Min						None	None			
Walk Time (s)	7.0	7.0						7.0	7.0			
Flash Dont Walk (s)	8.0	8.0						21.0	21.0			
Pedestrian Calls (#/hr)	0	0						0	0			
Act Effct Green (s)	61.7	61.7						27.7	27.7			
Actuated g/C Ratio	0.62	0.62						0.28	0.28			
v/c Ratio	0.22	0.96						0.19	1.04			
Control Delay	8.4	26.6						29.0	89.0			
Queue Delay	0.0	0.0						0.0	0.0			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	8.4	26.6						29.0	89.0			
LOS	A	C						C	F			
Approach Delay		25.3						78.7				
Approach LOS		C						E				
Queue Length 50th (m)	19.0	137.9						14.1	~92.4			
Queue Length 95th (m)	m33.0	#156.6						26.7	#152.0			
Internal Link Dist (m)		152.8			231.7			319.3			378.9	
Turn Bay Length (m)												
Base Capacity (vph)	908	2813						489	438			
Starvation Cap Reductn	0	0						0	0			
Spillback Cap Reductn	0	0						0	0			
Storage Cap Reductn	0	0						0	0			
Reduced v/c Ratio	0.22	0.96						0.19	1.04			

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 8 (8%), Referenced to phase 2:EBTL and 6:, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.04			
Intersection Signal Delay: 33.9		Intersection LOS: C	
Intersection Capacity Utilization 83.1%		ICU Level of Service E	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 3: Metcalfe Street & Isabella Street

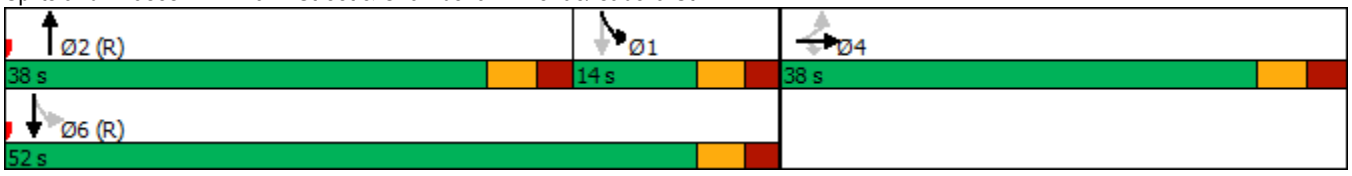


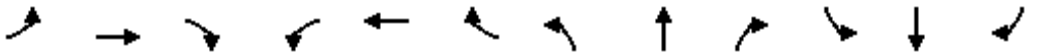
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	569	86	0	0	0	0	834	165	200	372	0
Future Volume (vph)	85	569	86	0	0	0	0	834	165	200	372	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		30.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Ped Bike Factor		1.00	0.93					0.96			0.98	
Frt			0.850					0.975				
Flt Protected		0.994									0.983	
Satd. Flow (prot)	0	3228	1446	0	0	0	0	3112	0	0	3217	0
Flt Permitted		0.994									0.455	
Satd. Flow (perm)	0	3220	1344	0	0	0	0	3112	0	0	1461	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			102					29				
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		340.2			147.7			337.2			403.0	
Travel Time (s)		24.5			10.6			24.3			29.0	
Confl. Peds. (#/hr)	15		44	44		15	139		135	135		139
Confl. Bikes (#/hr)									4			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	7%	7%	0%	0%	0%	0%	4%	6%	5%	6%	0%
Adj. Flow (vph)	85	569	86	0	0	0	0	834	165	200	372	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	654	86	0	0	0	0	999	0	0	572	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6	1	
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0					5.0		5.0	5.0	
Minimum Split (s)	26.1	26.1	26.1					22.7		10.7	22.7	
Total Split (s)	38.0	38.0	38.0					38.0		14.0	52.0	
Total Split (%)	42.2%	42.2%	42.2%					42.2%		15.6%	57.8%	
Maximum Green (s)	31.9	31.9	31.9					32.3		8.3	46.3	
Yellow Time (s)	3.3	3.3	3.3					3.3		3.3	3.3	
All-Red Time (s)	2.8	2.8	2.8					2.4		2.4	2.4	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		6.1	6.1					5.7			5.7	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Recall Mode	None	None	None					C-Min		None	C-Min	
Walk Time (s)	7.0	7.0	7.0					7.0			7.0	
Flash Dont Walk (s)	13.0	13.0	13.0					10.0			10.0	
Pedestrian Calls (#/hr)	0	0	0					0			0	
Act Effct Green (s)		25.1	25.1					53.1			53.1	
Actuated g/C Ratio		0.28	0.28					0.59			0.59	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.73	0.19					0.54			0.30	
Control Delay		33.9	4.4					13.1			10.6	
Queue Delay		0.0	0.0					0.0			0.0	
Total Delay		33.9	4.4					13.1			10.6	
LOS		C	A					B			B	
Approach Delay		30.4						13.1			10.6	
Approach LOS		C						B			B	
Queue Length 50th (m)		53.6	0.0					48.9			24.0	
Queue Length 95th (m)		64.1	7.1					79.8			40.6	
Internal Link Dist (m)		316.2			123.7			313.2			379.0	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		1144	543					1847			1900	
Starvation Cap Reductn		0	0					0			0	
Spillback Cap Reductn		0	0					0			0	
Storage Cap Reductn		0	0					0			0	
Reduced v/c Ratio		0.57	0.16					0.54			0.30	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 41 (46%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.73			
Intersection Signal Delay: 18.0		Intersection LOS: B	
Intersection Capacity Utilization 85.1%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 1: Bank Street & Chamberlain Avenue/Isabella St





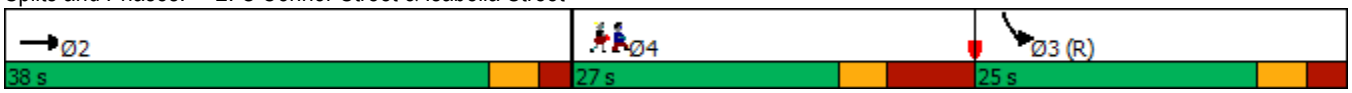
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1773	10	0	0	0	0	0	0	614	0	0
Future Volume (vph)	0	1773	10	0	0	0	0	0	0	614	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.00	1.00
Ped Bike Factor		1.00								0.90		
Frt		0.999										
Flt Protected										0.950		
Satd. Flow (prot)	0	6005	0	0	0	0	0	0	0	4644	0	0
Flt Permitted										0.950		
Satd. Flow (perm)	0	6005	0	0	0	0	0	0	0	4166	0	0
Right Turn on Red			Yes			Yes			Yes	No		Yes
Satd. Flow (RTOR)		1										
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		170.7			176.8			343.1			405.6	
Travel Time (s)		12.3			12.7			24.7			29.2	
Confl. Peds. (#/hr)	6		46	46		6	66		72	72		66
Confl. Bikes (#/hr)			2			2			32			5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	4%	20%	0%	0%	0%	0%	0%	0%	5%	0%	0%
Adj. Flow (vph)	0	1773	10	0	0	0	0	0	0	614	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1783	0	0	0	0	0	0	0	614	0	0
Turn Type		NA								Prot		
Protected Phases		2								3		
Permitted Phases												
Detector Phase		2								3		
Switch Phase												
Minimum Initial (s)		5.0								5.0		
Minimum Split (s)		28.6								25.0		
Total Split (s)		38.0								25.0		
Total Split (%)		42.2%								27.8%		
Maximum Green (s)		32.4								18.9		
Yellow Time (s)		3.3								3.3		
All-Red Time (s)		2.3								2.8		
Lost Time Adjust (s)		0.0								0.0		
Total Lost Time (s)		5.6								6.1		
Lead/Lag										Lag		
Lead-Lag Optimize?										Yes		
Vehicle Extension (s)		3.0								3.0		
Recall Mode		Min								C-Max		
Walk Time (s)		12.0										
Flash Dont Walk (s)		11.0										
Pedestrian Calls (#/hr)		0										
Act Effct Green (s)		32.4								45.9		
Actuated g/C Ratio		0.36								0.51		
v/c Ratio		0.82								0.26		
Control Delay		30.2								12.8		
Queue Delay		0.0								0.0		

Lane Group	Ø4
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (k/h)	
Link Distance (m)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	27.2
Total Split (s)	27.0
Total Split (%)	30%
Maximum Green (s)	17.8
Yellow Time (s)	3.3
All-Red Time (s)	5.9
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		30.2								12.8		
LOS		C								B		
Approach Delay		30.2									12.8	
Approach LOS		C									B	
Queue Length 50th (m)		80.3								20.2		
Queue Length 95th (m)		94.9								26.9		
Internal Link Dist (m)		146.7			152.8			319.1			381.6	
Turn Bay Length (m)												
Base Capacity (vph)		2162								2368		
Starvation Cap Reductn		0								0		
Spillback Cap Reductn		0								0		
Storage Cap Reductn		0								0		
Reduced v/c Ratio		0.82								0.26		

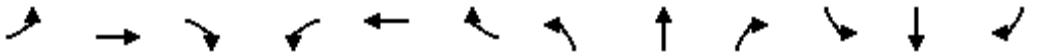
Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 65 (72%), Referenced to phase 3:SBL, Start of Green			
Natural Cycle: 85			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.82			
Intersection Signal Delay: 25.7		Intersection LOS: C	
Intersection Capacity Utilization 56.1%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 2: O'Connor Street & Isabella Street



Lane Group	Ø4
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	946	1441	0	0	0	0	0	94	301	0	0	0
Future Volume (vph)	946	1441	0	0	0	0	0	94	301	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt									0.850			
Flt Protected	0.950	0.990										
Satd. Flow (prot)	1472	4428	0	0	0	0	0	1784	1488	0	0	0
Flt Permitted	0.950	0.990										
Satd. Flow (perm)	1472	4428	0	0	0	0	0	1784	1488	0	0	0
Right Turn on Red	No		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									37			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		176.8			255.7			343.3			402.9	
Travel Time (s)		12.7			18.4			24.7			29.0	
Confl. Peds. (#/hr)			12	12			27					27
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	6%	0%	0%	0%	0%	0%	2%	4%	0%	0%	0%
Adj. Flow (vph)	946	1441	0	0	0	0	0	94	301	0	0	0
Shared Lane Traffic (%)	39%											
Lane Group Flow (vph)	577	1810	0	0	0	0	0	94	301	0	0	0
Turn Type	Perm	NA						NA	Perm			
Protected Phases		2						4				
Permitted Phases	2								4			
Detector Phase	2	2						4	4			
Switch Phase												
Minimum Initial (s)	5.0	5.0						5.0	5.0			
Minimum Split (s)	23.3	23.3						33.3	33.3			
Total Split (s)	63.8	63.8						36.2	36.2			
Total Split (%)	63.8%	63.8%						36.2%	36.2%			
Maximum Green (s)	58.5	58.5						30.9	30.9			
Yellow Time (s)	3.3	3.3						3.3	3.3			
All-Red Time (s)	2.0	2.0						2.0	2.0			
Lost Time Adjust (s)	0.0	0.0						0.0	0.0			
Total Lost Time (s)	5.3	5.3						5.3	5.3			
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0						3.0	3.0			
Recall Mode	C-Min	C-Min						None	None			
Walk Time (s)	7.0	7.0						7.0	7.0			
Flash Dont Walk (s)	8.0	8.0						21.0	21.0			
Pedestrian Calls (#/hr)	0	0						0	0			
Act Effct Green (s)	66.1	66.1						23.3	23.3			
Actuated g/C Ratio	0.66	0.66						0.23	0.23			
v/c Ratio	0.59	0.62						0.23	0.80			
Control Delay	14.1	11.8						30.3	47.4			
Queue Delay	0.5	0.2						0.0	0.0			
Total Delay	14.6	12.1						30.3	47.4			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	B						C	D			
Approach Delay		12.7						43.3				
Approach LOS		B						D				
Queue Length 50th (m)	65.4	70.4						14.8	48.7			
Queue Length 95th (m)	127.3	106.8						25.2	71.7			
Internal Link Dist (m)		152.8			231.7			319.3			378.9	
Turn Bay Length (m)												
Base Capacity (vph)	973	2927						551	485			
Starvation Cap Reductn	124	372						0	0			
Spillback Cap Reductn	0	0						0	0			
Storage Cap Reductn	0	0						0	0			
Reduced v/c Ratio	0.68	0.71						0.17	0.62			

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 17.0		Intersection LOS: B	
Intersection Capacity Utilization 65.8%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 3: Metcalfe Street & Isabella Street

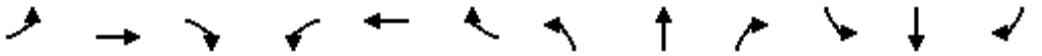
Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	912	23	0	0	0	60
Future Vol, veh/h	912	23	0	0	0	60
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	-	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	912	23	0	0	0	60

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	468
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	6.9
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.3
Pot Cap-1 Maneuver	-	-		0	547
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	547
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	12.4
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	547	-	-
HCM Lane V/C Ratio	0.11	-	-
HCM Control Delay (s)	12.4	-	-
HCM Lane LOS	B	-	-
HCM 95th %tile Q(veh)	0.4	-	-



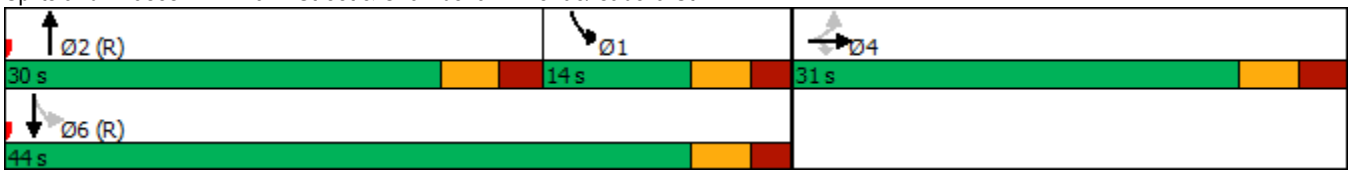
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	61	698	137	0	0	0	0	448	109	216	720	0
Future Volume (vph)	61	698	137	0	0	0	0	448	109	216	720	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		30.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Ped Bike Factor		1.00	0.91					0.95			0.98	
Frt			0.850					0.971				
Flt Protected		0.996									0.989	
Satd. Flow (prot)	0	3346	1547	0	0	0	0	3101	0	0	3320	0
Flt Permitted		0.996									0.693	
Satd. Flow (perm)	0	3343	1403	0	0	0	0	3101	0	0	2275	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			122					42				
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		340.2			147.7			337.2			403.0	
Travel Time (s)		24.5			10.6			24.3			29.0	
Confl. Peds. (#/hr)	10		72	72		10	183		180	180		183
Confl. Bikes (#/hr)			3						10			15
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%	0%	3%	3%	3%	3%	0%
Adj. Flow (vph)	61	698	137	0	0	0	0	448	109	216	720	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	759	137	0	0	0	0	557	0	0	936	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0					5.0		5.0	5.0	
Minimum Split (s)	26.1	26.1	26.1					22.7		10.7	22.7	
Total Split (s)	31.0	31.0	31.0					30.0		14.0	44.0	
Total Split (%)	41.3%	41.3%	41.3%					40.0%		18.7%	58.7%	
Maximum Green (s)	24.9	24.9	24.9					24.3		8.3	38.3	
Yellow Time (s)	3.3	3.3	3.3					3.3		3.3	3.3	
All-Red Time (s)	2.8	2.8	2.8					2.4		2.4	2.4	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		6.1	6.1					5.7			5.7	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Recall Mode	None	None	None					C-Min		None	C-Min	
Walk Time (s)	7.0	7.0	7.0					7.0			7.0	
Flash Dont Walk (s)	13.0	13.0	13.0					10.0			10.0	
Pedestrian Calls (#/hr)	0	0	0					0			0	
Act Effct Green (s)		22.6	22.6					40.6			40.6	
Actuated g/C Ratio		0.30	0.30					0.54			0.54	

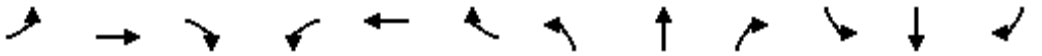
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.75	0.27					0.33			0.76	
Control Delay		28.7	6.4					9.9			19.5	
Queue Delay		0.0	0.0					0.0			0.0	
Total Delay		28.7	6.4					9.9			19.5	
LOS		C	A					A			B	
Approach Delay		25.3						9.9			19.5	
Approach LOS		C						A			B	
Queue Length 50th (m)		48.9	1.4					20.5			53.1	
Queue Length 95th (m)		66.6	12.3					31.1			80.4	
Internal Link Dist (m)		316.2			123.7			313.2			379.0	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		1109	547					1697			1230	
Starvation Cap Reductn		0	0					0			0	
Spillback Cap Reductn		0	0					0			0	
Storage Cap Reductn		0	0					0			0	
Reduced v/c Ratio		0.68	0.25					0.33			0.76	

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 38 (51%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 19.4 Intersection LOS: B
Intersection Capacity Utilization 86.0% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: Bank Street & Chamberlain Avenue/Isabella St





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1326	15	0	0	0	0	0	0	1359	0	0
Future Volume (vph)	0	1326	15	0	0	0	0	0	0	1359	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.00	1.00
Ped Bike Factor		1.00								0.97		
Frt		0.998										
Flt Protected										0.950		
Satd. Flow (prot)	0	6057	0	0	0	0	0	0	0	4780	0	0
Flt Permitted										0.950		
Satd. Flow (perm)	0	6057	0	0	0	0	0	0	0	4629	0	0
Right Turn on Red			Yes			Yes			Yes	No		Yes
Satd. Flow (RTOR)		2										
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		170.7			176.8			343.1			405.6	
Travel Time (s)		12.3			12.7			24.7			29.2	
Confl. Peds. (#/hr)	6		39	39		6	30		30	30		30
Confl. Bikes (#/hr)			2						7			12
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	3%	7%	0%	0%	0%	0%	0%	0%	2%	0%	0%
Adj. Flow (vph)	0	1326	15	0	0	0	0	0	0	1359	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1341	0	0	0	0	0	0	0	1359	0	0
Turn Type		NA								Prot		
Protected Phases		2								3		
Permitted Phases												
Detector Phase		2								3		
Switch Phase												
Minimum Initial (s)		5.0								5.0		
Minimum Split (s)		28.6								11.1		
Total Split (s)		38.2								34.6		
Total Split (%)		38.2%								34.6%		
Maximum Green (s)		32.6								28.5		
Yellow Time (s)		3.3								3.3		
All-Red Time (s)		2.3								2.8		
Lost Time Adjust (s)		0.0								0.0		
Total Lost Time (s)		5.6								6.1		
Lead/Lag										Lag		
Lead-Lag Optimize?										Yes		
Vehicle Extension (s)		3.0								3.0		
Recall Mode		Min								C-Max		
Walk Time (s)		12.0										
Flash Dont Walk (s)		11.0										
Pedestrian Calls (#/hr)		0										
Act Effct Green (s)		31.1								57.2		
Actuated g/C Ratio		0.31								0.57		
v/c Ratio		0.71								0.50		
Control Delay		32.7								13.8		
Queue Delay		0.3								0.0		

Lane Group	Ø4
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (k/h)	
Link Distance (m)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	27.2
Total Split (s)	27.2
Total Split (%)	27%
Maximum Green (s)	18.0
Yellow Time (s)	3.3
All-Red Time (s)	5.9
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	

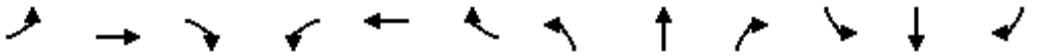
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		33.0								13.8		
LOS		C								B		
Approach Delay		33.0									13.8	
Approach LOS		C									B	
Queue Length 50th (m)		64.8								54.4		
Queue Length 95th (m)		77.1								65.8		
Internal Link Dist (m)		146.7			152.8			319.1			381.6	
Turn Bay Length (m)												
Base Capacity (vph)		1975								2735		
Starvation Cap Reductn		0								0		
Spillback Cap Reductn		169								0		
Storage Cap Reductn		0								0		
Reduced v/c Ratio		0.74								0.50		

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 74.2 (74%), Referenced to phase 3:SBL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 23.3		Intersection LOS: C	
Intersection Capacity Utilization 70.7%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 2: O'Connor Street & Isabella Street

Lane Group	Ø4
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	225	2460	0	0	0	0	0	95	456	0	0	0
Future Volume (vph)	225	2460	0	0	0	0	0	95	456	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt									0.850			
Flt Protected	0.950											
Satd. Flow (prot)	1472	4560	0	0	0	0	0	1767	1517	0	0	0
Flt Permitted	0.950											
Satd. Flow (perm)	1472	4560	0	0	0	0	0	1767	1517	0	0	0
Right Turn on Red	No		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									25			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		176.8			255.7			343.3			402.9	
Travel Time (s)		12.7			18.4			24.7			29.0	
Confl. Peds. (#/hr)			55	55			52					52
Confl. Bikes (#/hr)			5			1						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	3%	0%	0%	0%	0%	0%	3%	2%	0%	0%	0%
Adj. Flow (vph)	225	2460	0	0	0	0	0	95	456	0	0	0
Shared Lane Traffic (%)	10%											
Lane Group Flow (vph)	202	2483	0	0	0	0	0	95	456	0	0	0
Turn Type	Perm	NA						NA	Perm			
Protected Phases		2						4				
Permitted Phases	2								4			
Detector Phase	2	2						4	4			
Switch Phase												
Minimum Initial (s)	5.0	5.0						5.0	5.0			
Minimum Split (s)	20.3	20.3						33.3	33.3			
Total Split (s)	67.0	67.0						33.0	33.0			
Total Split (%)	67.0%	67.0%						33.0%	33.0%			
Maximum Green (s)	61.7	61.7						27.7	27.7			
Yellow Time (s)	3.3	3.3						3.3	3.3			
All-Red Time (s)	2.0	2.0						2.0	2.0			
Lost Time Adjust (s)	0.0	0.0						0.0	0.0			
Total Lost Time (s)	5.3	5.3						5.3	5.3			
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0						3.0	3.0			
Recall Mode	C-Min	C-Min						None	None			
Walk Time (s)	7.0	7.0						7.0	7.0			
Flash Dont Walk (s)	8.0	8.0						21.0	21.0			
Pedestrian Calls (#/hr)	0	0						0	0			
Act Effct Green (s)	61.7	61.7						27.7	27.7			
Actuated g/C Ratio	0.62	0.62						0.28	0.28			
v/c Ratio	0.22	0.88						0.19	1.04			
Control Delay	8.0	16.0						29.0	89.0			
Queue Delay	0.0	2.4						0.0	0.0			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	8.0	18.4						29.0	89.0			
LOS	A	B						C	F			
Approach Delay		17.6						78.7				
Approach LOS		B						E				
Queue Length 50th (m)	13.9	156.8						14.1	~92.4			
Queue Length 95th (m)	m24.1	183.7						26.7	#152.0			
Internal Link Dist (m)		152.8			231.7			319.3			378.9	
Turn Bay Length (m)												
Base Capacity (vph)	908	2813						489	438			
Starvation Cap Reductn	0	216						0	0			
Spillback Cap Reductn	0	0						0	0			
Storage Cap Reductn	0	0						0	0			
Reduced v/c Ratio	0.22	0.96						0.19	1.04			

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 8 (8%), Referenced to phase 2:EBTL and 6:, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.04			
Intersection Signal Delay: 28.0		Intersection LOS: C	
Intersection Capacity Utilization 79.9%		ICU Level of Service D	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 3: Metcalfe Street & Isabella Street

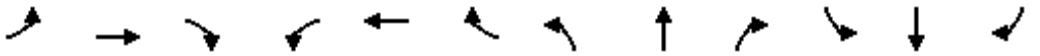
Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	979	45	0	0	0	33
Future Vol, veh/h	979	45	0	0	0	33
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	-	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	979	45	0	0	0	33

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	512
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	6.9
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.3
Pot Cap-1 Maneuver	-	-		0	512
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	512
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	12.5
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	512	-	-
HCM Lane V/C Ratio	0.064	-	-
HCM Control Delay (s)	12.5	-	-
HCM Lane LOS	B	-	-
HCM 95th %tile Q(veh)	0.2	-	-



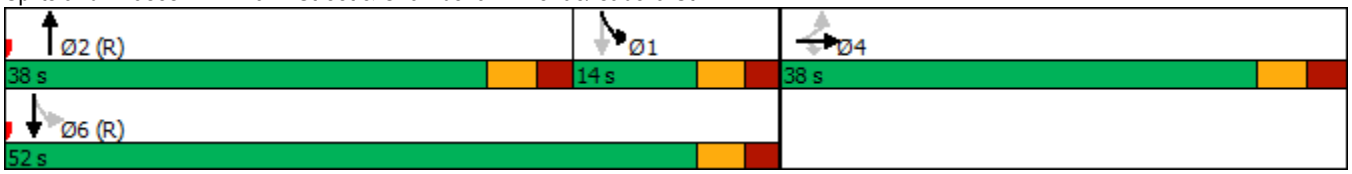
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	620	94	0	0	0	0	834	180	218	372	0
Future Volume (vph)	92	620	94	0	0	0	0	834	180	218	372	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		30.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Ped Bike Factor		1.00	0.93					0.96			0.98	
Frt			0.850					0.973				
Flt Protected		0.994									0.982	
Satd. Flow (prot)	0	3228	1446	0	0	0	0	3096	0	0	3215	0
Flt Permitted		0.994									0.455	
Satd. Flow (perm)	0	3220	1344	0	0	0	0	3096	0	0	1461	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			102					32				
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		340.2			147.7			337.2			403.0	
Travel Time (s)		24.5			10.6			24.3			29.0	
Confl. Peds. (#/hr)	15		44	44		15	139		135	135		139
Confl. Bikes (#/hr)									4			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	7%	7%	0%	0%	0%	0%	4%	6%	5%	6%	0%
Adj. Flow (vph)	92	620	94	0	0	0	0	834	180	218	372	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	712	94	0	0	0	0	1014	0	0	590	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6	1	
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0					5.0		5.0	5.0	
Minimum Split (s)	26.1	26.1	26.1					22.7		10.7	22.7	
Total Split (s)	38.0	38.0	38.0					38.0		14.0	52.0	
Total Split (%)	42.2%	42.2%	42.2%					42.2%		15.6%	57.8%	
Maximum Green (s)	31.9	31.9	31.9					32.3		8.3	46.3	
Yellow Time (s)	3.3	3.3	3.3					3.3		3.3	3.3	
All-Red Time (s)	2.8	2.8	2.8					2.4		2.4	2.4	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		6.1	6.1					5.7			5.7	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Recall Mode	None	None	None					C-Min		None	C-Min	
Walk Time (s)	7.0	7.0	7.0					7.0			7.0	
Flash Dont Walk (s)	13.0	13.0	13.0					10.0			10.0	
Pedestrian Calls (#/hr)	0	0	0					0			0	
Act Effct Green (s)		27.2	27.2					51.0			51.0	
Actuated g/C Ratio		0.30	0.30					0.57			0.57	

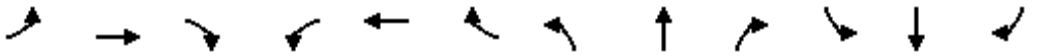
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.73	0.20					0.57			0.32	
Control Delay		32.5	4.8					14.6			11.8	
Queue Delay		0.0	0.0					0.0			0.0	
Total Delay		32.5	4.8					14.6			11.8	
LOS		C	A					B			B	
Approach Delay		29.2						14.6			11.8	
Approach LOS		C						B			B	
Queue Length 50th (m)		57.4	0.0					53.5			26.7	
Queue Length 95th (m)		68.8	8.3					84.6			43.6	
Internal Link Dist (m)		316.2			123.7			313.2			379.0	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		1154	547					1768			1835	
Starvation Cap Reductn		0	0					0			0	
Spillback Cap Reductn		0	0					0			0	
Storage Cap Reductn		0	0					0			0	
Reduced v/c Ratio		0.62	0.17					0.57			0.32	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 41 (46%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 18.8 Intersection LOS: B
Intersection Capacity Utilization 88.0% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: Bank Street & Chamberlain Avenue/Isabella St





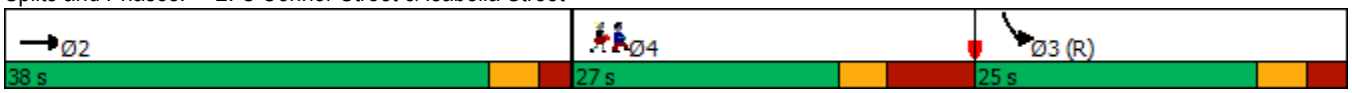
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1928	10	0	0	0	0	0	0	670	0	0
Future Volume (vph)	0	1928	10	0	0	0	0	0	0	670	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.00	1.00
Ped Bike Factor		1.00								0.90		
Frt		0.999										
Flt Protected										0.950		
Satd. Flow (prot)	0	6006	0	0	0	0	0	0	0	4644	0	0
Flt Permitted										0.950		
Satd. Flow (perm)	0	6006	0	0	0	0	0	0	0	4166	0	0
Right Turn on Red			Yes			Yes			Yes	No		Yes
Satd. Flow (RTOR)		1										
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		170.7			176.8			343.1			405.6	
Travel Time (s)		12.3			12.7			24.7			29.2	
Confl. Peds. (#/hr)	6		46	46		6	66		72	72		66
Confl. Bikes (#/hr)			2			2			32			5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	4%	20%	0%	0%	0%	0%	0%	0%	5%	0%	0%
Adj. Flow (vph)	0	1928	10	0	0	0	0	0	0	670	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1938	0	0	0	0	0	0	0	670	0	0
Turn Type		NA								Prot		
Protected Phases		2								3		
Permitted Phases		2										
Detector Phase		2								3		
Switch Phase												
Minimum Initial (s)		5.0								5.0		
Minimum Split (s)		28.6								25.0		
Total Split (s)		38.0								25.0		
Total Split (%)		42.2%								27.8%		
Maximum Green (s)		32.4								18.9		
Yellow Time (s)		3.3								3.3		
All-Red Time (s)		2.3								2.8		
Lost Time Adjust (s)		0.0								0.0		
Total Lost Time (s)		5.6								6.1		
Lead/Lag										Lag		
Lead-Lag Optimize?										Yes		
Vehicle Extension (s)		3.0								3.0		
Recall Mode		Min								C-Max		
Walk Time (s)		12.0										
Flash Dont Walk (s)		11.0										
Pedestrian Calls (#/hr)		0										
Act Effct Green (s)		32.4								45.9		
Actuated g/C Ratio		0.36								0.51		
v/c Ratio		0.90								0.28		
Control Delay		34.0								13.0		
Queue Delay		0.0								0.0		

Lane Group	Ø4
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (k/h)	
Link Distance (m)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	27.2
Total Split (s)	27.0
Total Split (%)	30%
Maximum Green (s)	17.8
Yellow Time (s)	3.3
All-Red Time (s)	5.9
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		34.0								13.0		
LOS		C								B		
Approach Delay		34.0									13.0	
Approach LOS		C									B	
Queue Length 50th (m)		90.6								22.3		
Queue Length 95th (m)		106.5								29.5		
Internal Link Dist (m)		146.7			152.8			319.1			381.6	
Turn Bay Length (m)												
Base Capacity (vph)		2162								2368		
Starvation Cap Reductn		0								0		
Spillback Cap Reductn		0								43		
Storage Cap Reductn		0								0		
Reduced v/c Ratio		0.90								0.29		

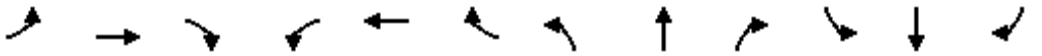
Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 31 (34%), Referenced to phase 3:SBL, Start of Green			
Natural Cycle: 85			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.90			
Intersection Signal Delay: 28.6		Intersection LOS: C	
Intersection Capacity Utilization 58.4%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 2: O'Connor Street & Isabella Street



Lane Group	Ø4
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1029	1570	0	0	0	0	0	94	301	0	0	0
Future Volume (vph)	1029	1570	0	0	0	0	0	94	301	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt									0.850			
Flt Protected	0.950	0.990										
Satd. Flow (prot)	1472	4428	0	0	0	0	0	1784	1488	0	0	0
Flt Permitted	0.950	0.990										
Satd. Flow (perm)	1472	4428	0	0	0	0	0	1784	1488	0	0	0
Right Turn on Red	No		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									28			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		176.8			255.7			343.3			402.9	
Travel Time (s)		12.7			18.4			24.7			29.0	
Confl. Peds. (#/hr)			12	12			27					27
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	6%	0%	0%	0%	0%	0%	2%	4%	0%	0%	0%
Adj. Flow (vph)	1029	1570	0	0	0	0	0	94	301	0	0	0
Shared Lane Traffic (%)	39%											
Lane Group Flow (vph)	628	1971	0	0	0	0	0	94	301	0	0	0
Turn Type	Perm	NA						NA	Perm			
Protected Phases		2						4				
Permitted Phases	2								4			
Detector Phase	2	2						4	4			
Switch Phase												
Minimum Initial (s)	5.0	5.0						5.0	5.0			
Minimum Split (s)	23.3	23.3						33.3	33.3			
Total Split (s)	57.0	57.0						33.0	33.0			
Total Split (%)	63.3%	63.3%						36.7%	36.7%			
Maximum Green (s)	51.7	51.7						27.7	27.7			
Yellow Time (s)	3.3	3.3						3.3	3.3			
All-Red Time (s)	2.0	2.0						2.0	2.0			
Lost Time Adjust (s)	0.0	0.0						0.0	0.0			
Total Lost Time (s)	5.3	5.3						5.3	5.3			
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0						3.0	3.0			
Recall Mode	C-Min	C-Min						None	None			
Walk Time (s)	7.0	7.0						7.0	7.0			
Flash Dont Walk (s)	8.0	8.0						21.0	21.0			
Pedestrian Calls (#/hr)	0	0						0	0			
Act Effct Green (s)	57.8	57.8						21.6	21.6			
Actuated g/C Ratio	0.64	0.64						0.24	0.24			
v/c Ratio	0.66	0.69						0.22	0.80			
Control Delay	11.7	9.6						26.8	44.3			
Queue Delay	0.4	0.1						0.0	0.0			
Total Delay	12.0	9.7						26.8	44.3			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	A						C	D			
Approach Delay		10.3						40.1				
Approach LOS		B						D				
Queue Length 50th (m)	107.9	115.3						13.0	44.4			
Queue Length 95th (m)	m150.1	152.5						23.2	67.7			
Internal Link Dist (m)		152.8			231.7			319.3			378.9	
Turn Bay Length (m)												
Base Capacity (vph)	945	2844						549	477			
Starvation Cap Reductn	62	183						0	0			
Spillback Cap Reductn	0	0						0	0			
Storage Cap Reductn	0	0						0	0			
Reduced v/c Ratio	0.71	0.74						0.17	0.63			

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 80 (89%), Referenced to phase 2:EBTL, Start of Green			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 14.2		Intersection LOS: B	
Intersection Capacity Utilization 69.1%		ICU Level of Service C	
Analysis Period (min) 15			

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

Splits and Phases: 3: Metcalfe Street & Isabella Street

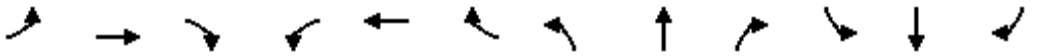
Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	995	23	0	0	0	60
Future Vol, veh/h	995	23	0	0	0	60
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	-	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	995	23	0	0	0	60

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	509
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	6.9
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.3
Pot Cap-1 Maneuver	-	-		0	515
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	515
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	12.9
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	515	-	-
HCM Lane V/C Ratio	0.117	-	-
HCM Control Delay (s)	12.9	-	-
HCM Lane LOS	B	-	-
HCM 95th %tile Q(veh)	0.4	-	-



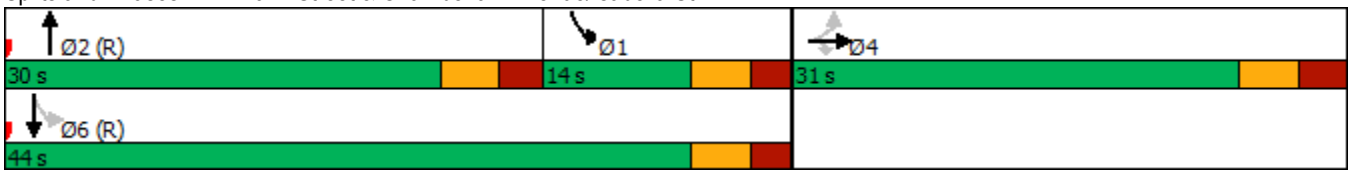
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	66	760	150	0	0	0	0	448	119	234	720	0
Future Volume (vph)	66	760	150	0	0	0	0	448	119	234	720	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		30.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Ped Bike Factor		1.00	0.91					0.95			0.98	
Frt			0.850					0.969				
Flt Protected		0.996									0.988	
Satd. Flow (prot)	0	3346	1547	0	0	0	0	3083	0	0	3317	0
Flt Permitted		0.996									0.681	
Satd. Flow (perm)	0	3343	1403	0	0	0	0	3083	0	0	2233	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			122					47				
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		340.2			147.7			337.2			403.0	
Travel Time (s)		24.5			10.6			24.3			29.0	
Confl. Peds. (#/hr)	10		72	72		10	183		180	180		183
Confl. Bikes (#/hr)			3						10			15
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%	0%	3%	3%	3%	3%	0%
Adj. Flow (vph)	66	760	150	0	0	0	0	448	119	234	720	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	826	150	0	0	0	0	567	0	0	954	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0					5.0		5.0	5.0	
Minimum Split (s)	26.1	26.1	26.1					22.7		10.7	22.7	
Total Split (s)	31.0	31.0	31.0					30.0		14.0	44.0	
Total Split (%)	41.3%	41.3%	41.3%					40.0%		18.7%	58.7%	
Maximum Green (s)	24.9	24.9	24.9					24.3		8.3	38.3	
Yellow Time (s)	3.3	3.3	3.3					3.3		3.3	3.3	
All-Red Time (s)	2.8	2.8	2.8					2.4		2.4	2.4	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		6.1	6.1					5.7			5.7	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Recall Mode	None	None	None					C-Min		None	C-Min	
Walk Time (s)	7.0	7.0	7.0					7.0			7.0	
Flash Dont Walk (s)	13.0	13.0	13.0					10.0			10.0	
Pedestrian Calls (#/hr)	0	0	0					0			0	
Act Effct Green (s)		23.4	23.4					39.8			39.8	
Actuated g/C Ratio		0.31	0.31					0.53			0.53	

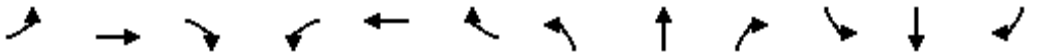
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.79	0.29					0.34			0.81	
Control Delay		29.7	7.2					10.2			22.0	
Queue Delay		0.0	0.0					0.0			0.0	
Total Delay		29.7	7.2					10.2			22.0	
LOS		C	A					B			C	
Approach Delay		26.3						10.2			22.0	
Approach LOS		C						B			C	
Queue Length 50th (m)		53.8	2.7					21.3			56.8	
Queue Length 95th (m)		73.8	14.4					31.5			#95.5	
Internal Link Dist (m)		316.2			123.7			313.2			379.0	
Turn Bay Length (m)			30.0									
Base Capacity (vph)		1109	547					1657			1184	
Starvation Cap Reductn		0	0					0			0	
Spillback Cap Reductn		0	0					0			0	
Storage Cap Reductn		0	0					0			0	
Reduced v/c Ratio		0.74	0.27					0.34			0.81	

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 38 (51%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 21.0 Intersection LOS: C
Intersection Capacity Utilization 88.9% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Bank Street & Chamberlain Avenue/Isabella St





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1443	15	0	0	0	0	0	0	1483	0	0
Future Volume (vph)	0	1443	15	0	0	0	0	0	0	1483	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.00	1.00
Ped Bike Factor		1.00								0.97		
Frt		0.998										
Flt Protected										0.950		
Satd. Flow (prot)	0	6057	0	0	0	0	0	0	0	4780	0	0
Flt Permitted										0.950		
Satd. Flow (perm)	0	6057	0	0	0	0	0	0	0	4631	0	0
Right Turn on Red			Yes			Yes			Yes	No		Yes
Satd. Flow (RTOR)		2										
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		170.7			176.8			343.1			405.6	
Travel Time (s)		12.3			12.7			24.7			29.2	
Confl. Peds. (#/hr)	6		39	39		6	30		30	30		30
Confl. Bikes (#/hr)			2						7			12
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	3%	7%	0%	0%	0%	0%	0%	0%	2%	0%	0%
Adj. Flow (vph)	0	1443	15	0	0	0	0	0	0	1483	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1458	0	0	0	0	0	0	0	1483	0	0
Turn Type		NA								Prot		
Protected Phases		2								3		
Permitted Phases												
Detector Phase		2								3		
Switch Phase												
Minimum Initial (s)		5.0								5.0		
Minimum Split (s)		28.6								11.1		
Total Split (s)		38.0								35.0		
Total Split (%)		38.0%								35.0%		
Maximum Green (s)		32.4								28.9		
Yellow Time (s)		3.3								3.3		
All-Red Time (s)		2.3								2.8		
Lost Time Adjust (s)		0.0								0.0		
Total Lost Time (s)		5.6								6.1		
Lead/Lag										Lag		
Lead-Lag Optimize?										Yes		
Vehicle Extension (s)		3.0								3.0		
Recall Mode		Min								C-Max		
Walk Time (s)		12.0										
Flash Dont Walk (s)		11.0										
Pedestrian Calls (#/hr)		0										
Act Effct Green (s)		31.7								56.6		
Actuated g/C Ratio		0.32								0.57		
v/c Ratio		0.76								0.55		
Control Delay		33.6								14.8		
Queue Delay		5.1								0.0		

Lane Group	Ø4
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (k/h)	
Link Distance (m)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	27.2
Total Split (s)	27.0
Total Split (%)	27%
Maximum Green (s)	17.8
Yellow Time (s)	3.3
All-Red Time (s)	5.9
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	

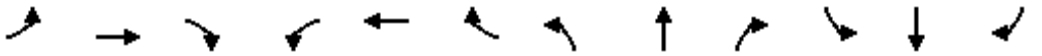
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		38.7								14.8		
LOS		D								B		
Approach Delay		38.7									14.8	
Approach LOS		D									B	
Queue Length 50th (m)		72.5								61.3		
Queue Length 95th (m)		85.8								73.7		
Internal Link Dist (m)		146.7			152.8			319.1			381.6	
Turn Bay Length (m)												
Base Capacity (vph)		1963								2703		
Starvation Cap Reductn		0								0		
Spillback Cap Reductn		438								0		
Storage Cap Reductn		0								0		
Reduced v/c Ratio		0.96								0.55		

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 74 (74%), Referenced to phase 3:SBL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.76			
Intersection Signal Delay: 26.6		Intersection LOS: C	
Intersection Capacity Utilization 74.9%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 2: O'Connor Street & Isabella Street

Lane Group	Ø4
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	244	2682	0	0	0	0	0	95	456	0	0	0
Future Volume (vph)	244	2682	0	0	0	0	0	95	456	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	0.86	0.86	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt									0.850			
Flt Protected	0.950											
Satd. Flow (prot)	1472	4560	0	0	0	0	0	1767	1517	0	0	0
Flt Permitted	0.950											
Satd. Flow (perm)	1472	4560	0	0	0	0	0	1767	1517	0	0	0
Right Turn on Red	No		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									25			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		176.8			255.7			343.3			402.9	
Travel Time (s)		12.7			18.4			24.7			29.0	
Confl. Peds. (#/hr)			55	55			52					52
Confl. Bikes (#/hr)			5			1						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	3%	0%	0%	0%	0%	0%	3%	2%	0%	0%	0%
Adj. Flow (vph)	244	2682	0	0	0	0	0	95	456	0	0	0
Shared Lane Traffic (%)	10%											
Lane Group Flow (vph)	220	2706	0	0	0	0	0	95	456	0	0	0
Turn Type	Perm	NA						NA	Perm			
Protected Phases		2						4				
Permitted Phases	2								4			
Detector Phase	2	2						4	4			
Switch Phase												
Minimum Initial (s)	5.0	5.0						5.0	5.0			
Minimum Split (s)	20.3	20.3						33.3	33.3			
Total Split (s)	67.0	67.0						33.0	33.0			
Total Split (%)	67.0%	67.0%						33.0%	33.0%			
Maximum Green (s)	61.7	61.7						27.7	27.7			
Yellow Time (s)	3.3	3.3						3.3	3.3			
All-Red Time (s)	2.0	2.0						2.0	2.0			
Lost Time Adjust (s)	0.0	0.0						0.0	0.0			
Total Lost Time (s)	5.3	5.3						5.3	5.3			
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0						3.0	3.0			
Recall Mode	C-Min	C-Min						None	None			
Walk Time (s)	7.0	7.0						7.0	7.0			
Flash Dont Walk (s)	8.0	8.0						21.0	21.0			
Pedestrian Calls (#/hr)	0	0						0	0			
Act Effct Green (s)	61.7	61.7						27.7	27.7			
Actuated g/C Ratio	0.62	0.62						0.28	0.28			
v/c Ratio	0.24	0.96						0.19	1.04			
Control Delay	8.6	23.5						29.0	89.0			
Queue Delay	0.0	19.2						0.0	0.0			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	8.6	42.6						29.0	89.0			
LOS	A	D						C	F			
Approach Delay		40.1						78.7				
Approach LOS		D						E				
Queue Length 50th (m)	16.0	181.5						14.1	~92.4			
Queue Length 95th (m)	m26.0	#231.3						26.7	#152.0			
Internal Link Dist (m)		152.8			231.7			319.3			378.9	
Turn Bay Length (m)												
Base Capacity (vph)	908	2813						489	438			
Starvation Cap Reductn	0	216						0	0			
Spillback Cap Reductn	0	0						0	0			
Storage Cap Reductn	0	0						0	0			
Reduced v/c Ratio	0.24	1.04						0.19	1.04			

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 8 (8%), Referenced to phase 2:EBTL and 6:, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.04			
Intersection Signal Delay: 46.2		Intersection LOS: D	
Intersection Capacity Utilization 83.6%		ICU Level of Service E	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 3: Metcalfe Street & Isabella Street

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1068	45	0	0	0	33
Future Vol, veh/h	1068	45	0	0	0	33
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	-	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	1068	45	0	0	0	33

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	557
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	6.9
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.3
Pot Cap-1 Maneuver	-	-		0	479
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	479
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	13.1
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	479	-	-
HCM Lane V/C Ratio	0.069	-	-
HCM Control Delay (s)	13.1	-	-
HCM Lane LOS	B	-	-
HCM 95th %tile Q(veh)	0.2	-	-