

# Transportation Impact Study Update

# PROPOSED BROCKTON APARTMENTS

117 Forest Avenue and 175 Catharine Street South  
HAMILTON, ONTARIO

October, 2023  
Project No: NT-16-103

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**nextrans**  
CONSULTING ENGINEERS

NextEng Consulting Group Inc.

October 31, 2023

**Attention: David Horwood**

Representative Holdings Inc.  
c/o David Horwood  
242 Main Street East,  
Hamilton, ON L8N 1H5

**Re: Transportation Impact Study Update  
Proposed Brockton Apartments – Residential Development  
117 Forest Avenue and 175 Catharine Street South  
Our Project No. NT-16-103**

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NexTrans Consulting Engineers (A Division of NextEng Consulting Group Inc.) is pleased to present the enclosed Transportation Impact Study Update for the above noted site in support of a Zoning By-law Amendment application for a proposed Brockton Apartments residential development. The purpose of this Study Update is to address the City of Hamilton's transportation related comments outlined in the Letter dated February 23, 2023, as well as to update the latest site plan statistics. It should be noted that NexTrans has provided the original transportation impact study dated October, 2022.

The subject lands are located at the municipal addresses 117 Forest Avenue and 175 Catharine Street South, in the City of Hamilton. The subject site consists of two vacant lots and one 10-storey apartment building. The proposed development will involve the redevelopment of the two vacant lots. The latest development proposal consists of a 24-storey high-rise building with a total of 248 residential dwelling units. The proposed development also provides a total of 191 vehicle parking spaces and 129 bicycle parking spaces, inclusive of long-term and short-term spaces.

The transportation impact study update, which addressed all of the City's comments, concludes that the proposed development can adequately be accommodated by the existing transportation network, existing Hamilton Transit service, as well as the recommended Transportation Demand Management measures and incentives recommended in this report.

We trust the enclosed sufficiently addresses your needs. Should you have any questions, please do not hesitate to contact the undersigned.

Yours truly,

**Nextrans Consulting Engineers**

A Division of NextEng Consulting Group Inc.

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**Report Submission Record**

Identification	Date	Description of issued and/or revision
Final Report	October 31, 2023	For Final Submission

## CITY OF HAMILTON COMMENTS

The following comments have been received from the City of Hamilton in a Letter dated February 23, 2023. Appropriate comments are provided, with the reference to the associated sections of this Study Update.

1. **Transportation Planning does not support the proposed Zoning By-law Amendment (ZAC-23-019) as the proposed density and corresponding required number of parking stalls to be provided in conjunction with the underground parking area of the existing residential building at 175 Catharine Street South cannot support simultaneous two-way movements due to the infrastructure limitations of the existing underground parking area. Queuing and conflicts occurring nearby underground parking entry/exit locations has the potential to spillback onto the municipal right-of-way leading to potential conflicts between vulnerable road users (children, older adults, pedestrians, cyclists) travelling within the surrounding area.**

Additionally, minor revisions are required to the Transportation Impact Study (TIS) are required to be completed to the satisfaction and approval of the Manager, Transportation Planning in order to adequately assess the proposed developments impact on the surrounding road network.

**Response:** [Noted and these comments have been fully addressed in this Study Update.](#)

2. **Transportation Planning reviewed the submitted Transportation Impact Study document which requires the following revisions to be completed to the satisfaction and approval of the Manager, Transportation Planning:**
  - a. **The Professional Engineer Seal at the front of the report has not been dated. Transportation Planning requires the Professional Engineer Seal to follow the Professional Engineers Act and be dated within the seal in order verify professional liability.**
  - b. **The consultant shall provide Transportation Planning with all Synchro Files utilized in the operational analysis.**
  - c. **Trip generation indicated in Table 41 of the TIS indicated that Land Use Code 222 Multifamily Housing (High-Rise) Close to Rail Transit. Although the subject lands fall within the category of 'close to rail transit', the Transportation Tomorrow Survey data presented in Table 62 indicates that only 1% of the population in this area utilizes GO Transit for daily trips and is contradictory to the trip generation reductions associated with the 'Close to Rail Transit' component of Land Use Code 222. The TIS shall be revised to utilized 'Not Close to Rail Transit' land use subcategory as well as the General Urban/Suburban Setting/Location.**
  - d. **The driveway access points indicated in Figure 103 are not consistent with the proposed driveway access points on the site plan provided and shall be revised accordingly in the future total analysis review.**
  - e. **The Parking Assessment conducted in Section 8 references dated parking studies (referenced studies are dated 2017 and 2018) that were completed for previous development applications that are no longer valid. A revised parking assessment is required to be submitted.**

**Response:** [Noted and these comments have been fully addressed in this Study Update.](#)

3. **Considering the increase in density being proposed within the subject lands, Transportation Planning shall require a provision of funds to the amount of \$10,000 for the purpose of installing future traffic calming measures within the surrounding area of the proposed development, subject to the satisfaction and approval of the Manager, Transportation Planning.**

At a time when the Applicant is prepared to provide the required funds, Transportation Planning will correspond with the Transportation Operations & Maintenance department to provide an account number for the funds to be deposited accordingly.

**Response:** Noted. This requirement will be included a part of the site plan condition.

4. Transportation Planning requires short-term and long-term bicycle parking to be provided as per the requirements of the City of Hamilton Comprehensive Zoning By-law 05-200, Section 5: Parking. All short-term and long-term bicycle parking shall be clearly indicated, illustrated and the total number of spaces shall be numbered on the site plan accordingly.

**Response:** Noted. The short-term and long-term bicycle parking assessment for the proposed development has been included in Section 9 of this Study Update. The proposed development will meet these requirements.

5. Transportation Planning recommends additional Transportation Demand Management (TDM) measures to be provided:
  - Provision of preloaded Presto/Transit passes with the purchase of an individual residential unit;
  - Reducing the number of passenger vehicle parking stalls provided to the minimum required through the City of Hamilton Comprehensive Zoning By-Law 05-200, Section 5: Parking;
  - Unbundled the cost of an individual parking stall from the cost of a residential unit; and
  - Provision of Electric Vehicle (EV) charging stalls within the underground parking area.

**Response:** Given that the proposed development is located close to transit terminal and GO Train Station, therefore, transit incentives are not required. Residents who will be living in this area understand the convenient of the area and will make their conscious decisions.

To support TDM, the proposed development will provide a bicycle repair station on-site at a convenient location, as indicated in **Figure 12**. This measure is a long-term TDM measure that will benefit the residents many years to come.

6. The existing right-of-way at the subject property along Catharine Street South and Forest Avenue is approximately  $\pm 20.0$  metres. Transportation Planning does not require right-of-way dedications to be provided as the existing right-of-way width meets the requirements of the Council Approved Urban Official Plan: Chapter C - City Wide Systems and Designations, 4.5 Road Network Functional Classification, 4.5.2. Local Roads (Catharine Street South and Forest Avenue) are to be 20.117 metres.

**Response:** Noted. No further action is required.

7. Catharine Street South & Forest Avenue are both Local Roads. The Applicant is to dedicate a 4.57 metres x 4.57 metres Daylighting Triangle to the right-of-way, as per the Council Approved Urban Official Plan: Chapter C - City Wide Systems and Designations 4.5 Road Network Functional Classification; Daylighting Triangles 4.5.7.

**Response:** Noted and provide in the revised site plan.

8. Catharine Street South & Young Street are both Local Roads. The Applicant is to dedicate a 4.57 metres x 4.57 metres Daylighting Triangle to the right-of-way, as per the Council Approved Urban Official Plan: Chapter C - City Wide Systems and Designations 4.5 Road Network Functional Classification; Daylighting Triangles 4.5.7.

**Response:** Noted and provide in the revised site plan.

9. Short-term and long-term bicycle parking spaces are required to be clearly indicated and numbered on the site plan. Long-term bicycle parking spaces are indicated on the 'UNDERGROUND LEVEL 1 PLAN', however the total number of spaces are not indicated and do not correspond with the total number to be provided within the TIS.

**Response:** Noted. Both the TIS and the revised site plan will reflect the recommended short-term and long-term bicycle parking space requirements.

10. The site plan shall be revised to provide 4.57 metre x 4.57 metre daylighting triangle to be dedicated to the municipal right-of-way at the intersection of Catharine Street South & Forest Avenue and the intersection of Catharine Street South & Young Street.

**Response:** Noted and provide in the revised site plan.

11. Additional details are required indicating the proposed movements via the two (2) existing driveway access points leading to the underground parking to Catharine Street South and Young Street. These existing driveways are narrow and are currently non-conforming to city standards in order to facilitate two-way movements (both driveways into the subject property measure approximately  $\pm 4.8 - \pm 4.9$  metres in width) as indicated in Figure 1. The internal circulation throughout the site via these driveway access points is unclear.

**Response:**

12. For two-way operation onto municipal road, the driveway access width(s) must be 7.5 metres at the ultimate property line and curve radii minimum 7.0 metres. The proposed driveway access to Forest Avenue shall be revised in order to provide a minimum 7.5 metre width at the property line.

**Response:** Noted and have been provided in the revised site plan.

13. 5.0 metres x 5.0 metres visibility triangles must be provided for each driveway access. They must be illustrated, dimensioned and identified on the site plan. Visibility triangles are between the driveway limits and the ultimate property line (right-of-way limit) and no object or mature vegetation can exceed a height of 0.6 metres above the corresponding perpendicular centreline elevation of the adjacent street.

**Response:** Noted and provide in the revised site plan.

14. Transportation Planning generally supports the proposed Lay-By area along Forest Avenue provided that the Applicant/Owner will not propose waste collection to occur within the lay-by. The lay-by is solely to be utilized as a loading area, pick-up/drop-off and short-term duration stopping.

**Response:** Noted. However, drop-off/pick-up activities will be conducted on-site, using the available surface parking spaces.

15. The site plan indicates that the existing underground parking area is proposed to provide access to an additional 172 parking stalls under the proposed development. The existing underground parking area of the existing residential building at 175 Catharine Street does not appear to be suitable to support two-way movements based on the internal circulation widths measured as indicated in Figure 2.

**Response:** The new underground parking garage access will be provided via an existing retrofitted ramp that currently connects to Young Street. The width of the proposed underground garage access ramp is over 6m in width, which can accommodate two-way operations. The vehicle turning movements are provided in Section 7 of this Study Update.

16. Several parking stalls are located adjacent to structural walls and may result in difficult turning movements when maneuvering in/out as indicated in Figure 3 for parking stall #107. Other parking stalls with similar restrictions are noted at #52 and #73. A turning plan is required to be provided in order to illustrate the complete movements of a passenger vehicle entering/exiting the proposed parking stalls without conflicts and/or limitations.

**Response:** Noted. We have tested the vehicle turning movement using AutoTURN software. The parking spaces have been revised to ensure that vehicle can enter and exit these spaces without any issues.

17. An internal waste collection area has not been identified on the site plan. It is unclear how waste collection is being arranged for the proposed development (private / municipal, and where).

**Response:** A proposed on-site waste collection area has been provided at the north-east corner of the site. NexTrans has demonstrated the garbage truck and loading truck maneuverability for this proposed loading space and provided in Section 7 of this Study Update.

18. The site plan provided indicates a termination of the internal pedestrian prior to a formal connection with the existing sidewalk along Forest Avenue as indicated in the red area as illustrated in Figure 4. It is understood there are grade differences along Forest Avenue that may pose challenges to providing an accessible sidewalk connection in accordance with the Accessibility for Ontarians with Disabilities Act (AODA). The Applicant is required to revise the site plan in order to formally provide the connection or provide more information as to why the pedestrian connection cannot be formally provided. Should you have any questions, please email [tplanning@hamilton.ca](mailto:tplanning@hamilton.ca), referencing: 175 Catharine Street South and 117 Forest Avenue – ZAC-23-019 (Ward 2) Transportation Planning Response

**Response:** Noted and have been provided in the revised site plan.

## EXECUTIVE SUMMARY

NexTrans Consulting Engineers (A Division of NextEng Consulting Group Inc.) was retained by Representative Holdings Inc. (the 'Client') to undertake a Transportation Impact Study Update in support of a Zoning By-law Amendment application for a proposed Brockton Apartments residential development. The subject lands are located at the municipal addresses 117 Forest Avenue and 175 Catharine Street South, in the City of Hamilton.

The purpose of this Study Update is to address the City of Hamilton's transportation related comments outlined in the Letter dated February 23, 2023, as well as to update the latest site plan statistics. It should be noted that NexTrans has provided the original transportation impact study dated October, 2022.

This Transportation Impact Study is prepared in accordance with the submitted terms of reference and the City of Hamilton Traffic Impact Study Guidelines and Transportation Demand Management Guidelines.

### Proposed Development

The subject site consists of two vacant lots and one 10-storey apartment building. The proposed development will involve the redevelopment of the two vacant lots. The latest development proposal consists of a 24-storey high-rise building with a total of 248 residential dwelling units. The proposed development also provides a total of 191 vehicle parking spaces and 129 bicycle parking spaces, inclusive of short-term and long-term spaces.

### Proposed Development Access

Currently, the subject site has a full moves access onto Forest Avenue that provides access to the surface parking lot, which a second access (underground parking access) onto Catharine Street South, and third/fourth underground garage parking access to Young Street.

With the redevelopment of the two vacant lots, the existing accesses onto Catharine Street South and Young Street will remain, however, two full moves accesses will be provided onto Forest Avenue to service the proposed development surface parking lot and on-site loading area. One of the existing underground parking accesses onto Young Street will be retrofitted and will provide two-way access to the new underground parking area.

The analysis indicates that the proposed development accesses onto Forest Avenue, the existing underground parking accesses onto Catharine Street South and Young Street are expected to operate at acceptable levels of service with negligible delay or queue. The Young Street access to service the new underground parking area is also expected to operate at acceptable levels of service. The recommended lane configurations for the proposed development accesses include:

- Catharine Street South access (underground parking garage access) – no change
- Young Street access (existing westerly underground parking garage access) – no change
- Young Street access (retrofitted easterly underground parking garage access)
  - One inbound and one outbound lane (approximately 3± m each); and
  - One shared eastbound through/right lane and one shared westbound through/left on Young Street
- Forest Avenue west access:
  - One inbound and one outbound lane (approximately 3± m each); and
  - One shared eastbound through/left lane on Forest Avenue
- Forest Avenue east access:
  - One inbound and one outbound lane (approximately 3± m each); and
  - One shared eastbound through/left lane on Forest Avenue



## Transportation Capacity Assessment

The proposed development is expected to generate:

- 37 total two-way transit trips (20 inbound and 17 outbound) during the weekday morning peak hour and 17 total two-way transit trips (10 inbound and 17 outbound) during the afternoon peak hour;
- 62 total two-way walk trips (27 inbound and 35 outbound) during the weekday morning peak hour and 67 total two-way walk trips (30 inbound and 37 outbound) during the afternoon peak hour; and
- 73 total two-way auto trips (25 inbound and 48 outbound) during the weekday morning peak hour and 88 total two-way auto trips (49 inbound and 39 outbound) during the afternoon peak hour

## Auto Mode Assessment

The intersection capacity analysis indicates that the existing unsignalized intersections are currently operating at acceptable levels of service. However, some of the critical movements at the signalized intersections are currently operating near or at capacity with higher delay during the peak periods.

## Walking Mode Assessment

The area is currently well served by a complete network of sidewalks. The sidewalks are generally available on both sides of the streets and reasonably maintained on the public streets. Our analysis indicates that no improvements are required to the sidewalk network under the existing conditions.

As part of the proposed development, pedestrian connections will be provided internally within the proposed development. Direct entrances will be provided onto Forest Avenue and Catharine Street South to facilitate the proposed development pedestrians.

The existing sidewalks along Forest Avenue and Catharine Street South along the frontage of the proposed development will be maintained and enhanced, with sufficient lighting to help with security and user experience.

## Cycling Mode Assessment

Under the existing conditions, there are some bicycle facilities available in the area such as the dedicated bicycle lanes on Cannon Street, Hunter Street, Markland Street and Arkledun Avenue. There are also signed routes/sharrows on part of Arkledun Avenue, Stinson Street and Ferguson Avenue. Bicycle trails are also available in the east-west direction south of Charlton Street E and south of James Mountain Road.

Under Appendix B of the City of Hamilton Cycling Master Plan Update and Review, on-street bicycle lanes are identified on Charlton Avenue E between James Street S to Ferguson and John Street S between Charlton and St Joseph's Drive. It is NexTrans' understanding that the City is currently reviewing the design and it has not been finalized at this time. Our assessment indicates that this cycling project is important for both Charlton Street E and John Street S in order to complete the cycling network in the area.

The proposed development will provide a total of 129 bicycle parking spaces, with 5 short-term and 125 long-term bicycle parking spaces. This provision will support TDM and help reduce the numbers of single-occupant-vehicle trips to and from the proposed development. This provision will also help achieve the City's sustainability objectives and utilization of the existing and planned active transportation infrastructure.

## Transit Mode Assessment

The proposed development is expected to generate 37 total two-way non-auto trips (32 inbound and 5 outbound) during the weekday morning peak hour and 32 total two-way non-auto trips (11 inbound and 21 outbound) during the afternoon peak hour. It is anticipated that the majority of these trips will be transit related trips.

As indicated in Section 2.4, the area is currently well serviced by the existing transit network. The proposed development has excellent access to the public transit and only located approximately 400 m (or less than 6-minute walk) to the Hamilton GO Train Station and transit terminal. The proposed development is also located within a few minutes walk to bus stops for HSR Bus Routes 22, 23, 24, 25, 26, 27.

It is NexTrans' understanding that the Province has cancelled the proposed Light Rail Transit (LRT) in 2019 due to project rising costs. However, in February, 2021, the Province has recommitted this project with some funding contribution from various levels of government. Based on the information obtained from the Metrolinx website ([www.metrolinx.com](http://www.metrolinx.com)), the Hamilton LRT project will play a key role in the revitalization of Hamilton's urban environment by transforming how residents travel across the heart of the city. Modern light rail service will connect key areas, destinations and institutions along Main Street, King Street and Queenston Road, creating a 14-kilometre multi-modal corridor and an enhanced streetscape.

Our assessment analysis indicate that the proposed development is located in the heart of Downtown Hamilton and has one of the best locations for use of existing and future public transit. The proposed development transit trips can be accommodated by the existing and future transit services without any additional improvements. The proposed land uses also support future transit ridership and help reduce the numbers of single-occupant-vehicles to and from the proposed development.

### Transportation Demand Management Measures and Incentives

The Report identifies and recommends appropriate Transportation Demand Management measures and incentives to support active transportation and transit, to meet the objectives and requirements in the City's *TDM for Development Report (June, 2015)*.

### Vehicle Parking Assessment

Based on this information, the new proposed development needs to provide a total of 161 vehicle parking spaces, inclusive of residential, barrier-free and visitor parking space requirements.

The proposed development provides a total of 191 vehicle parking spaces, which also include barrier-free and visitor parking. Therefore, the proposed development only slightly exceeds the minimum applicable Zoning By-law requirements by 30 spaces. NexTrans' assessment and review indicate that this arrangement is appropriate since the current Zoning By-law does not require visitor parking, the surface parking spaces can be designated for visitor parking. Therefore, the effective site underground vehicle parking will be approximately 168 spaces, which is only a few spaces higher than the minimum site-specific Zoning By-law requirement.

### Bicycle Parking Assessment

It is NexTrans' understanding that the proposed development is required to provide 5 short-term parking spaces and 0.5 bicycle parking spaces/unit as per the current Zoning By-law requirements. On this basis, the proposed development will provide a total of 129 bicycle parking spaces, including 124 long-term and 5 short-term spaces. This meets the applicable Zoning By-law requirements.

### Site Loading Assessment

The proposed development will provide a waste pad and a loading space on-site. The waste pad is located between the existing building and new building (north-west corner of the new building) and a loading space at the north-east corner of the site, adjacent to the surface parking lot.

Both the proposed waste pad and the loading space will allow the servicing vehicle to back-in or use the front-end loader, whichever is appropriate, as both the waste pad and the loading have direct access onto the proposed internal driveway.

NexTrans provided the vehicle turning movement diagrams that demonstrates the maneuverability of the servicing vehicles accessing the site in different arrangement.

## Study Recommendations

Based on the Study assessment and findings, the following recommendations are provided:

- The proposed development implements the Transportation Demand Management (TDM) measures and incentives identified in Section 9 of this report to support active transportation and public transit, to meet the objectives and requirements by the City of Hamilton's TDM for Development (June, 2015);
- The proposed development will not provide transit incentive, but will provide one bicycle repair station on-site, at a convenient location;
- The proposed development provides a total of 129 bicycle parking spaces, with 124 long-term and 5 short-term spaces;
- The proposed development reduces the vehicle parking supply, where appropriate;
- The proposed development provides direct pedestrian and cycling connections to Forest Avenue; and
- No physical improvements are required at the boundary roadway intersections to accommodate the future background traffic and the proposed development site generated traffic

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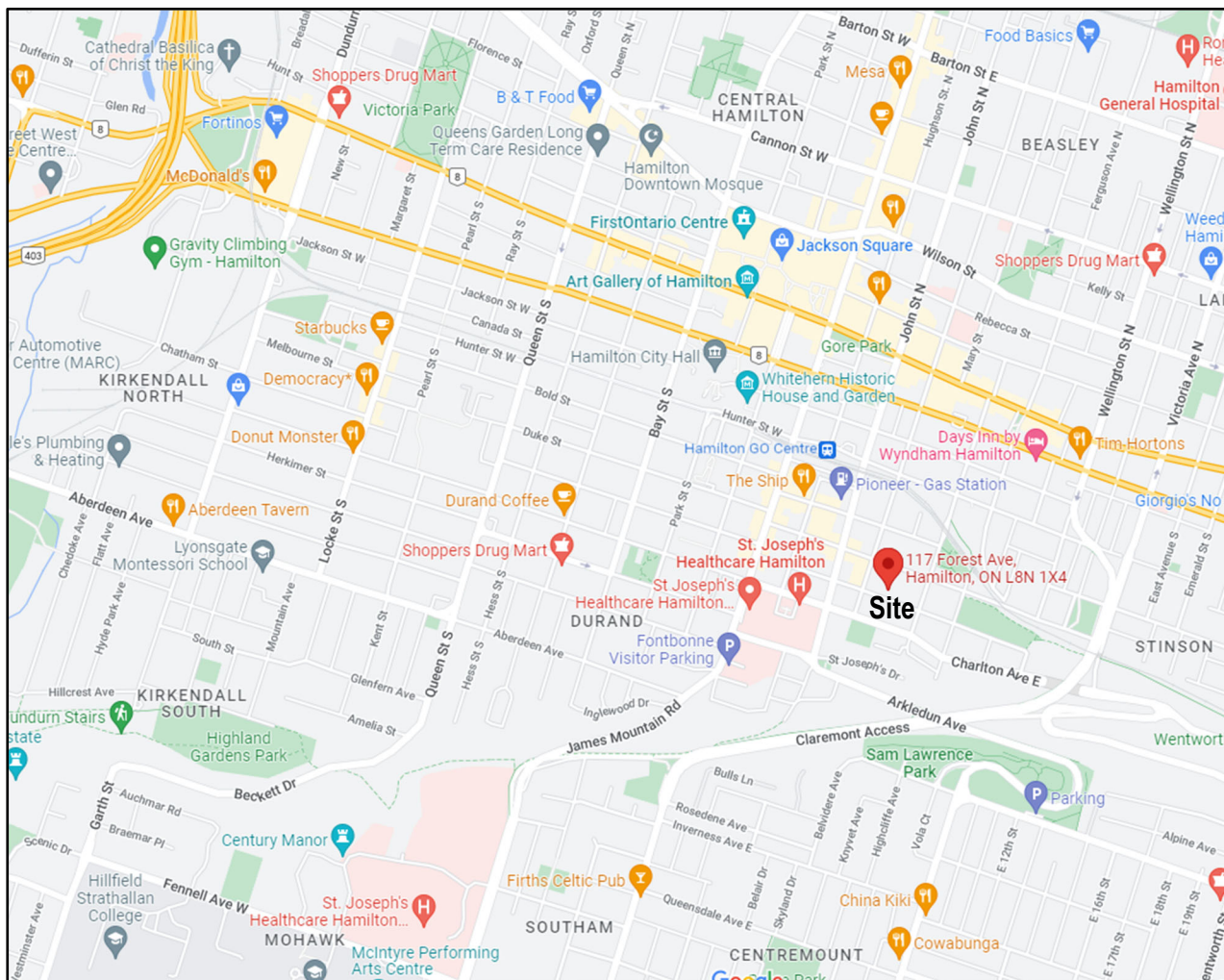
Appendix F – Future Total Traffic Level of Service Calculations

## 1.0 INTRODUCTION

NexTrans Consulting Engineers (A Division of NextEng Consulting Group Inc.) was retained by Representative Holdings Inc. (the 'Client') to undertake a Transportation Impact Study Update in support of a Zoning By-law Amendment application for a proposed Brockton Apartments residential development. The subject lands are located at the municipal addresses 117 Forest Avenue and 175 Catharine Street South, in the City of Hamilton. The location of the proposed development is illustrated in **Figure 1**.

The purpose of this Study Update is to address the City of Hamilton's transportation related comments outlined in the Letter dated February 23, 2023, as well as to update the latest site plan statistics. It should be noted that NexTrans has provided the original transportation impact study dated October, 2022. This Transportation Impact Study is prepared in accordance with the submitted terms of reference (**Appendix A**) and the City of Hamilton Traffic Impact Study Guidelines and Transportation Demand Management Guidelines.

**Figure 1 – Proposed Development Location**

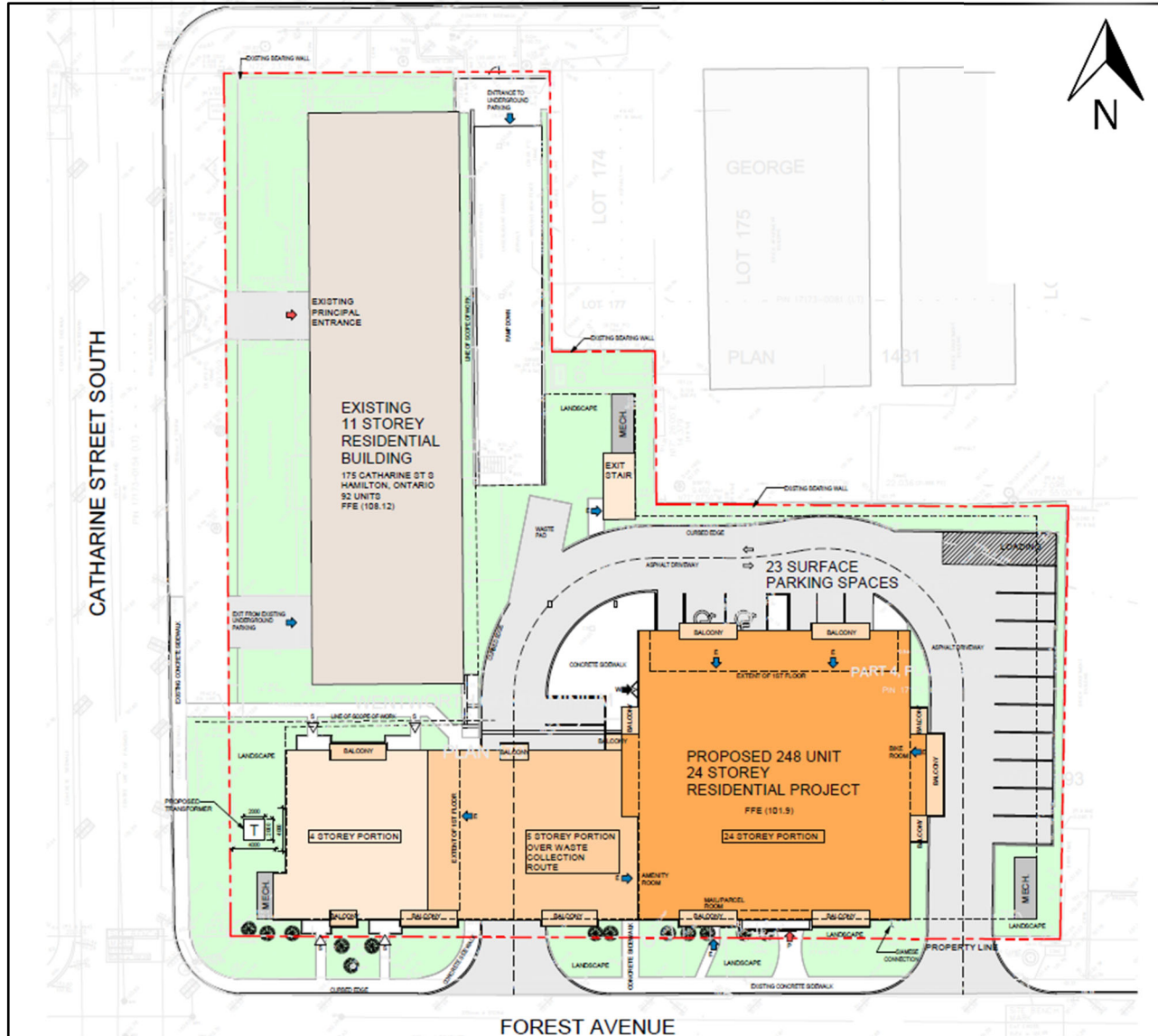


Source: Google Map

The subject site consists of two vacant lots and one 10-storey apartment building. The proposed development will involve the redevelopment of the two vacant lots. The latest development proposal consists of a 24-storey high-rise building with a total of 248 residential dwelling units. The proposed development also provides a total of 191 vehicle parking spaces and 129 bicycle parking spaces, inclusive of short-term and long-term spaces. **Figure 2** illustrates the conceptual site plan.



Figure 2 – Conceptual Site Plan



## 2.0 EXISTING TRANSPORTATION CONDITIONS

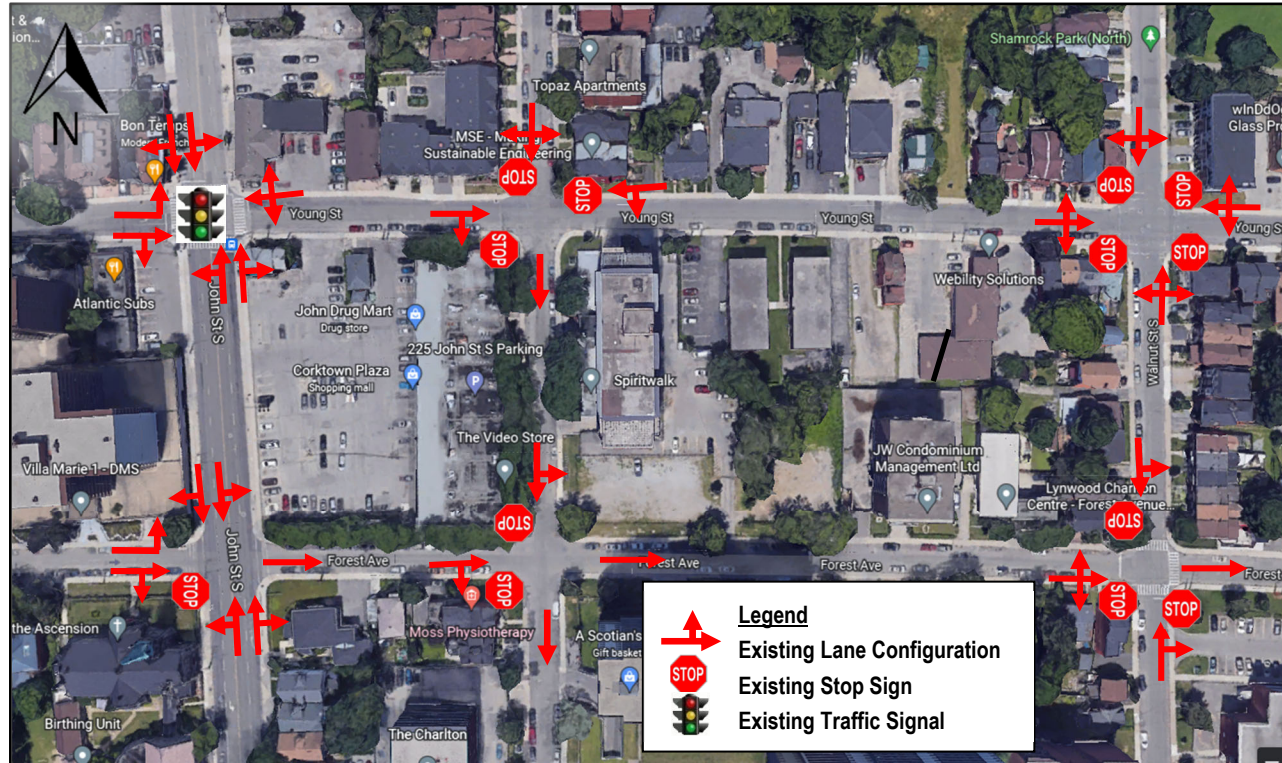
### 2.1. Existing Road Network

The existing road network, lane configuration and existing traffic control for the study area are shown in **Figure 3**. The description of the existing road network in the study area is summarized in **Table 1** below.

Table 1 – Summary of the Existing Road Network

Road Name	Jurisdiction	Number of Lanes	Sidewalk/Bike Lane	Speed
John Street S	City of Hamilton	4	Sidewalk on both sides of the street with no bike facilities	50 km/h
Catharine St S (one-way SB)	City of Hamilton	2 (on-street parking)	Sidewalk on both sides of the street with no bike facilities	40 km/h
Forest Avenue (one-way WB)	City of Hamilton	2 (on-street parking)	Sidewalk on both sides of the street with no bike facilities	30 km/h
Young Street	City of Hamilton	2 (on-street parking)	Sidewalk on both sides of the street with no bike facilities	40 km/h
Walnut Street S	City of Hamilton	2 (on-street parking)	Sidewalk on both sides of the street with no bike facilities	30 km/h

**Figure 3 – Existing Lane Configuration and Traffic Control**



Source: Google Map

### 2.3. Existing Active Transportation Assessment

Figure 4 illustrates the cycling network in the study area.

#### Walking

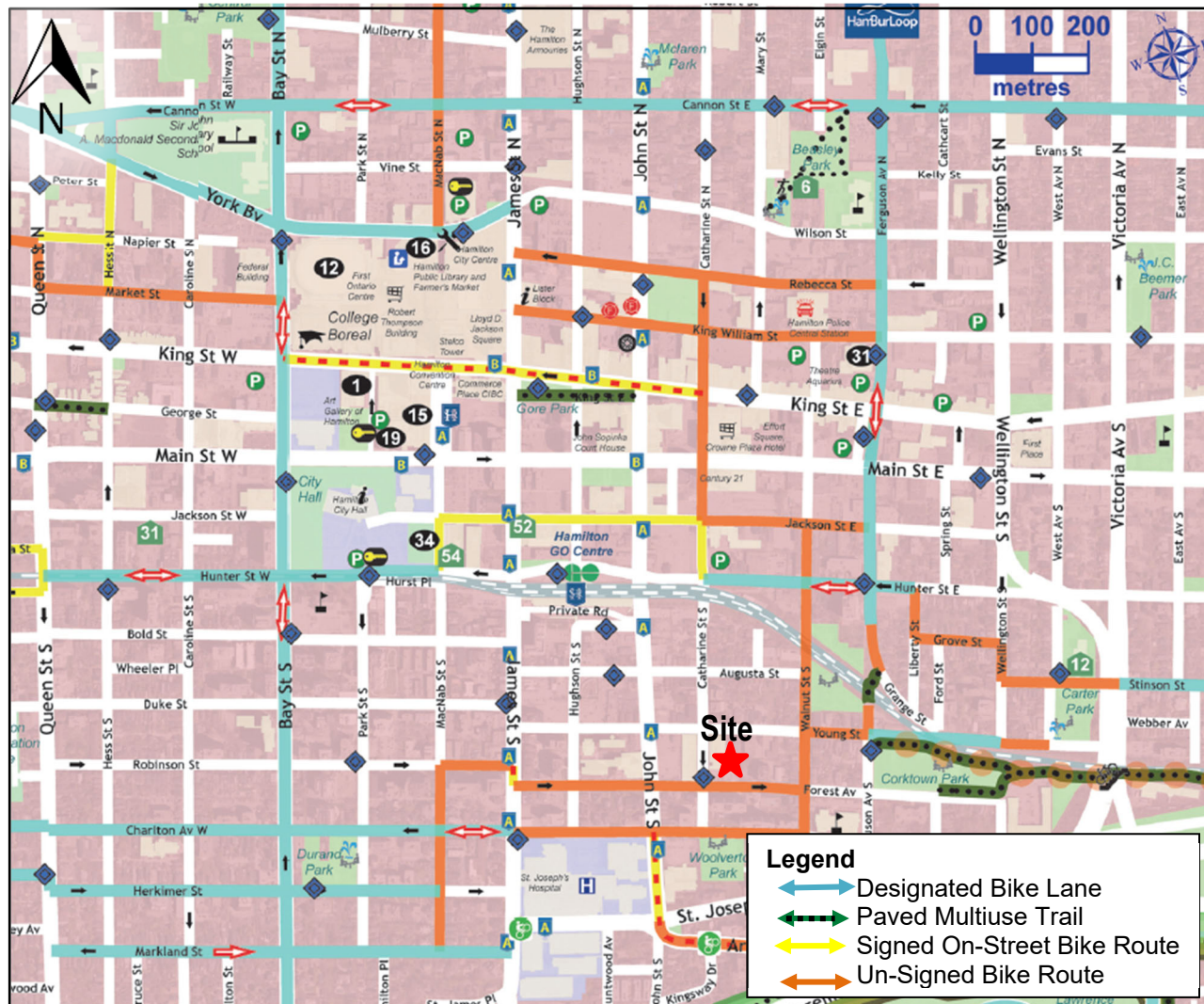
The area is currently well served by a complete network of sidewalks. The sidewalks are generally available on both sides of the streets and reasonably maintained on the public streets. Our analysis indicates that no improvements are required to the sidewalk network under the existing conditions on the public streets given some potential physical constraints. However, under the future total conditions, NexTrans will review and provide recommendations for sidewalk improvements, if appropriate.

#### Cycling

Under the existing conditions, there are some bicycle facilities available in the area such as the dedicated bicycle lanes on Cannon Street, Hunter Street, Markland Street and Arkledun Avenue. There are also signed routes/sharrows on part of Arkledun Avenue, Stinson Street and Ferguson Avenue. Bicycle trails are also available in the east-west direction south of Charlton Street E and south of James Mountain Road.

However, there are still gaps in the cycling network. Our analysis and assessment indicate that a better and more connected bicycle network should be implemented as part of future City’s capital projects in order to increase cycling trips and reduce the number of single-occupant-vehicle trips to and from the area. NexTrans will review the current City’s proposal for bicycle lanes on Charlton Avenue E and John Street S in the area.

Figure 4 – Existing Bicycle Network in the Study Area



Source: Hamilton Cycling Map

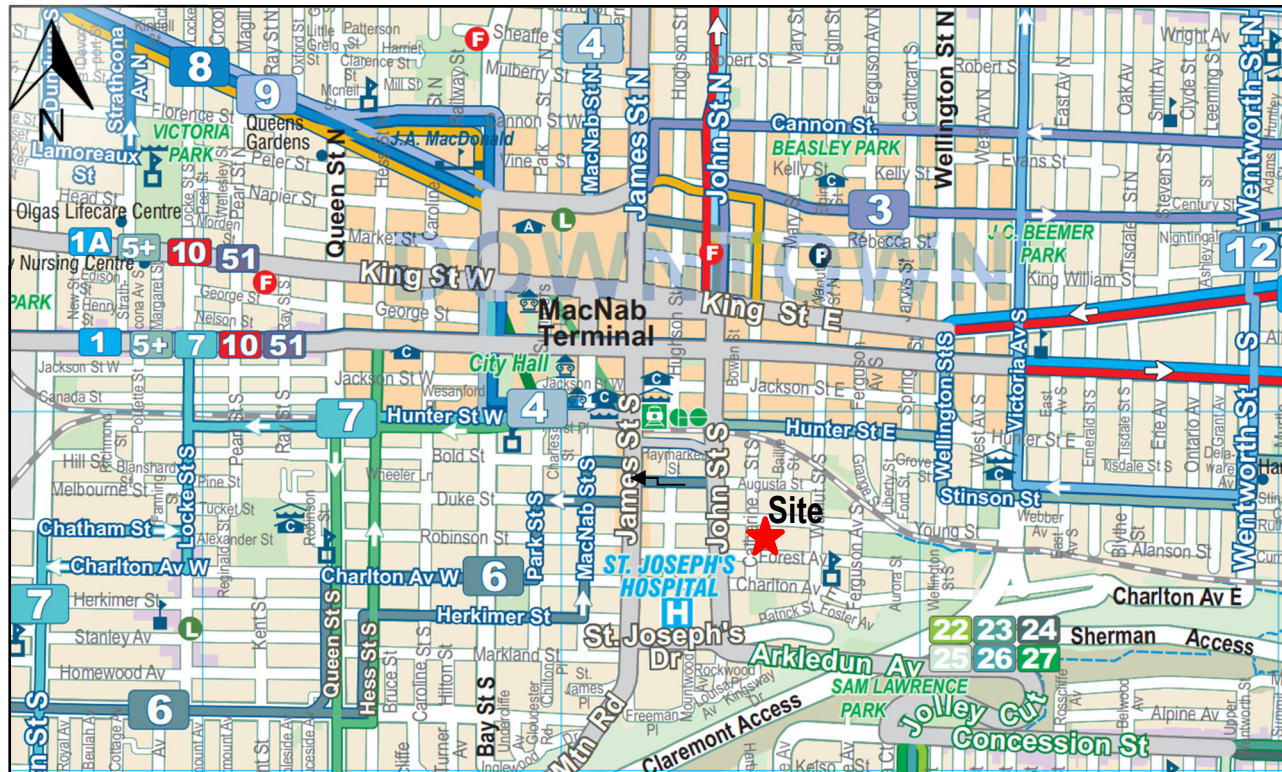
### 2.4. Existing Transit Assessment

Figure 5 illustrates the existing HSR Transit Bus Routes in the study area. The area is currently well serviced by the existing transit network. The proposed development has excellent access to the public transit and only located approximately 400 m (or less than 6-minute walk) to the Hamilton GO Train Station and transit terminal. The proposed development is also located within a few minutes walk to bus stops for HSR Bus Routes 22, 23, 24, 25, 26, 27.

It is NexTrans’ understanding that the Province has cancelled the proposed Light Rail Transit (LRT) in 2019 due to project rising costs. However, in February, 2021, the Province has recommitted this project with some funding contribution from various levels of government. Based on the information obtained from the Metrolinx website ([www.metrolinx.com](http://www.metrolinx.com)), the Hamilton LRT project will play a key role in the revitalization of Hamilton’s urban environment by transforming how residents travel across the heart of the city. Modern light rail service will connect key areas, destinations and institutions along Main Street, King Street and Queenston Road, creating a 14-kilometre multi-modal corridor and an enhanced streetscape.

Our assessment analysis indicate that the proposed development is located in the heart of Downtown Hamilton and has one of the best locations for use of existing and future public transit. The proposed land uses also support future transit ridership and help reduce the numbers of single-occupant-vehicles to and from the proposed development.

Figure 5 – HSR Transit System Map for the Area



Source: HSR Transit System Map

## 2.5. Existing Traffic Volumes

Existing traffic volumes at the study area intersections were undertaken by Spectrum on Tuesday June 7, 2022 and during the morning (7:00 a.m. to 10:00 a.m.) and afternoon (4:00 p.m. to 7:00 p.m.) peak periods for the following intersections:

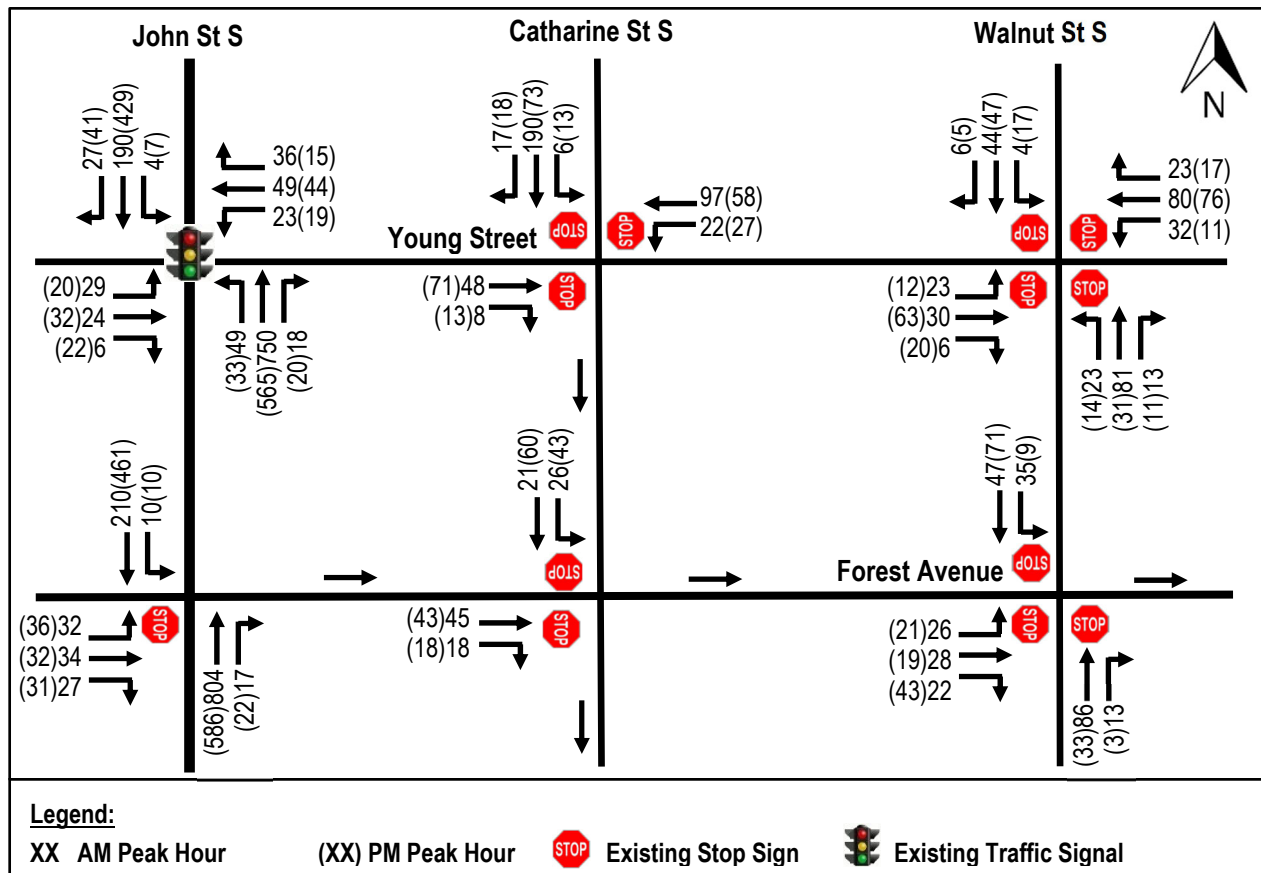
- Forest Avenue at Catharine Street South – Tuesday June 7, 2022
- Forest Avenue at Walnut Street South – Tuesday June 7, 2022
- Forest Avenue at John Street South – Tuesday June 7, 2022
- John Street South at Young Street – Tuesday June 7, 2022
- Young Street at Catharine Street – Tuesday June 7, 2022
- Young Street at Walnut Street South – Tuesday June 7, 2022

It should be noted that the traffic turning movement counts were undertaken while the Province was fully opened with no restrictions. All businesses and schools were opened at the time. NexTrans' review also indicates that there were no major road constructions in the area that may potentially impact the traffic turning movement counts.

Therefore, traffic is mostly returning to normal. This is the new normal and some employees will permanently be working from home. This provision may not change in the future, and even if it does, it will take a few years to get back to the pre-pandemic situation.

The Turning movement counts are summarized in **Appendix B**. The existing volumes are illustrated in **Figure 6**.

Figure 6 – Existing Traffic Volumes



### 2.6. Existing Traffic Assessment

The existing volumes in **Figure 6** were analyzed using Synchro Version 11 software. The methodology of the software follows the procedures described and outlined in the Highway Capacity Manual, HCM 2000, published by the Transportation Research Board. It should be noted that the printouts for unsignalized intersections are based on HCM outputs and the results for signalized intersections are based on Synchro so that queues and more detailed information are provided. The detailed results are provided in **Appendix C** and summarized in **Table 2**.

It should be noted that NexTrans has requested the signal timing plans for the John Street South/Young Street intersection in early June, 2022. However, NexTrans has not received the data in time for the preparation of this Study as of August 2, 2022. For the purposes of this assessment, NexTrans has utilized the existing traffic signal timing plan for the John Street South/Charlton Avenue E intersection. All input parameters should be consistent between the two intersections give that the John Street South/Young Street is only located about 200 m to the north. Therefore, this provision is reasonable.

**Table 2 – Existing Levels of Service**

Intersection	Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Available Storage Length (m)
		LOS (v/c)	Delay (s)	95 <sup>th</sup> Queue (m)	LOS (v/c)	Delay (s)	95 <sup>th</sup> Queue (m)	
John Street S/ Young Street (signalized)	<b>Overall</b>	<b>A (0.46)</b>	<b>8</b>		<b>A (0.35)</b>	<b>6</b>		
	EB – L	D (0.26)	40	14	D (0.14)	27	10	~15
	EB – TR	C (0.13)	30	12	C (0.24)	27	17	~100
	WB – LTR	C (0.46)	33	31	C (0.35)	34	25	~90
	NB – LTR	A (0.36)	4	35	A (0.27)	3	22	~100
	SB – LTR	A (0.09)	3	8	A (0.19)	3	15	~100
John Street S/ Forest Avenue (unsignalized)	EB – LTR	C (0.33)	23	11	C (0.36)	25	13	~100
	NB – TR	A (0.34)	0	0	A (0.24)	0	0	~100
	SB – TL	A (0.02)	2	0	A (0.01)	1	0	~100
Young Street/ Catharine Street S (signalized)	EB – TR	A (0.08)	8	-	A (0.11)	8	-	~90
	WB – TL	A (0.17)	9	-	A (0.12)	8	-	~175
	SB – LTR	A (0.29)	9	-	A (0.14)	8	-	~100
Forest Avenue/ Catharine Street S (unsignalized)	EB – TR	A (0.10)	7	-	A (0.08)	7	-	~90
	SB – LTR	A (0.08)	8	-	A (0.14)	8	-	~100
Young Street/ Walnut Street S (signalized)	EB – LTR	A (0.08)	8	-	A (0.12)	8	-	~175
	WB – LTR	A (0.18)	8	-	A (0.13)	8	-	~100
	NB – LTR	A (0.16)	8	-	A (0.07)	8	-	~100
	SB – LTR	A (0.07)	8	-	A (0.09)	8	-	~65
Forest Avenue/ Walnut Street S (unsignalized)	EB – LTR	A (0.11)	8	-	A (0.10)	7	-	~175
	NB – TR	A (0.13)	8	-	A (0.05)	7	-	~100
	SB – TL	A (0.12)	8	-	A (0.10)	8	-	~100

The analysis indicates that under the existing conditions, all signalized and unsignalized intersections are currently operating at acceptable levels of service during the morning and afternoon peak periods.

### 3.0 TRANSPORTATION AND LAND USE PLANNING CONTEXT

#### 3.1. Existing Area Context

Based on NexTrans comprehensive review of the study area, it is evident that there is a wide range of different types of land uses and housing types currently exist in the area such as residential (including rental), retail/commercial, St. Joseph’s Health Care Hamilton and medical offices on John Street S, James Street S and Charlton Avenue E.

#### 3.2. Future Rapid Transit Corridor

It is NexTrans’ understanding that the Province has cancelled the proposed Light Rail Transit (LRT) in 2019 due to project rising costs. However, in February, 2021, the Province has recommitted this project with some funding contribution from various levels of government. Based on the information obtained from the Metrolinx website ([www.metrolinx.com](http://www.metrolinx.com)), the Hamilton LRT project will play a key role in the revitalization of Hamilton’s urban environment by transforming how residents travel across the heart of the city. Modern light rail service will connect key areas, destinations and institutions along Main Street, King Street and Queenston Road, creating a 14-kilometre multi-modal corridor and an enhanced streetscape. With the excellent existing transit service along with the Future Rapid Transit Corridor in the Downtown Core, the proposed development represents good transportation planning since it utilizes the existing transportation network, existing and future transit network, as well as the existing active transportation network in the area. The traffic pattern and generation are also consistent with the existing neighbourhood.

#### 3.3. Cycling Master Plan

Under Appendix B of the City of Hamilton Cycling Master Plan Update and Review, on-street bicycle lanes are identified on Charlton Avenue E between James Street s to Ferguson and John Street S between Charlton and St Joseph’s Drive. It is NexTrans’ understanding that the City is currently reviewing the design and it has not been finalized at this time. Our assessment and review indicate that this cycling project is important for both Charlton Street E and John Street S in order to complete the cycling network in the area.

## 4.0 FUTURE BACKGROUND CONDITIONS

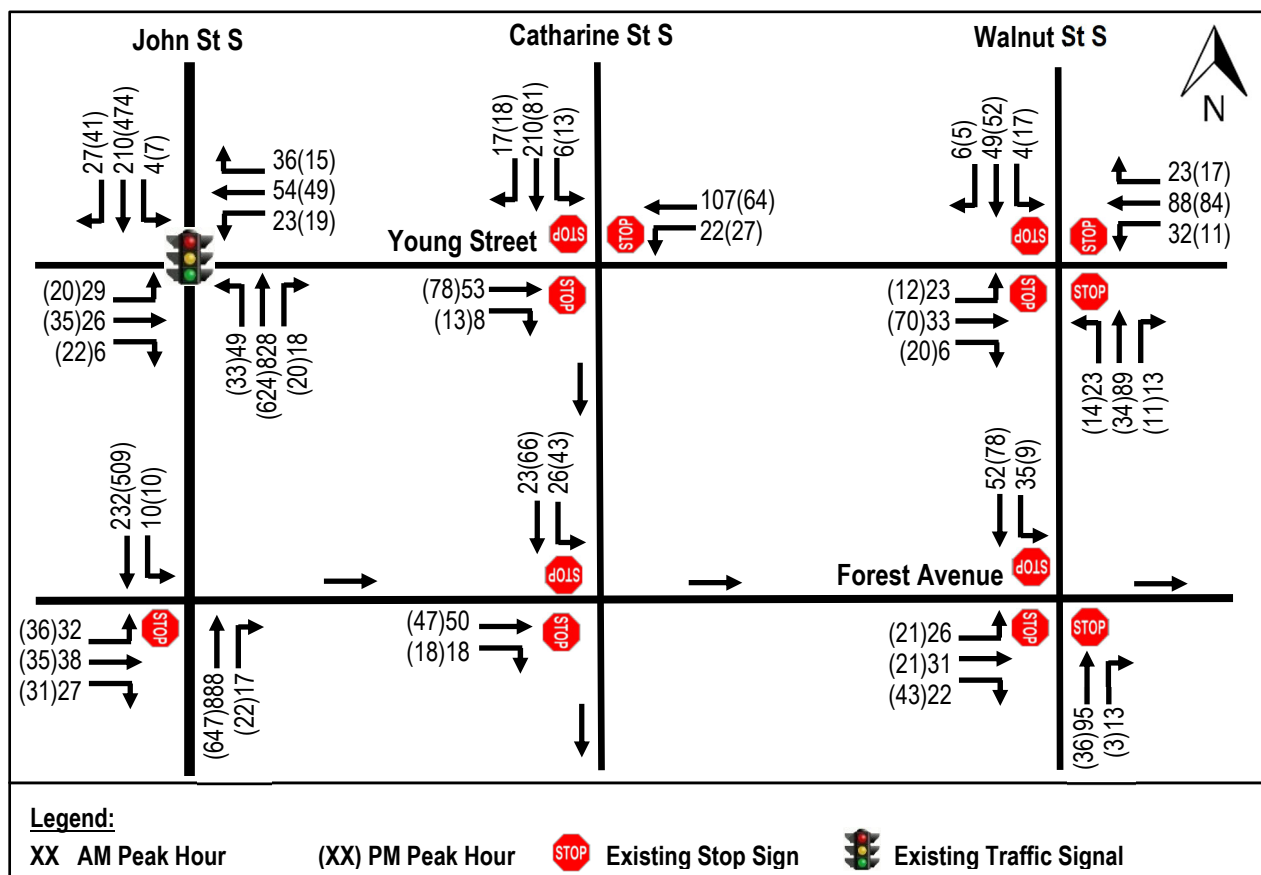
### 4.1. Analysis Horizon

For the purposes of this assessment, a five-year horizon (2022 to 2027) has been carried out for the study analysis. This is consistent with the City’s Traffic Impact Study Guidelines and industry best practices.

### 4.2. Future Background Corridor Growth

Based on NexTrans’ consultation with the City staff through the submitted study terms of reference, staff indicated that a 2% background traffic growth per annum for the boundary road network in the study area. This is consistent with the City’s Traffic Impact Study Guidelines. **Figure 7** illustrates the future background corridor growth.

**Figure 7 – 2027 Future Background Corridor Growth**



### 4.3. Background Development Applications

In the preparation of the original study and the study update, NexTrans has reviewed the available background development applications in the area based on the information provided on the City of Hamilton Development Application Portal. The review indicates that the majority of the background developments are either conversions from rental units to condominium units or small-scale development that does not generate significant auto trips. Our assessment indicates that these proposed background developments will be captured as part of the 2% growth per annum. **Table 3** summarizes the background development applications in the area. For 225 John Street S, the residential trip generation forecasts were undertaken using the information contained in the *Trip Generation Manual, 11<sup>th</sup> Edition* published by the Institute of Transportation Engineers (ITE). The site trip generation for 225 Forest Avenue is summarized in **Table 4**.

**Table 3 – Future Background Developments in Close Proximity to Study Area**

Location	Development Details	Proposed Units
225 John Street S	Proposed mixed-use development consisting of a 27-storey and a 14-storey	415 dwelling units and 354 dwelling units, 900 m <sup>2</sup> of ground related retail
119 John Street S	Mixed-use development	723 residential units and 1,587 m <sup>2</sup> of ground related retail
155 Charlton Ave E	Condominium Conversion	Convert 34 of 38 existing rental units to condominium units
46 Arkledun Ave	Condominium Conversion	Convert 72 rental residential units to condominium units
147 Yonge St	3-storey Townhouse Dwellings	7 units
154 Catharine St S	Condominium	14 units
86 Augusta St	Condominium	6 units

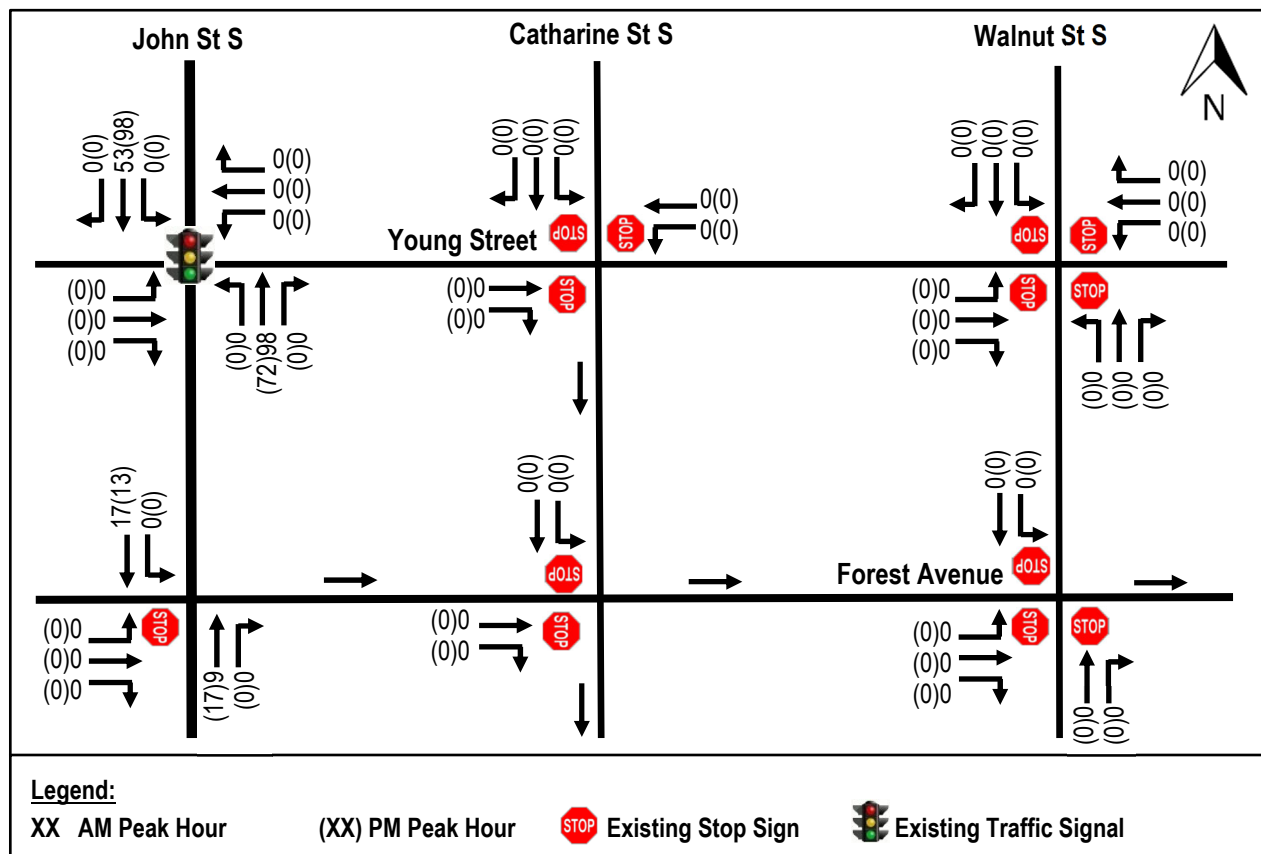
Table 4 summarizes the background site trip generation.

**Table 4 – Background Site Traffic Trip Generation**

ITE Land Use	Magnitude (units)	Parameters		Morning Peak Hour			Afternoon Peak Hour		
				In	Out	Total	In	Out	Total
Multifamily Housing (High-Rise) LUC 222 Close to Rail Transit	769	Vehicle Trips	Trip Rates (use average as no equations were given)	0.08	0.15	0.23	0.15	0.11	0.26
			<b>New Auto Trips</b>	<b>62</b>	<b>115</b>	<b>177</b>	<b>115</b>	<b>85</b>	<b>200</b>
		Walk + Bike + Transit	Trip Rates (use average as no equations were given)	0.15	0.02	0.17	0.05	0.1	0.15
			<b>New Non-Auto Trips</b>	<b>115</b>	<b>16</b>	<b>131</b>	<b>38</b>	<b>77</b>	<b>115</b>
<b>Total New Trips</b>				<b>177</b>	<b>131</b>	<b>308</b>	<b>153</b>	<b>162</b>	<b>315</b>

The background development located at 225 John Street S is expected to generate 177 two-way auto trips (62 inbound and 115 outbound) and 200 two-way auto trips (115 inbound and 85 outbound) during the morning and afternoon peak hours, respectively. Figure 8 illustrates the site traffic volumes for background developments noted above.

**Figure 8 – Background Development Site Traffic**

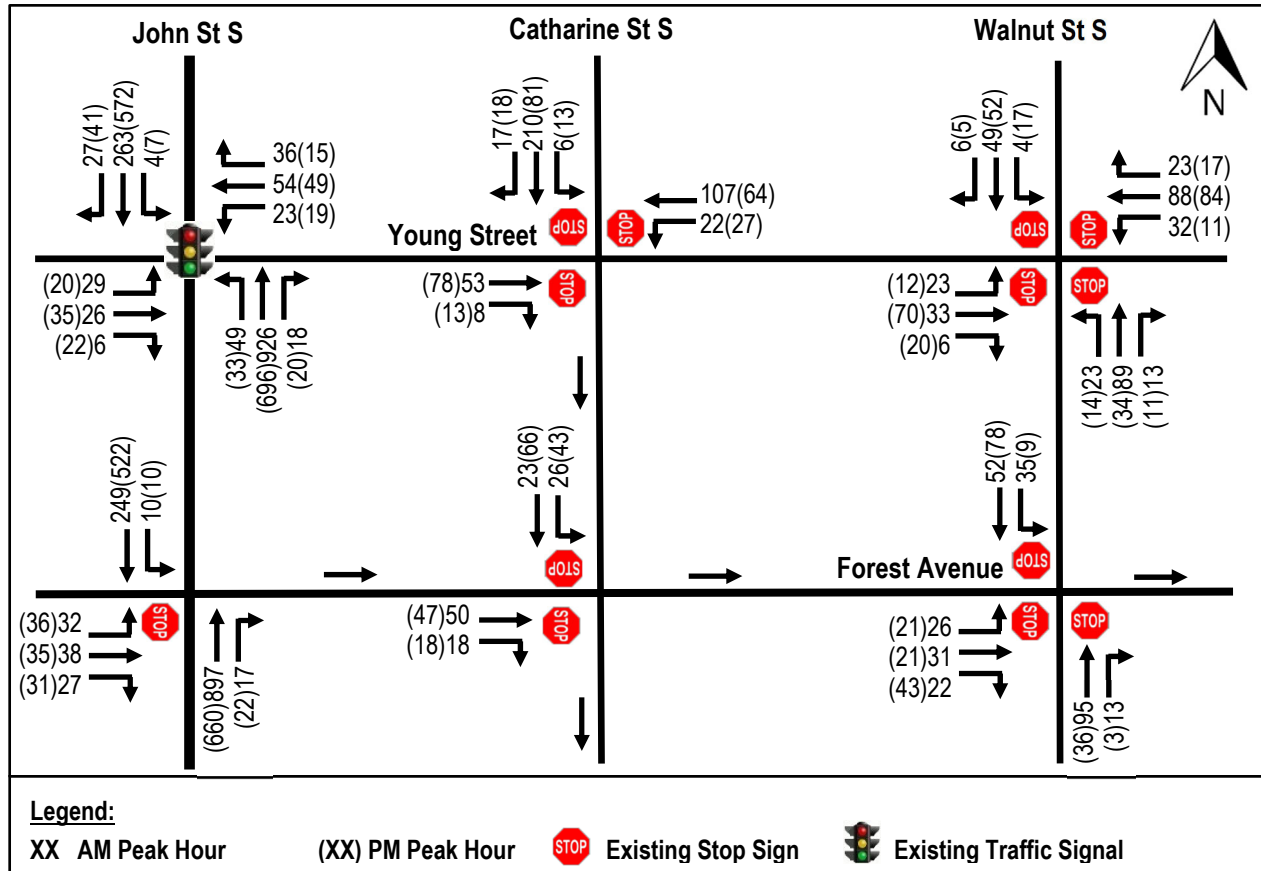




### 4.4. Future Background Traffic Assessment

The estimated future background traffic volumes are illustrated in **Figure 9**, and were analyzed using Synchro 10 software. The detailed calculations are provided in **Appendix D** and summarized in **Table 5**.

**Figure 9 – 2027 Future Background Traffic Volumes**



**Table 5 – 2027 Future Background Levels of Service**

Intersection	Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Available Storage Length (m)
		LOS (v/c)	Delay (s)	95 <sup>th</sup> Queue (m)	LOS (v/c)	Delay (s)	95 <sup>th</sup> Queue (m)	
John Street S/ Young Street (signalized)	<b>Overall</b>	<b>A (0.47)</b>	<b>8</b>		<b>A (0.37)</b>	<b>6</b>		
	EB – L	D (0.25)	39	13	D (0.14)	37	10	~15
	EB – TR	C (0.14)	30	13	C (0.25)	27	17	~100
	WB – LTR	C (0.47)	33	31	C (0.37)	35	26	~90
	NB – LTR	A (0.46)	5	48	A (0.33)	3	28	~100
SB – LTR	A (0.13)	3	11	A (0.25)	3	21	~100	
John Street S/ Forest Avenue (unsignalized)	EB – LTR	D (0.42)	30	16	D (0.44)	31	17	~100
	NB – TR	A (0.37)	0	0	A (0.27)	0	0	~100
	SB – TL	A (0.02)	1	0	A (0.01)	1	0	~100
Young Street/ Catharine Street S (signalized)	EB – TR	A (0.09)	8	-	A (0.12)	8	-	~90
	WB – TL	A (0.19)	9	-	A (0.13)	8	-	~175
	SB – LTR	A (0.32)	10	-	A (0.15)	8	-	~100
Forest Avenue/ Catharine Street S (unsignalized)	EB – TR	A (0.10)	7	-	A (0.09)	7	-	~90
	SB – LTR	A (0.08)	8	-	A (0.15)	8	-	~100
Young Street/ Walnut Street S (signalized)	EB – LTR	A (0.09)	8	-	A (0.13)	8	-	~175
	WB – LTR	A (0.19)	9	-	A (0.14)	8	-	~100
	NB – LTR	A (0.17)	9	-	A (0.08)	8	-	~100
	SB – LTR	A (0.08)	8	-	A (0.10)	8	-	~65

Forest Avenue/ Walnut Street S (unsignalized)	EB – LTR NB – TR SB – TL	A (0.11) A (0.15) A (0.12)	8 8 8	- - -	A (0.10) A (0.05) A (0.11)	7 7 8	- - -	~175 ~100 ~100
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The analysis indicates that under the 2027 future background conditions, all signalized and unsignalized intersections are expected to operate at acceptable levels of service during the morning and afternoon peak periods.

## 5.0 PROPOSED DEVELOPMENT ASSESSMENT

### 5.1. Proposed Development

The proposed development will involve the redevelopment of the two vacant lots, which consists of a 24-storey high-rise building with a total of 248 residential dwelling units.

The 2016 Transportation Tomorrow Survey (TTS) and the *Trip Generation Manual, 11<sup>th</sup> Edition* published by the Institute of Transportation Engineers (ITE) information was reviewed to estimate the modal split, trip distribution and trip generation for the proposed development.

### 5.2. Modes of Travel Assessment in the Area

**Table 6** summarizes the travel mode split information based on the review of the 2016 Transportation Tomorrow Survey data for Traffic Zones 5159 and 5168. Detailed information is included in **Appendix E**.

**Table 6 – Modes of Travel based on 2016 TTS**

Land use	Time Period	Auto Driver	Auto Passenger	Local Transit	GO Transit	Cycle	Walk
Residential	AM Peak Period (6:00 AM – 9:00 AM)	35%	2%	40%	1%	4%	18%
	PM Peak Period (3:00 PM – 6:00 PM)	51%	8%	30%	1%	2%	8%

Based on the information above, the predominant modes of travel for the residents in the area under the existing conditions are non-auto modes of transportation such as walking, cycling, public transit and carpooling. The high walking percentage is expected given the close proximity of the area to the Hamilton GO Centre/HSR Terminal and Downtown area. It is expected that for non-residential mode, the driving percentage is higher than other modes.

### 5.3. Site Trip Generation

The trip generation forecasts were undertaken using the information contained in the *Trip Generation Manual, 11<sup>th</sup> Edition* published by the Institute of Transportation Engineers (ITE). It should be noted that the proposed development has excellent access to the public transit and only located approximately 400 m (or less than 6-minute walk) to the Hamilton GO Train Station (Rail Transit) and HSR transit terminal, and similar distance to the Future Rapid Transit Corridor along King Street.

For these reasons, the previous assessment used the ITE Land Use Codes (LUC) 222 “Multifamily Housing High-Rise Close to Rail Transit” average rates have been utilized for the proposed development.

However, the City has requested that the ITE Land Use Codes (LUC) 222 “Multifamily Housing High-Rise Not Close to Rail Transit” should be utilized for the proposed development. Therefore, the revised analysis reflected and addressed this comment.

It also should be noted that no modal split is applied to the average trip rates. **Table 7** summarizes the site trip generations based on the methodologies outlined above.

**Table 7 – Site Traffic Trip Generation**

ITE Land Use	Magnitude (units)	Parameters		Morning Peak Hour			Afternoon Peak Hour		
				In	Out	Total	In	Out	Total
Multifamily Housing (High-Rise) LUC 222 Not Close to Rail Transit	248	Vehicle Trips	Trip Rates AM - $T = 0.22*(X) + 18.85$ PM - $T = 0.26*(X) + 23.12$	0.10	0.19	0.29	0.20	0.15	0.35
			<b>New Auto Trips</b>	<b>25</b>	<b>48</b>	<b>73</b>	<b>49</b>	<b>39</b>	<b>88</b>
		Transit Trips	Trip Rates (use average as no equations were given)	0.08	0.07	0.15	0.04	0.03	0.07
			<b>New Transit Trips</b>	<b>20</b>	<b>17</b>	<b>37</b>	<b>10</b>	<b>7</b>	<b>17</b>
		Walk Trips	Trip Rates (use average as no equations were given)	0.11	0.14	0.25	0.12	0.15	0.27
			<b>New Walk Trips</b>	<b>27</b>	<b>35</b>	<b>62</b>	<b>30</b>	<b>37</b>	<b>67</b>
<b>Total New Person Trips</b>				<b>72</b>	<b>100</b>	<b>172</b>	<b>89</b>	<b>83</b>	<b>172</b>

The proposed development is expected to generate:

- 37 total two-way transit trips (20 inbound and 17 outbound) during the weekday morning peak hour and 17 total two-way transit trips (10 inbound and 17 outbound) during the afternoon peak hour;
- 62 total two-way walk trips (27 inbound and 35 outbound) during the weekday morning peak hour and 67 total two-way walk trips (30 inbound and 37 outbound) during the afternoon peak hour; and
- 73 total two-way auto trips (25 inbound and 48 outbound) during the weekday morning peak hour and 88 total two-way auto trips (49 inbound and 39 outbound) during the afternoon peak hour

#### 5.4. Site Trip Distribution and Assignment

The 2016 Transportation Tomorrow Survey (TTS) data was reviewed for Traffic Zones 5159 and 5168 in order to estimate the general trip distribution for the proposed development. **Table 8** summarizes the auto trip distribution based on the 2016 TTS traffic zone data.

**Table 8 – Site Trip Distribution Based on TTS Data**

Land Use	Hamilton	Halton Region	Toronto	Flamborough	Niagara Region	Waterloo	Total
Residential	65%	13%	0%	13%	2%	7%	100%
Non-residential	52%	9%	5%	18%	10%	6%	100%

**Table 9** summarizes the auto trip assignment based on the general trip distribution noted above, existing transportation network and turning restrictions in the area for the proposed development. **Figure 10** illustrates the site traffic volumes.

**Table 9 – Site Trip Assignment**

Direction To/From	Street Name	Residential
North	John Street South	37%
South	John Street South/Arkledun Avenue	15%
East	Charlton Ave E/Main St E via Wentworth St S and Victoria Ave S	28%
West	Charlton Ave W/Main St E via John St S and James St S	20%
<b>Total</b>		<b>100%</b>

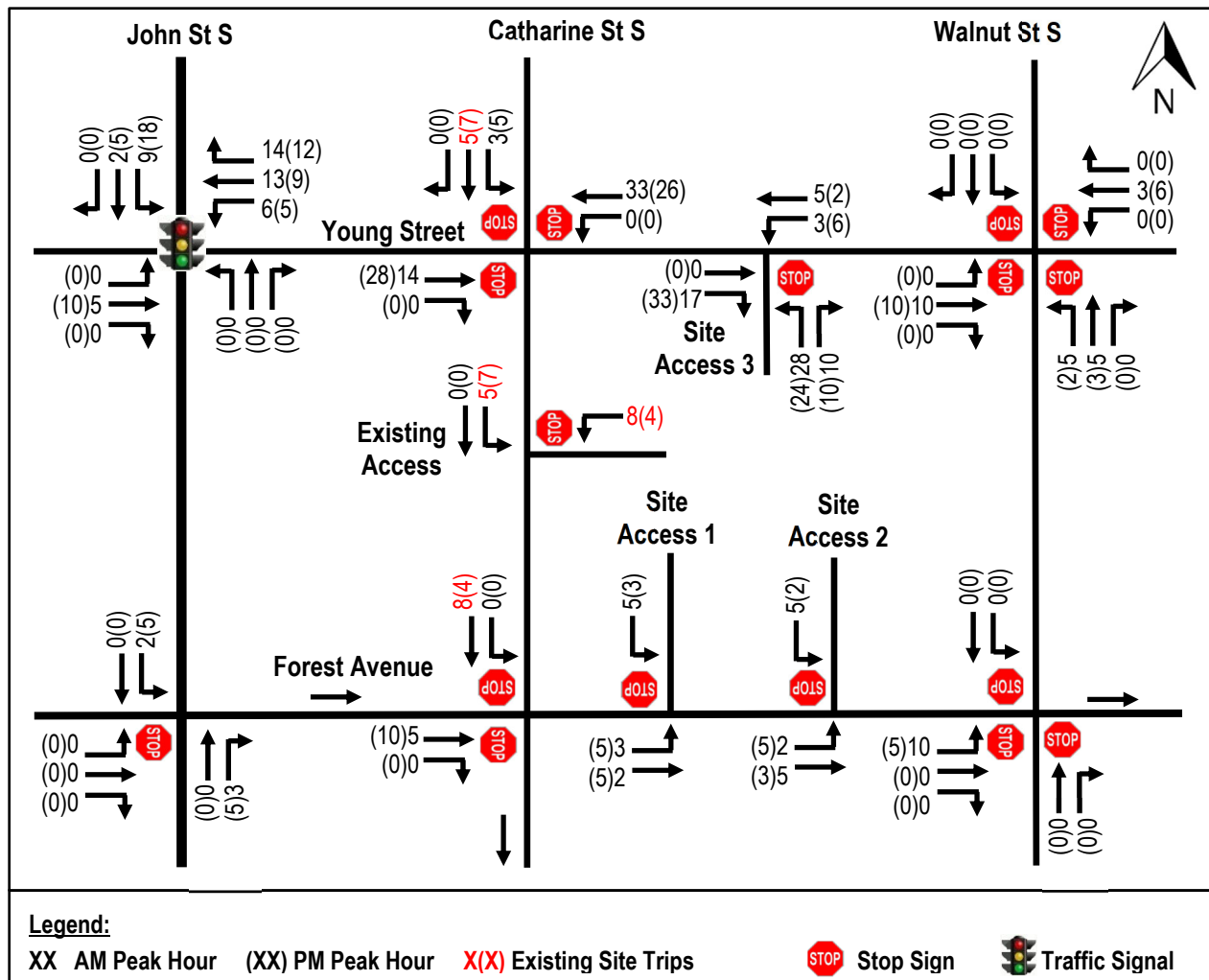
It should be noted that the trip assignment is also based on logical routes, one-way operation, turning restrictions as well as the general trip distribution noted above. **Figure 10** illustrates the proposed development site generated traffic based on the methodologies indicated above.

With the redevelopment of the two vacant lots, the existing accesses onto Catharine Street South and Young Street will remain, however, two full moves accesses will be provided onto Forest Avenue to service the proposed development

surface parking lot and on-site loading area. One of the existing underground parking accesses onto Young Street will be retrofitted and will provide two-way access to the new underground parking area.

The existing site trips to the existing building with 94 dwelling units will be kept consistent with the previous assessment. The existing apartment trips are also included in **Figure 10** below.

**Figure 10 – Site Traffic Volumes**



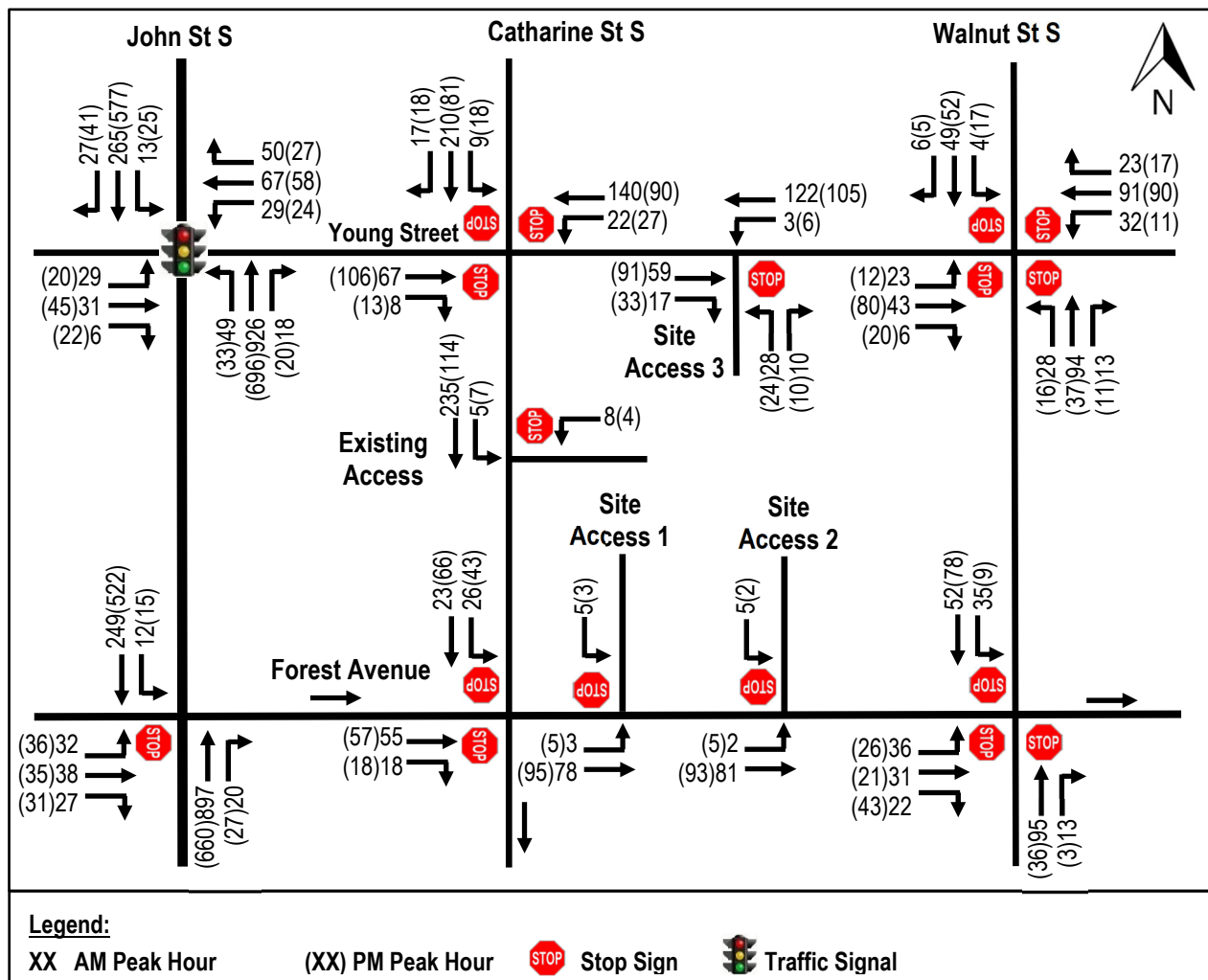
## 6.0 FUTURE TOTAL CONDITIONS

### 6.1. Future Total Traffic Assessment for Auto Mode

The estimated future total traffic volumes (future background traffic volumes plus site generated traffic volumes) are illustrated in **Figure 11**, and were analyzed using Synchro 11 software. The detailed calculations are provided in **Appendix F** and summarized in **Table 10**.

The analysis indicates that under the 2027 future total conditions, all signalized and unsignalized intersections are expected to operate at acceptable levels of service during the morning and afternoon peak periods. The proposed/existing accesses are also expected to operate at acceptable levels of services with minimum delay or queue.

Figure 11 – 2027 Future Total Traffic Volumes



The recommended lane configurations for the proposed development accesses include:

- Catharine Street South access (underground parking garage access) – no change
- Young Street access (existing westerly underground parking garage access) – no change
- Young Street access (retrofitted easterly underground parking garage access)
  - One inbound and one outbound lane (approximately 3± m each); and
  - One shared eastbound through/right lane and one shared westbound through/left on Young Street
- Forest Avenue west access:
  - One inbound and one outbound lane (approximately 3± m each); and
  - One shared eastbound through/left lane on Forest Avenue
- Forest Avenue east access:
  - One inbound and one outbound lane (approximately 3± m each); and
  - One shared eastbound through/left lane on Forest Avenue

**Table 10 – 2027 Future Total Levels of Service**

Intersection	Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Available Storage Length (m)
		LOS (v/c)	Delay (s)	95 <sup>th</sup> Queue (m)	LOS (v/c)	Delay (s)	95 <sup>th</sup> Queue (m)	
John Street S/ Young Street (signalized)	<b>Overall</b>	<b>A (0.55)</b>	<b>9</b>		<b>A (0.40)</b>	<b>7</b>		
	EB – L	D (0.26)	38	13	D (0.15)	37	10	~15
	EB – TR	C (0.13)	29	13	C (0.28)	28	19	~100
	WB – LTR	D (0.55)	35	39	C (0.40)	35	28	~90
	NB – LTR	A (0.47)	6	54	A (0.33)	3	29	~100
	SB – LTR	A (0.15)	4	13	A (0.26)	3	23	~100
John Street S/ Forest Avenue (unsignalized)	EB – LTR	D (0.42)	30	16	D (0.45)	33	17	~100
	NB – TR	A (0.37)	0	0	A (0.27)	0	0	~100
	SB – TL	A (0.02)	2	1	A (0.02)	1	1	~100
Young Street/ Catharine Street S (signalized)	EB – TR	A (0.10)	8	-	A (0.14)	8	-	~90
	WB – TL	A (0.21)	9	-	A (0.14)	8	-	~175
	SB – LTR	A (0.32)	10	-	A (0.15)	8	-	~100
Forest Avenue/ Catharine Street S (unsignalized)	EB – TR	A (0.11)	8	-	A (0.10)	8	-	~90
	SB – LTR	A (0.08)	8	-	A (0.15)	8	-	~100
Young Street/ Walnut Street S (signalized)	EB – LTR	A (0.10)	8	-	A (0.13)	8	-	~175
	WB – LTR	A (0.20)	9	-	A (0.15)	8	-	~100
	NB – LTR	A (0.19)	9	-	A (0.11)	8	-	~100
	SB – LTR	A (0.08)	8	-	A (0.10)	8	-	~65
Forest Avenue/ Walnut Street S (unsignalized)	EB – LTR	A (0.13)	8	-	A (0.14)	8	-	~175
	NB – TR	A (0.15)	8	-	A (0.05)	7	-	~100
	SB – TL	A (0.12)	8	-	A (0.11)	8	-	~100
Forest Avenue/ Site Access 1 (unsignalized)	EB – TL	A (0.00)	0	0	A (0.02)	10	0	~30
	SB – R	A (0.01)	9	1	A (0.02)	1	0	~15
Catharine Street South/ Site Access (unsignalized)	SB – TL	B (0.01)	10	0	A (0.01)	1	0	~50
	WB – R	A (0.00)	0	0	A (0.02)	10	1	~15
Forest Avenue/ Site Access 2 (unsignalized)	EB – TL	A (0.00)	0	0	A (0.02)	10	0	~40
	SB – R	A (0.01)	9	0	A (0.02)	1	0	~15
Young Street/ Site Access 3 (unsignalized)	EB – TR	A (0.05)	0	0	A (0.02)	10	0	~20
	WB – TL	A (0.00)	0	0	A (0.02)	1	0	~135
	NB – LR	A (0.05)	10	1	A (0.00)	0	0	~15

## 6.2. Transit Mode Assessment

The proposed development is expected to generate 37 total two-way transit trips (20 inbound and 17 outbound) during the weekday morning peak hour and 17 total two-way transit trips (10 inbound and 17 outbound) during the afternoon peak hour.

As indicated in Section 2.4, the area is currently well serviced by the existing transit network. The proposed development has excellent access to the public transit and only located approximately 400 m (or less than 6-minute walk) to the Hamilton GO Train Station and transit terminal. The proposed development is also located within a few minutes walk to bus stops for HSR Bus Routes 22, 23, 24, 25, 26, 27.

It is NexTrans' understanding that the Province has cancelled the proposed Light Rail Transit (LRT) in 2019 due to project rising costs. However, in February, 2021, the Province has recommitted this project with some funding contribution from various levels of government. Based on the information obtained from the Metrolinx website ([www.metrolinx.com](http://www.metrolinx.com)), the Hamilton LRT project will play a key role in the revitalization of Hamilton's urban environment by transforming how residents travel across the heart of the city. Modern light rail service will connect key areas, destinations and institutions along Main Street, King Street and Queenston Road, creating a 14-kilometre multi-modal corridor and an enhanced streetscape.

NexTrans' assessment analysis indicate that the proposed development is located in the heart of Downtown Hamilton and has one of the best locations for use of existing and future public transit. The proposed development transit trips can be accommodated by the existing and future transit services without any additional improvements. The proposed land uses also support future transit ridership and help reduce the numbers of single-occupant-vehicles to and from the proposed development.

### 6.3. Active Transportation Mode Assessment

#### 6.3.1. Walking Mode Assessment

The area is currently well served by a complete network of sidewalks. The sidewalks are generally available on both sides of the streets and reasonably maintained on the public streets. NexTrans' assessment and review indicate that no improvements are required to the sidewalk network under the existing conditions as there are no missing gaps or links.

As part of the proposed development, pedestrian connections will be provided internally within the proposed development. Direct entrances will be provided onto Forest Avenue and Catharine Street South to facilitate the proposed development pedestrian access. The existing sidewalks along Forest Avenue and Catharine Street South along the frontage of the proposed development will be maintained and enhanced, with sufficient lighting to help with security and user experience.

#### 6.3.2. Cycling Mode Assessment

Under the existing conditions, there are some bicycle facilities available in the area such as the dedicated bicycle lanes on Cannon Street, Hunter Street, Markland Street and Arkledun Avenue. There are also signed routes/sharrows on part of Arkledun Avenue, Stinson Street and Ferguson Avenue. Bicycle trails are also available in the east-west direction south of Charlton Street E and south of James Mountain Road.

Under Appendix B of the City of Hamilton Cycling Master Plan Update and Review, on-street bicycle lanes are identified on Charlton Avenue E between James Street s to Ferguson and John Street S between Charlton and St Joseph's Drive. It is NexTrans' understanding that the City is currently reviewing the design and it has not been finalized at this time. Our review indicates that this cycling project is important for both Charlton Street E and John Street S in order to complete the cycling network in the area.

The proposed development will provide a total of 129 bicycle parking spaces, with 5 short-term and 124 long-term bicycle parking spaces. This provision will support TDM and help reduce the numbers of single-occupant-vehicle trips to and from the proposed development.

This provision will also help achieve the City's sustainability objectives and utilization of the existing and planned active transportation infrastructure.

NexTrans recommends that the proposed development provide a bike repair station on-site at a convenient location instead of providing transit incentives given that the proposed development is well-served by existing Hamilton Transit System. The proposed location is illustrated in **Figure 12**. The final location will be confirmed at the subsequent stage of the proposed development.

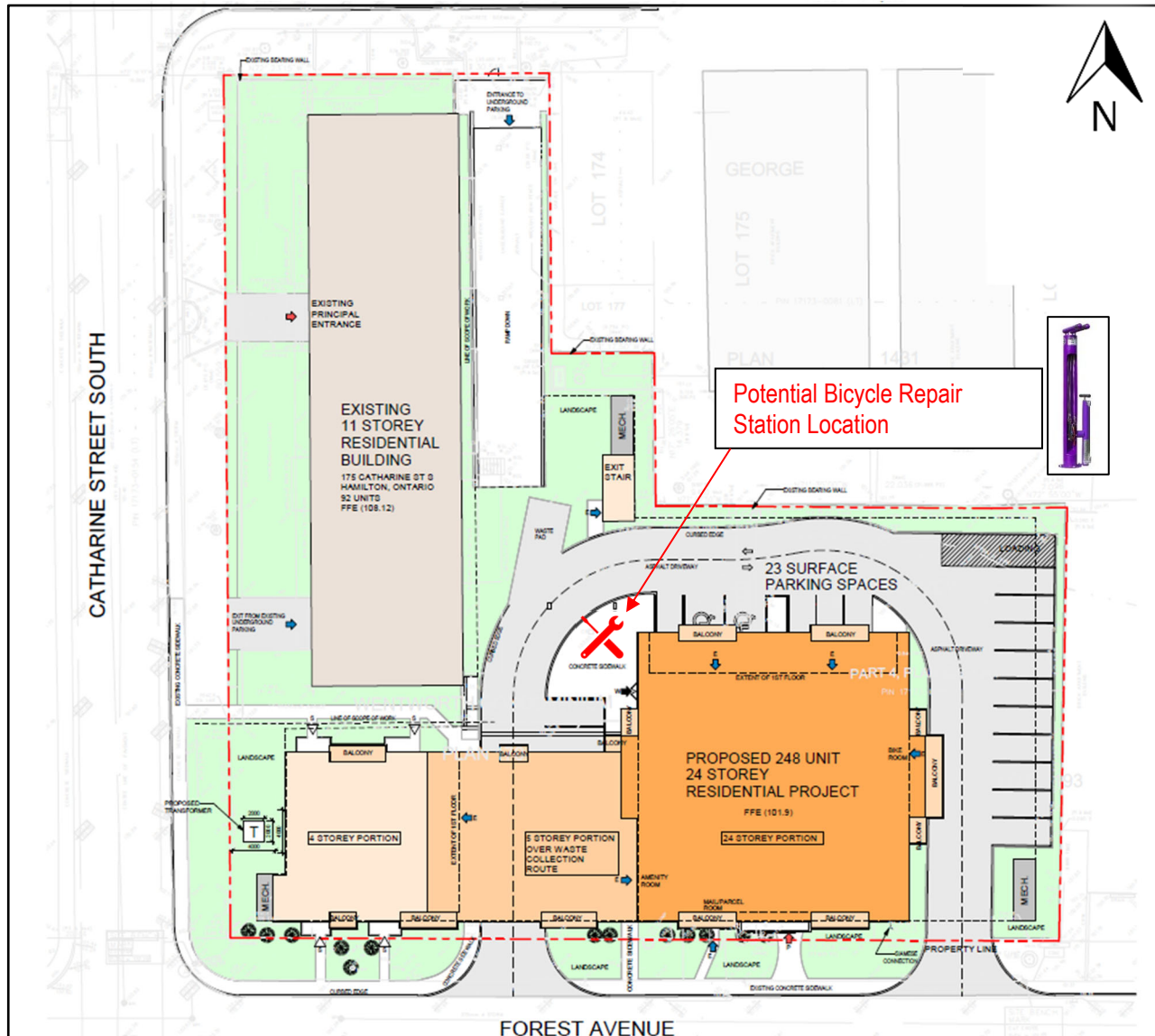
## 7.0 SITE PLAN REVIEW

### 7.1. Proposed Development Access Location

Currently, the subject site has a full moves access onto Forest Avenue that provides access to the surface parking lot, which a second access (underground parking access) onto Catharine Street South, and third/fourth underground garage parking access to Young Street.

With the redevelopment of the two vacant lots, the existing accesses onto Catharine Street South and Young Street will remain, however, two full moves accesses will be provided onto Forest Avenue to service the proposed development surface parking lot and on-site loading area. One of the existing underground parking accesses onto Young Street will be retrofitted and will provide two-way access to the new underground parking area.

**Figure 12 – Proposed Bicycle Repair Station Location**



The analysis indicates that the proposed development accesses onto Forest Avenue, the existing underground parking accesses onto Catharine Street South and Young Street are expected to operate at acceptable levels of service with negligible delay or queue. The Young Street access to service the new underground parking area is also expected to operate at acceptable levels of service. The recommended lane configurations for the proposed development accesses include:

- Catharine Street South access (underground parking garage access) – no change
- Young Street access (existing westerly underground parking garage access) – no change
- Young Street access (retrofitted easterly underground parking garage access)
  - One inbound and one outbound lane (approximately 3± m each); and
  - One shared eastbound through/right lane and one shared westbound through/left on Young Street



- Forest Avenue west access:
  - One inbound and one outbound lane (approximately 3± m each); and
  - One shared eastbound through/left lane on Forest Avenue
- Forest Avenue east access:
  - One inbound and one outbound lane (approximately 3± m each); and
  - One shared eastbound through/left lane on Forest Avenue

## 7.2. Solid Waste Pick-up

It is NexTrans’ understanding that the proposed development will provide a waste pad and a loading space on-site. The waste pad is located between the existing building and new building (north-west corner of the new building) and a loading space at the north-east corner of the site, adjacent to the surface parking lot.

Both the proposed waste pad and the loading space will allow the servicing vehicle to back-in or use the front-end loader, whichever is appropriate, as both the waste pad and the loading have direct access onto the proposed internal driveway.

NexTrans provided the vehicle turning movement diagrams that demonstrates the maneuverability of the servicing vehicles accessing the site in different arrangement. These movements are illustrated in **Figures 13 and 14**.

## 7.3. Vehicle Turning Movements for Underground Parking Ramp and Parking

As requested by the City, the vehicle turning templates have been provided that demonstrate the following:

- **Figure 15** – illustrating side-by-side passenger vehicles accessing the ramp to the new underground parking area; and
- **Figures 16 and 17** – illustrating passenger vehicles accessing the constrained parking spaces in parking levels 1, 2 and 3.

## 8.0 PARKING ASSESSMENT

### 8.1. Previous Vehicle Parking Requirements

It is NexTrans’ understanding that the proposed development is subject to site-specific Zoning By-law No. 20-216. **Table 11** below summarizes the vehicle parking requirements for the proposed development based on the site-specific Zoning By-law noted.

**Table 11 – Vehicle Parking Requirement Based on Site-Specific Zoning By-law No. 20-216**

Land Use	Magnitude	Required Rates	Total Requirement
Residential Existing	92 units	NA	Minimum 57 spaces
Residential Proposed	248 units	0.65 spaces/unit	161 spaces

Based on this information, the new proposed development needs to provide a total of 161 vehicle parking spaces, inclusive of residential, barrier-free and visitor parking space requirements.

The proposed development provides a total of 191 vehicle parking spaces, which also include barrier-free and visitor parking. Therefore, the proposed development only slightly exceeds the minimum applicable Zoning By-law requirements by 30 spaces. NexTrans’ assessment and review indicate that this arrangement is appropriate since the current Zoning By-law does not require visitor parking, the surface parking spaces can be designated for visitor parking. Therefore, the effective site underground vehicle parking will be approximately 168 spaces, which is only a few spaces higher than the minimum site-specific Zoning By-law requirement.

## 9.0 BICYCLE PARKING

For the purpose of this assessment, Zoning By-law No. 05-200 Sections 5.7 c) and 5.7 e) (Consolidated as of September, 2019) has been reviewed and applied in the analysis. **Table 13**, based on the City's Zoning By-law No. 05-200, Sections 5.7 c) and 5.7 e).

**Table 12 – Zoning By-law No. 05-200 Bicycle Parking Requirement**

Land Use	No. of Unit/GFA	Long-Term Spaces	Short-Term Spaces	Total
Residential	248 units	0.5 spaces/dwelling unit 124 spaces	5 spaces	129 spaces

Based on the current Zoning By-law requirement, the proposed development requires 129 bicycle parking spaces (5 short-term and 124 long-term). The proposed development will provide a total of 124 long-term and 5 short-term spaces, for a total of 129 bicycle parking spaces. This meets the Zoning By-law requirement and this provision will encourage future residents to use active mode of transportation to and from the proposed development.

NexTrans recommends that the proposed development provide a bike repair station on-site at a convenient location instead of providing transit incentives given that the proposed development is well-served by existing Hamilton Transit System. The proposed location is illustrated in **Figure 12**. The final location will be confirmed at the subsequent stage of the proposed development.

## 10.0 TRANSPORTATION DEMAND MANAGEMENT (TDM) OPTIONS

### 10.1. Planning and Design

#### a. Increase Density and Compact Site Design

As indicated, the latest development proposal consists of a 24-storey high-rise building with a total of 248 residential dwelling units.

This is a very compact development that utilized the existing lands that are currently vacant. Our review and assessment indicate that the current development proposal provides a better and suitable land use mix for these lands and maximize the transportation planning potential for walking, cycling and existing and future public transit initiatives.

#### b. Site Design Elements

It is NexTrans' understanding that the proposed development concept is designed to maximize the available developable space that includes the following design elements:

- Direct main entrances are provided onto Forest Avenue to facilitate pedestrians;
- Minimizes surface parking spaces and interference with pedestrians and cyclists;
- Provides a total of 124 long-term secured bicycle racks on site with 5 short-term surface bicycle parking spaces for visitors, for a total of 129 bicycle parking spaces; and
- Provides only a total of 191 vehicle parking spaces, inclusive of residential, barrier-free and visitor spaces.

This information indicates that the proposed design elements are sufficient to accommodate the active modes of transportation for the proposed development.

### 10.2. Walking and Cycling

### **a. Sidewalks and pathways**

It is NexTrans' understanding that pedestrian walkways are provided along the side of the building, internal to the site and inside the buildings, to facilitate pedestrian circulation.

### **b. Bicycle Parking (Long and Short-Term)**

It is NexTrans' understanding that the proposed development will include 124 secured, long-term and short-term bike storage within the site for the residents.

### **c. End of Trip Facilities (Lockers, Showers)**

Based on our review of the City's Guidelines, this requirement is more appropriate for large employment buildings. As the proposed development only include small ground-related retail and commercial spaces, as such, this requirement is not applicable for the proposed development.

## **10.3. Transit**

### **a. Direct Connections to Transit**

The proposed development is committed to provide direct pedestrian connections and place the main entrance to the adjacent public roads. These connections provide direct access to existing transit stop at the John Street S/Young Street intersection.

### **b. Weather Protected Waiting Areas**

Given that the proposed development is not directly fronting onto existing bus routes and bus stops, it is Nextrans recommendation that HSR should review and provide transit shelters where appropriate.

## **10.4. Parking**

Based on this information, the new proposed development needs to provide a total of 161 vehicle parking spaces, inclusive of residential, barrier-free and visitor parking space requirements.

The proposed development provides a total of 191 vehicle parking spaces, which also include barrier-free and visitor parking. Therefore, the proposed development only slightly exceeds the minimum applicable Zoning By-law requirements by 30 spaces. NexTrans' assessment and review indicate that this arrangement is appropriate since the current Zoning By-law does not require visitor parking, the surface parking spaces can be designated for visitor parking. Therefore, the effective site underground vehicle parking will be approximately 168 spaces, which is only a few spaces higher than the minimum site-specific Zoning By-law requirement.

### **a. Opportunities for Reduced Parking Requirements**

As noted above, the proposed development will reduce the numbers of vehicle parking spaces to support TDM and minimize the numbers of single-occupant-vehicle trips to and from the proposed developments.

### **b. Unbundle Parking**

It is NexTrans' understanding that a portion of the parking provided will be available on demand basis. Therefore, this requirement is met.

### **c. Paid Parking**

This provision is not applicable for this type of residential development. However, with the rental component, parking

rental will be separate from the unit rental.

#### **d. Carpool Parking**

Based on our review of the City's TDM Guidelines, this requirement is only applicable to non-residential development such as large employment buildings. As such, it is not applicable for the proposed development with residential dwelling units.

#### **e. Shared Parking**

This provision is only applicable to mixed-use development and is not required for residential development.

### **10.5. Carshare/Bikeshare**

#### **Carshare Potential**

It is suggested that the proposed development designates one or two parking spaces for carshare, if required or economically feasible. It should be noted that the carshare company will evaluate and determine if the proposed building is feasible for carshare operation.

#### **Bikeshare Potential**

Since the proposed development will provide a total of 124 long-term secured bicycle racks on site with 5 short-term surface bicycle parking spaces for visitors, for a total of 129 bicycle parking spaces, therefore, bikeshare provision is not required for the proposed development.

#### **a. On-Site Carshare Vehicle(s) and Parking Spot(s)**

It is suggested that the proposed development designates at least one parking space for future carshare service for the residents living in the buildings.

#### **b. On-Site Bikeshare**

NexTrans' review and assessment of the proposed development indicate that this requirement is not required for the proposed development as per the reasons noted above.

### **10.6. Wayfinding and Travel Planning**

#### **a. Wayfinding Signage**

This provision is not required for the proposed development given its location and small-scale development. The proposed development is visible to visitors and residents.

#### **b. Travel Planning Tools and Support for Development of a School Travel Plan**

Based on NexTrans' review of the area, the proposed development is located approximately:

- 200 m to Queen Victoria Elementary School;
- 2.6 km to Cathedral High School;
- 1.9 km to Sir John A Macdonald Secondary School; and
- 1.3 km to Ryerson Middle School

This information indicates that elementary school students can easily walk to Queen Victoria Elementary School located at 166 Forest Avenue. High School students can either walk, bicycle or take public transit to Cathedral High School or Sir John A Macdonald Secondary School.

It is maybe beneficial to have travel planning tools to support development school travel plan, however, given the location the proposed development relative to the surrounding schools, a school travel plan is not necessary. As such, we do not recommend a school travel plan for the proposed development.

## 10.7. Education/Promotion and Incentives

### a. TDM Branding

Based on NexTrans' review of the City's TDM Guidelines, TDM branding is not required for the proposed development given the nature of the proposed land uses, which are mostly residential dwelling units. Our assessment and analysis indicate that TDM branding would not be effective for this type of land use.

### b. Membership in TMAs/Smart Commute

It is NexTrans' understanding that TMAs and Smart Commute are currently concentrate their efforts in helping employment base programs and incentives. These programs and incentives are not currently expanded to include residential developments. Therefore, this requirement is only applicable to non-residential development. As such, it is not applicable for this proposed mixed-use (residential and small retail) development.

### c. Opportunities for Transit Passes, Carshare Memberships, or Bikeshare Memberships

#### Bikeshare Membership

As indicated, the proposed development provides a total of 124 long-term bicycle parking spaces and 5 short-term visitor bicycle parking spaces at convenient locations, for a total of 129 bicycle parking spaces. Therefore, the assessment indicated that bikeshare membership is not required for the proposed development.

#### Carshare Membership

The Study suggests that the proposed development designates at least two parking spaces for carshare. It is also recommended that the proposed development contact carshare company in the future to provide carshare service for the residents living in the buildings. Once carshare is established in the buildings, carshare membership information can be made available at the building management office in the future, if appropriate.

#### Transit Passes

Given that the proposed development is located close to transit terminal and GO Train Station, our assessment and review of the walking radius to the transit facilities indicates that transit incentives are not required. Residents who will be living in this area understand the convenient of the area and will make their conscious decisions.

The City has requested that pre-loaded Presto Cards be provided to the units. However, given the reasons noted above, this requirement is not appropriate for this development.

To support TDM, the proposed development will provide a bicycle repair station on-site at a convenient location, as indicated in **Figure 12**. This measure is a long-term TDM measure that will benefit the residents many years to come.

## 10.8. Project Trip Reductions for TDM Measures

**Table 12** summarizes the travel mode split information based on the review of the 2016 Transportation Tomorrow Survey data for Traffic Zones 5159 and 5168.

**Table 13 – Modes of Travel based on 2016 TTS**

Land use	Time Period	Auto Driver	Auto Passenger	Local Transit	GO Transit	Cycle	Walk
Residential	AM Peak Period (6:00 AM – 9:00 AM)	35%	2%	40%	1%	4%	18%
	PM Peak Period (3:00 PM – 6:00 PM)	51%	8%	30%	1%	2%	8%

Based on the information above, the predominant modes of travel for the residents in the area under the existing conditions are non-auto modes of transportation such as walking, cycling, public transit and carpooling. The high walking percentage is expected given the close proximity of the area to the Hamilton GO Centre/HSR Terminal and Downtown area. It is expected that for non-residential mode, the driving percentage is higher than other modes.

### 10.9. Site Plan that Incorporates TDM Measures/Strategies

It is NexTrans’ understanding that the proposed development concept is designed to maximize the available developable space that includes the following design elements:

- Direct main entrances are provided onto Forest Avenue to facilitate pedestrians;
- Minimizes surface parking spaces and interference with pedestrians and cyclists;
- Provides a total of 124 long-term secured bicycle racks on site with 5 short-term surface bicycle parking spaces for visitors, for a total of 129 bicycle parking spaces; and
- Provides only a total of 191 vehicle parking spaces, inclusive of residential, barrier-free and visitor spaces.

The analysis indicates that the proposed design elements are sufficient to accommodate the active modes of transportation for the proposed development.

### 10.10. Proposed Monitoring and Evaluation of TDM Measures

It is suggested that the Owner or building management, where appropriate, should monitor the short-term and long-term bike parking usage in order to make provision for future expansion if necessary; and

### 10.11. Conclusions / Recommendations for TDM Measures

Based on the review of the context of the proposed development in relation to the TDM requirements by the City of Hamilton findings of this report, a number of TDM measures and incentives are recommended for the proposed development. **Table 15** summarizes the recommended TDM measures and incentives.

**Table 14 – Recommended TDM Measures for the Proposed Development**

Category	TDM Initiative Suggested by NexTrans	Recommended Actions	Responsibility
Cycling	<ul style="list-style-type: none"> <li>• Visible, well-lit, short-term bicycle parking for visitors (above minimum provisions or recommendations)</li> <li>• Secure, indoor bicycle parking storage spaces for tenants/residents</li> <li>• Ensure development connects to bicycle network</li> </ul>	<ul style="list-style-type: none"> <li>• The proposed development to provide a total of 129 bicycle parking spaces</li> <li>• Provide secured long-term parking spaces underground;</li> <li>• Provide 5 short-term bicycle parking spaces for visitors at surface</li> <li>• Provide a bicycle repair station at a convenient location</li> </ul>	Applicant
Walking	<ul style="list-style-type: none"> <li>• Safe, attractive and direct walkways for pedestrians linking building entrances with public sidewalks and with key destinations such as schools</li> <li>• Enhanced pedestrian amenities on-site (benches, landscaping, lighting)</li> </ul>	<ul style="list-style-type: none"> <li>• Provide direct shared pedestrian and cycling connections onto Forest Avenue</li> </ul>	Applicant

Transit	<ul style="list-style-type: none"> <li>Enhance walking routes between main building entrance(s) and transit stops/stations</li> <li>Bicycle parking located at or near transit stops</li> <li>Implement transit priority measures (queue jump lanes, traffic signal priority, bus only lanes)</li> </ul>	<ul style="list-style-type: none"> <li>Not required</li> </ul>	Applicant/ City of Hamilton
Parking	<ul style="list-style-type: none"> <li>Reduced minimum parking requirements based on proximity to transit</li> <li>Shared parking with nearby developments or on-street spaces</li> <li>Unbundle parking costs from unit costs</li> </ul>	<ul style="list-style-type: none"> <li>Only provide 191 vehicle parking spaces, as per the recommendations of this Study</li> </ul>	Applicant
Information Brochure/ Letter	<ul style="list-style-type: none"> <li>Provide an information brochure/letter for each residential unit that include HSR Transit System schedules, GO Transit schedules, cycling maps and community maps.</li> </ul>	<ul style="list-style-type: none"> <li>Provide a brochure (or a letter) to new residents that include all website links to HSR Transit System schedules, GO Transit schedules, community maps and cycling maps.</li> <li>Provide hard copies of the HSR system map and schedule for Bus Routes 22, 23, 24, 25, 26 and 27, GO Transit schedule, cycling maps and community maps at the sale office and building management office, or close to the building entrances</li> </ul>	Applicant
Pre-loaded PRESTO Card	<ul style="list-style-type: none"> <li>Provide transit incentives such as transit passes</li> </ul>	<ul style="list-style-type: none"> <li>Not required</li> <li>The proposed development will provide a bike repair station instead</li> </ul>	Applicant
Monitoring	<ul style="list-style-type: none"> <li>Monitoring and evaluation of TDM measures</li> </ul>	<ul style="list-style-type: none"> <li>Monitor the short-term and long-term bike parking usage in order to make provision for future expansion if necessary</li> </ul>	Applicant

## 11.0 CONCLUSIONS / RECOMMENDATIONS

### 11.1. Study Conclusions

The findings and conclusions of the analysis are as follows:

- The proposed development is expected to generate:
  - 37 total two-way transit trips (20 inbound and 17 outbound) during the weekday morning peak hour and 17 total two-way transit trips (10 inbound and 17 outbound) during the afternoon peak hour;
  - 62 total two-way walk trips (27 inbound and 35 outbound) during the weekday morning peak hour and 67 total two-way walk trips (30 inbound and 37 outbound) during the afternoon peak hour; and
  - 73 total two-way auto trips (25 inbound and 48 outbound) during the weekday morning peak hour and 88 total two-way auto trips (49 inbound and 39 outbound) during the afternoon peak hour
- The intersection capacity analysis indicates that the existing, future background and future total conditions, all signalized and unsignalized intersections are expected to operate at acceptable levels of service. No improvements are required to accommodate the background development and the proposed development site generated traffic.

- The analysis indicates that the proposed development accesses onto Forest Avenue and existing underground parking accesses onto Young Street and Catharine Street South are expected to operate at acceptable levels of service with negligible delay or queue.
- Based on the transit assessment, the site is currently located within short walking distance to HSR Transit System and Hamilton GO Station. The analysis indicates that the the proposed development is well-served by the HSR Transit System and the potential transit ridership generated by the proposed development can be accommodated without any additional improvements.
- Based on this information, the new proposed development needs to provide a total of 161 vehicle parking spaces, inclusive of residential, barrier-free and visitor parking space requirements.

The proposed development provides a total of 191 vehicle parking spaces, which also include barrier-free and visitor parking. Therefore, the proposed development only slightly exceeds the minimum applicable Zoning By-law requirements by 30 spaces. NexTrans' assessment and review indicate that this arrangement is appropriate since the current Zoning By-law does not require visitor parking, the surface parking spaces can be designated for visitor parking. Therefore, the effective site underground vehicle parking will be approximately 168 spaces, which is only a few spaces higher than the minimum site-specific Zoning By-law requirement.

- Based on the current Zoning By-law requirement, the proposed development requires 129 bicycle parking spaces (5 short-term and 124 long-term). The proposed development will provide a total of 124 long-term and 5 short-term spaces, for a total of 129 bicycle parking spaces. This meets the Zoning By-law requirement and this provision will encourage future residents to use active mode of transportation to and from the proposed development.

NexTrans recommends that the proposed development provide a bike repair station on-site at a convenient location instead of providing transit incentives given that the proposed development is well-served by existing Hamilton Transit System. The proposed location is illustrated in **Figure 12** of this Study Update. The final location will be confirmed at the subsequent stage of the proposed development.

- The proposed development will provide a waste pad and a loading space on-site. The waste pad is located between the existing building and new building (north-west corner of the new building) and a loading space at the north-east corner of the site, adjacent to the surface parking lot. Both the proposed waste pad and the loading space will allow the servicing vehicle to back-in or use the front-end loader, whichever is appropriate, as both the waste pad and the loading have direct access onto the proposed internal driveway. NexTrans provided the vehicle turning movement diagrams that demonstrates the maneuverability of the servicing vehicles accessing the site in different arrangement.

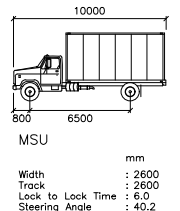
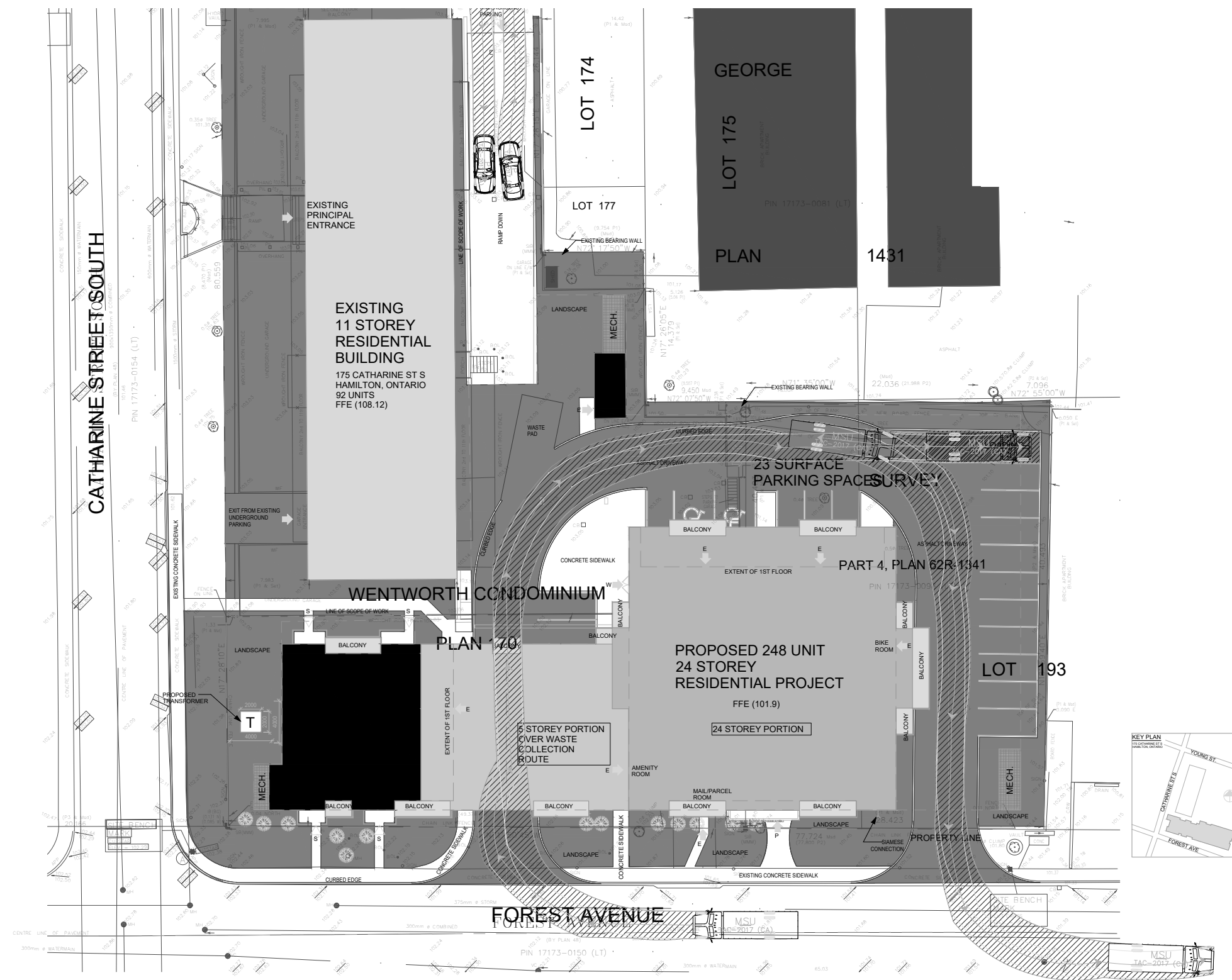
## 11.2. Study Recommendations

Based on the Study assessment and findings, the following recommendations are provided:

- The proposed development implements the Transportation Demand Management (TDM) measures and incentives identified in Section 9 of this report to support active transportation and public transit, to meet the objectives and requirements by the City of Hamilton's TDM for Development (June, 2015);
- The proposed development will not provide transit incentive, but will provide one bicycle repair station on-site, at a convenient location;
- The proposed development provides a total of 129 bicycle parking spaces, with 124 long-term and 5 short-term spaces;
- The proposed development reduces the vehicle parking supply, where appropriate;



- The proposed development provides direct pedestrian and cycling connections to Forest Avenue; and
- No physical improvements are required at the boundary roadway intersections to accommodate the future background traffic and the proposed development site generated traffic



KEY PLAN



BENCHMARK

REVISIONS

NO	REVISION	DATE	BY

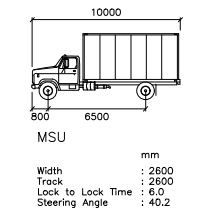
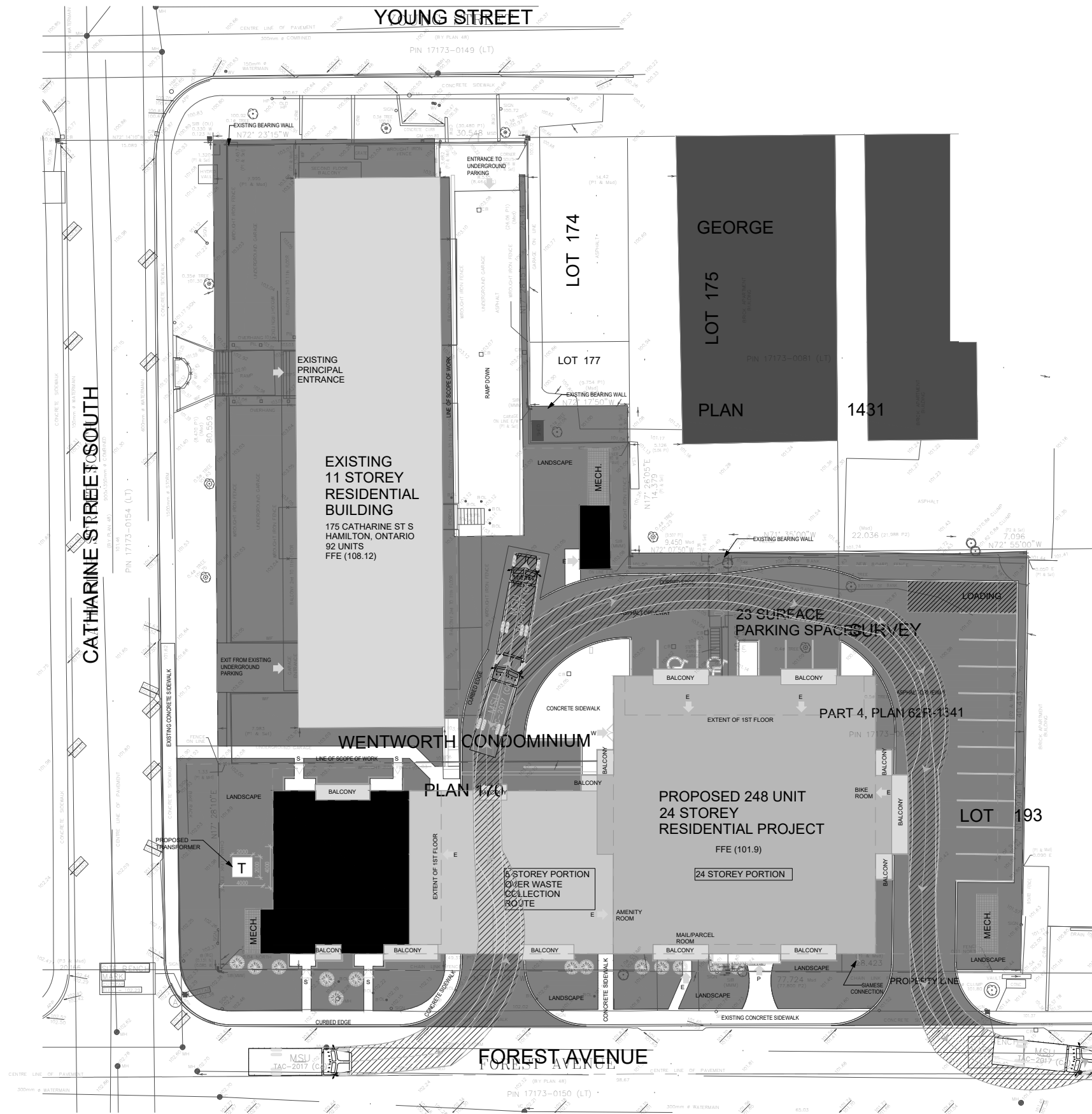
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PROJECT NAME:  
Residential Development  
117 Forest Ave 175 Catherine St  
City of Hamilton

DRAWING TITLE:  
AutoTURN Analysis  
MSU TAC-2017

DESIGN BY: K.A.	DATE: October 27, 2023
CHECKED BY: R.P.	PROJECT NO:
DRAWN BY: K.A.	NT-16-103
SCALE: NTS	DRAWING NO: Figure 13



KEY PLAN



BENCHMARK

REVISIONS

NO	REVISION	DATE	BY

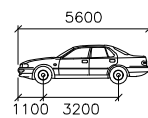
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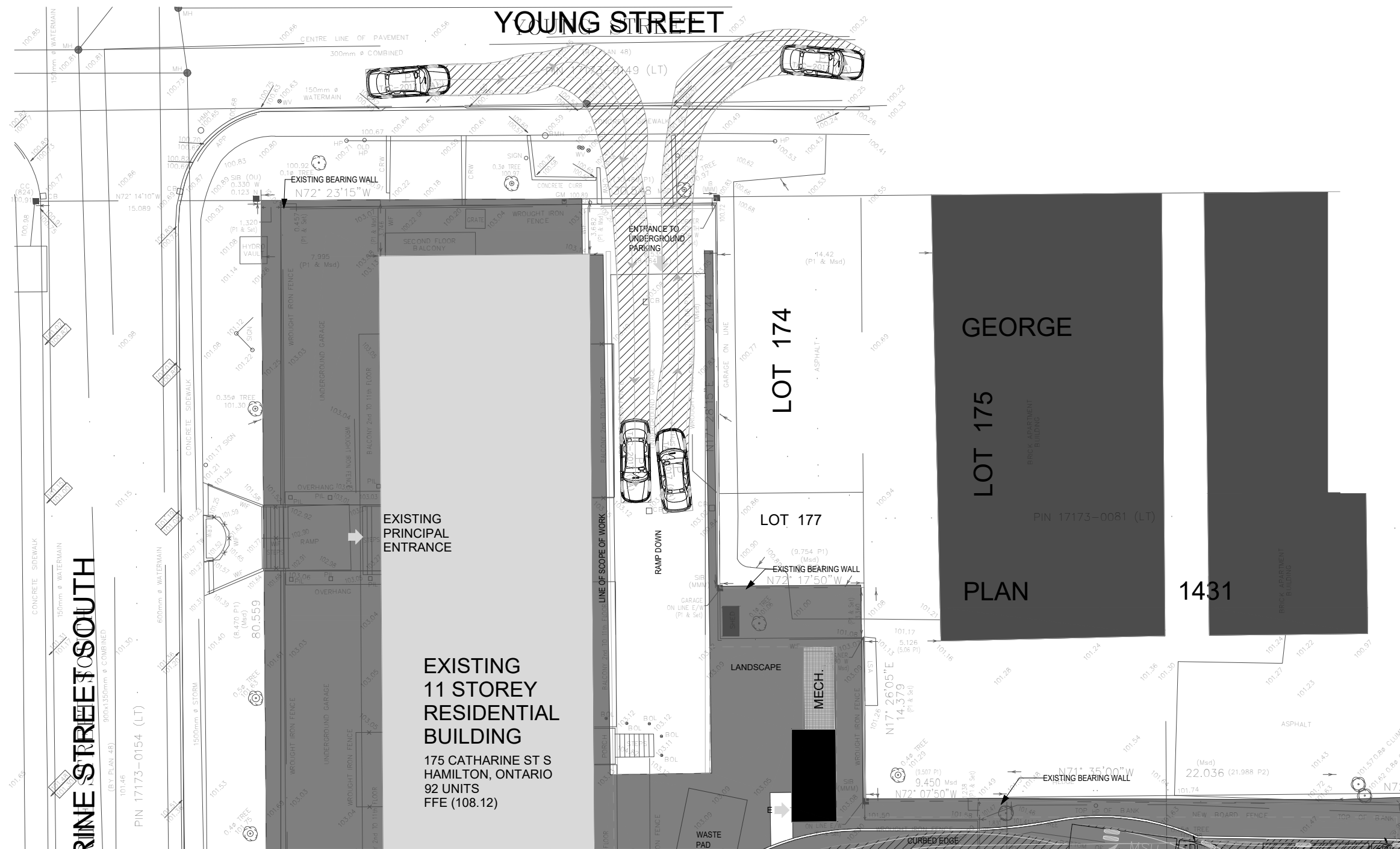
PROJECT NAME:  
Residential Development  
117 Forest Ave 175 Catharine St  
City of Toronto

DRAWING TITLE:  
AutoTURN Analysis  
MSU TAC-2017

DESIGN BY: K.A.	DATE: October 27, 2023
CHECKED BY: R.P.	PROJECT NO: NT-16-103
DRAWN BY: K.A.	DRAWING NO: Figure 14
SCALE: NTS	



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



BENCHMARK

REVISIONS

NO	REVISION	DATE	BY

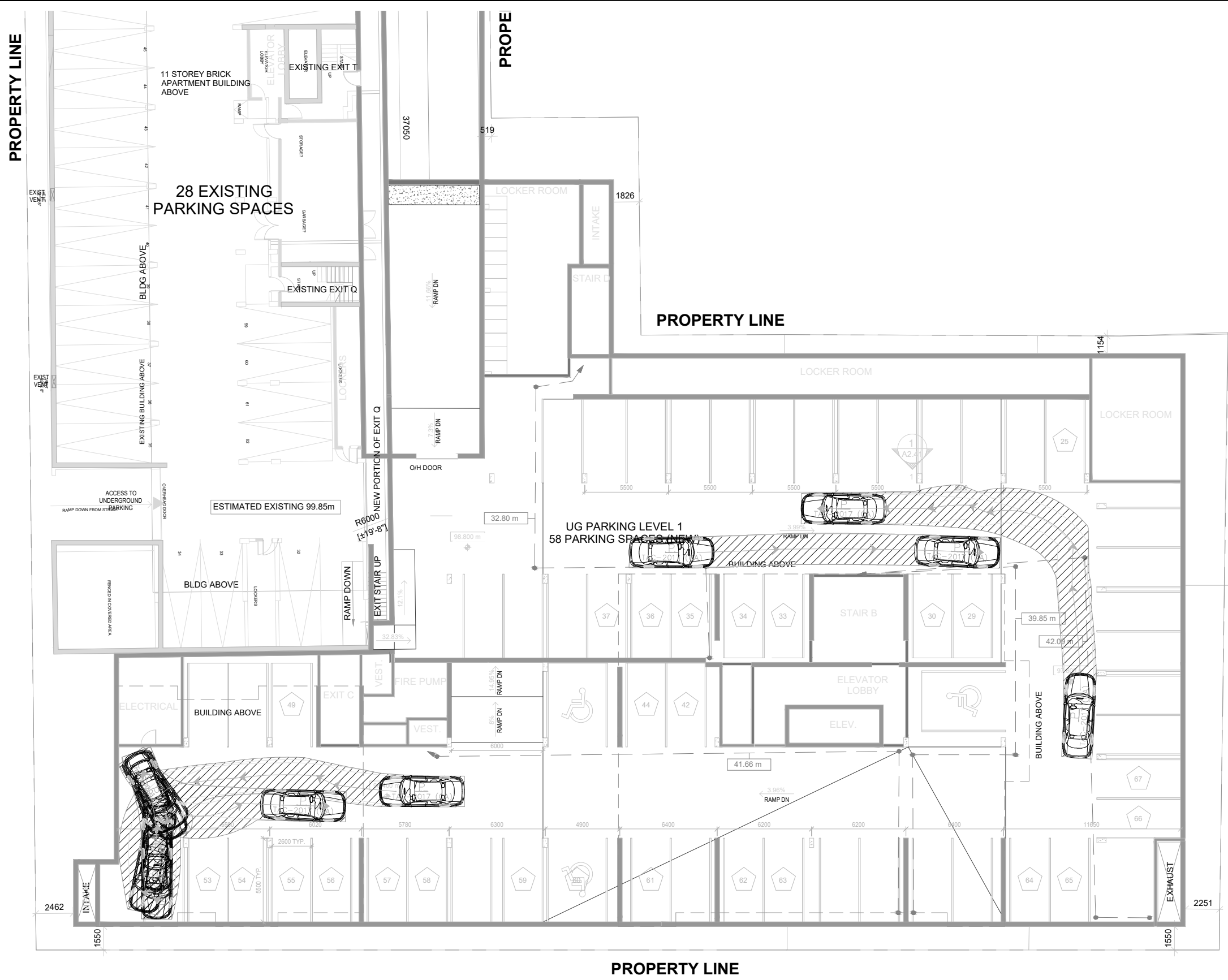
STAMP



PROJECT NAME:  
 Residential Development  
 117 Forest Ave & 175 Catherine Street  
 City of Hamilton

DRAWING TITLE:  
 AutoTURN Analysis  
 P TAC-2017

DESIGN BY: K.A.	DATE: October 27, 2023
CHECKED BY: R.P.	PROJECT NO: NT-16-103
DRAWN BY: K.A.	
SCALE: NTS	DRAWING NO: Figure 15



BENCHMARK

REVISIONS

NO	REVISION	DATE	BY

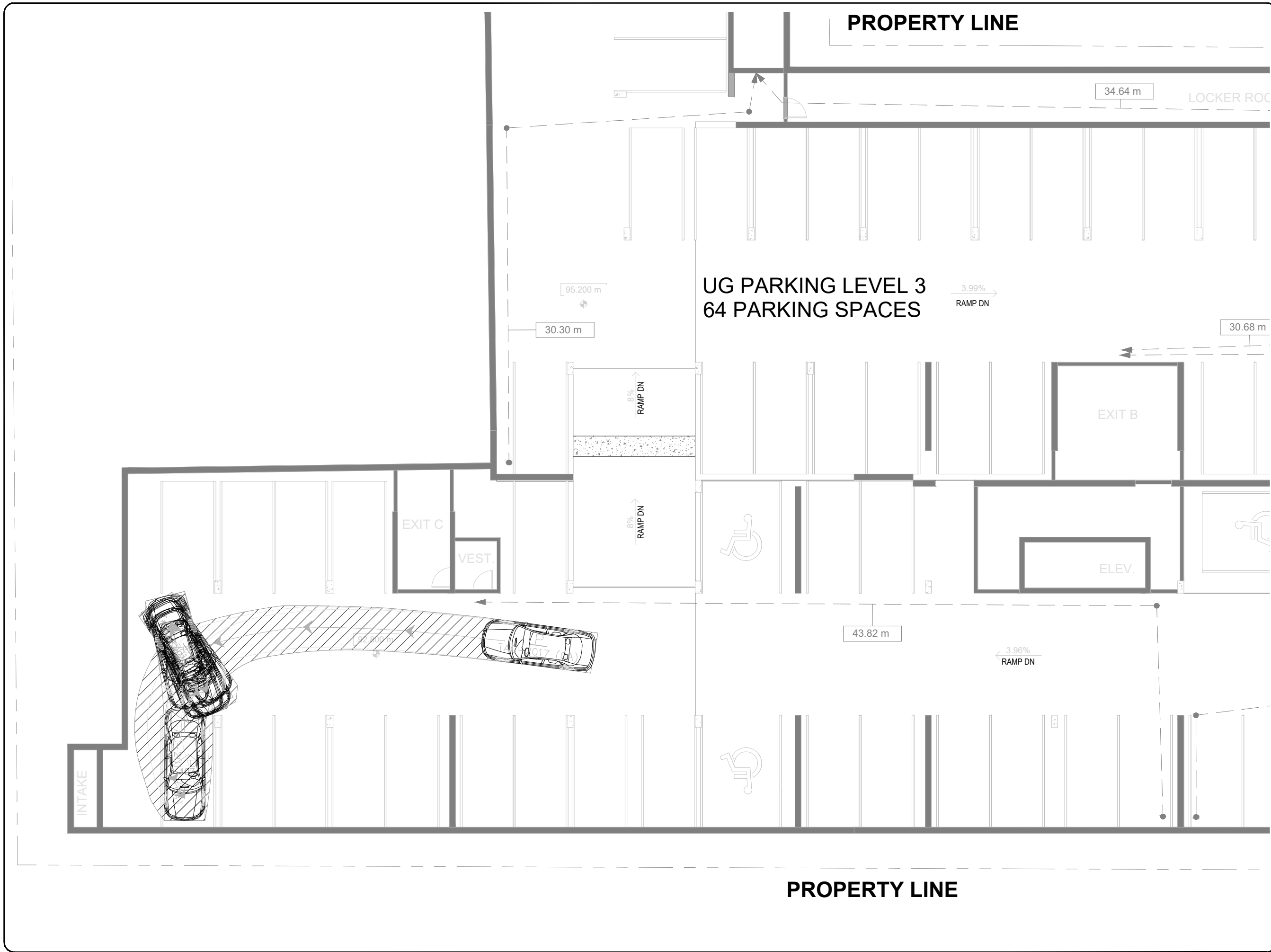
STAMP



PROJECT NAME:  
Residential Development  
117 Forest Ave 175 Catherine St  
City of Hamilton

DRAWING TITLE:  
AutoTURN Analysis  
P TAC-2017

DESIGN BY: K.A.	DATE: October 30, 2023
CHECKED BY: R.P.	PROJECT NO: NT-16-103
DRAWN BY: K.A.	DRAWING NO: Figure 16
SCALE: NTS	



KEY PLAN



BENCHMARK

REVISIONS

NO	REVISION	DATE	BY

STAMP



PROJECT NAME:  
Residential Development  
117 Forest Ave 175 Catherine St  
City of Hamilton

DRAWING TITLE:  
AutoTURN Analysis  
P TAC-2017

DESIGN BY: K.A.	DATE: October 30, 2023
CHECKED BY: R.P.	PROJECT NO: NT-16-103
DRAWN BY: K.A.	DRAWING NO: Figure 17
SCALE: NTS	

# **Appendix A**

**City's Comments /  
Terms of Reference**



February 23, 2023

Attention: Rino Dal Bello, Senior Project Manager, Development Planning  
Alaina Baldassarra, Planner I, Development Planning

Prepared By: Matthew Radaelli, Project Manager, Transportation Planning

Reviewed By: Domenic Di Flavio, Project Manager, Transportation Planning

**SUBJECT:** 175 Catharine Street South and 117 Forest Avenue, Hamilton (Ward 2)  
ZAC-23-019 (Previous Files: DA-22-014, ZAC-17-008)

- Zoning By-law Amendment – **DO NOT SUPPORT**
- Transportation Impact Study – **REVISIONS REQUIRED**
- Traffic Calming Assessment – **FUNDS REQUIRED**
- Transportation Demand Management – **MEASURES REQUIRED, MEASURES RECOMMENDED**
- Right-of-Way Dedications – **NOT REQUIRED**
- Daylighting Triangle Dedications – **REQUIRED**
- Future Site Plan – **REVISIONS REQUIRED**

### **Synopsis of Transportation Planning Comments for Planning Report**

Transportation Planning does not support the proposed development as the proposed density does not appear to be supported by the existing underground infrastructure provided, leading to potential queuing and conflicts within the municipal right-of-way along Catharine Street and Young Street.

The following summary items are provided:

- Internal vehicle circulation throughout the existing underground parking area of the existing residential building at 175 Catharine Street South is unknown. Proposed access configurations and use of existing driveways is also unclear based on the submitted site plan.
- Revisions to the Transportation Impact Study (TIS) are required to be completed to the satisfaction and approval of the Manager, Transportation Planning.
- A provision of funds to the amount of \$10,000 for the purpose of installing future traffic calming measures within the surrounding area of the proposed development is required.





- The Applicant is to dedicate a 4.57 metres x 4.57 metres Daylighting Triangles to the municipal right-of-way at the intersections of Catharine Street South & Forest Avenue and Catharine Street South & Young Street.

### ***Documents Reviewed***

- *SITE PLAN*, Drawing #SP1.01, Revision #4, dated July 29, 2022.
- *UNDERGROUND LEVEL 3 PLAN*, Drawing #A1.01, Revision #4, dated July 29, 2022.
- *UNDERGROUND LEVEL 2 PLAN*, Drawing #A1.02, Revision #4, dated July 29, 2022.
- *UNDERGROUND LEVEL 1 PLAN*, Drawing #A1.03, Revision #4, dated July 29, 2022.
- *1ST FLOOR PLAN*, Drawing #A1.04, Revision #4, dated July 29, 2022.
- *Transportation Impact Study PROPOSED BROCKTON APARTMENTS*, dated October, 2022, prepared by NexTrans Consulting Engineers.

### **Zoning By-law Amendment – Do Not Support**

1. Transportation Planning does not support the proposed Zoning By-law Amendment (ZAC-23-019) as the proposed density and corresponding required number of parking stalls to be provided in conjunction with the underground parking area of the existing residential building at 175 Catharine Street South cannot support simultaneous two-way movements due to the infrastructure limitations of the existing underground parking area. Queuing and conflicts occurring nearby underground parking entry/exit locations has the potential to spillback onto the municipal right-of-way leading to potential conflicts between vulnerable road users (children, older adults, pedestrians, cyclists) travelling within the surrounding area.

Additionally, minor revisions are required to the Transportation Impact Study (TIS) are required to be completed to the satisfaction and approval of the Manager, Transportation Planning in order to adequately assess the proposed developments impact on the surrounding road network.

### **Transportation Impact Study – Revisions Required**

2. Transportation Planning reviewed the submitted Transportation Impact Study document which requires the following revisions to be completed to the satisfaction and approval of the Manager, Transportation Planning:
  - a. The Professional Engineer Seal at the front of the report has not been dated. Transportation Planning requires the Professional Engineer Seal to



follow the Professional Engineers Act and be dated within the seal in order to verify professional liability.

- b. The consultant shall provide Transportation Planning with all Synchro Files utilized in the operational analysis.
- c. Trip generation indicated in Table 4<sup>1</sup> of the TIS indicated that Land Use Code 222 Multifamily Housing (High-Rise) **Close to Rail Transit**. Although the subject lands fall within the category of 'close to rail transit', the Transportation Tomorrow Survey data presented in Table 6<sup>2</sup> indicates that only 1% of the population in this area utilizes GO Transit for daily trips and is contradictory to the trip generation reductions associated with the 'Close to Rail Transit' component of Land Use Code 222. The TIS shall be revised to utilize 'Not Close to Rail Transit' land use subcategory as well as the General Urban/Suburban Setting/Location.
- d. The driveway access points indicated in Figure 10<sup>3</sup> are not consistent with the proposed driveway access points on the site plan provided and shall be revised accordingly in the future total analysis review.
- e. The Parking Assessment conducted in Section 8 references dated parking studies (referenced studies are dated 2017 and 2018) that were completed for previous development applications that are no longer valid. A revised parking assessment is required to be submitted

### **Traffic Calming Assessment – Funds Required**

3. Considering the increase in density being proposed within the subject lands, Transportation Planning shall require a provision of funds to the amount of \$10,000 for the purpose of installing future traffic calming measures within the surrounding area of the proposed development, subject to the satisfaction and approval of the Manager, Transportation Planning.

At a time when the Applicant is prepared to provide the required funds, Transportation Planning will correspond with the Transportation Operations & Maintenance department to provide an account number for the funds to be deposited accordingly.

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<sup>1</sup> TIS, Page 9

<sup>2</sup>

<sup>3</sup> TIS, Page 13



**Transportation Demand Management – Measures Required, Measures Recommended**

4. Transportation Planning requires short-term and long-term bicycle parking to be provided as per the requirements of the City of Hamilton Comprehensive Zoning By-law 05-200, Section 5: Parking. All short-term and long-term bicycle parking shall be clearly indicated, illustrated and the total number of spaces shall be numbered on the site plan accordingly.

*Additional Measures Recommended:*

5. Transportation Planning recommends additional Transportation Demand Management (TDM) measures to be provided:
  - Provision of preloaded Presto/Transit passes with the purchase of an individual residential unit;
  - Reducing the number of passenger vehicle parking stalls provided to the minimum required through the City of Hamilton Comprehensive Zoning By-Law 05-200, Section 5: Parking;
  - Unbundled the cost of an individual parking stall from the cost of a residential unit; and
  - Provision of Electric Vehicle (EV) charging stalls within the underground parking area.

**Right-of-Way Dedications – Not Required**

6. The existing right-of-way at the subject property along Catharine Street South and Forest Avenue is approximately ±20.0 metres. Transportation Planning does not require right-of-way dedications to be provided as the existing right-of-way width meets the requirements of the Council Approved Urban Official Plan: Chapter C - City Wide Systems and Designations, 4.5 Road Network Functional Classification, 4.5.2. Local Roads (Catharine Street South and Forest Avenue) are to be 20.117 metres.

**Daylighting Triangle Dedications – Required**

7. Catharine Street South & Forest Avenue are both Local Roads. The Applicant is to dedicate a 4.57 metres x 4.57 metres Daylighting Triangle to the right-of-way, as per the Council Approved Urban Official Plan: Chapter C - City Wide Systems and Designations 4.5 Road Network Functional Classification; Daylighting Triangles 4.5.7.



8. Catharine Street South & Young Street are both Local Roads. The Applicant is to dedicate a 4.57 metres x 4.57 metres Daylighting Triangle to the right-of-way, as per the Council Approved Urban Official Plan: Chapter C - City Wide Systems and Designations 4.5 Road Network Functional Classification; Daylighting Triangles 4.5.7.

### **Future Site Plan – Revisions Required**

#### ***Transportation Demand Management Measures***

9. Short-term and long-term bicycle parking spaces are required to be clearly indicated and numbered on the site plan. Long-term bicycle parking spaces are indicated on the 'UNDERGROUND LEVEL 1 PLAN', however the total number of spaces are not indicated and do not correspond with the total number to be provided within the TIS.

#### ***Daylighting Triangle Dedications***

10. The site plan shall be revised to provide 4.57 metre x 4.57 metre daylighting triangle to be dedicated to the municipal right-of-way at the intersection of Catharine Street South & Forest Avenue and the intersection of Catharine Street South & Young Street.

#### ***Driveway Access & Lay-bys***

11. Additional details are required indicating the proposed movements via the two (2) existing driveway access points leading to the underground parking to Catharine Street South and Young Street. These existing driveways are narrow and are currently non-conforming to city standards in order to facilitate two-way movements (both driveways into the subject property measure approximately  $\pm 4.8 - \pm 4.9$  metres in width) as indicated in **Figure 1**. The internal circulation throughout the site via these driveway access points is unclear.

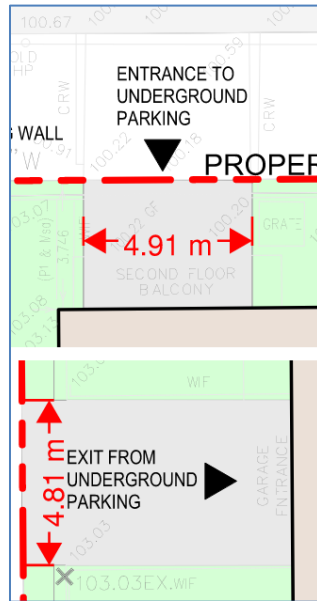


Figure 1: Non-conforming Driveway Width

- 12. For two-way operation onto municipal road, the driveway access width(s) must be 7.5 metres at the ultimate property line and curve radii minimum 7.0 metres. The proposed driveway access to Forest Avenue shall be revised in order to provide a minimum 7.5 metre width at the property line.
- 13. 5.0 metres x 5.0 metres visibility triangles must be provided for each driveway access. They must be illustrated, dimensioned and identified on the site plan. Visibility triangles are between the driveway limits and the ultimate property line (right-of-way limit) and no object or mature vegetation can exceed a height of 0.6 metres above the corresponding perpendicular centreline elevation of the adjacent street.
- 14. Transportation Planning generally supports the proposed Lay-By area along Forest Avenue provided that the Applicant/Owner will not propose waste collection to occur within the lay-by. The lay-by is solely to be utilized as a loading area, pick-up/drop-off and short-term duration stopping.

**Internal Circulation**

- 15. The site plan indicates that the existing underground parking area is proposed to provide access to an additional 172 parking stalls under the proposed development. The existing underground parking area of the existing residential building at 175 Catharine Street does not appear to be suitable to support two-



way movements based on the internal circulation widths measured as indicated in **Figure 2**.

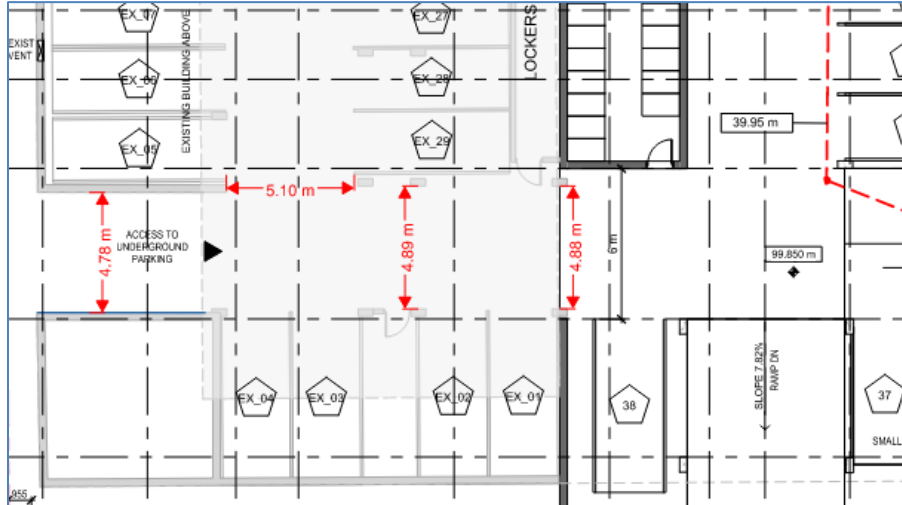


Figure 2: Insufficient Internal Circulation Width for Two-Way Movements

16. Several parking stalls are located adjacent to structural walls and may result in difficult turning movements when maneuvering in/out as indicated in **Figure 3** for parking stall #107. Other parking stalls with similar restrictions are noted at #52 and #73. A turning plan is required to be provided in order to illustrate the complete movements of a passenger vehicle entering/exiting the proposed parking stalls without conflicts and/or limitations.

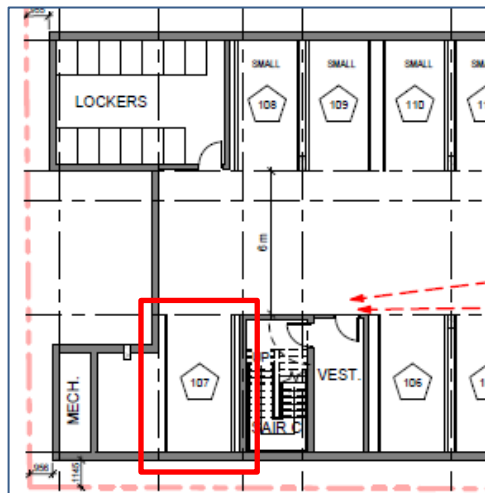


Figure 3: Parking Stall with Potential Limited Access

17. An internal waste collection area has not been identified on the site plan. It is unclear how waste collection is being arranged for the proposed development



(private / municipal, and where).

- 18. If proposed waste collection is to occur internal to the subject lands a turning plan is required to clearly illustrate the complete movements of a waste collection vehicle entering the site in a forward manner, maneuvering into/out of the waste collection area, and exiting the site in a forward manner without conflicts and/or limitations.

**Pedestrian Facilities**

- 19. The site plan provided indicates a termination of the internal pedestrian prior to a formal connection with the existing sidewalk along Forest Avenue as indicated in the red area as illustrated in **Figure 4**. It is understood there are grade differences along Forest Avenue that may pose challenges to providing an accessible sidewalk connection in accordance with the Accessibility for Ontarians with Disabilities Act (AODA). The Applicant is required to revise the site plan in order to formally provide the connection or provide more information as to why the pedestrian connection cannot be formally provided.

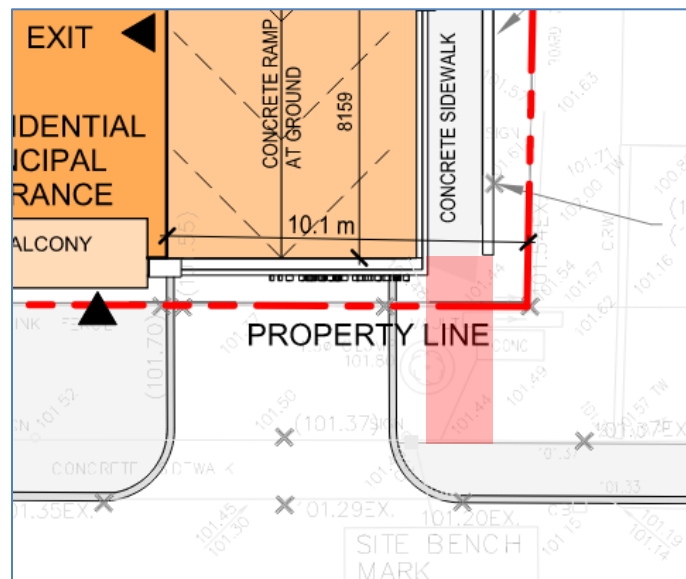


Figure 4: Internal Sidewalk Termination Prior to Connection with Municipal Sidewalk

Should you have any questions, please email [tplanning@hamilton.ca](mailto:tplanning@hamilton.ca), referencing: 175 Catharine Street South and 117 Forest Avenue – ZAC-23-019 (Ward 2) Transportation Planning Response

cc: Development Engineering Approvals

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**From:** Transportation Planning <[Transportation.Planning@hamilton.ca](mailto:Transportation.Planning@hamilton.ca)>  
**Sent:** June 13, 2022 11:44 AM  
**To:** Sam Nguyen <[sam@nextrans.ca](mailto:sam@nextrans.ca)>  
**Cc:** Scott Beedie <[sbeedie@urbansolutions.info](mailto:sbeedie@urbansolutions.info)>  
**Subject:** RE: Terms of Reference - 117 Forest Avenue Proposed Residential Development

Hi Sam,

Thank you for your submission. It has been noted that under Application DA-22-014 this site has been reviewed with a much lower residential unit density compared to what is being proposed in your TIS submission (previously approximately 80 units vs. the 216 units proposed). Without setting precedent, Transportation Planning does not require a TIS to be submitted for the increase in density to the site provided that the number of residential units does not significantly exceed the 216 units now proposed.

It shall be noted that following the formal submission of the Application, Transportation Planning will request funds to be provided for the purpose of implementing Traffic Calming measures within the surrounding neighbourhood due to the increase in residential density (please note a traffic calming study is not required). Please let me know if you have any questions or concerns. Thank you,

Matthew Radaelli  
Project Manager, Transportation Planning – Development Approvals  
*On Behalf of Transportation Planning*

COVID-19 UPDATE: Flexibility and patience is asked of ourselves, clients, contractors and customers working with the City of Hamilton. Most staff are working remotely with limited access to voicemail, so please send emails. All in-person meetings that are required will be become conference calls or another form of virtual meetings. The City is making adjustments to ensure staff are connected to office tools and project files while we protect ourselves and our communities during this time. Please note that while we are trying to maintain time frames for comments on applications and dealing with responding information, we may not always achieve these goals.

---

**From:** Sam Nguyen <[sam@nextrans.ca](mailto:sam@nextrans.ca)>  
**Sent:** June 3, 2022 12:09 PM  
**To:** Transportation Planning <[Transportation.Planning@hamilton.ca](mailto:Transportation.Planning@hamilton.ca)>  
**Cc:** Scott Beedie <[sbeedie@urbansolutions.info](mailto:sbeedie@urbansolutions.info)>  
**Subject:** Terms of Reference - 117 Forest Avenue Proposed Residential Development

Good afternoon,

We have been retained to undertake a TIS to support a proposed residential development located at 117 Forest Avenue, in the City of Hamilton. The following is a proposed scope of the TIS that takes into consideration the City Traffic Impact Study Guidelines:

1. Study Area intersection:
  - a. John Street S/Young St (signalized)



- b. John Street S/Forest Avenue (unsignalized)
  - c. Young Street/Catharine Street S (unsignalized)
  - d. Forest Avenue/Catharine Street S (unsignalized)
  - e. Young Street/Walnut Street S (unsignalized)
  - f. Forest Avenue/Walnut Street S (unsignalized)
  - g. Site accesses
1. Horizon Year
    - a. Project completion by 2025-2026
    - b. Analysis horizon year 2027 (five years from 2022)
  1. Background Developments and Growth Rate
    - a. Background corridor through traffic growth – 2% as per City typical requirements
    - b. Please let us know if any proposed background developments in the area
    - c. Please send us any available TIS for the background developments in the area
  1. Trip Generation
    - a. ITE Trip Generation Manual 11<sup>th</sup> Edition or trip generation at the existing driveways, where appropriate.
    - b. Multimodal trip generation using 2016 TTS modal split data
  1. Trip Distribution
    - a. Extract 2016 TTS data based on the surrounding traffic zones where appropriate
  1. Future Total Assessment
    - a. The following tasks will be conducted for the future total conditions:
      - Future Total Traffic Assessment for Auto Mode (using existing signal timing and optimize as necessary)
      - Future non-auto mode assessment
      - Proposed development access assessment
      - Vehicular and Bicycle Parking Assessment
      - Internal Site Circulation and loading assessment (if necessary)
  1. Transit, Active Transportation and TDM
    - a. Conduct a review of the existing and proposed future transit network in the area. Based on these findings, appropriate recommendations will be provided to ensure adequate walking distances to/from the proposed development to transit stations/stops.
    - b. Review the existing and proposed future active transportation network in the area. Based on these findings, Nextrans will identify missing gaps and additional interconnections and connections from the proposed development to adjacent land uses, the City facilities, as well as to transit stations/stops.
    - c. A Transportation Demand Management (TDM) assessment will be undertaken to identify specific measures and programs to reduce single-occupant-vehicle trips to/from the proposed development. These TDM measures and programs may include but not limited to, Carpooling, Auto Share, Bike racks, Parking management strategies, etc. The TDM report will be completed and included as part of this Study for submission purposes submitted in accordance with the City requirements.
  1. Parking Justification Study if necessary

Thanks,

**Sam (Trang) Nguyen**  
Transportation Analyst

o: 905-503-2563 ext. 207  
e: [sam@nextrans.ca](mailto:sam@nextrans.ca)

w: [www.nextrans.ca](http://www.nextrans.ca)

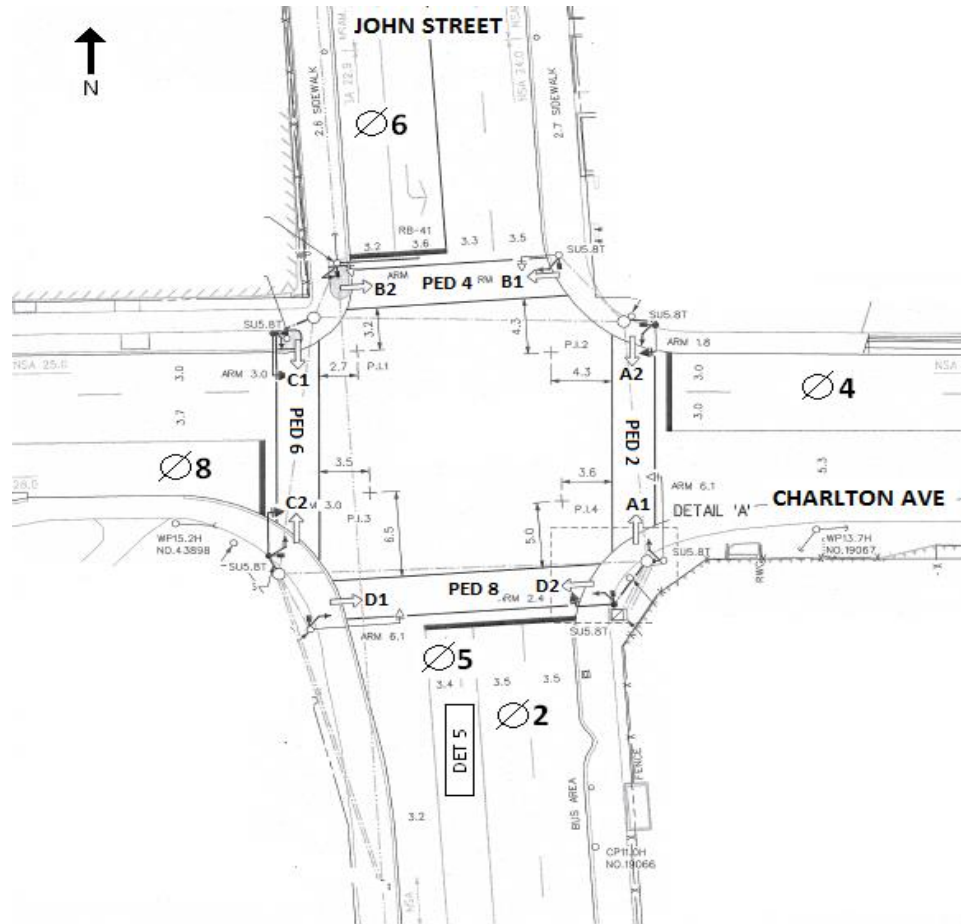
**NexTrans Consulting Engineers**  
**A Division of NextEng Consulting Group Inc.**  
520 Industrial Parkway South, Suite 201  
Aurora ON L4G 6W8

# **Appendix B**

## **Existing Traffic Data and Signal Timing Plans**

# City of Hamilton - Traffic Traffic Signal Controller Timing Data

Intersection: **Charlton & John**  
 Controller Type: **3000E**      Page **1** of **14**  
 Programmed By: **JC**      Installed By: \_\_\_\_\_  
 Date: **March 6/17**      Date: \_\_\_\_\_



- φ1:
- φ2: John - NB, East Xwalk
- φ3:
- φ4: Charlton - WB, North Xwalk
- φ5: John - NBLT
- φ6: John - SB, West Xwalk
- φ7:
- φ8: Charlton - EB, South Xwalk

**Flash Operation:**      Red: John  
                                      Red: Charlton

**SEQUENCE/START-UP (MM-3-1-1)**

**START-UP PHASES/INTERVAL/SEQUENCE**

(X = Enable for start-up phases. Must be compatible if more than one)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
START-UP	Phases				X				X									
	Interval	0	(0=Red, 1=Yel, 2= Grn, determines color of selected phases above on start-up)															
	Flash	10	(0-255 seconds start-up flash time)															
	Red	5.0	(0-25.5 secs = length of first red after start-up if start-up in yellow or red)															
	Sequence	3	(2=single ring, 3=dual ring, 4=123/567+48, 5=12/56+3478, 6=1234/56+78, 7=1234/5678, 8=dual quad, 9=12ph)															

**PHASE RING ASSIGNMENTS**

X = Phase assigned to ring (if used). Phases in different rings but same co-phase group can time together.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RING	Ring 1		X		X												
	Ring 2					X	X		X								
	Ring 3																
	Ring 4																

**CO-PHASE GRP 1-4 ASSIGNMENTS**

X = phase assigned to co-phase group. All ph's assigned to rings must be assigned to co-phase group.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CO-PHASE	CO PH 1		X			X	X										
	CO PH 2				X				X								
	CO PH 3																
	CO PH 4																

PHASE RECALLS/MODES; MIN, MAX, etc. (MM-3-1-2-1-PGDN, etc.)

USE 1 TO ALL 4 TIMING PLANS

		(X = ENABLE)															
		TP1 PHASE RECALLS															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK					X											
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
NO SKIP																	

		(X = ENABLE)															
		TP2 PHASE RECALLS															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK					X											
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
NO SKIP																	

**CONTROLLER DATA**

		(X = ENABLE)															
		<b>TP3 PHASE RECALLS</b>															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK					X											
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

**PHASE RECALLS/MODES; CNA, INH MAX, PED OPTIONS, etc. (MM-3-1-2-2) ONLY 1 PLAN PER UNIT**

		(X = ENABLE)															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	CNA 1		X		X		X		X								
	CNA 2																
	CNA 3																
	CNA 4																
	WRM		X		X		X		X								
	INH MAX																
	PED RECY																
	FL WALK																
	FDW->YEL																
	FDW->RED																
	COND PED																

		TP1															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		10		10	5	10		10								
	Passage					2											
	Yellow		3.3		3.3	3.0	3.3		3.3								
	Red		2.4		2.4	0.0	2.4		2.4								
	Walk		12		8		12		8								
	Ped Clr		10		11		10		11								
	Max 1		40		20	10	40		20								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	Al/Act																
	Max In																



**CONTROLLER DATA**

		TP2															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		10		10	5	10		10								
	Passage					2											
	Yellow		3.3		3.3	3.0	3.3		3.3								
	Red		2.4		2.4	0.0	2.4		2.4								
	Walk		12		8		12		8								
	Ped Clr		10		11		10		11								
	Max 1		50		30	20	50		30								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

		TP3															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		10		10	5	10		10								
	Passage					2											
	Yellow		3.3		3.3	3.0	3.3		3.3								
	Red		2.4		2.4	0.0	2.4		2.4								
	Walk		12		8		12		8								
	Ped Clr		10		11		10		11								
	Max 1		50		20	15	50		20								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

DUAL ENTRY (MM-3-1-6)

DUAL ENTRY ENABLE:	<b>Y</b>	Y/N: Y=Enable Dual Entry. Note this is only one setting even though it appears on each controller screen.
--------------------	----------	---

PG1	PH/CALLS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DUAL ENTRY ASSIGNMENTS	1																
	2						X										
	3																
	4								X								
	5			X													
	6			X													
	7																
	8					X											

VEHICLE DETECTOR ASSIGNMENTS (MM-3-1-4-1, PGDN etc.)

(X = ASSIGN VEH DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET ASSIGNMENTS	1																
	2																
	3																
	4																
	5						X										
	6																
	7																
	8																

DETECTOR MODES (MM-3-1-4-3)

	DET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET MODES	Mode	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

DETECTOR TIMES (MM-3-1-4-4)

	DET	1	2	3	4	5	6	7	8
DET TIMES	Delay	0	0	0	0	0	0	0	0
	Str/Stp								

**SELECTION SOURCE (MM-3-2-2)**

Entries determine how parameters get selected

Cycle Source:	<b>1</b>	0=TOD, 1=CL, 2=INT
Split Source:	<b>0</b>	0=TOD, 1=CL, 2=INT
Offset Source:	<b>0</b>	0=TOD, 1=CL, 2=INT

Free Source:	<b>0</b>	0=TOD, 1=CL, 2=INT
Flash Source:	<b>0</b>	0=TOD, 1=CL, 2=INT
Inter-TOD Revert:	<b>255</b>	0-255 SECS

TOD = Time of day control by internal clock, CL = Closed loop (comm), INT = Interconnect. Inter-TOD Revert is time allowed after failed interconnect before unit reverts to TOD (Time Base) control.

**COORD BASIC OPTIONS (MM-3-2-3)**

Reference to End (vs. begin) of Main St.:	<b>N</b>	Y/N: Y = Offset references to end of main st. green. N = Beginning of Main st. green.
Use % (vs. secs) for Phase Allocation:	<b>N</b>	Y/N: Y = Phase allocations loaded as percent of 100. N = Allocations in seconds.
Use % (vs. secs) for Offset Entry:	<b>N</b>	Y/N: Y = Offset loaded as percent of 100. N = Offset loaded in seconds.
Use Fixed (vs. floating) Force Offs:	<b>Y</b>	Y/N: Y = Force offs are fixed to cycle. N=Force offs like max times, begin with green.
Permissive Type:	<b>0</b>	0-2: 0=Yield, 1= Single, 2= Multiple. See Permissives note below

**C/S TO TIMING PLAN (MM-3-2-9-6)**

**USE THIS CHART WHEN 4 SPLITS/CYCLE = Y**

SPLIT TO TIME PLAN	CYCLE	1	2	3	4	5	6
	SPLIT 1	<b>1</b>	<b>2</b>	<b>3</b>			
	SPLIT 2		<b>2</b>				
	SPLIT 3						
	SPLIT 4						

(0-4 = TIME PLAN IMPLEMENTED  
WHEN SPLIT IN EFFECT)

**CYCLES & OFFSETS (MM-3-2-4)**

**NOTE: FIRST SPECIFY OFFSET SEEKING MODE AND 4 SPLITS CYCLE MODE (ENHANCED OPTIONS, OPERATING MODES)**

CYCLE & OFFSETS	Cycle #	1/1	2/1	2/2	3/1	4/1
	Length	<b>70</b>	<b>90</b>		<b>90</b>	
	Offset 1	<b>36</b>	<b>28</b>		<b>64</b>	
	Offset 2					
	Offset 3					
	Offset 4					
	Offset 5					
	Max Dwell	<b>32</b>	<b>32</b>		<b>32</b>	

**COORD PHASES (MM-3-2-5)**

COORD PHASES	CYCLE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
	<b>1-1</b>		<b>X</b>					<b>X</b>										
	<b>2-1</b>		<b>X</b>					<b>X</b>										
	<b>2-2</b>		<b>X</b>					<b>X</b>										
	<b>3-1</b>		<b>X</b>					<b>X</b>										

PHASE ALLOCATION (MM-3-2-6)

ENTRY IN:	<b>Secs</b>	% or Secs: Not a controller entry--for reference only. Controller entry is under
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PHASE ALLO-CATION	PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	<b>C1 S1</b>			<b>44</b>		<b>26</b>	<b>10</b>	<b>34</b>		<b>26</b>							
C1 S2																	
C1 S3																	
C1 S4																	
<b>C2 S1</b>			<b>55</b>		<b>35</b>	<b>20</b>	<b>35</b>		<b>35</b>								
<b>C2 S2</b>																	
C2 S3																	
C2 S4																	
<b>C3 S1</b>			<b>58</b>		<b>32</b>	<b>15</b>	<b>43</b>		<b>32</b>								
C3 S2																	
C3 S3																	
C3 S4																	
<b>C4 S1</b>																	
C4 S2																	
C4 S3																	
C4 S4																	

OFFSET SEEKING MODE (MM-3-2-7)

Offset Seeking Mode:	<b>0</b>
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Mode

- 0 Add only, cycle times 20% slow only to get in sync
- 1 Dwell, cycle timer stops at cycle 0 up to max dwell time to get in step
- 2 Short Route, cycle times 20% fast or slow--whichever gets in step fastest

**ENHANCED OPTIONS**

**OPERATING OPTIONS (MM-3-2-9-1)**

Enhanced Perm:	<b>Y</b>	Y/N: See note	Invert Free In:	<b>N</b>	Y/N: See note
Central Override:	<b>N</b>	Y/N: See note	Split Matrix:	<b>N</b>	Y/N: See note
No PCL Offset Adjust:	<b>N</b>	Y/N: See note	4 Splits/Cycle:	<b>Y</b>	Y/N: See note
			No Early Coord Ped:	<b>N</b>	Y/N: See note

Yeil Percent	<b>1</b>	0-10%: See note
EGB%	<b>0</b>	0-100%: See note
RGB%	<b>0</b>	0-100%: See note
# Cycles to out of step:	<b>0</b>	0-255: 0=Disable

**CYCLE SYNC OPTIONS (MM-3-2-9-2)**

Sync Source:	<b>0</b>	0-2, 0=TOD/CL/Interconnect, 1= City Zero, 2= Absolute
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Charts below only For City Zero offsets or Absolute (0's). These are not daily reference times for Sync Source Option 0 (see TOD).

Cycle 1:	<b>0</b>	Cycle 2:	<b>0</b>	Cycle 3:	<b>0</b>
Cycle 4:	<b>0</b>	Cycle 5:	<b>0</b>	Cycle 6:	<b>0</b>

**MANUAL/AUTO FORCE OFFS & PERMS**

**SET MANUAL MODE (MM-3-2-9-3-1)**

Auto Perm and FO:	<b>Y</b>	Y/N: Y = Perms & Force offs auto-calculated from phase allocations. N = Manually entered
Ped Perm:	<b>0</b>	0-255: 0 = Auto calculated. 1-255 = secs each ped perm, starting with vehicle permissives

**DAY PLANS (MM-3-3-1-#)**

	HH	MM	CIRCUIT PLAN	C	O	S	CKT	ON/OFF
<b>1</b>	<b>00</b>	<b>00</b>					<b>11(FRE)</b>	<b>OFF</b>
	<b>00</b>	<b>00</b>		<b>1</b>	<b>1</b>	<b>1</b>		
<b>2</b>	<b>00</b>	<b>00</b>					<b>11(FRE)</b>	<b>OFF</b>
	<b>00</b>	<b>00</b>		<b>1</b>	<b>1</b>	<b>1</b>		
	<b>06</b>	<b>00</b>		<b>2</b>	<b>1</b>	<b>1</b>		
	<b>10</b>	<b>00</b>		<b>1</b>	<b>1</b>	<b>1</b>		
	<b>14</b>	<b>30</b>		<b>3</b>	<b>1</b>	<b>1</b>		
	<b>18</b>	<b>30</b>		<b>1</b>	<b>1</b>	<b>1</b>		

**WEEK PLANS (MM-3-3-3)**

Plan	SUN	MON	TUE	WED	THU	FRI	SAT
<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>
2							
3							
4							
5							

**CIRCUIT OVERRIDES (MM-3-3-6)**

For each circuit specify TOD (time of day controlled), or manually ON or OFF. Default = TOD

CIRCUIT OVERRIDES	Circuit	65	66	67	68	69	70	71	72
	Function	LL1	LL2	LL3	LL4	LL5	LL6	LL7	LL8
	State								
	Circuit	<b>73</b>	74	75	76	<b>77</b>	78	79	80
	Function	<b>CN1</b>	CN2	CN3	CN4	<b>WRM</b>	MIN	DIM	CVS
	State	<b>ON</b>				<b>ON</b>			
CIRCUIT OVERRIDES	Circuit	113	114	115	116	117	118	119	120
	Function	UD1	UD2	UD3	UD4	UD5	UD6	UD7	UD8
	State								
	Circuit	121	122	123	124	<b>125</b>	<b>126</b>	127	128
	Function	PH2	DP2	DP3	3CD	<b>EVL</b>	<b>EML</b>	ASC	DCP
	State					<b>ON</b>	<b>ON</b>		

**DAYLIGHT SAVINGS (MM-3-3-7)**

DAY LIGHT SAVINGS	Spring		Fall	
	(0-12)	(0-5)	(0-12)	(0-5)
	Month	WOM	Month	WOM
	<b>3</b>	<b>2</b>	<b>11</b>	<b>1</b>

Enter Month and Week of Month for Spring Forward and Fall Back days (typical 4 - 1 and 10 - 5). Unit will adjust at 2AM on Sunday of week specified. Enter zero (or leave blank) if Daylight Savings not used.

**SYNC REFERENCE MODE (MM-3-3-8)**

Mode:	<b>0</b>	0 = Time dependent, 1 = C/O/S Event
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Time Clock Reset:	HH: <b>00</b>	MM: <b>00</b>	TOD clock reset to by TBC input
Interrupter:	<b>N</b> Y/N; Y = Interrupter pulses provided		
Pulses:	<b>0</b> 0-6 = Number of interrupter pulses		

TIME DEPENDENT CYCLE REFERENCES
---------------------------------

	HH	MM
CYC 1:	<b>00</b>	<b>00</b>
CYC 4:	<b>00</b>	<b>00</b>

	HH	MM
CYC 2:	<b>00</b>	<b>00</b>
CYC 5:	<b>00</b>	<b>00</b>

	HH	MM
CYC 3:	<b>00</b>	<b>00</b>
CYC 6:	<b>00</b>	<b>00</b>

When mode = Time dependent, enter reference times of day for each cycle. Default = 00:00 = midnight = most commonly used reference. When mode = C/O/S Event, cycle restarts on each COS change. Only use this mode for specific reasons. Time dependent most common used mode.



## CLOSED LOOP ID (MM-3-5-1)

CLOSED LOOP ID	Master Type:	<b>1</b>	0 = None, 1 = 3000 Series Master, 2 = 3800 EL master
	Intersection ID	<b>4</b>	0-255
	Master Identification	<b>11</b>	0-255
	Allow Comm Xfer Between Ports 2 & 3		Y/N: Y = Incoming signal on Master port (2 or 3), gets echo'd on other port

## COMM SET-UP (MM-3-5-2)

PG1 PORT ASSIGN	Master (CL) Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used to receive Master Comm)
	Monitor Port		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Monitor Data Upload)
	Central Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Direct Dial-up Modem)

PG2 PORT 2 SETUP	Data Rate:	<b>9600</b>	1200, 2400, 4800, 9600, 14400, 19200
	Parity	<b>0</b>	0 = None, 1 = Odd, 2=Even
	Data bits	<b>1</b>	0 = 7 bits, 1 = 8 bits

PG3 PORT 3 SETUP	Data Rate:	<b>1200</b>	1200, 2400, 4800, 9600, 14400, 19200
	Parity	<b>0</b>	0 = None, 1 = Odd, 2=Even
	Data bits	<b>1</b>	0 = 7 bits, 1 = 8 bits

PG4	Modem Set-up String:		Up to 40 charaters; A-Z, or # @ = , ! ; % \ &
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## PHONE NUMBERS (MM-3-5-3)

PHONE NUM- BERS	Tone:		Y/N
	Phone 1:		Number & control characters (W , ; # ' / T P) if used
	Phone 2:		Number & control characters (W , ; # ' / T P) if used

## LOG DATA (MM-3-5-5)

PG1 SAMPLE	Volume Log Sample period:	<b>60</b>	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 125 (EVL)
	MOE Log Sample period:	<b>60</b>	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 126 (EML)



Turning Movement Count (4 . FOREST AVE & CATHARINE ST)

Start Time	N Approach CATHARINE ST						E Approach FOREST AVE						S Approach CATHARINE ST						W Approach FOREST AVE						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total		
07:00:00	0	4	4	0	5	8	0	0	0	0	4	0	0	0	0	2	0	4	4	0	0	1	8	16		
07:15:00	0	11	1	0	13	12	0	0	0	0	9	0	0	0	0	3	0	4	8	0	0	0	12	24		
07:30:00	0	9	1	0	9	10	0	0	0	0	1	0	0	0	0	4	0	4	10	0	0	2	14	24		
07:45:00	0	3	4	0	5	7	0	0	0	0	5	0	0	0	0	9	0	4	12	0	0	3	16	23	87	
08:00:00	0	7	4	0	12	11	0	0	0	0	9	0	0	0	0	5	0	1	12	0	0	1	13	24	95	
08:15:00	0	4	4	0	18	8	0	0	0	0	13	0	0	0	0	4	0	3	16	0	0	2	19	27	98	
08:30:00	0	3	7	0	5	10	0	0	0	0	6	0	0	0	0	5	0	7	5	0	0	1	12	22	96	
08:45:00	0	7	9	0	12	16	0	0	0	0	6	0	0	0	0	5	0	2	8	0	0	5	10	26	99	
09:00:00	0	7	6	0	4	13	0	0	0	0	2	0	0	0	0	4	0	6	16	0	0	2	22	35	110	
09:15:00	0	6	2	0	7	8	0	0	0	0	6	0	0	0	0	8	0	2	8	0	0	5	10	18	101	
09:30:00	0	8	5	0	11	13	0	0	0	0	4	0	0	0	0	2	0	3	9	0	0	0	12	25	104	
09:45:00	0	2	3	0	11	5	0	0	0	0	6	0	0	0	0	11	0	5	12	0	0	2	17	22	100	
***BREAK***																										
16:00:00	0	23	4	0	22	27	0	0	0	0	15	0	1	0	0	0	9	1	7	10	0	0	2	17	45	
16:15:00	0	13	4	0	14	17	0	0	0	0	15	0	0	1	0	0	6	1	5	10	0	0	4	15	33	
16:30:00	0	10	5	0	16	15	0	0	0	0	11	0	0	0	0	6	0	6	10	0	0	2	16	31		
16:45:00	0	18	12	0	14	30	0	0	0	0	13	0	0	0	0	3	0	3	11	0	0	6	14	44	153	
17:00:00	0	13	11	0	16	24	0	0	0	0	9	0	0	0	0	3	0	6	12	0	0	6	18	42	150	
17:15:00	0	9	12	0	18	21	0	0	2	0	11	2	0	0	0	5	0	7	9	0	0	5	16	39	156	
17:30:00	0	20	8	0	9	28	0	0	0	0	11	0	0	0	0	4	0	2	11	0	0	4	13	41	166	
17:45:00	0	14	8	0	12	22	0	0	0	0	6	0	1	0	0	5	1	4	15	0	0	6	19	42	164	
18:00:00	0	10	7	0	11	17	0	0	0	0	4	0	0	0	0	4	0	2	9	0	0	5	11	28	150	
18:15:00	0	7	15	0	16	22	0	0	0	0	15	0	0	0	0	7	0	6	9	0	0	6	15	37	148	
18:30:00	0	15	10	0	8	25	0	0	0	0	8	0	0	0	0	8	0	3	8	0	0	7	11	36	143	
18:45:00	0	11	6	0	16	17	0	0	0	0	12	0	0	2	0	4	2	4	11	0	0	2	15	34	135	
<b>Grand Total</b>	0	234	152	0	284	386	0	0	2	0	201	2	2	3	0	0	126	5	100	245	0	0	79	345	738	-
<b>Approach%</b>	0%	60.6%	39.4%	0%	-	-	0%	0%	100%	0%	-	-	40%	60%	0%	0%	-	29%	71%	0%	0%	-	-	-	-	
<b>Totals %</b>	0%	31.7%	20.6%	0%	52.3%	0%	0%	0.3%	0%	0.3%	0.3%	0.3%	0.3%	0.4%	0%	0%	0.7%	13.6%	33.2%	0%	0%	46.7%	-	-	-	
<b>Heavy</b>	0	2	2	0	-	-	0	0	0	0	-	-	0	0	0	0	-	0	9	0	0	-	-	-	-	
<b>Heavy %</b>	0%	0.9%	1.3%	0%	-	-	0%	0%	0%	0%	-	-	0%	0%	0%	0%	-	0%	3.7%	0%	0%	-	-	-	-	
<b>Bicycles</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>Bicycle %</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Peak Hour: 08:15 AM - 09:15 AM Weather: Light Rain (18.14 °C)

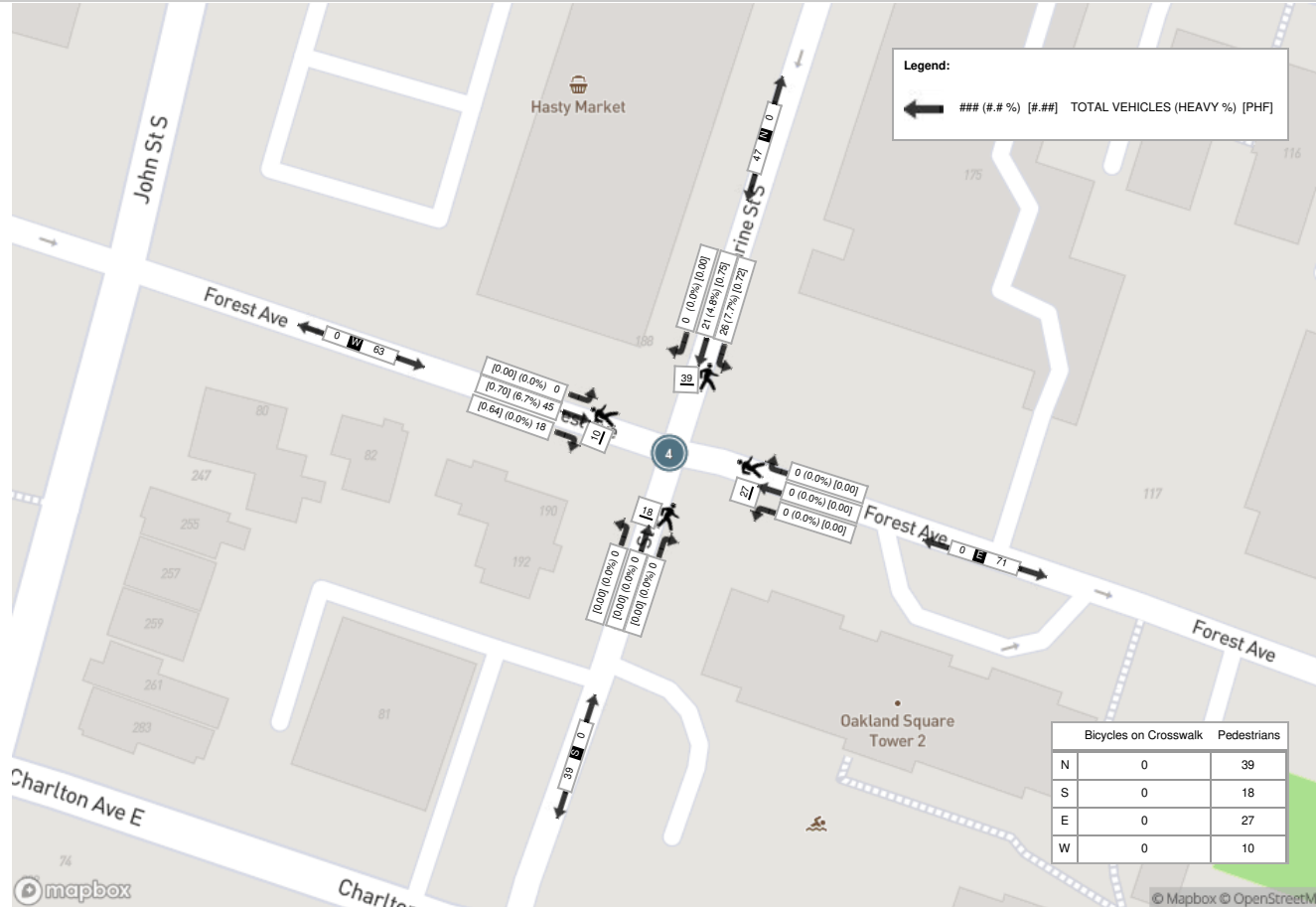
Start Time	N Approach CATHARINE ST						E Approach FOREST AVE						S Approach CATHARINE ST						W Approach FOREST AVE						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
08:15:00	0	4	4	0	18	8	0	0	0	0	13	0	0	0	0	4	0	3	16	0	0	2	19	27	
08:30:00	0	3	7	0	5	10	0	0	0	0	6	0	0	0	0	5	0	7	5	0	0	1	12	22	
08:45:00	0	7	9	0	12	16	0	0	0	0	6	0	0	0	0	5	0	2	8	0	0	5	10	26	
09:00:00	0	7	6	0	4	13	0	0	0	0	2	0	0	0	0	4	0	6	16	0	0	2	22	35	
<b>Grand Total</b>	0	21	26	0	39	47	0	0	0	0	27	0	0	0	0	18	0	18	45	0	0	10	63	110	
<b>Approach%</b>	0%	44.7%	55.3%	0%	-	-	0%	0%	0%	0%	-	0%	0%	0%	0%	-	28.6%	71.4%	0%	0%	-	-	-		
<b>Totals %</b>	0%	19.1%	23.6%	0%	42.7%	42.7%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	16.4%	40.9%	0%	0%	57.3%	-	-		
<b>PHF</b>	0	0.75	0.72	0	0.73	0.73	0	0	0	0	0	0	0	0	0	0	0.64	0.7	0	0	0.72	-	-		
<b>Heavy</b>	0	1	2	0	3	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	-	-		
<b>Heavy %</b>	0%	4.8%	7.7%	0%	6.4%	6.4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	6.7%	0%	0%	4.8%	-	-		
<b>Lights</b>	0	20	24	0	44	44	0	0	0	0	0	0	0	0	0	0	18	42	0	0	60	-	-		
<b>Lights %</b>	0%	95.2%	92.3%	0%	93.6%	93.6%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	93.3%	0%	0%	95.2%	-	-		
<b>Single-Unit Trucks</b>	0	1	1	0	2	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	-	-		
<b>Single-Unit Trucks %</b>	0%	4.8%	3.8%	0%	4.3%	4.3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2.2%	0%	0%	1.6%	-	-		
<b>Buses</b>	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	-	-		
<b>Buses %</b>	0%	0%	3.8%	0%	2.1%	2.1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	4.4%	0%	0%	3.2%	-	-		
<b>Bicycles on Road</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-		
<b>Bicycles on Road %</b>	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-	-		
<b>Pedestrians</b>	-	-	-	-	39	-	-	-	-	27	-	-	-	-	18	-	-	-	-	-	10	-	-		
<b>Pedestrians%</b>	-	-	-	-	41.5%	-	-	-	-	28.7%	-	-	-	-	19.1%	-	-	-	-	-	10.6%	-	-		
<b>Bicycles on Crosswalk</b>	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	0	-	-		
<b>Bicycles on Crosswalk%</b>	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-		



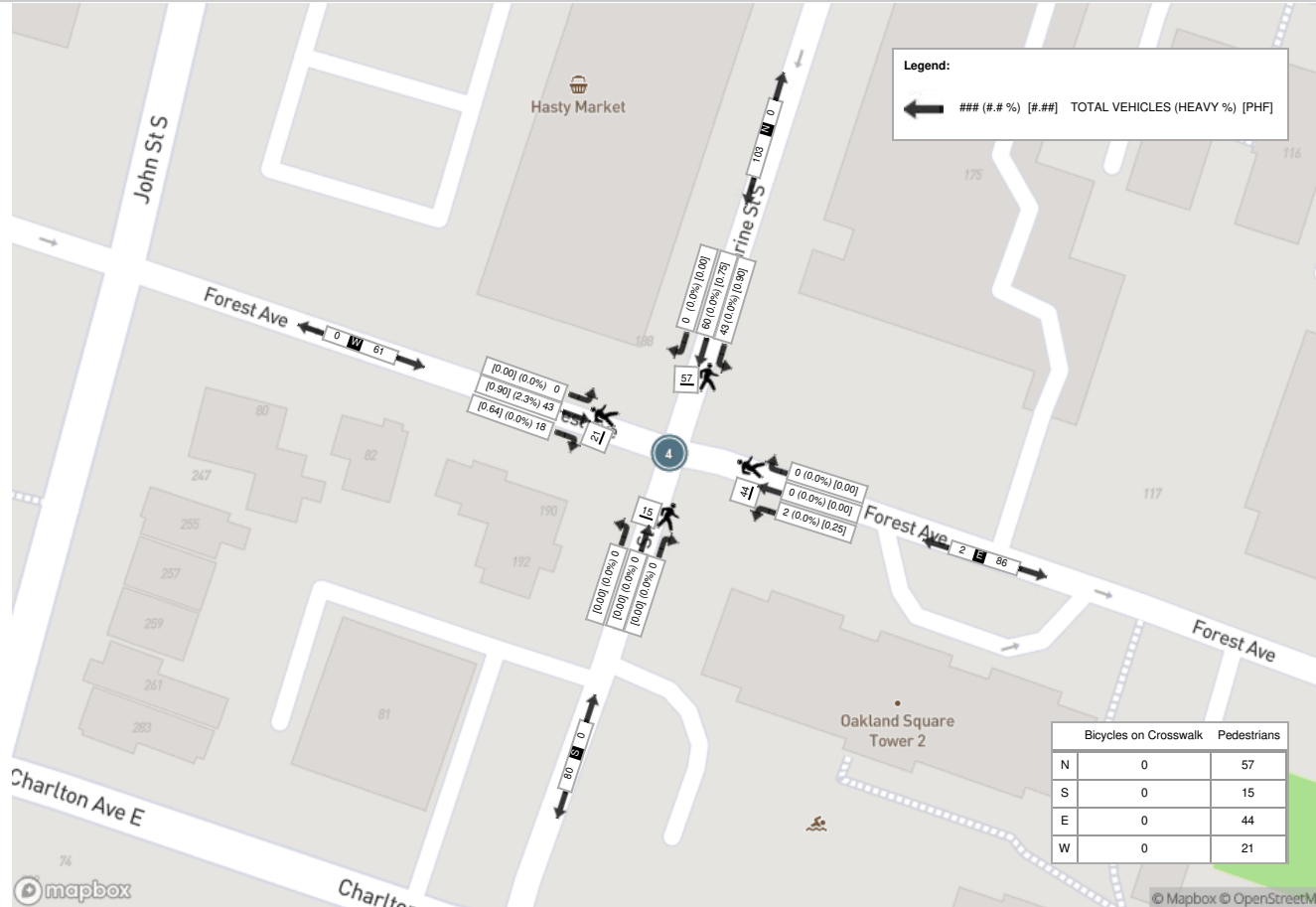
**Peak Hour: 04:45 PM - 05:45 PM Weather: Overcast Clouds (20.65 °C)**

Start Time	N Approach CATHARINE ST						E Approach FOREST AVE						S Approach CATHARINE ST						W Approach FOREST AVE						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
16:45:00	0	18	12	0	14	30	0	0	0	0	13	0	0	0	0	3	0	3	11	0	0	6	14	44	
17:00:00	0	13	11	0	16	24	0	0	0	0	9	0	0	0	0	3	0	6	12	0	0	6	18	42	
17:15:00	0	9	12	0	18	21	0	0	2	0	11	2	0	0	0	5	0	7	9	0	0	5	16	39	
17:30:00	0	20	8	0	9	28	0	0	0	0	11	0	0	0	0	4	0	2	11	0	0	4	13	41	
<b>Grand Total</b>	<b>0</b>	<b>60</b>	<b>43</b>	<b>0</b>	<b>57</b>	<b>103</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>44</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>15</b>	<b>0</b>	<b>18</b>	<b>43</b>	<b>0</b>	<b>0</b>	<b>21</b>	<b>61</b>	<b>166</b>	
<b>Approach%</b>	0%	58.3%	41.7%	0%	-	-	0%	0%	100%	0%	-	0%	0%	0%	0%	-	29.5%	70.5%	0%	0%	-	-	-	-	
<b>Totals %</b>	0%	36.1%	25.9%	0%	62%	62%	0%	0%	1.2%	0%	1.2%	0%	0%	0%	0%	0%	10.8%	25.9%	0%	0%	36.7%	36.7%	-	-	
<b>PHF</b>	0	0.75	0.9	0	0.86	0.86	0	0	0.25	0	0.25	0	0	0	0	0	0.64	0.9	0	0	0.85	0.85	-	-	
<b>Heavy</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	-	-	
<b>Heavy %</b>	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2.3%	0%	0%	1.6%	-	-	
<b>Lights</b>	0	60	43	0	57	103	0	0	0	0	44	0	0	0	0	15	0	18	42	0	0	21	60	-	
<b>Lights %</b>	0%	100%	100%	0%	100%	100%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%	0%	100%	97.7%	0%	0%	15.3%	98.4%	-	
<b>Single-Unit Trucks</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	-	-	
<b>Single-Unit Trucks %</b>	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2.3%	0%	0%	1.6%	-	-	
<b>Buses</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	
<b>Buses %</b>	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-	-	
<b>Bicycles on Road</b>	0	0	0	0	0	0	0	0	2	0	2	2	0	0	0	0	0	0	0	0	0	0	0	-	
<b>Bicycles on Road %</b>	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-	
<b>Pedestrians</b>	-	-	-	-	57	-	-	-	-	44	-	-	-	-	15	-	-	-	-	-	21	-	-	-	
<b>Pedestrians%</b>	-	-	-	-	41.6%	-	-	-	-	32.1%	-	-	-	-	10.9%	-	-	-	-	-	15.3%	-	-	-	
<b>Bicycles on Crosswalk</b>	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	0	-	-	-	
<b>Bicycles on Crosswalk%</b>	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	

Peak Hour: 08:15 AM - 09:15 AM Weather: Light Rain (18.14 °C)



Peak Hour: 04:45 PM - 05:45 PM Weather: Overcast Clouds (20.65 °C)





Turning Movement Count (6 . FOREST AVE & WALNUT ST S)

Start Time	N Approach WALNUT ST S						E Approach FOREST AVE						S Approach WALNUT ST S						W Approach FOREST AVE						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total		
07:00:00	0	5	0	0	0	5	0	0	0	0	3	0	0	8	0	0	0	8	7	1	8	0	0	16	29	
07:15:00	0	7	0	0	2	7	0	0	0	0	0	0	2	9	0	0	2	11	3	3	3	0	1	9	27	
07:30:00	0	6	0	0	3	6	0	0	0	0	0	0	1	13	0	0	4	14	4	3	5	0	0	12	32	
07:45:00	0	11	0	0	3	11	0	0	0	0	1	0	4	25	0	0	9	29	3	7	8	0	0	18	58	146
08:00:00	0	12	9	0	2	21	0	0	0	0	6	0	1	20	0	0	16	21	8	5	3	0	8	16	58	175
08:15:00	0	12	18	0	9	30	1	0	0	0	20	1	5	24	0	0	42	29	5	10	7	0	6	22	82	230
08:30:00	0	12	8	0	5	20	0	0	0	0	26	0	3	17	0	0	31	20	6	6	8	0	7	20	60	258
08:45:00	0	6	3	0	4	9	0	0	0	0	6	0	1	24	0	0	6	25	1	7	4	0	3	12	46	246
09:00:00	0	7	5	0	2	12	0	0	0	0	0	0	2	18	0	0	5	20	3	7	10	0	0	20	52	240
09:15:00	0	4	1	0	4	5	0	0	0	0	0	0	1	17	0	0	3	18	4	5	8	0	2	17	40	198
09:30:00	0	3	0	0	3	3	0	0	0	0	2	0	0	14	0	0	1	14	4	3	7	0	1	14	31	169
09:45:00	0	7	0	0	2	7	0	0	0	0	0	0	2	10	0	0	1	12	5	3	6	0	1	14	33	156
***BREAK***																										
16:00:00	0	19	5	0	8	24	0	0	0	0	3	0	1	7	0	0	7	8	15	4	3	0	3	22	54	
16:15:00	0	16	2	0	8	18	0	0	0	0	6	0	0	11	0	0	13	11	9	7	7	0	10	23	52	
16:30:00	0	18	2	1	1	21	0	0	1	0	1	1	1	6	0	0	6	7	14	4	4	0	2	22	51	
16:45:00	0	18	0	0	8	18	0	0	0	0	5	0	1	9	0	0	9	10	5	4	7	0	3	16	44	201
17:00:00	0	16	2	0	4	18	0	0	0	0	5	0	0	7	0	1	5	8	7	7	6	0	5	20	46	193
17:15:00	0	11	1	0	8	12	0	2	0	0	10	2	3	10	0	1	5	14	5	6	7	0	7	18	46	187
17:30:00	0	9	2	0	4	11	0	0	1	0	0	1	3	8	0	0	4	11	10	4	3	0	2	17	40	176
17:45:00	0	13	4	0	8	17	0	0	0	0	6	0	2	6	0	0	8	8	3	11	7	0	5	21	46	178
18:00:00	1	5	2	0	9	8	1	0	0	0	3	1	2	9	0	0	16	11	6	5	6	0	5	17	37	169
18:15:00	0	8	1	0	7	9	0	0	0	0	0	0	1	3	0	0	5	4	8	5	5	0	6	18	31	154
18:30:00	0	6	2	0	3	8	0	0	0	0	0	0	0	6	0	0	6	6	4	5	12	0	3	21	35	149
18:45:00	0	6	4	0	5	10	0	2	0	0	3	2	2	10	0	0	7	12	4	5	5	0	6	14	38	141
<b>Grand Total</b>	<b>1</b>	<b>237</b>	<b>71</b>	<b>1</b>	<b>112</b>	<b>310</b>	<b>2</b>	<b>4</b>	<b>2</b>	<b>0</b>	<b>106</b>	<b>8</b>	<b>38</b>	<b>291</b>	<b>0</b>	<b>2</b>	<b>211</b>	<b>331</b>	<b>143</b>	<b>127</b>	<b>149</b>	<b>0</b>	<b>86</b>	<b>419</b>	<b>1068</b>	<b>-</b>
<b>Approach%</b>	0.3%	76.5%	22.9%	0.3%	-	-	25%	50%	25%	0%	-	-	11.5%	87.9%	0%	0.6%	-	-	34.1%	30.3%	35.6%	0%	-	-	-	-
<b>Totals %</b>	0.1%	22.2%	6.6%	0.1%	29%	29%	0.2%	0.4%	0.2%	0%	0.7%	0.7%	3.6%	27.2%	0%	0.2%	31%	31%	13.4%	11.9%	14%	0%	39.2%	39.2%	-	-
<b>Heavy</b>	0	6	3	0	-	-	0	0	0	0	-	-	1	6	0	0	-	-	3	5	2	0	-	-	-	-
<b>Heavy %</b>	0%	2.5%	4.2%	0%	-	-	0%	0%	0%	0%	-	-	2.6%	2.1%	0%	0%	-	-	2.1%	3.9%	1.3%	0%	-	-	-	-
<b>Bicycles</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Bicycle %</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (18.14 °C)

Start Time	N Approach WALNUT ST S						E Approach FOREST AVE						S Approach WALNUT ST S						W Approach FOREST AVE						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
07:45:00	0	11	0	0	3	11	0	0	0	0	1	0	4	25	0	0	9	29	3	7	8	0	0	18	58
08:00:00	0	12	9	0	2	21	0	0	0	0	6	0	1	20	0	0	16	21	8	5	3	0	8	16	58
08:15:00	0	12	18	0	9	30	1	0	0	0	20	1	5	24	0	0	42	29	5	10	7	0	6	22	82
08:30:00	0	12	8	0	5	20	0	0	0	0	26	0	3	17	0	0	31	20	6	6	8	0	7	20	60
<b>Grand Total</b>	<b>0</b>	<b>47</b>	<b>35</b>	<b>0</b>	<b>19</b>	<b>82</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>53</b>	<b>1</b>	<b>13</b>	<b>86</b>	<b>0</b>	<b>0</b>	<b>98</b>	<b>99</b>	<b>22</b>	<b>28</b>	<b>26</b>	<b>0</b>	<b>21</b>	<b>76</b>	<b>258</b>
<b>Approach%</b>	0%	57.3%	42.7%	0%	-	-	100%	0%	0%	0%	-	-	13.1%	86.9%	0%	0%	-	-	28.9%	36.8%	34.2%	0%	-	-	-
<b>Totals %</b>	0%	18.2%	13.6%	0%	31.8%	0.4%	0.4%	0%	0%	0%	0.4%	0.4%	5%	33.3%	0%	0%	38.4%	8.5%	10.9%	10.1%	0%	29.5%	0%	-	-
<b>PHF</b>	0	0.98	0.49	0	0.68	0.25	0.25	0	0	0	0.25	0.25	0.65	0.86	0	0	0.85	0.69	0.7	0.81	0	0.86	0	-	-
<b>Heavy</b>	0	2	1	0	3	0	0	0	0	0	0	0	1	4	0	0	5	1	1	1	0	3	0	-	-
<b>Heavy %</b>	0%	4.3%	2.9%	0%	3.7%	0%	0%	0%	0%	0%	0%	0%	7.7%	4.7%	0%	0%	5.1%	4.5%	3.6%	3.8%	0%	3.9%	0%	-	-
<b>Lights</b>	0	44	34	0	78	1	0	0	0	0	1	11	82	0	0	93	21	26	25	0	72	0	-	-	
<b>Lights %</b>	0%	93.6%	97.1%	0%	95.1%	100%	0%	0%	0%	0%	100%	84.6%	95.3%	0%	0%	93.9%	95.5%	92.9%	96.2%	0%	94.7%	0%	-	-	
<b>Single-Unit Trucks</b>	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
<b>Single-Unit Trucks %</b>	0%	0%	2.9%	0%	1.2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-
<b>Buses</b>	0	2	0	0	2	0	0	0	0	0	0	0	1	4	0	0	5	1	1	1	0	3	0	-	-
<b>Buses %</b>	0%	4.3%	0%	0%	2.4%	0%	0%	0%	0%	0%	0%	0%	7.7%	4.7%	0%	0%	5.1%	4.5%	3.6%	3.8%	0%	3.9%	0%	-	-
<b>Bicycles on Road</b>	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	1	0	-	-
<b>Bicycles on Road %</b>	0%	2.1%	0%	0%	1.2%	0%	0%	0%	0%	0%	0%	0%	7.7%	0%	0%	0%	1%	0%	3.6%	0%	0%	1.3%	0%	-	-
<b>Pedestrians</b>	-	-	-	-	19	-	-	-	-	53	-	-	-	-	-	98	-	-	-	-	-	21	-	-	-
<b>Pedestrians%</b>	-	-	-	-	9.9%	-	-	-	-	27.7%	-	-	-	-	51.3%	-	-	-	-	-	-	11%	-	-	-
<b>Bicycles on Crosswalk</b>	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-
<b>Bicycles on Crosswalk%</b>	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	-	-	0%	-	-	-





Peak Hour: 04:00 PM - 05:00 PM Weather: Overcast Clouds (20.65 °C)

Start Time	N Approach WALNUT ST S						E Approach FOREST AVE						S Approach WALNUT ST S						W Approach FOREST AVE						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
16:00:00	0	19	5	0	8	24	0	0	0	0	3	0	1	7	0	0	7	8	15	4	3	0	3	22	54
16:15:00	0	16	2	0	8	18	0	0	0	0	6	0	0	11	0	0	13	11	9	7	7	0	10	23	52
16:30:00	0	18	2	1	1	21	0	0	1	0	1	1	1	6	0	0	6	7	14	4	4	0	2	22	51
16:45:00	0	18	0	0	8	18	0	0	0	0	5	0	1	9	0	0	9	10	5	4	7	0	3	16	44
<b>Grand Total</b>	0	71	9	1	25	81	0	0	1	0	15	1	3	33	0	0	35	36	43	19	21	0	18	83	201
<b>Approach%</b>	0%	87.7%	11.1%	1.2%	-	-	0%	0%	100%	0%	-	-	8.3%	91.7%	0%	0%	-	-	51.8%	22.9%	25.3%	0%	-	-	-
<b>Totals %</b>	0%	35.3%	4.5%	0.5%	40.3%	0%	0%	0.5%	0%	0.5%	0.5%	0.5%	1.5%	16.4%	0%	0%	17.9%	17.9%	21.4%	9.5%	10.4%	0%	41.3%	0%	-
<b>PHF</b>	0	0.93	0.45	0.25	0.84	0	0	0.25	0	0.25	0.25	0.25	0.75	0.75	0	0	0.82	0.82	0.72	0.68	0.75	0	0.9	0.9	-
<b>Heavy</b>	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	-
<b>Heavy %</b>	0%	1.4%	11.1%	0%	2.5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2.3%	5.3%	0%	0%	2.4%	0%	-
<b>Lights</b>	0	70	8	1	79	0	0	0	0	0	0	0	2	33	0	0	35	35	42	17	21	0	80	0	-
<b>Lights %</b>	0%	98.6%	88.9%	100%	97.5%	0%	0%	0%	0%	0%	0%	0%	66.7%	100%	0%	0%	97.2%	97.2%	97.7%	89.5%	100%	0%	96.4%	0%	-
<b>Single-Unit Trucks</b>	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	-
<b>Single-Unit Trucks %</b>	0%	1.4%	11.1%	0%	2.5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5.3%	0%	0%	1.2%	0%	-
<b>Buses</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	-
<b>Buses %</b>	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2.3%	0%	0%	0%	1.2%	0%	-
<b>Bicycles on Road</b>	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	1	1	0	1	0	0	1	0	-
<b>Bicycles on Road %</b>	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%	33.3%	0%	0%	0%	0%	2.8%	2.8%	0%	5.3%	0%	0%	1.2%	0%	-
<b>Pedestrians</b>	-	-	-	-	24	-	-	-	-	-	15	-	-	-	-	-	35	-	-	-	-	-	18	-	-
<b>Pedestrians %</b>	-	-	-	-	25.8%	-	-	-	-	-	16.1%	-	-	-	-	-	37.6%	-	-	-	-	-	19.4%	-	-
<b>Bicycles on Crosswalk</b>	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
<b>Bicycles on Crosswalk %</b>	-	-	-	-	1.1%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-

Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (18.14 °C)



Peak Hour: 04:00 PM - 05:00 PM Weather: Overcast Clouds (20.65 °C)





Turning Movement Count (2 . JOHN ST S & FOREST AVE)

Start Time	N Approach JOHN ST S						E Approach FOREST AVE						S Approach JOHN ST S						W Approach FOREST AVE						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total		
07:00:00	0	42	1	0	4	43	0	0	0	0	3	0	6	129	0	0	7	135	6	1	2	0	1	9	187	
07:15:00	0	35	3	0	4	38	0	0	0	0	8	0	8	154	0	0	2	162	4	3	2	0	5	9	209	
07:30:00	0	52	2	0	5	54	0	0	0	0	2	0	5	152	0	0	6	157	1	6	6	0	8	13	224	
07:45:00	0	51	2	0	3	53	0	0	0	0	6	0	7	212	0	0	6	219	5	8	4	0	5	17	289	909
08:00:00	0	55	0	0	5	55	0	0	0	0	2	0	6	202	0	0	2	208	5	7	13	0	1	25	288	1010
08:15:00	0	57	5	0	9	62	0	0	0	0	5	0	3	211	0	0	7	214	8	11	8	0	8	27	303	1104
08:30:00	0	47	3	0	2	50	0	0	0	0	6	0	1	179	0	0	2	180	9	8	7	0	4	24	254	1134
08:45:00	0	56	3	0	3	59	0	0	0	0	2	0	4	184	0	0	7	188	9	4	7	0	2	20	267	1112
09:00:00	0	65	4	0	4	69	0	0	0	0	4	0	8	153	0	0	6	161	12	9	14	0	6	35	265	1089
09:15:00	0	48	2	0	4	50	0	0	0	0	7	0	5	137	0	0	2	142	6	3	13	0	1	22	214	1000
09:30:00	1	57	4	0	3	62	0	0	0	0	7	0	2	112	0	0	5	114	8	6	14	0	3	28	204	950
09:45:00	0	56	4	0	5	60	0	0	0	0	3	0	4	104	0	0	5	108	12	10	12	0	0	34	202	885
***BREAK***																										
16:00:00	0	94	3	0	12	97	0	0	0	0	8	0	6	144	0	0	9	150	8	7	10	0	14	25	272	
16:15:00	0	100	4	0	10	104	0	0	0	0	12	0	2	155	0	0	5	157	6	11	8	0	7	25	286	
16:30:00	0	126	2	0	8	128	0	0	0	0	12	0	8	143	0	0	7	151	13	4	13	0	6	30	309	
16:45:00	0	107	2	0	9	109	0	0	0	0	12	0	4	147	0	0	4	151	6	8	10	0	3	24	284	1151
17:00:00	0	128	2	0	8	130	0	0	0	0	4	0	8	141	0	0	2	149	6	9	5	0	5	20	299	1178
17:15:00	0	95	3	0	1	98	0	0	0	0	5	0	7	134	0	0	3	141	6	4	7	0	9	17	256	1148
17:30:00	0	109	4	0	2	113	0	0	0	0	5	0	4	164	0	0	2	168	6	5	7	0	3	18	299	1138
17:45:00	0	79	5	0	4	84	0	0	0	0	4	0	7	176	0	0	1	183	4	8	3	0	7	15	282	1136
18:00:00	0	71	0	0	16	71	0	0	0	0	6	0	8	163	0	0	2	171	9	3	11	0	6	23	265	1102
18:15:00	0	64	4	0	7	68	0	0	0	0	9	0	3	149	0	0	4	152	3	7	5	0	5	15	235	1081
18:30:00	1	77	3	0	5	81	0	0	0	0	4	0	7	125	0	0	9	132	6	2	4	0	7	12	225	1007
18:45:00	0	72	4	0	4	76	0	0	0	0	6	0	6	119	0	0	4	125	6	5	6	0	5	17	218	943
<b>Grand Total</b>	<b>2</b>	<b>1743</b>	<b>69</b>	<b>0</b>	<b>137</b>	<b>1814</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>142</b>	<b>0</b>	<b>129</b>	<b>3689</b>	<b>0</b>	<b>0</b>	<b>109</b>	<b>3818</b>	<b>164</b>	<b>149</b>	<b>191</b>	<b>0</b>	<b>121</b>	<b>504</b>	<b>6136</b>	<b>-</b>
<b>Approach%</b>	0.1%	96.1%	3.8%	0%	-	-	0%	0%	0%	0%	-	-	3.4%	96.6%	0%	0%	-	-	32.5%	29.6%	37.9%	0%	-	-	-	
<b>Totals %</b>	0%	28.4%	1.1%	0%	29.6%	-	0%	0%	0%	0%	0%	0%	2.1%	60.1%	0%	0%	62.2%	-	2.7%	2.4%	3.1%	0%	8.2%	-	-	
<b>Heavy</b>	0	33	2	0	-	-	0	0	0	0	-	-	4	288	0	0	-	-	4	3	0	0	-	-	-	
<b>Heavy %</b>	0%	1.9%	2.9%	0%	-	-	0%	0%	0%	0%	-	-	3.1%	7.8%	0%	0%	-	-	2.4%	2%	0%	0%	-	-	-	
<b>Bicycles</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>Bicycle %</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (18.14 °C)

Start Time	N Approach JOHN ST S						E Approach FOREST AVE						S Approach JOHN ST S						W Approach FOREST AVE						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
07:45:00	0	51	2	0	3	53	0	0	0	0	6	0	7	212	0	0	6	219	5	8	4	0	5	17	289
08:00:00	0	55	0	0	5	55	0	0	0	0	2	0	6	202	0	0	2	208	5	7	13	0	1	25	288
08:15:00	0	57	5	0	9	62	0	0	0	0	5	0	3	211	0	0	7	214	8	11	8	0	8	27	303
08:30:00	0	47	3	0	2	50	0	0	0	0	6	0	1	179	0	0	2	180	9	8	7	0	4	24	254
<b>Grand Total</b>	<b>0</b>	<b>210</b>	<b>10</b>	<b>0</b>	<b>19</b>	<b>220</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>19</b>	<b>0</b>	<b>17</b>	<b>804</b>	<b>0</b>	<b>0</b>	<b>17</b>	<b>821</b>	<b>27</b>	<b>34</b>	<b>32</b>	<b>0</b>	<b>18</b>	<b>93</b>	<b>1134</b>
<b>Approach%</b>	0%	95.5%	4.5%	0%	-	-	0%	0%	0%	0%	-	-	2.1%	97.9%	0%	0%	-	29%	36.6%	34.4%	0%	-	-	-	
<b>Totals %</b>	0%	18.5%	0.9%	0%	19.4%	19.4%	0%	0%	0%	0%	0%	0%	1.5%	70.9%	0%	0%	72.4%	2.4%	3%	2.8%	0%	8.2%	-	-	
<b>PHF</b>	0	0.92	0.5	0	0.89	0.89	0	0	0	0	0	0	0.61	0.95	0	0	0.94	0.75	0.77	0.62	0	0.86	-	-	
<b>Heavy</b>	0	9	1	0	10	10	0	0	0	0	0	0	1	51	0	0	52	2	0	0	0	2	-	-	
<b>Heavy %</b>	0%	4.3%	10%	0%	4.5%	4.5%	0%	0%	0%	0%	0%	0%	5.9%	6.3%	0%	0%	6.3%	7.4%	0%	0%	0%	2.2%	-	-	
<b>Lights</b>	0	201	9	0	210	210	0	0	0	0	0	0	16	753	0	0	769	25	33	32	0	90	-	-	
<b>Lights %</b>	0%	95.7%	90%	0%	95.5%	95.5%	0%	0%	0%	0%	0%	0%	94.1%	93.7%	0%	0%	93.7%	92.6%	97.1%	100%	0%	96.8%	-	-	
<b>Single-Unit Trucks</b>	0	6	0	0	6	6	0	0	0	0	0	0	0	7	0	0	7	2	0	0	0	2	-	-	
<b>Single-Unit Trucks %</b>	0%	2.9%	0%	0%	2.7%	2.7%	0%	0%	0%	0%	0%	0%	0%	0.9%	0%	0%	0.9%	7.4%	0%	0%	0%	2.2%	-	-	
<b>Buses</b>	0	2	1	0	3	3	0	0	0	0	0	0	1	44	0	0	45	0	0	0	0	0	-	-	
<b>Buses %</b>	0%	1%	10%	0%	1.4%	1.4%	0%	0%	0%	0%	0%	0%	5.9%	5.5%	0%	0%	5.5%	0%	0%	0%	0%	0%	-	-	
<b>Articulated Trucks</b>	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	
<b>Articulated Trucks %</b>	0%	0.5%	0%	0%	0.5%	0.5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-	-	
<b>Bicycles on Road</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	-	
<b>Bicycles on Road %</b>	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2.9%	0%	0%	0%	1.1%	-	
<b>Pedestrians</b>	-	-	-	-	19	-	-	-	-	19	-	-	-	-	-	17	-	-	-	-	-	18	-	-	
<b>Pedestrians%</b>	-	-	-	-	26%	-	-	-	-	26%	-	-	-	-	23.3%	-	-	-	-	-	24.7%	-	-	-	
<b>Bicycles on Crosswalk</b>	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	
<b>Bicycles on Crosswalk%</b>	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	-	-	0%	-	-	



**Peak Hour: 04:15 PM - 05:15 PM Weather: Overcast Clouds (20.65 °C)**

Start Time	N Approach JOHN ST S						E Approach FOREST AVE						S Approach JOHN ST S						W Approach FOREST AVE						Int. Total (15 min)	
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total		
16:15:00	0	100	4	0	10	104	0	0	0	0	12	0	2	155	0	0	5	157	6	11	8	0	7	25	286	
16:30:00	0	126	2	0	8	128	0	0	0	0	12	0	8	143	0	0	7	151	13	4	13	0	6	30	309	
16:45:00	0	107	2	0	9	109	0	0	0	0	12	0	4	147	0	0	4	151	6	8	10	0	3	24	284	
17:00:00	0	128	2	0	8	130	0	0	0	0	4	0	8	141	0	0	2	149	6	9	5	0	5	20	299	
<b>Grand Total</b>	<b>0</b>	<b>461</b>	<b>10</b>	<b>0</b>	<b>35</b>	<b>471</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>40</b>	<b>0</b>	<b>22</b>	<b>586</b>	<b>0</b>	<b>0</b>	<b>18</b>	<b>608</b>	<b>31</b>	<b>32</b>	<b>36</b>	<b>0</b>	<b>21</b>	<b>99</b>	<b>1178</b>	
<b>Approach%</b>	0%	97.9%	2.1%	0%	-	-	0%	0%	0%	0%	-	-	3.6%	96.4%	0%	0%	-	-	31.3%	32.3%	36.4%	0%	-	-	-	
<b>Totals %</b>	0%	39.1%	0.8%	0%	40%	40%	0%	0%	0%	0%	0%	0%	1.9%	49.7%	0%	0%	51.6%	51.6%	2.6%	2.7%	3.1%	0%	8.4%	8.4%	-	
<b>PHF</b>	0	0.9	0.63	0	0.91	0.91	0	0	0	0	0	0	0	0.69	0.95	0	0	0.97	0.97	0.6	0.73	0.69	0	0.83	0.83	-
<b>Heavy</b>	0	6	0	0	6	6	0	0	0	0	0	0	1	51	0	0	52	52	0	1	0	0	1	1	-	
<b>Heavy %</b>	0%	1.3%	0%	0%	1.3%	1.3%	0%	0%	0%	0%	0%	0%	4.5%	8.7%	0%	0%	8.6%	8.6%	0%	3.1%	0%	0%	1%	1%	-	
<b>Lights</b>	0	455	10	0	465	465	0	0	0	0	0	0	21	534	0	0	555	555	31	31	36	0	98	98	-	
<b>Lights %</b>	0%	98.7%	100%	0%	98.7%	98.7%	0%	0%	0%	0%	0%	0%	95.5%	91.1%	0%	0%	91.3%	91.3%	100%	96.9%	100%	0%	99%	99%	-	
<b>Single-Unit Trucks</b>	0	3	0	0	3	3	0	0	0	0	0	0	1	3	0	0	4	4	0	0	0	0	0	0	-	
<b>Single-Unit Trucks %</b>	0%	0.7%	0%	0%	0.6%	0.6%	0%	0%	0%	0%	0%	0%	4.5%	0.5%	0%	0%	0.7%	0.7%	0%	0%	0%	0%	0%	0%	-	
<b>Buses</b>	0	3	0	0	3	3	0	0	0	0	0	0	0	47	0	0	47	47	0	1	0	0	1	1	-	
<b>Buses %</b>	0%	0.7%	0%	0%	0.6%	0.6%	0%	0%	0%	0%	0%	0%	0%	8%	0%	0%	7.7%	7.7%	0%	3.1%	0%	0%	1%	1%	-	
<b>Articulated Trucks</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	-	
<b>Articulated Trucks %</b>	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.2%	0%	0%	0.2%	0.2%	0%	0%	0%	0%	0%	0%	-	
<b>Bicycles on Road</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	-	
<b>Bicycles on Road %</b>	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.2%	0%	0%	0.2%	0.2%	0%	0%	0%	0%	0%	0%	-	
<b>Pedestrians</b>	-	-	-	-	35	-	-	-	-	-	39	-	-	-	-	-	18	-	-	-	-	-	21	-	-	
<b>Pedestrians %</b>	-	-	-	-	30.7%	-	-	-	-	-	34.2%	-	-	-	-	-	15.8%	-	-	-	-	-	18.4%	-	-	
<b>Bicycles on Crosswalk</b>	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-	
<b>Bicycles on Crosswalk %</b>	-	-	-	-	0%	-	-	-	-	-	0.9%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	

Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (18.14 °C)



Peak Hour: 04:15 PM - 05:15 PM Weather: Overcast Clouds (20.65 °C)







Turning Movement Count (1 . JOHN ST S & YOUNG ST)

Start Time	N Approach JOHN ST S						E Approach YOUNG ST						S Approach JOHN ST S						W Approach YOUNG ST						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total		
07:00:00	4	35	0	0	1	39	5	6	3	0	1	14	1	133	2	0	5	136	4	3	2	0	6	9	198	
07:15:00	7	33	1	0	3	41	7	9	5	0	4	21	1	153	3	0	5	157	0	5	3	0	12	8	227	
07:30:00	6	49	0	0	1	55	3	13	10	0	4	26	1	158	4	0	2	163	1	6	5	0	7	12	256	
07:45:00	7	48	0	0	2	55	6	14	5	0	3	25	5	197	5	0	2	207	1	6	8	0	13	15	302	983
08:00:00	6	49	1	0	2	56	11	8	5	0	5	24	3	184	21	0	4	208	0	5	4	0	2	9	297	1082
08:15:00	7	55	3	0	1	65	6	16	6	0	8	28	7	200	13	0	4	220	1	7	8	0	6	16	329	1184
08:30:00	7	38	0	0	3	45	13	11	7	0	3	31	3	169	10	0	10	182	4	6	9	0	6	19	277	1205
08:45:00	8	47	3	0	3	58	3	15	10	0	3	28	4	162	21	0	5	187	2	8	6	0	4	16	289	1192
09:00:00	9	61	1	0	4	71	5	11	3	0	4	19	3	148	13	0	10	164	1	5	8	0	6	14	268	1163
09:15:00	8	43	2	0	4	53	3	19	5	0	6	27	3	129	10	0	6	142	2	7	9	0	4	18	240	1074
09:30:00	11	53	0	0	0	64	3	14	5	0	2	22	1	121	8	0	7	130	3	1	3	0	8	7	223	1020
09:45:00	8	47	0	0	9	55	2	20	6	0	8	28	3	106	7	0	4	116	4	8	4	0	2	16	215	946
***BREAK***																										
16:00:00	12	95	4	0	9	111	3	9	6	0	9	18	3	147	0	0	21	150	3	14	3	0	16	20	299	
16:15:00	11	96	1	0	3	108	1	13	4	0	14	18	6	151	8	0	5	165	4	5	4	0	7	13	304	
16:30:00	10	116	1	0	1	127	7	11	5	0	10	23	5	142	4	0	10	151	7	7	6	0	10	20	321	
16:45:00	11	98	4	0	8	113	2	15	5	0	9	22	4	132	16	0	18	152	6	9	7	0	17	22	309	1233
17:00:00	9	119	1	0	5	129	5	5	5	0	5	15	5	140	5	0	19	150	5	11	3	0	12	19	313	1247
17:15:00	11	95	5	0	6	111	4	5	6	0	13	15	5	130	6	0	13	141	3	9	6	0	12	18	285	1228
17:30:00	16	101	3	0	2	120	8	11	2	0	8	21	5	156	3	0	12	164	2	6	4	0	12	12	317	1224
17:45:00	15	79	2	0	8	96	3	12	4	0	10	19	4	166	4	0	13	174	1	3	5	0	11	9	298	1213
18:00:00	8	65	2	0	11	75	6	13	3	0	6	22	2	158	7	0	15	167	0	8	7	0	6	15	279	1179
18:15:00	8	66	3	0	15	77	4	18	0	0	18	22	4	151	3	0	12	158	3	6	3	0	14	12	269	1163
18:30:00	5	70	3	0	10	78	5	13	9	0	8	27	3	122	3	0	9	128	4	7	5	0	6	16	249	1095
18:45:00	5	66	0	0	6	71	8	11	3	0	10	22	2	116	3	0	17	121	3	4	4	0	7	11	225	1022
<b>Grand Total</b>	<b>209</b>	<b>1624</b>	<b>40</b>	<b>0</b>	<b>117</b>	<b>1873</b>	<b>123</b>	<b>292</b>	<b>122</b>	<b>0</b>	<b>171</b>	<b>537</b>	<b>83</b>	<b>3571</b>	<b>179</b>	<b>0</b>	<b>228</b>	<b>3833</b>	<b>64</b>	<b>156</b>	<b>126</b>	<b>0</b>	<b>206</b>	<b>346</b>	<b>6589</b>	<b>-</b>
<b>Approach%</b>	11.2%	86.7%	2.1%	0%	-	-	22.9%	54.4%	22.7%	0%	-	-	2.2%	93.2%	4.7%	0%	-	-	18.5%	45.1%	36.4%	0%	-	-	-	
<b>Totals %</b>	3.2%	24.6%	0.6%	0%	28.4%	1.9%	4.4%	1.9%	0%	0%	8.1%	1.3%	54.2%	2.7%	0%	58.2%	1%	2.4%	1.9%	0%	5.3%	-	-	-		
<b>Heavy</b>	3	34	1	0	-	1	5	4	0	-	-	0	286	3	0	-	-	0	1	4	0	-	-	-		
<b>Heavy %</b>	1.4%	2.1%	2.5%	0%	-	0.8%	1.7%	3.3%	0%	-	-	0%	8%	1.7%	0%	-	-	0%	0.6%	3.2%	0%	-	-	-		
<b>Bicycles</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>Bicycle %</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (18.14 °C)

Start Time	N Approach JOHN ST S						E Approach YOUNG ST						S Approach JOHN ST S						W Approach YOUNG ST						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
07:45:00	7	48	0	0	2	55	6	14	5	0	3	25	5	197	5	0	2	207	1	6	8	0	13	15	302
08:00:00	6	49	1	0	2	56	11	8	5	0	5	24	3	184	21	0	4	208	0	5	4	0	2	9	297
08:15:00	7	55	3	0	1	65	6	16	6	0	8	28	7	200	13	0	4	220	1	7	8	0	6	16	329
08:30:00	7	38	0	0	3	45	13	11	7	0	3	31	3	169	10	0	10	182	4	6	9	0	6	19	277
<b>Grand Total</b>	<b>27</b>	<b>190</b>	<b>4</b>	<b>0</b>	<b>8</b>	<b>221</b>	<b>36</b>	<b>49</b>	<b>23</b>	<b>0</b>	<b>19</b>	<b>108</b>	<b>18</b>	<b>750</b>	<b>49</b>	<b>0</b>	<b>20</b>	<b>817</b>	<b>6</b>	<b>24</b>	<b>29</b>	<b>0</b>	<b>27</b>	<b>59</b>	<b>1205</b>
<b>Approach%</b>	12.2%	86%	1.8%	0%	-	-	33.3%	45.4%	21.3%	0%	-	-	2.2%	91.8%	6%	0%	-	-	10.2%	40.7%	49.2%	0%	-	-	-
<b>Totals %</b>	2.2%	15.8%	0.3%	0%	18.3%	18.3%	3%	4.1%	1.9%	0%	9%	9%	1.5%	62.2%	4.1%	0%	67.8%	67.8%	0.5%	2%	2.4%	0%	4.9%	4.9%	-
<b>PHF</b>	0.96	0.86	0.33	0	0.85	0.85	0.69	0.77	0.82	0	0.87	0.87	0.64	0.94	0.58	0	0.93	0.93	0.38	0.86	0.81	0	0.78	0.78	-
<b>Heavy</b>	1	9	0	0	10	10	1	2	1	0	4	4	0	50	1	0	51	51	0	0	2	0	2	2	-
<b>Heavy %</b>	3.7%	4.7%	0%	0%	4.5%	4.5%	2.8%	4.1%	4.3%	0%	3.7%	3.7%	0%	6.7%	2%	0%	6.2%	6.2%	0%	0%	6.9%	0%	3.4%	3.4%	-
<b>Lights</b>	26	181	4	0	211	211	35	46	22	0	103	103	18	700	48	0	766	766	6	23	27	0	56	56	-
<b>Lights %</b>	96.3%	95.3%	100%	0%	95.5%	95.5%	97.2%	93.9%	95.7%	0%	95.4%	95.4%	100%	93.3%	98%	0%	93.8%	93.8%	100%	95.8%	93.1%	0%	94.9%	94.9%	-
<b>Single-Unit Trucks</b>	1	6	0	0	7	7	1	1	0	0	2	2	0	6	1	0	7	7	0	0	1	0	1	1	-
<b>Single-Unit Trucks %</b>	3.7%	3.2%	0%	0%	3.2%	3.2%	2.8%	2%	0%	0%	1.9%	1.9%	0%	0.8%	2%	0%	0.9%	0.9%	0%	0%	3.4%	0%	1.7%	1.7%	-
<b>Buses</b>	0	2	0	0	2	2	0	1	1	0	2	2	0	44	0	0	44	44	0	0	1	0	1	1	-
<b>Buses %</b>	0%	1.1%	0%	0%	0.9%	0.9%	0%	2%	4.3%	0%	1.9%	1.9%	0%	5.9%	0%	0%	5.4%	5.4%	0%	0%	3.4%	0%	1.7%	1.7%	-
<b>Articulated Trucks</b>	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
<b>Articulated Trucks %</b>	0%	0.5%	0%	0%	0.5%	0.5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-
<b>Bicycles on Road</b>	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	1	0	0	1	1	-
<b>Bicycles on Road %</b>	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	0.9%	0.9%	0%	0%	0%	0%	0%	0%	0%	4.2%	0%	0%	1.7%	1.7%	-
<b>Pedestrians</b>	-	-	-	-	8	8	-	-	-	-	19	19	-	-	-	-	20	20	-	-	-	-	26	26	-
<b>Pedestrians %</b>	-	-	-	-	10.8%	10.8%	-	-	-	-	25.7%	25.7%	-	-	-	-	27%	27%	-	-	-	-	35.1%	35.1%	-
<b>Bicycles on Crosswalk</b>	-	-	-	-	0	0	-	-	-	-	0	0	-	-	-	-	0	0	-	-	-	-	1	1	-
<b>Bicycles on Crosswalk %</b>	-	-	-	-	0%	0%	-	-	-	-	0%	0%	-	-	-	-	0%	0%	-	-	-	-	1.4%	1.4%	-



Peak Hour: 04:15 PM - 05:15 PM Weather: Overcast Clouds (20.65 °C)

Start Time	N Approach JOHN ST S						E Approach YOUNG ST						S Approach JOHN ST S						W Approach YOUNG ST						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
16:15:00	11	96	1	0	3	108	1	13	4	0	14	18	6	151	8	0	5	165	4	5	4	0	7	13	304
16:30:00	10	116	1	0	1	127	7	11	5	0	10	23	5	142	4	0	10	151	7	7	6	0	10	20	321
16:45:00	11	98	4	0	8	113	2	15	5	0	9	22	4	132	16	0	18	152	6	9	7	0	17	22	309
17:00:00	9	119	1	0	5	129	5	5	5	0	5	15	5	140	5	0	19	150	5	11	3	0	12	19	313
<b>Grand Total</b>	<b>41</b>	<b>429</b>	<b>7</b>	<b>0</b>	<b>17</b>	<b>477</b>	<b>15</b>	<b>44</b>	<b>19</b>	<b>0</b>	<b>38</b>	<b>78</b>	<b>20</b>	<b>565</b>	<b>33</b>	<b>0</b>	<b>52</b>	<b>618</b>	<b>22</b>	<b>32</b>	<b>20</b>	<b>0</b>	<b>46</b>	<b>74</b>	<b>1247</b>
<b>Approach%</b>	8.6%	89.9%	1.5%	0%	-	-	19.2%	56.4%	24.4%	0%	-	-	3.2%	91.4%	5.3%	0%	-	-	29.7%	43.2%	27%	0%	-	-	
<b>Totals %</b>	3.3%	34.4%	0.6%	0%	38.3%	-	1.2%	3.5%	1.5%	0%	6.3%	-	1.6%	45.3%	2.6%	0%	49.6%	-	1.8%	2.6%	1.6%	0%	5.9%	-	
<b>PHF</b>	0.93	0.9	0.44	0	0.92	-	0.54	0.73	0.95	0	0.85	-	0.83	0.94	0.52	0	0.94	-	0.79	0.73	0.71	0	0.84	-	
<b>Heavy</b>	0	6	0	0	6	-	0	0	1	0	1	-	0	52	0	0	52	-	0	0	0	0	0	-	
<b>Heavy %</b>	0%	1.4%	0%	0%	1.3%	-	0%	0%	5.3%	0%	1.3%	-	0%	9.2%	0%	0%	8.4%	-	0%	0%	0%	0%	0%	-	
<b>Lights</b>	41	423	7	0	471	-	15	43	17	0	75	-	20	512	33	0	565	-	22	29	20	0	71	-	
<b>Lights %</b>	100%	98.6%	100%	0%	98.7%	-	100%	97.7%	89.5%	0%	96.2%	-	100%	90.6%	100%	0%	91.4%	-	100%	90.6%	100%	0%	95.9%	-	
<b>Single-Unit Trucks</b>	0	3	0	0	3	-	0	0	0	0	0	-	0	3	0	0	3	-	0	0	0	0	0	-	
<b>Single-Unit Trucks %</b>	0%	0.7%	0%	0%	0.6%	-	0%	0%	0%	0%	0%	-	0%	0.5%	0%	0%	0.5%	-	0%	0%	0%	0%	0%	-	
<b>Buses</b>	0	3	0	0	3	-	0	0	1	0	1	-	0	48	0	0	48	-	0	0	0	0	0	-	
<b>Buses %</b>	0%	0.7%	0%	0%	0.6%	-	0%	0%	5.3%	0%	1.3%	-	0%	8.5%	0%	0%	7.8%	-	0%	0%	0%	0%	0%	-	
<b>Articulated Trucks</b>	0	0	0	0	0	-	0	0	0	0	0	-	0	1	0	0	1	-	0	0	0	0	0	-	
<b>Articulated Trucks %</b>	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0.2%	0%	0%	0.2%	-	0%	0%	0%	0%	0%	-	
<b>Bicycles on Road</b>	0	0	0	0	0	-	0	1	1	0	2	-	0	1	0	0	1	-	0	3	0	0	3	-	
<b>Bicycles on Road %</b>	0%	0%	0%	0%	0%	-	0%	2.3%	5.3%	0%	2.6%	-	0%	0.2%	0%	0%	0.2%	-	0%	9.4%	0%	0%	4.1%	-	
<b>Pedestrians</b>	-	-	-	-	16	-	-	-	-	-	37	-	-	-	-	-	52	-	-	-	-	-	45	-	
<b>Pedestrians %</b>	-	-	-	-	10.5%	-	-	-	-	-	24.2%	-	-	-	-	-	34%	-	-	-	-	-	29.4%	-	
<b>Bicycles on Crosswalk</b>	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	1	-	
<b>Bicycles on Crosswalk %</b>	-	-	-	-	0.7%	-	-	-	-	-	0.7%	-	-	-	-	-	0%	-	-	-	-	-	0.7%	-	

Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (18.14 °C)



Peak Hour: 04:15 PM - 05:15 PM Weather: Overcast Clouds (20.65 °C)





Turning Movement Count (3 . YOUNG ST & CATHARINE ST)

Start Time	N Approach CATHARINE ST						E Approach YOUNG ST						S Approach CATHARINE ST						W Approach YOUNG ST						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total		
07:00:00	6	3	1	0	2	10	0	10	3	0	2	13	0	0	0	0	3	0	1	2	0	0	3	3	26	
07:15:00	2	6	0	0	3	8	0	20	3	1	5	24	0	0	0	0	5	0	2	6	0	0	4	8	40	
07:30:00	1	9	3	0	1	13	0	28	1	0	3	29	0	0	0	0	2	0	1	7	0	0	1	8	50	
07:45:00	3	1	3	0	1	7	0	21	5	0	1	26	0	0	0	0	1	0	1	11	0	0	2	12	45	161
08:00:00	5	6	0	0	5	11	0	22	5	1	3	28	0	0	0	0	1	0	2	12	0	0	3	14	53	188
08:15:00	4	2	2	0	2	8	0	27	5	0	4	32	0	0	0	0	4	0	3	14	0	0	5	17	57	205
08:30:00	5	6	3	0	3	14	0	23	4	0	5	27	0	0	0	0	3	0	1	9	0	0	3	10	51	206
08:45:00	3	5	1	0	4	9	0	25	8	0	1	33	0	0	0	0	4	0	2	13	0	0	8	15	57	218
09:00:00	3	9	1	0	5	13	0	17	4	0	4	21	0	0	0	0	6	0	0	11	0	0	0	11	45	210
09:15:00	3	4	1	0	2	8	0	28	5	0	4	33	0	0	0	0	1	0	1	9	0	0	0	10	51	204
09:30:00	5	3	2	0	1	10	0	18	9	0	1	27	0	0	0	0	3	0	0	1	0	0	0	1	38	191
09:45:00	7	2	0	0	6	9	0	25	4	0	1	29	0	0	0	0	1	0	2	11	0	0	2	13	51	185
***BREAK***																										
16:00:00	4	21	8	0	2	33	0	14	4	0	4	18	0	0	0	0	11	0	3	22	0	0	7	25	76	
16:15:00	3	13	3	0	6	19	0	19	2	0	4	21	0	1	0	0	3	1	4	15	0	0	6	19	60	
16:30:00	4	9	3	0	6	16	0	21	3	0	4	24	0	0	0	0	9	0	3	15	0	0	8	18	58	
16:45:00	5	15	2	0	19	22	0	14	11	0	13	25	0	0	0	0	12	0	3	21	0	0	12	24	71	265
17:00:00	4	23	6	0	9	33	0	13	4	0	5	17	0	0	0	0	10	0	2	15	0	0	10	17	67	256
17:15:00	7	13	3	0	4	23	0	13	8	0	5	21	0	0	0	0	7	0	3	21	0	0	9	24	68	264
17:30:00	2	22	2	0	3	26	0	18	4	0	7	22	0	0	0	0	4	0	5	14	0	0	7	19	67	273
17:45:00	3	16	2	0	15	21	0	15	4	0	0	19	0	0	0	0	9	0	1	11	0	0	3	12	52	254
18:00:00	3	10	4	0	17	17	0	21	6	0	7	27	0	0	0	0	6	0	2	10	0	0	5	12	56	243
18:15:00	5	10	2	0	14	17	0	18	7	0	7	25	0	0	0	0	6	0	6	12	0	0	10	18	60	235
18:30:00	0	17	2	0	7	19	0	25	8	0	4	33	0	0	0	0	7	0	6	8	0	0	9	14	66	234
18:45:00	3	12	3	0	4	18	0	17	6	0	4	23	0	0	2	0	6	2	2	6	0	0	5	8	51	233
<b>Grand Total</b>	<b>90</b>	<b>237</b>	<b>57</b>	<b>0</b>	<b>141</b>	<b>384</b>	<b>0</b>	<b>472</b>	<b>123</b>	<b>2</b>	<b>98</b>	<b>597</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>124</b>	<b>3</b>	<b>56</b>	<b>276</b>	<b>0</b>	<b>0</b>	<b>122</b>	<b>332</b>	<b>1316</b>	<b>-</b>
<b>Approach%</b>	23.4%	61.7%	14.8%	0%	-	-	0%	79.1%	20.6%	0.3%	-	-	0%	33.3%	66.7%	0%	-	-	16.9%	83.1%	0%	0%	-	-	-	-
<b>Totals %</b>	6.8%	18%	4.3%	0%	29.2%	29.2%	0%	35.9%	9.3%	0.2%	45.4%	45.4%	0%	0.1%	0.2%	0%	0.2%	0.2%	4.3%	21%	0%	0%	25.2%	-	-	-
<b>Heavy</b>	0	3	3	0	-	-	0	8	2	0	-	-	0	0	0	0	-	-	0	3	0	0	-	-	-	-
<b>Heavy %</b>	0%	1.3%	5.3%	0%	-	-	0%	1.7%	1.6%	0%	-	-	0%	0%	0%	0%	-	-	0%	1.1%	0%	0%	-	-	-	-
<b>Bicycles</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Bicycle %</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Peak Hour: 08:00 AM - 09:00 AM Weather: Light Rain (18.14 °C)

Start Time	N Approach CATHARINE ST						E Approach YOUNG ST						S Approach CATHARINE ST						W Approach YOUNG ST						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
08:00:00	5	6	0	0	5	11	0	22	5	1	3	28	0	0	0	0	1	0	2	12	0	0	3	14	53
08:15:00	4	2	2	0	2	8	0	27	5	0	4	32	0	0	0	0	4	0	3	14	0	0	5	17	57
08:30:00	5	6	3	0	3	14	0	23	4	0	5	27	0	0	0	0	3	0	1	9	0	0	3	10	51
08:45:00	3	5	1	0	4	9	0	25	8	0	1	33	0	0	0	0	4	0	2	13	0	0	8	15	57
<b>Grand Total</b>	<b>17</b>	<b>19</b>	<b>6</b>	<b>0</b>	<b>14</b>	<b>42</b>	<b>0</b>	<b>97</b>	<b>22</b>	<b>1</b>	<b>13</b>	<b>120</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>12</b>	<b>0</b>	<b>8</b>	<b>48</b>	<b>0</b>	<b>0</b>	<b>19</b>	<b>56</b>	<b>218</b>
<b>Approach%</b>	40.5%	45.2%	14.3%	0%	-	-	0%	80.8%	18.3%	0.8%	-	-	0%	0%	0%	0%	-	14.3%	85.7%	0%	0%	-	-	-	
<b>Totals %</b>	7.8%	8.7%	2.8%	0%	19.3%	19.3%	0%	44.5%	10.1%	0.5%	55%	55%	0%	0%	0%	0%	0%	3.7%	22%	0%	0%	25.7%	25.7%	-	
<b>PHF</b>	0.85	0.79	0.5	0	0.75	0.75	0	0.9	0.69	0.25	0.91	0.91	0	0	0	0	0	0.67	0.86	0	0	0.82	0.82	-	
<b>Heavy</b>	0	1	1	0	2	2	0	3	2	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	-
<b>Heavy %</b>	0%	5.3%	16.7%	0%	4.8%	4.8%	0%	3.1%	9.1%	0%	4.2%	4.2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-
<b>Lights</b>	17	18	5	0	40	40	0	94	20	1	115	115	0	0	0	0	0	8	47	0	0	55	55	-	
<b>Lights %</b>	100%	94.7%	83.3%	0%	95.2%	95.2%	0%	96.9%	90.9%	100%	95.8%	95.8%	0%	0%	0%	0%	0%	100%	97.9%	0%	0%	98.2%	98.2%	-	
<b>Single-Unit Trucks</b>	0	0	1	0	1	1	0	2	2	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	-
<b>Single-Unit Trucks %</b>	0%	0%	16.7%	0%	2.4%	2.4%	0%	2.1%	9.1%	0%	3.3%	3.3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-
<b>Buses</b>	0	1	0	0	1	1	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	-
<b>Buses %</b>	0%	5.3%	0%	0%	2.4%	2.4%	0%	1%	0%	0%	0.8%	0.8%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-
<b>Bicycles on Road</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	-	
<b>Bicycles on Road %</b>	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2.1%	0%	0%	1.8%	1.8%	-	
<b>Pedestrians</b>	-	-	-	-	14	14	-	-	-	13	13	13	-	-	-	-	12	-	-	-	-	19	19	-	
<b>Pedestrians%</b>	-	-	-	-	24.1%	24.1%	-	-	-	22.4%	22.4%	22.4%	-	-	-	-	20.7%	-	-	-	-	32.8%	32.8%	-	
<b>Bicycles on Crosswalk</b>	-	-	-	-	0	0	-	-	-	0	0	0	-	-	-	-	0	-	-	-	-	0	0	-	
<b>Bicycles on Crosswalk%</b>	-	-	-	-	0%	0%	-	-	-	0%	0%	0%	-	-	-	-	0%	-	-	-	-	0%	0%	-	



**Peak Hour: 04:45 PM - 05:45 PM Weather: Overcast Clouds (20.65 °C)**

Start Time	N Approach CATHARINE ST						E Approach YOUNG ST						S Approach CATHARINE ST						W Approach YOUNG ST						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
16:45:00	5	15	2	0	19	22	0	14	11	0	13	25	0	0	0	0	12	0	3	21	0	0	12	24	71
17:00:00	4	23	6	0	9	33	0	13	4	0	5	17	0	0	0	0	10	0	2	15	0	0	10	17	67
17:15:00	7	13	3	0	4	23	0	13	8	0	5	21	0	0	0	0	7	0	3	21	0	0	9	24	68
17:30:00	2	22	2	0	3	26	0	18	4	0	7	22	0	0	0	0	4	0	5	14	0	0	7	19	67
<b>Grand Total</b>	<b>18</b>	<b>73</b>	<b>13</b>	<b>0</b>	<b>35</b>	<b>104</b>	<b>0</b>	<b>58</b>	<b>27</b>	<b>0</b>	<b>30</b>	<b>85</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>33</b>	<b>0</b>	<b>13</b>	<b>71</b>	<b>0</b>	<b>0</b>	<b>38</b>	<b>84</b>	<b>273</b>
<b>Approach%</b>	17.3%	70.2%	12.5%	0%		-	0%	68.2%	31.8%	0%		-	0%	0%	0%	0%		-	15.5%	84.5%	0%	0%		-	-
<b>Totals %</b>	6.6%	26.7%	4.8%	0%		38.1%	0%	21.2%	9.9%	0%		31.1%	0%	0%	0%	0%		0%	4.8%	26%	0%	0%		30.8%	-
<b>PHF</b>	0.64	0.79	0.54	0		0.79	0	0.81	0.61	0		0.85	0	0	0	0		0	0.65	0.85	0	0		0.88	-
<b>Heavy</b>	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	1	0	0		1	-
<b>Heavy %</b>	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	1.4%	0%	0%		1.2%	-
<b>Lights</b>	17	73	13	0		103	0	53	27	0		80	0	0	0	0		0	13	67	0	0		80	-
<b>Lights %</b>	94.4%	100%	100%	0%		99%	0%	91.4%	100%	0%		94.1%	0%	0%	0%	0%		0%	100%	94.4%	0%	0%		95.2%	-
<b>Single-Unit Trucks</b>	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	1	0	0		1	-
<b>Single-Unit Trucks %</b>	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	1.4%	0%	0%		1.2%	-
<b>Buses</b>	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	-
<b>Buses %</b>	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	-
<b>Bicycles on Road</b>	1	0	0	0		1	0	5	0	0		5	0	0	0	0		0	0	3	0	0		3	-
<b>Bicycles on Road %</b>	5.6%	0%	0%	0%		1%	0%	8.6%	0%	0%		5.9%	0%	0%	0%	0%		0%	0%	4.2%	0%	0%		3.6%	-
<b>Pedestrians</b>	-	-	-	-	35		-	-	-	-	29		-	-	-	-	33		-	-	-	-	38		-
<b>Pedestrians%</b>	-	-	-	-	25.7%		-	-	-	-	21.3%		-	-	-	-	24.3%		-	-	-	-	27.9%		-
<b>Bicycles on Crosswalk</b>	-	-	-	-	0		-	-	-	-	1		-	-	-	-	0		-	-	-	-	0		-
<b>Bicycles on Crosswalk%</b>	-	-	-	-	0%		-	-	-	-	0.7%		-	-	-	-	0%		-	-	-	-	0%		-



Peak Hour: 08:00 AM - 09:00 AM Weather: Light Rain (18.14 °C)



Peak Hour: 04:45 PM - 05:45 PM Weather: Overcast Clouds (20.65 °C)





Turning Movement Count (5 . YOUNG ST & WALNUT ST S)

Start Time	N Approach WALNUT ST S						E Approach YOUNG ST						S Approach WALNUT ST S						W Approach YOUNG ST						Int. Total (15 min)	Int. Total (1 hr)	
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total			
07:00:00	0	3	0	0	1	3	0	8	3	0	3	11	1	10	5	0	2	16	0	5	1	0	0	6	36		
07:15:00	1	3	0	0	1	4	2	19	3	0	1	24	2	9	2	0	1	13	0	3	2	0	2	5	46		
07:30:00	2	3	0	0	4	5	2	23	3	0	0	28	2	17	0	0	1	19	1	9	0	0	3	10	62		
07:45:00	0	6	0	0	0	6	0	21	5	0	0	26	3	28	3	0	0	34	0	11	4	0	0	15	81	225	
08:00:00	1	11	3	0	0	15	6	22	9	0	3	37	1	17	5	0	2	23	1	9	5	0	6	15	90	279	
08:15:00	3	14	1	0	1	18	10	17	12	0	10	39	3	20	7	0	2	30	3	7	6	0	8	16	103	336	
08:30:00	2	13	0	0	1	15	7	20	6	0	6	33	6	16	8	0	2	30	2	3	8	0	4	13	91	365	
08:45:00	3	4	3	0	1	10	6	21	5	0	3	32	1	20	5	0	4	26	2	6	3	0	2	11	79	363	
09:00:00	1	4	0	0	4	5	1	17	4	0	0	22	5	20	2	0	5	27	1	9	4	0	3	14	68	341	
09:15:00	5	3	3	0	1	11	1	20	1	0	0	22	5	9	10	0	3	24	1	7	2	0	0	10	67	305	
09:30:00	2	2	2	0	0	6	0	19	0	0	0	19	1	11	7	0	0	19	1	2	0	0	2	3	47	261	
09:45:00	1	4	3	0	1	8	1	20	5	0	1	26	4	5	6	0	3	15	0	5	4	0	3	9	58	240	
***BREAK***																											
16:00:00	0	9	2	0	1	11	3	16	2	0	4	21	0	6	4	0	3	10	13	16	2	0	8	31	73		
16:15:00	1	13	6	0	4	20	5	19	4	0	2	28	3	8	4	0	4	15	1	18	2	0	3	21	84		
16:30:00	1	15	6	0	4	22	4	22	2	0	2	28	2	8	3	0	6	13	3	13	3	0	5	19	82		
16:45:00	3	10	3	0	6	16	5	19	3	0	6	27	6	9	3	0	8	18	3	16	5	0	12	24	85	324	
17:00:00	1	9	3	0	5	13	4	14	4	0	4	22	0	8	5	0	6	13	6	10	4	0	12	20	68	319	
17:15:00	1	6	4	0	3	11	2	15	3	0	11	20	1	14	2	0	3	17	4	19	3	0	4	26	74	309	
17:30:00	1	9	5	0	6	15	6	17	3	0	5	26	1	6	4	0	4	11	0	13	2	0	1	15	67	294	
17:45:00	1	10	6	0	15	17	2	12	4	0	2	18	1	8	4	0	4	13	2	9	1	0	4	12	60	269	
18:00:00	1	5	6	0	7	12	0	22	2	0	5	24	0	8	8	0	5	16	1	9	1	0	7	11	63	264	
18:15:00	3	7	1	0	4	11	1	18	1	0	3	20	1	5	2	0	5	8	1	7	2	0	6	10	49	239	
18:30:00	1	5	5	0	12	11	2	25	1	0	3	28	4	9	6	0	6	19	2	5	2	0	3	9	67	239	
18:45:00	1	7	3	0	0	11	2	13	3	0	1	18	0	8	6	0	3	14	2	6	1	0	6	9	52	231	
<b>Grand Total</b>	<b>36</b>	<b>175</b>	<b>65</b>	<b>0</b>	<b>82</b>	<b>276</b>	<b>72</b>	<b>439</b>	<b>88</b>	<b>0</b>	<b>75</b>	<b>599</b>	<b>53</b>	<b>279</b>	<b>111</b>	<b>0</b>	<b>82</b>	<b>443</b>	<b>50</b>	<b>217</b>	<b>67</b>	<b>0</b>	<b>104</b>	<b>334</b>	<b>1652</b>	<b>-</b>	
<b>Approach%</b>	13%	63.4%	23.8%	0%	-	-	12%	73.3%	14.7%	0%	-	-	12%	63%	25.1%	0%	-	15%	65%	20.1%	0%	-	-	-	-	-	
<b>Totals %</b>	2.2%	10.6%	3.9%	0%	-	16.7%	4.4%	26.6%	5.3%	0%	-	36.3%	3.2%	16.9%	6.7%	0%	-	26.8%	3%	13.1%	4.1%	0%	-	20.2%	-	-	
<b>Heavy</b>	1	5	0	0	-	-	0	11	3	0	-	-	1	7	0	0	-	-	1	3	2	0	-	-	-	-	
<b>Heavy %</b>	2.8%	2.9%	0%	0%	-	-	0%	2.5%	3.4%	0%	-	-	1.9%	2.5%	0%	0%	-	-	2%	1.4%	3%	0%	-	-	-	-	
<b>Bicycles</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Bicycle %</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (18.14 °C)

Start Time	N Approach WALNUT ST S						E Approach YOUNG ST						S Approach WALNUT ST S						W Approach YOUNG ST						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
07:45:00	0	6	0	0	0	6	0	21	5	0	0	26	3	28	3	0	0	34	0	11	4	0	0	15	81
08:00:00	1	11	3	0	0	15	6	22	9	0	3	37	1	17	5	0	2	23	1	9	5	0	6	15	90
08:15:00	3	14	1	0	1	18	10	17	12	0	10	39	3	20	7	0	2	30	3	7	6	0	8	16	103
08:30:00	2	13	0	0	1	15	7	20	6	0	6	33	6	16	8	0	2	30	2	3	8	0	4	13	91
<b>Grand Total</b>	<b>6</b>	<b>44</b>	<b>4</b>	<b>0</b>	<b>2</b>	<b>54</b>	<b>23</b>	<b>80</b>	<b>32</b>	<b>0</b>	<b>19</b>	<b>135</b>	<b>13</b>	<b>81</b>	<b>23</b>	<b>0</b>	<b>6</b>	<b>117</b>	<b>6</b>	<b>30</b>	<b>23</b>	<b>0</b>	<b>18</b>	<b>59</b>	<b>365</b>
<b>Approach%</b>	11.1%	81.5%	7.4%	0%	-	-	17%	59.3%	23.7%	0%	-	-	11.1%	69.2%	19.7%	0%	-	-	10.2%	50.8%	39%	0%	-	-	-
<b>Totals %</b>	1.6%	12.1%	1.1%	0%	14.8%	6.3%	21.9%	8.8%	0%	37%	3.6%	22.2%	6.3%	0%	32.1%	1.6%	8.2%	6.3%	0%	16.2%	-	-	-	-	-
<b>PHF</b>	0.5	0.79	0.33	0	0.75	0.58	0.91	0.67	0	0.87	0.54	0.72	0.72	0	0.86	0.5	0.68	0.72	0	0.92	-	-	-	-	-
<b>Heavy</b>	0	2	0	0	2	0	6	0	0	6	1	4	0	0	5	1	1	0	0	2	-	-	-	-	-
<b>Heavy %</b>	0%	4.5%	0%	0%	3.7%	0%	7.5%	0%	0%	4.4%	7.7%	4.9%	0%	0%	4.3%	16.7%	3.3%	0%	0%	3.4%	-	-	-	-	-
<b>Lights</b>	6	41	4	0	51	23	73	32	0	128	12	77	23	0	112	5	28	23	0	56	-	-	-	-	-
<b>Lights %</b>	100%	93.2%	100%	0%	94.4%	100%	91.3%	100%	0%	94.8%	92.3%	95.1%	100%	0%	95.7%	83.3%	93.3%	100%	0%	94.9%	-	-	-	-	-
<b>Single-Unit Trucks</b>	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	1	0	0	0	1	-	-	-	-	-
<b>Single-Unit Trucks %</b>	0%	0%	0%	0%	0%	0%	5%	0%	0%	3%	0%	0%	0%	0%	0%	16.7%	0%	0%	0%	1.7%	-	-	-	-	-
<b>Buses</b>	0	2	0	0	2	0	2	0	0	2	1	4	0	0	5	0	1	0	0	1	-	-	-	-	-
<b>Buses %</b>	0%	4.5%	0%	0%	3.7%	0%	2.5%	0%	0%	1.5%	7.7%	4.9%	0%	0%	4.3%	0%	3.3%	0%	0%	1.7%	-	-	-	-	-
<b>Bicycles on Road</b>	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	-	-	-	-	-
<b>Bicycles on Road %</b>	0%	2.3%	0%	0%	1.9%	0%	1.3%	0%	0%	0.7%	0%	0%	0%	0%	0%	0%	3.3%	0%	0%	1.7%	-	-	-	-	-
<b>Pedestrians</b>	-	-	-	-	2	-	-	-	-	19	-	-	-	-	6	-	-	-	-	18	-	-	-	-	-
<b>Pedestrians%</b>	-	-	-	-	4.4%	-	-	-	-	42.2%	-	-	-	-	13.3%	-	-	-	-	40%	-	-	-	-	-
<b>Bicycles on Crosswalk</b>	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-
<b>Bicycles on Crosswalk%</b>	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	-



Peak Hour: 04:00 PM - 05:00 PM Weather: Overcast Clouds (20.65 °C)

Start Time	N Approach WALNUT ST S						E Approach YOUNG ST						S Approach WALNUT ST S						W Approach YOUNG ST						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
16:00:00	0	9	2	0	1	11	3	16	2	0	4	21	0	6	4	0	3	10	13	16	2	0	8	31	73
16:15:00	1	13	6	0	4	20	5	19	4	0	2	28	3	8	4	0	4	15	1	18	2	0	3	21	84
16:30:00	1	15	6	0	4	22	4	22	2	0	2	28	2	8	3	0	6	13	3	13	3	0	5	19	82
16:45:00	3	10	3	0	6	16	5	19	3	0	6	27	6	9	3	0	8	18	3	16	5	0	12	24	85
<b>Grand Total</b>	<b>5</b>	<b>47</b>	<b>17</b>	<b>0</b>	<b>15</b>	<b>69</b>	<b>17</b>	<b>76</b>	<b>11</b>	<b>0</b>	<b>14</b>	<b>104</b>	<b>11</b>	<b>31</b>	<b>14</b>	<b>0</b>	<b>21</b>	<b>56</b>	<b>20</b>	<b>63</b>	<b>12</b>	<b>0</b>	<b>28</b>	<b>95</b>	<b>324</b>
<b>Approach%</b>	7.2%	68.1%	24.6%	0%	-	-	16.3%	73.1%	10.6%	0%	-	-	19.6%	55.4%	25%	0%	-	-	21.1%	66.3%	12.6%	0%	-	-	-
<b>Totals %</b>	1.5%	14.5%	5.2%	0%	21.3%	21.3%	5.2%	23.5%	3.4%	0%	32.1%	32.1%	3.4%	9.6%	4.3%	0%	17.3%	17.3%	6.2%	19.4%	3.7%	0%	29.3%	29.3%	-
<b>PHF</b>	0.42	0.78	0.71	0	0.78	0.78	0.85	0.86	0.69	0	0.93	0.93	0.46	0.86	0.88	0	0.78	0.78	0.38	0.88	0.6	0	0.77	0.77	-
<b>Heavy</b>	0	0	0	0	0	0	0	1	1	0	2	2	0	0	0	0	0	0	0	0	1	0	1	1	-
<b>Heavy %</b>	0%	0%	0%	0%	0%	0%	0%	1.3%	9.1%	0%	1.9%	1.9%	0%	0%	0%	0%	0%	0%	0%	0%	8.3%	0%	1.1%	1.1%	-
<b>Lights</b>	5	47	17	0	69	69	17	72	10	0	99	99	10	31	14	0	55	55	20	55	11	0	86	86	-
<b>Lights %</b>	100%	100%	100%	0%	100%	100%	100%	94.7%	90.9%	0%	95.2%	95.2%	90.9%	100%	100%	0%	98.2%	98.2%	100%	87.3%	91.7%	0%	90.5%	90.5%	-
<b>Single-Unit Trucks</b>	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	1	0	1	1	-
<b>Single-Unit Trucks %</b>	0%	0%	0%	0%	0%	0%	0%	0%	9.1%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	8.3%	0%	1.1%	1.1%	-
<b>Buses</b>	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	-
<b>Buses %</b>	0%	0%	0%	0%	0%	0%	0%	1.3%	0%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-
<b>Bicycles on Road</b>	0	0	0	0	0	0	0	3	0	0	3	3	1	0	0	0	1	1	0	8	0	0	8	8	-
<b>Bicycles on Road %</b>	0%	0%	0%	0%	0%	0%	0%	3.9%	0%	0%	2.9%	2.9%	9.1%	0%	0%	0%	1.8%	1.8%	0%	12.7%	0%	0%	8.4%	8.4%	-
<b>Pedestrians</b>	-	-	-	-	15	-	-	-	-	-	14	-	-	-	-	-	21	-	-	-	-	-	28	-	-
<b>Pedestrians%</b>	-	-	-	-	19.2%	-	-	-	-	-	17.9%	-	-	-	-	-	26.9%	-	-	-	-	-	35.9%	-	-
<b>Bicycles on Crosswalk</b>	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
<b>Bicycles on Crosswalk%</b>	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-

Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (18.14 °C)



Peak Hour: 04:00 PM - 05:00 PM Weather: Overcast Clouds (20.65 °C)





















# **Appendix C**

## **Existing Traffic Level of Service Calculations**



Lanes, Volumes, Timings  
3: John Street South & Young Street

08-01-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	24	6	23	49	36	49	750	18	4	190	27
Future Volume (vph)	29	24	6	23	49	36	49	750	18	4	190	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	15.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1668	1813	0	0	1699	0	0	3326	0	0	3312	0
Flt Permitted	0.512				0.931			0.918			0.945	
Satd. Flow (perm)	891	1813	0	0	1590	0	0	3055	0	0	3132	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			28			4			29	
Link Speed (k/h)		40			40			50			50	
Link Distance (m)		56.2			95.6			98.8			61.1	
Travel Time (s)		5.1			8.6			7.1			4.4	
Confl. Peds. (#/hr)	8		20	20		8	27		19	19		27
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	0%	0%	4%	4%	3%	2%	7%	0%	0%	5%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	4
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	31	32	0	0	117	0	0	878	0	0	237	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			2			6	
Permitted Phases	8			4			2			6		
Detector Phase	8	8		4	4		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.7	24.7		23.5	23.5		28.7	28.7		28.7	28.7	
Total Split (s)	30.0	30.0		30.0	30.0		60.0	60.0		60.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%		66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	24.3	24.3		25.5	25.5		54.3	54.3		54.3	54.3	
Yellow Time (s)	3.3	3.3		3.5	3.5		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.4	2.4		1.0	1.0		2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	-1.0	-1.0			-1.0			-1.0			-1.0	
Total Lost Time (s)	4.7	4.7			3.5			4.7			4.7	

Lanes, Volumes, Timings  
 3: John Street South & Young Street

08-01-2022

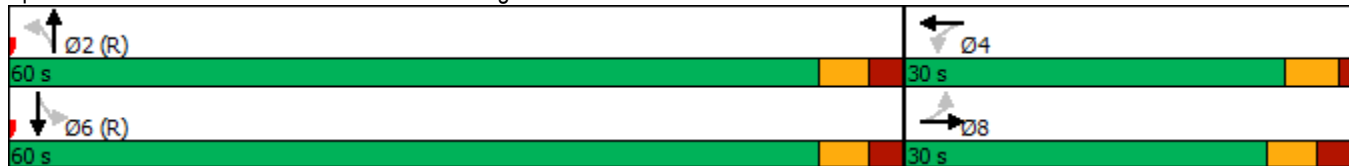


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	8.0	8.0		8.0	8.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	12.1	12.1			13.0			72.6			72.6	
Actuated g/C Ratio	0.13	0.13			0.14			0.81			0.81	
v/c Ratio	0.26	0.13			0.46			0.36			0.09	
Control Delay	40.2	30.1			32.5			3.8			2.5	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	40.2	30.1			32.5			3.8			2.5	
LOS	D	C			C			A			A	
Approach Delay		35.1			32.5			3.8			2.5	
Approach LOS		D			C			A			A	
Queue Length 50th (m)	5.2	4.3			15.1			20.6			3.7	
Queue Length 95th (m)	13.5	12.1			30.6			35.3			7.9	
Internal Link Dist (m)		32.2			71.6			74.8			37.1	
Turn Bay Length (m)	15.0											
Base Capacity (vph)	250	513			487			2465			2532	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.12	0.06			0.24			0.36			0.09	

Intersection Summary

Area Type: Other  
 Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 28 (31%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green  
 Natural Cycle: 55  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.46  
 Intersection Signal Delay: 7.6  
 Intersection Capacity Utilization 65.9%  
 Analysis Period (min) 15  
 Intersection LOS: A  
 ICU Level of Service C

Splits and Phases: 3: John Street South & Young Street



# HCM Unsignalized Intersection Capacity Analysis

## 6: John Street South & Forest Avenue

08-01-2022


















Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔						↕			↕	
Traffic Volume (veh/h)	32	34	27	0	0	0	0	804	17	10	210	0
Future Volume (Veh/h)	32	34	27	0	0	0	0	804	17	10	210	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	34	36	29	0	0	0	0	855	18	11	223	0
Pedestrians		18			19			17			19	
Lane Width (m)		3.5			0.0			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			1			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)											99	
pX, platoon unblocked												
vC, conflicting volume	710	1155	146	1080	1146	474	241			892		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	710	1155	146	1080	1146	474	241			892		
tC, single (s)	7.5	6.5	7.0	7.5	6.5	6.9	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	89	81	97	100	100	100	100			98		
cM capacity (veh/h)	308	193	834	139	195	533	1318			708		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>	<b>SB 2</b>							
Volume Total	99	570	303	85	149							
Volume Left	34	0	0	11	0							
Volume Right	29	0	18	0	0							
cSH	298	1700	1700	708	1700							
Volume to Capacity	0.33	0.34	0.18	0.02	0.09							
Queue Length 95th (m)	11.3	0.0	0.0	0.4	0.0							
Control Delay (s)	23.0	0.0	0.0	1.5	0.0							
Lane LOS	C			A								
Approach Delay (s)	23.0	0.0		0.5								
Approach LOS	C											
<b>Intersection Summary</b>												
Average Delay			2.0									
Intersection Capacity Utilization			42.3%			ICU Level of Service				A		
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis















## 9: Catharine Street South & Young Street

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	48	8	22	97	0	0	0	0	6	190	17
Future Volume (vph)	0	48	8	22	97	0	0	0	0	6	190	17
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	53	9	24	107	0	0	0	0	7	209	19
Direction, Lane #	EB 1	WB 1	SB 1									
Volume Total (vph)	62	131	235									
Volume Left (vph)	0	24	7									
Volume Right (vph)	9	0	19									
Hadj (s)	-0.09	0.11	0.04									
Departure Headway (s)	4.5	4.6	4.4									
Degree Utilization, x	0.08	0.17	0.29									
Capacity (veh/h)	738	730	786									
Control Delay (s)	7.9	8.6	9.2									
Approach Delay (s)	7.9	8.6	9.2									
Approach LOS	A	A	A									
Intersection Summary												
Delay			8.8									
Level of Service			A									
Intersection Capacity Utilization			35.9%	ICU Level of Service								A
Analysis Period (min)			15									

















HCM Unsignalized Intersection Capacity Analysis  
 10: Catharine Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	45	18	0	0	0	0	0	0	26	21	0
Future Volume (vph)	0	45	18	0	0	0	0	0	0	26	21	0
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Hourly flow rate (vph)	0	62	25	0	0	0	0	0	0	36	29	0
Direction, Lane #	EB 1	SB 1										
Volume Total (vph)	87	65										
Volume Left (vph)	0	36										
Volume Right (vph)	25	0										
Hadj (s)	-0.09	0.22										
Departure Headway (s)	4.0	4.3										
Degree Utilization, x	0.10	0.08										
Capacity (veh/h)	889	810										
Control Delay (s)	7.4	7.7										
Approach Delay (s)	7.4	7.7										
Approach LOS	A	A										
<b>Intersection Summary</b>												
Delay			7.5									
Level of Service			A									
Intersection Capacity Utilization			25.2%		ICU Level of Service					A		
Analysis Period (min)			15									
















HCM Unsignalized Intersection Capacity Analysis  
 13: Walnut Street South & Young Street

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	23	30	6	32	80	23	23	81	13	4	44	6
Future Volume (vph)	23	30	6	32	80	23	23	81	13	4	44	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	33	7	35	87	25	25	88	14	4	48	7
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	65	147	127	59								
Volume Left (vph)	25	35	25	4								
Volume Right (vph)	7	25	14	7								
Hadj (s)	0.07	0.03	0.05	0.01								
Departure Headway (s)	4.6	4.4	4.5	4.6								
Degree Utilization, x	0.08	0.18	0.16	0.07								
Capacity (veh/h)	745	767	756	737								
Control Delay (s)	8.0	8.4	8.4	7.9								
Approach Delay (s)	8.0	8.4	8.4	7.9								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.3									
Level of Service			A									
Intersection Capacity Utilization			28.2%	ICU Level of Service	A							
Analysis Period (min)			15									




















HCM Unsignalized Intersection Capacity Analysis  
 14: Walnut Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	26	28	22	0	0	0	0	86	13	35	47	0
Future Volume (vph)	26	28	22	0	0	0	0	86	13	35	47	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	30	33	26	0	0	0	0	100	15	41	55	0
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total (vph)	89	115	96									
Volume Left (vph)	30	0	41									
Volume Right (vph)	26	15	0									
Hadj (s)	-0.03	0.01	0.15									
Departure Headway (s)	4.3	4.2	4.4									
Degree Utilization, x	0.11	0.13	0.12									
Capacity (veh/h)	791	824	801									
Control Delay (s)	7.9	7.9	8.0									
Approach Delay (s)	7.9	7.9	8.0									
Approach LOS	A	A	A									
Intersection Summary												
Delay			7.9									
Level of Service			A									
Intersection Capacity Utilization			32.2%	ICU Level of Service								A
Analysis Period (min)			15									

Lanes, Volumes, Timings  
3: John Street South & Young Street

08-01-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	32	22	19	44	15	33	565	20	7	429	41
Future Volume (vph)	20	32	22	19	44	15	33	565	20	7	429	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	15.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1785	1704	0	0	1774	0	0	3318	0	0	3455	0
Flt Permitted	0.643				0.919			0.908			0.947	
Satd. Flow (perm)	1184	1704	0	0	1623	0	0	3015	0	0	3273	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		23			14			7			20	
Link Speed (k/h)		40			40			50			50	
Link Distance (m)		56.2			95.6			98.8			61.1	
Travel Time (s)		5.1			8.6			7.1			4.4	
Confl. Peds. (#/hr)	17		52	52		17	46		38	38		46
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	5%	0%	0%	0%	7%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	4
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	21	57	0	0	83	0	0	657	0	0	507	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			2			6	
Permitted Phases	8			4			2			6		
Detector Phase	8	8		4	4		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.7	24.7		23.5	23.5		28.7	28.7		28.7	28.7	
Total Split (s)	30.0	30.0		30.0	30.0		60.0	60.0		60.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%		66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	24.3	24.3		25.5	25.5		54.3	54.3		54.3	54.3	
Yellow Time (s)	3.3	3.3		3.5	3.5		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.4	2.4		1.0	1.0		2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	-1.0	-1.0			-1.0			-1.0			-1.0	
Total Lost Time (s)	4.7	4.7			3.5			4.7			4.7	



Lanes, Volumes, Timings  
 3: John Street South & Young Street

08-01-2022

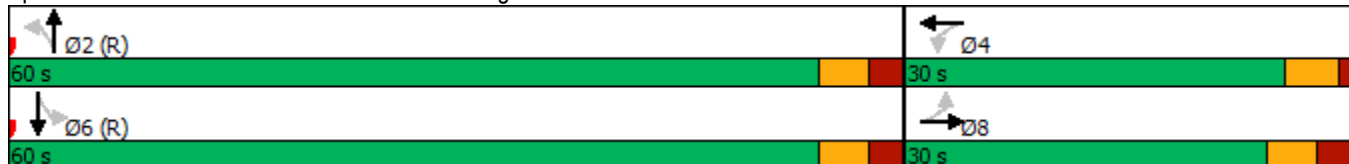


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	8.0	8.0		8.0	8.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	11.4	11.4			12.3			73.3			73.3	
Actuated g/C Ratio	0.13	0.13			0.14			0.81			0.81	
v/c Ratio	0.14	0.24			0.35			0.27			0.19	
Control Delay	37.1	26.5			33.9			3.0			2.6	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	37.1	26.5			33.9			3.0			2.6	
LOS	D	C			C			A			A	
Approach Delay		29.4			33.9			3.0			2.6	
Approach LOS		C			C			A			A	
Queue Length 50th (m)	3.5	5.6			11.5			13.9			9.6	
Queue Length 95th (m)	10.4	16.6			25.0			21.6			15.4	
Internal Link Dist (m)		32.2			71.6			74.8			37.1	
Turn Bay Length (m)	15.0											
Base Capacity (vph)	332	495			487			2457			2669	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.06	0.12			0.17			0.27			0.19	

Intersection Summary
















Area Type: Other  
 Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 28 (31%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green  
 Natural Cycle: 55  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.35  
 Intersection Signal Delay: 6.4  
 Intersection Capacity Utilization 62.9%  
 Analysis Period (min) 15  
 Intersection LOS: A  
 ICU Level of Service B

Splits and Phases: 3: John Street South & Young Street



HCM Unsignalized Intersection Capacity Analysis  
6: John Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	32	31	0	0	0	0	586	22	10	461	0
Future Volume (Veh/h)	36	32	31	0	0	0	0	586	22	10	461	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	37	33	32	0	0	0	0	604	23	10	475	0
Pedestrians		18			19			17			19	
Lane Width (m)		3.5			0.0			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			1			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)											99	
pX, platoon unblocked	0.99	0.99	0.99	0.99	0.99		0.99					
vC, conflicting volume	834	1159	272	958	1148	352	493			646		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	807	1136	238	932	1124	352	462			646		
tC, single (s)	7.5	6.6	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	86	83	96	100	100	100	100			99		
cM capacity (veh/h)	260	192	738	178	199	641	1080			949		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>	<b>SB 2</b>							
Volume Total	102	403	224	168	317							
Volume Left	37	0	0	10	0							
Volume Right	32	0	23	0	0							
cSH	285	1700	1700	949	1700							
Volume to Capacity	0.36	0.24	0.13	0.01	0.19							
Queue Length 95th (m)	12.5	0.0	0.0	0.3	0.0							
Control Delay (s)	24.5	0.0	0.0	0.6	0.0							
Lane LOS	C			A								
Approach Delay (s)	24.5	0.0		0.2								
Approach LOS	C											
<b>Intersection Summary</b>												
Average Delay			2.1									
Intersection Capacity Utilization			39.6%		ICU Level of Service				A			
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 9: Catharine Street South & Young Street















08-01-2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖			↖						↘	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	71	13	27	58	0	0	0	0	13	73	18
Future Volume (vph)	0	71	13	27	58	0	0	0	0	13	73	18
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	81	15	31	66	0	0	0	0	15	83	20
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>SB 1</b>									
Volume Total (vph)	96	97	118									
Volume Left (vph)	0	31	15									
Volume Right (vph)	15	0	20									
Hadj (s)	-0.08	0.06	-0.08									
Departure Headway (s)	4.2	4.3	4.2									
Degree Utilization, x	0.11	0.12	0.14									
Capacity (veh/h)	829	804	806									
Control Delay (s)	7.7	7.9	7.9									
Approach Delay (s)	7.7	7.9	7.9									
Approach LOS	A	A	A									
<b>Intersection Summary</b>												
Delay			7.9									
Level of Service			A									
Intersection Capacity Utilization			32.5%	ICU Level of Service								A
Analysis Period (min)			15									

















HCM Unsignalized Intersection Capacity Analysis  
 10: Catharine Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	43	18	0	0	0	0	0	0	43	60	0
Future Volume (vph)	0	43	18	0	0	0	0	0	0	43	60	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	0	50	21	0	0	0	0	0	0	50	70	0
Direction, Lane #	EB 1	SB 1										
Volume Total (vph)	71	120										
Volume Left (vph)	0	50										
Volume Right (vph)	21	0										
Hadj (s)	-0.15	0.08										
Departure Headway (s)	4.0	4.1										
Degree Utilization, x	0.08	0.14										
Capacity (veh/h)	868	847										
Control Delay (s)	7.4	7.8										
Approach Delay (s)	7.4	7.8										
Approach LOS	A	A										
<b>Intersection Summary</b>												
Delay			7.6									
Level of Service			A									
Intersection Capacity Utilization			27.0%		ICU Level of Service					A		
Analysis Period (min)			15									
















HCM Unsignalized Intersection Capacity Analysis  
 13: Walnut Street South & Young Street

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	12	63	20	11	76	17	14	31	11	17	47	5
Future Volume (vph)	12	63	20	11	76	17	14	31	11	17	47	5
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	13	68	22	12	82	18	15	33	12	18	51	5
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	103	112	60	74								
Volume Left (vph)	13	12	15	18								
Volume Right (vph)	22	18	12	5								
Hadj (s)	-0.09	-0.05	-0.07	0.01								
Departure Headway (s)	4.2	4.3	4.4	4.5								
Degree Utilization, x	0.12	0.13	0.07	0.09								
Capacity (veh/h)	814	801	771	757								
Control Delay (s)	7.8	7.9	7.7	7.9								
Approach Delay (s)	7.8	7.9	7.7	7.9								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			7.9									
Level of Service			A									
Intersection Capacity Utilization			27.3%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 14: Walnut Street South & Forest Avenue

08-01-2022



















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	21	19	43	0	0	0	0	33	3	9	71	0
Future Volume (vph)	21	19	43	0	0	0	0	33	3	9	71	0
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
Hourly flow rate (vph)	23	21	48	0	0	0	0	37	3	10	79	0
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total (vph)	92	40	89									
Volume Left (vph)	23	0	10									
Volume Right (vph)	48	3	0									
Hadj (s)	-0.23	-0.04	0.06									
Departure Headway (s)	4.0	4.1	4.2									
Degree Utilization, x	0.10	0.05	0.10									
Capacity (veh/h)	879	837	836									
Control Delay (s)	7.4	7.3	7.7									
Approach Delay (s)	7.4	7.3	7.7									
Approach LOS	A	A	A									
Intersection Summary												
Delay			7.5									
Level of Service			A									
Intersection Capacity Utilization			31.9%	ICU Level of Service								A
Analysis Period (min)			15									

# **Appendix D**

## **Future Background Level of Service Calculations**

Lanes, Volumes, Timings  
3: John Street South & Young Street

08-01-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	26	6	23	54	36	49	926	18	4	263	27
Future Volume (vph)	29	26	6	23	54	36	49	926	18	4	263	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	15.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1668	1817	0	0	1704	0	0	3328	0	0	3331	0
Flt Permitted	0.536				0.938			0.918			0.946	
Satd. Flow (perm)	933	1817	0	0	1606	0	0	3055	0	0	3154	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			27			4			22	
Link Speed (k/h)		40			40			50			50	
Link Distance (m)		56.2			95.6			98.8			61.1	
Travel Time (s)		5.1			8.6			7.1			4.4	
Confl. Peds. (#/hr)	8		20	20		8	27		19	19		27
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	0%	0%	4%	4%	3%	2%	7%	0%	0%	5%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	4
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	31	34	0	0	122	0	0	1068	0	0	316	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			2			6	
Permitted Phases	8			4			2			6		
Detector Phase	8	8		4	4		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.7	24.7		23.5	23.5		28.7	28.7		28.7	28.7	
Total Split (s)	30.0	30.0		30.0	30.0		60.0	60.0		60.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%		66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	24.3	24.3		25.5	25.5		54.3	54.3		54.3	54.3	
Yellow Time (s)	3.3	3.3		3.5	3.5		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.4	2.4		1.0	1.0		2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	-1.0	-1.0			-1.0			-1.0			-1.0	
Total Lost Time (s)	4.7	4.7			3.5			4.7			4.7	



Lanes, Volumes, Timings  
 3: John Street South & Young Street

08-01-2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	8.0	8.0		8.0	8.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	12.2	12.2			13.4			68.4			68.4	
Actuated g/C Ratio	0.14	0.14			0.15			0.76			0.76	
v/c Ratio	0.25	0.14			0.47			0.46			0.13	
Control Delay	39.2	30.2			32.9			4.9			3.0	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	39.2	30.2			32.9			4.9			3.0	
LOS	D	C			C			A			A	
Approach Delay		34.5			32.9			4.9			3.0	
Approach LOS		C			C			A			A	
Queue Length 50th (m)	5.2	4.6			16.1			27.5			5.4	
Queue Length 95th (m)	13.3	12.7			31.7			47.6			10.9	
Internal Link Dist (m)		32.2			71.6			74.8			37.1	
Turn Bay Length (m)	15.0											
Base Capacity (vph)	262	515			491			2322			2402	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.12	0.07			0.25			0.46			0.13	

Intersection Summary

Area Type: Other  
 Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 28 (31%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green  
 Natural Cycle: 55  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.47  
 Intersection Signal Delay: 7.9  
 Intersection Capacity Utilization 71.0%  
 Analysis Period (min) 15  
 Intersection LOS: A  
 ICU Level of Service C

Splits and Phases: 3: John Street South & Young Street



# HCM Unsignalized Intersection Capacity Analysis

## 6: John Street South & Forest Avenue

08-01-2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔						↕			↕	
Traffic Volume (veh/h)	32	38	27	0	0	0	0	897	17	10	249	0
Future Volume (Veh/h)	32	38	27	0	0	0	0	897	17	10	249	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	34	40	29	0	0	0	0	954	18	11	265	0
Pedestrians		18			19			17			19	
Lane Width (m)		3.5			0.0			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			1			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)											99	
pX, platoon unblocked												
vC, conflicting volume	801	1296	168	1202	1287	524	283			991		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	801	1296	168	1202	1287	524	283			991		
tC, single (s)	7.5	6.5	7.0	7.5	6.5	6.9	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	87	75	96	100	100	100	100			98		
cM capacity (veh/h)	264	158	808	107	160	495	1272			647		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>	<b>SB 2</b>							
Volume Total	103	636	336	99	177							
Volume Left	34	0	0	11	0							
Volume Right	29	0	18	0	0							
cSH	247	1700	1700	647	1700							
Volume to Capacity	0.42	0.37	0.20	0.02	0.10							
Queue Length 95th (m)	15.5	0.0	0.0	0.4	0.0							
Control Delay (s)	29.6	0.0	0.0	1.4	0.0							
Lane LOS	D			A								
Approach Delay (s)	29.6	0.0		0.5								
Approach LOS	D											
<b>Intersection Summary</b>												
Average Delay			2.4									
Intersection Capacity Utilization			44.9%		ICU Level of Service					A		
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 9: Catharine Street South & Young Street















08-01-2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔						↔	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	53	8	22	107	0	0	0	0	6	210	17
Future Volume (vph)	0	53	8	22	107	0	0	0	0	6	210	17
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	58	9	24	118	0	0	0	0	7	231	19
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>SB 1</b>									
Volume Total (vph)	67	142	257									
Volume Left (vph)	0	24	7									
Volume Right (vph)	9	0	19									
Hadj (s)	-0.08	0.10	0.05									
Departure Headway (s)	4.6	4.7	4.5									
Degree Utilization, x	0.09	0.19	0.32									
Capacity (veh/h)	722	719	777									
Control Delay (s)	8.1	8.8	9.5									
Approach Delay (s)	8.1	8.8	9.5									
Approach LOS	A	A	A									
<b>Intersection Summary</b>												
Delay			9.1									
Level of Service			A									
Intersection Capacity Utilization			37.3%	ICU Level of Service								A
Analysis Period (min)			15									

















HCM Unsignalized Intersection Capacity Analysis  
 10: Catharine Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	47	18	0	0	0	0	0	0	26	23	0
Future Volume (vph)	0	47	18	0	0	0	0	0	0	26	23	0
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Hourly flow rate (vph)	0	64	25	0	0	0	0	0	0	36	32	0
Direction, Lane #	EB 1	SB 1										
Volume Total (vph)	89	68										
Volume Left (vph)	0	36										
Volume Right (vph)	25	0										
Hadj (s)	-0.08	0.22										
Departure Headway (s)	4.0	4.3										
Degree Utilization, x	0.10	0.08										
Capacity (veh/h)	886	810										
Control Delay (s)	7.4	7.7										
Approach Delay (s)	7.4	7.7										
Approach LOS	A	A										
<b>Intersection Summary</b>												
Delay			7.5									
Level of Service			A									
Intersection Capacity Utilization			25.4%		ICU Level of Service					A		
Analysis Period (min)			15									
















HCM Unsignalized Intersection Capacity Analysis  
 13: Walnut Street South & Young Street

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	23	33	6	32	88	23	23	89	13	4	49	6
Future Volume (vph)	23	33	6	32	88	23	23	89	13	4	49	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	36	7	35	96	25	25	97	14	4	53	7
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	68	156	136	64								
Volume Left (vph)	25	35	25	4								
Volume Right (vph)	7	25	14	7								
Hadj (s)	0.07	0.03	0.05	0.02								
Departure Headway (s)	4.6	4.5	4.6	4.6								
Degree Utilization, x	0.09	0.19	0.17	0.08								
Capacity (veh/h)	735	757	748	727								
Control Delay (s)	8.1	8.6	8.5	8.0								
Approach Delay (s)	8.1	8.6	8.5	8.0								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.4									
Level of Service			A									
Intersection Capacity Utilization			29.0%	ICU Level of Service	A							
Analysis Period (min)			15									



















HCM Unsignalized Intersection Capacity Analysis  
 14: Walnut Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	26	31	22	0	0	0	0	95	13	35	52	0
Future Volume (vph)	26	31	22	0	0	0	0	95	13	35	52	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	30	36	26	0	0	0	0	110	15	41	60	0
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total (vph)	92	125	101									
Volume Left (vph)	30	0	41									
Volume Right (vph)	26	15	0									
Hadj (s)	-0.03	0.02	0.14									
Departure Headway (s)	4.4	4.2	4.4									
Degree Utilization, x	0.11	0.15	0.12									
Capacity (veh/h)	782	820	798									
Control Delay (s)	7.9	8.0	8.0									
Approach Delay (s)	7.9	8.0	8.0									
Approach LOS	A	A	A									
Intersection Summary												
Delay			8.0									
Level of Service			A									
Intersection Capacity Utilization			32.3%	ICU Level of Service								A
Analysis Period (min)			15									

Lanes, Volumes, Timings  
3: John Street South & Young Street

08-01-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	35	22	19	49	15	33	696	20	7	572	41
Future Volume (vph)	20	35	22	19	49	15	33	696	20	7	572	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	15.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1785	1713	0	0	1780	0	0	3323	0	0	3472	0
Flt Permitted	0.620				0.923			0.904			0.948	
Satd. Flow (perm)	1142	1713	0	0	1635	0	0	3004	0	0	3294	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		23			13			5			15	
Link Speed (k/h)		40			40			50			50	
Link Distance (m)		56.2			95.6			98.8			61.1	
Travel Time (s)		5.1			8.6			7.1			4.4	
Confl. Peds. (#/hr)	17		52	52		17	46		38	38		46
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	5%	0%	0%	0%	7%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	4
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	21	60	0	0	88	0	0	796	0	0	660	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			2			6	
Permitted Phases	8			4			2			6		
Detector Phase	8	8		4	4		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.7	24.7		23.5	23.5		28.7	28.7		28.7	28.7	
Total Split (s)	30.0	30.0		30.0	30.0		60.0	60.0		60.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%		66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	24.3	24.3		25.5	25.5		54.3	54.3		54.3	54.3	
Yellow Time (s)	3.3	3.3		3.5	3.5		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.4	2.4		1.0	1.0		2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	-1.0	-1.0			-1.0			-1.0			-1.0	
Total Lost Time (s)	4.7	4.7			3.5			4.7			4.7	

Lanes, Volumes, Timings  
 3: John Street South & Young Street

08-01-2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	8.0	8.0		8.0	8.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	11.5	11.5			12.4			73.2			73.2	
Actuated g/C Ratio	0.13	0.13			0.14			0.81			0.81	
v/c Ratio	0.14	0.25			0.37			0.33			0.25	
Control Delay	37.1	27.1			34.6			3.3			2.9	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	37.1	27.1			34.6			3.3			2.9	
LOS	D	C			C			A			A	
Approach Delay		29.7			34.6			3.3			2.9	
Approach LOS		C			C			A			A	
Queue Length 50th (m)	3.5	6.1			12.6			18.1			13.5	
Queue Length 95th (m)	10.3	17.4			26.3			28.2			21.3	
Internal Link Dist (m)		32.2			71.6			74.8			37.1	
Turn Bay Length (m)	15.0											
Base Capacity (vph)	321	498			490			2445			2682	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.07	0.12			0.18			0.33			0.25	

Intersection Summary

Area Type: Other  
 Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 28 (31%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green  
 Natural Cycle: 55  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.37  
 Intersection Signal Delay: 6.2  
 Intersection Capacity Utilization 65.5%  
 Analysis Period (min) 15  
 Intersection LOS: A  
 ICU Level of Service C

Splits and Phases: 3: John Street South & Young Street





# HCM Unsignalized Intersection Capacity Analysis

## 6: John Street South & Forest Avenue

08-01-2022


















Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕						↕↕			↕↕	
Traffic Volume (veh/h)	36	35	31	0	0	0	0	660	22	10	522	0
Future Volume (Veh/h)	36	35	31	0	0	0	0	660	22	10	522	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	37	36	32	0	0	0	0	680	23	10	538	0
Pedestrians		18			19			17			19	
Lane Width (m)		3.5			0.0			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			1			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)											99	
pX, platoon unblocked	0.98	0.98	0.98	0.98	0.98		0.98					
vC, conflicting volume	935	1298	304	1066	1286	390	556			722		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	895	1265	251	1029	1253	390	508			722		
tC, single (s)	7.5	6.6	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	83	77	96	100	100	100	100			99		
cM capacity (veh/h)	223	159	719	143	166	605	1031			889		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>	<b>SB 2</b>							
Volume Total	105	453	250	189	359							
Volume Left	37	0	0	10	0							
Volume Right	32	0	23	0	0							
cSH	241	1700	1700	889	1700							
Volume to Capacity	0.44	0.27	0.15	0.01	0.21							
Queue Length 95th (m)	16.6	0.0	0.0	0.3	0.0							
Control Delay (s)	31.1	0.0	0.0	0.6	0.0							
Lane LOS	D			A								
Approach Delay (s)	31.1	0.0		0.2								
Approach LOS	D											
<b>Intersection Summary</b>												
Average Delay			2.5									
Intersection Capacity Utilization			41.3%			ICU Level of Service				A		
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis















## 9: Catharine Street South & Young Street

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	78	13	27	64	0	0	0	0	13	81	18
Future Volume (vph)	0	78	13	27	64	0	0	0	0	13	81	18
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	89	15	31	73	0	0	0	0	15	92	20
Direction, Lane #	EB 1	WB 1	SB 1									
Volume Total (vph)	104	104	127									
Volume Left (vph)	0	31	15									
Volume Right (vph)	15	0	20									
Hadj (s)	-0.07	0.06	-0.07									
Departure Headway (s)	4.2	4.4	4.3									
Degree Utilization, x	0.12	0.13	0.15									
Capacity (veh/h)	820	797	797									
Control Delay (s)	7.8	8.0	8.1									
Approach Delay (s)	7.8	8.0	8.1									
Approach LOS	A	A	A									
Intersection Summary												
Delay			8.0									
Level of Service			A									
Intersection Capacity Utilization			32.8%	ICU Level of Service								A
Analysis Period (min)			15									

















HCM Unsignalized Intersection Capacity Analysis  
 10: Catharine Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	47	18	0	0	0	0	0	0	43	66	0
Future Volume (vph)	0	47	18	0	0	0	0	0	0	43	66	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	0	55	21	0	0	0	0	0	0	50	77	0
Direction, Lane #	EB 1	SB 1										
Volume Total (vph)	76	127										
Volume Left (vph)	0	50										
Volume Right (vph)	21	0										
Hadj (s)	-0.14	0.08										
Departure Headway (s)	4.0	4.1										
Degree Utilization, x	0.09	0.15										
Capacity (veh/h)	861	845										
Control Delay (s)	7.4	7.9										
Approach Delay (s)	7.4	7.9										
Approach LOS	A	A										
<b>Intersection Summary</b>												
Delay			7.7									
Level of Service			A									
Intersection Capacity Utilization			27.3%		ICU Level of Service					A		
Analysis Period (min)			15									
















HCM Unsignalized Intersection Capacity Analysis  
 13: Walnut Street South & Young Street

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	12	70	20	11	84	17	14	34	11	17	52	5
Future Volume (vph)	12	70	20	11	84	17	14	34	11	17	52	5
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	13	75	22	12	90	18	15	37	12	18	56	5
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	110	120	64	79								
Volume Left (vph)	13	12	15	18								
Volume Right (vph)	22	18	12	5								
Hadj (s)	-0.08	-0.04	-0.07	0.01								
Departure Headway (s)	4.3	4.3	4.4	4.5								
Degree Utilization, x	0.13	0.14	0.08	0.10								
Capacity (veh/h)	805	793	760	748								
Control Delay (s)	7.9	8.0	7.8	8.0								
Approach Delay (s)	7.9	8.0	7.8	8.0								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.0									
Level of Service			A									
Intersection Capacity Utilization			27.7%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 14: Walnut Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	21	21	43	0	0	0	0	36	3	9	78	0
Future Volume (vph)	21	21	43	0	0	0	0	36	3	9	78	0
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
Hourly flow rate (vph)	23	23	48	0	0	0	0	40	3	10	87	0
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total (vph)	94	43	97									
Volume Left (vph)	23	0	10									
Volume Right (vph)	48	3	0									
Hadj (s)	-0.22	-0.04	0.06									
Departure Headway (s)	4.0	4.2	4.2									
Degree Utilization, x	0.10	0.05	0.11									
Capacity (veh/h)	871	833	834									
Control Delay (s)	7.4	7.4	7.7									
Approach Delay (s)	7.4	7.4	7.7									
Approach LOS	A	A	A									
Intersection Summary												
Delay			7.6									
Level of Service			A									
Intersection Capacity Utilization			32.1%	ICU Level of Service								A
Analysis Period (min)			15									

# **Appendix E**

## **2016 TTS Data**

## Modes of Travel - AM Peak Periods (6:00 - 9:00)

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode\_prime  
 Column: 2006 GTA zone of household - gta06\_hhld

Filters:

Primary travel mode of trip - mode\_prime In B            C            D            G            J            M            P            T            U            W  
 and  
 Start time of trip - start\_time In 600-900  
 and  
 2006 GTA zone of household - gta06\_hhld In 5159            5168

Trip 2016

Table:

Modes of Transportation/Traffic Zones	5159	5168	Total	Percentage
Transit excluding GO rail	154	453	607	39%
Cycle	61	0	61	4%
Auto driver	342	203	545	35%
GO rail only	0	23	23	1%
Auto passenger	26	7	33	2%
Walk	104	169	273	18%
Total	687	855	1542	100%

## Modes of Travel - PM Peak Periods (3:00 - 6:00 PM)

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode\_prime

Column: 2006 GTA zone of household - gta06\_hhld

Filters:

Primary travel mode of trip - mode\_prime In B

C            D            G            J            M            P            T            U            W

and

Start time of trip - start\_time In 1500-1800

and

2006 GTA zone of household - gta06\_hhld In 5159

5168

Trip 2016

Table:

Modes of Transportation/Traffic Zones	5159	5168	Total	Percentage
Transit excluding GO rail	263	392	655	26%
Cycle	61	0	61	2%
Auto driver	1148	125	1273	51%
GO rail only	0	23	23	1%
Joint GO rail and local transit	0	70	70	3%
Auto passenger	137	7	144	6%
Taxi passenger	34	0	34	1%
Paid rideshare	34	0	34	1%
Walk	59	152	211	8%
<b>Total</b>	<b>1736</b>	<b>769</b>	<b>2505</b>	<b>100%</b>



## Residential Auto Trip Distribution - External Hamilton

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06\_orig

Column: Planning district of destination - pd\_dest

Filters:

Primary travel mode of trip - mode\_prime In D                    M                    P                    T                    U

and

Start time of trip - start\_time In 600-900

and

2006 GTA zone of household - gta06\_hhld In 5159                    5168

Trip 2016

Table:

Traffic Zones	PD 2 of Toronto	Burlington	Flamborough	Hamilton	St. Catharines	Kitchener	Brant	Total
5159	0	71	70	175	13	17	23	369
5168	0	0	0	178	0	0	0	178
Total	0	71	70	353	13	17	23	547
Percentage	0.0%	13.0%	12.8%	64.5%	2.4%	3.1%	4.2%	100.0%

## Residential Auto Trip Distribution - Internal Hamilton

Wed Apr 29 2020 12:42:36 GMT-0400 (Eastern Daylight Time) - Run Time: 2229ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06\_orig

Column: 2006 GTA zone of destination - gta06\_dest

Filters:

Primary travel mode of trip - mode\_prime In D  
and

Start time of trip - start\_time In 600-900  
and

2006 GTA zone of origin - gta06\_orig In 5159  
and

Ward number of destination - ward\_dest In 171-185

Trip 2016

Table:

	5069	5084	5089	5100	5140	5144	5151	5155	5172	5182	5186	5194	5195	5198	5203	5214	5223	5241	5246	5251	
5159	28	51	66	44	0	41	98	97	0	0	0	0	21	53	0	26	26	25	34	17	627
5168	0	0	0	0	72	14	0	0	43	53	80	39	0	0	20	0	0	0	0	0	321
	28	51	66	44	72	55	98	97	43	53	80	39	21	53	20	26	26	25	34	17	948
	3%	5%	7%	5%	8%	6%	10%	10%	5%	6%	8%	4%	2%	6%	2%	3%	3%	3%	4%	2%	

Hamilton	65%		
	East	43%	28%
	West	18%	12%
	North	18%	11%
	South	21%	14%
		100%	

## Transit Trip Distribution - External Hamilton

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06\_orig

Column: Planning district of destination - pd\_dest

Filters:

Primary travel mode of trip - mode\_prime In B

C

G

J

W

and

Start time of trip - start\_time In 600-900

and

2006 GTA zone of household - gta06\_hhld In 5159

5168

Trip 2016

Table:

Traffic Zones	PD 1 of Toronto	Flamborough	Dundas	Hamilton	Total
5159	34	40	0	229	303
5168	23	0	143	462	628
Total	57	40	143	691	931
Percentage	6%	4%	15%	74%	100%

## Transit Trip Distribution - Internal Hamilton

Wed Apr 29 2020 12:40:34 GMT-0400 (Eastern Daylight Time) - Run Time: 2725ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06\_orig

Column: 2006 GTA zone of destination - gta06\_dest

Filters:

Primary travel mode of trip - mode\_prime In B C G J W  
and

Start time of trip - start\_time In 600-900

and

2006 GTA zone of origin - gta06\_orig In 5159 5168

and

Ward number of destination - ward\_dest In 171-185

Trip 2016

Table:

	5121	5139	5140	5143	5159	5167	5172	5184	5190	5191	5193	5194	5195	5198	5199	5201	5214	
5159	0	0	0	26	79	24	15	98	0	0	0	59	19	0	31	0	40	391
5168	26	89	42	0	0	0	25	92	17	143	18	41	0	72	41	40	0	646
	26	89	42	26	79	24	40	190	17	143	18	100	19	72	72	40	40	1037
	3%	9%	4%	3%	8%	2%	4%	18%	2%	14%	2%	10%	2%	7%	7%	4%	4%	100%

## Non-Residential Modes of Travel (AM Peak Period)

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode\_prime

Column: 2006 GTA zone of destination - gta06\_dest

Filters:

Primary travel mode of trip - mode\_prime In B                    C            D            G            J            M            P            T            U            W  
 and  
 Start time of trip - start\_time In 600-900  
 and  
 2006 GTA zone of destination - gta06\_dest In 5159                    5168  
 and  
 Trip purpose of destination - purp\_dest In E                    M            P            R            W

Trip 2016

Table:

Modes of Transportation/Traffic Zones	5159	5168	Total	Percentage
Transit excluding GO rail	364	71	435	12%
Cycle	132	0	132	4%
Auto driver	1696	641	2337	65%
Auto passenger	377	105	482	13%
Walk	201	0	201	6%
<b>Total</b>	<b>2770</b>	<b>817</b>	<b>3587</b>	<b>100%</b>

## Non-Residential Modes of Travel (PM Peak Period)

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode\_prime

Column: 2006 GTA zone of destination - gta06\_dest

Filters:

Start time of trip - start\_time In 1500-1800  
 and  
 Primary travel mode of trip - mode\_prime In B                    C            D            G            J            M            P            T            U            W  
 and  
 2006 GTA zone of destination - gta06\_dest In 5159                    5168  
 and  
 Trip purpose of destination - purp\_dest In E                    M            P            R            W

Trip 2016

Table:

Modes of Transportation/Traffic Zones	5159	5168	Total	Percentage
Transit excluding GO rail	0	39	39	14%
Auto driver	161	22	183	64%
Auto passenger	13	0	13	5%
Walk	51	0	51	18%
<b>Total</b>	<b>225</b>	<b>61</b>	<b>286</b>	<b>100%</b>





















# **Appendix F**

## **Future Total Level of Service Calculations**

Lanes, Volumes, Timings  
3: John Street South & Young Street

10-27-2023

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	29	6	29	67	50	49	926	18	13	265	27
Future Volume (vph)	29	29	6	29	67	50	49	926	18	13	265	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	15.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1668	1822	0	0	1698	0	0	3328	0	0	3337	0
Flt Permitted	0.462				0.938			0.917			0.904	
Satd. Flow (perm)	805	1822	0	0	1601	0	0	3052	0	0	3022	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			30			4			21	
Link Speed (k/h)		40			40			50			50	
Link Distance (m)		56.2			95.6			98.8			61.1	
Travel Time (s)		5.1			8.6			7.1			4.4	
Confl. Peds. (#/hr)	8		20	20		8	27		19	19		27
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	0%	0%	4%	4%	3%	2%	7%	0%	0%	5%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	4
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	31	37	0	0	157	0	0	1068	0	0	328	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			2			6	
Permitted Phases	8			4			2			6		
Detector Phase	8	8		4	4		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.7	24.7		23.5	23.5		28.7	28.7		28.7	28.7	
Total Split (s)	30.0	30.0		30.0	30.0		60.0	60.0		60.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%		66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	24.3	24.3		25.5	25.5		54.3	54.3		54.3	54.3	
Yellow Time (s)	3.3	3.3		3.5	3.5		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.4	2.4		1.0	1.0		2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	-1.0	-1.0			-1.0			-1.0			-1.0	
Total Lost Time (s)	4.7	4.7			3.5			4.7			4.7	



Lanes, Volumes, Timings  
 3: John Street South & Young Street

10-27-2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	8.0	8.0		8.0	8.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	13.4	13.4			14.6			67.2			67.2	
Actuated g/C Ratio	0.15	0.15			0.16			0.75			0.75	
v/c Ratio	0.26	0.13			0.55			0.47			0.15	
Control Delay	38.3	28.9			35.0			5.6			3.5	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	38.3	28.9			35.0			5.6			3.5	
LOS	D	C			D			A			A	
Approach Delay		33.2			35.0			5.6			3.5	
Approach LOS		C			D			A			A	
Queue Length 50th (m)	5.1	5.0			21.7			30.0			6.2	
Queue Length 95th (m)	13.0	12.9			38.7			54.0			13.0	
Internal Link Dist (m)		32.2			71.6			74.8			37.1	
Turn Bay Length (m)	15.0											
Base Capacity (vph)	226	516			492			2280			2261	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.14	0.07			0.32			0.47			0.15	

Intersection Summary
















Area Type: Other  
 Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 28 (31%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green  
 Natural Cycle: 55  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.55  
 Intersection Signal Delay: 9.1  
 Intersection Capacity Utilization 72.4%  
 Analysis Period (min) 15  
 Intersection LOS: A  
 ICU Level of Service C

Splits and Phases: 3: John Street South & Young Street



HCM Unsignalized Intersection Capacity Analysis  
 6: John Street South & Forest Avenue

10-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	38	27	0	0	0	0	897	20	12	249	0
Future Volume (Veh/h)	32	38	27	0	0	0	0	897	20	12	249	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	34	40	29	0	0	0	0	954	21	13	265	0
Pedestrians		18			19			17			19	
Lane Width (m)		3.5			0.0			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			1			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)											99	
pX, platoon unblocked												
vC, conflicting volume	805	1303	168	1208	1292	526	283			994		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	805	1303	168	1208	1292	526	283			994		
tC, single (s)	7.5	6.5	7.0	7.5	6.5	6.9	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	87	74	96	100	100	100	100			98		
cM capacity (veh/h)	262	156	808	105	159	494	1272			645		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>	<b>SB 2</b>							
Volume Total	103	636	339	101	177							
Volume Left	34	0	0	13	0							
Volume Right	29	0	21	0	0							
cSH	244	1700	1700	645	1700							
Volume to Capacity	0.42	0.37	0.20	0.02	0.10							
Queue Length 95th (m)	15.7	0.0	0.0	0.5	0.0							
Control Delay (s)	30.0	0.0	0.0	1.6	0.0							
Lane LOS	D			A								
Approach Delay (s)	30.0	0.0		0.6								
Approach LOS	D											
<b>Intersection Summary</b>												
Average Delay			2.4									
Intersection Capacity Utilization			45.0%		ICU Level of Service				A			
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 9: Catharine Street South & Young Street

10-27-2023

















Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↻			↻						↻	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	67	8	22	140	0	0	0	0	9	210	17
Future Volume (vph)	0	67	8	22	140	0	0	0	0	9	210	17
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	74	9	24	154	0	0	0	0	10	231	19

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	83	178	260
Volume Left (vph)	0	24	10
Volume Right (vph)	9	0	19
Hadj (s)	-0.07	0.09	0.05
Departure Headway (s)	4.7	4.7	4.6
Degree Utilization, x	0.11	0.23	0.33
Capacity (veh/h)	709	714	750
Control Delay (s)	8.3	9.2	9.8
Approach Delay (s)	8.3	9.2	9.8
Approach LOS	A	A	A

Intersection Summary		
Delay		9.4
Level of Service		A
Intersection Capacity Utilization	41.3%	ICU Level of Service
Analysis Period (min)		15

















HCM Unsignalized Intersection Capacity Analysis  
 10: Catharine Street South & Forest Avenue

10-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	57	18	0	0	0	0	0	0	26	23	0
Future Volume (vph)	0	57	18	0	0	0	0	0	0	26	23	0
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Hourly flow rate (vph)	0	78	25	0	0	0	0	0	0	36	32	0
Direction, Lane #	EB 1	SB 1										
Volume Total (vph)	103	68										
Volume Left (vph)	0	36										
Volume Right (vph)	25	0										
Hadj (s)	-0.06	0.22										
Departure Headway (s)	4.0	4.3										
Degree Utilization, x	0.11	0.08										
Capacity (veh/h)	880	802										
Control Delay (s)	7.5	7.7										
Approach Delay (s)	7.5	7.7										
Approach LOS	A	A										
<b>Intersection Summary</b>												
Delay			7.6									
Level of Service			A									
Intersection Capacity Utilization			25.6%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 13: Walnut Street South & Young Street
















10-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	23	43	6	32	91	23	28	94	13	4	49	6
Future Volume (vph)	23	43	6	32	91	23	28	94	13	4	49	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	47	7	35	99	25	30	102	14	4	53	7
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	79	159	146	64								
Volume Left (vph)	25	35	30	4								
Volume Right (vph)	7	25	14	7								
Hadj (s)	0.07	0.03	0.06	0.02								
Departure Headway (s)	4.7	4.5	4.6	4.7								
Degree Utilization, x	0.10	0.20	0.19	0.08								
Capacity (veh/h)	729	748	740	717								
Control Delay (s)	8.2	8.7	8.7	8.1								
Approach Delay (s)	8.2	8.7	8.7	8.1								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.5									
Level of Service			A									
Intersection Capacity Utilization			30.5%	ICU Level of Service	A							
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 14: Walnut Street South & Forest Avenue

10-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	36	31	22	0	0	0	0	95	13	35	52	0
Future Volume (vph)	36	31	22	0	0	0	0	95	13	35	52	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	42	36	26	0	0	0	0	110	15	41	60	0
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total (vph)	104	125	101									
Volume Left (vph)	42	0	41									
Volume Right (vph)	26	15	0									
Hadj (s)	0.00	0.02	0.14									
Departure Headway (s)	4.4	4.3	4.4									
Degree Utilization, x	0.13	0.15	0.12									
Capacity (veh/h)	776	812	790									
Control Delay (s)	8.1	8.0	8.0									
Approach Delay (s)	8.1	8.0	8.0									
Approach LOS	A	A	A									
Intersection Summary												
Delay			8.0									
Level of Service			A									
Intersection Capacity Utilization			32.3%	ICU Level of Service								A
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 17: Forest Avenue & Site Access 1









10-27-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		4			4	
Traffic Volume (veh/h)	3	78	0	0	5	0
Future Volume (Veh/h)	3	78	0	0	5	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	85	0	0	5	0
Pedestrians		20			20	
Lane Width (m)		3.5			3.5	
Walking Speed (m/s)		1.2			1.2	
Percent Blockage		2			2	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	20				111	40
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	20				111	40
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1583				875	1004
Direction, Lane #	EB 1	SB 1				
Volume Total	88	5				
Volume Left	3	5				
Volume Right	0	0				
cSH	1583	875				
Volume to Capacity	0.00	0.01				
Queue Length 95th (m)	0.0	0.1				
Control Delay (s)	0.3	9.1				
Lane LOS	A	A				
Approach Delay (s)	0.3	9.1				
Approach LOS		A				
<b>Intersection Summary</b>						
Average Delay			0.7			
Intersection Capacity Utilization			23.1%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis  
 19: Catharine Street South & Existing Access

10-27-2023

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	8	0	0	0	5	235
Future Volume (Veh/h)	8	0	0	0	5	235
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	0	0	0	5	255
Pedestrians	20		20			20
Lane Width (m)	3.5		0.0			3.5
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	2		0			2
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	305	40			20	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	305	40			20	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	678	1004			1583	
<b>Direction, Lane #</b>	<b>WB 1</b>	<b>SB 1</b>				
Volume Total	9	260				
Volume Left	9	5				
Volume Right	0	0				
cSH	678	1583				
Volume to Capacity	0.01	0.00				
Queue Length 95th (m)	0.3	0.1				
Control Delay (s)	10.4	0.2				
Lane LOS	B	A				
Approach Delay (s)	10.4	0.2				
Approach LOS	B					
<b>Intersection Summary</b>						
Average Delay			0.5			
Intersection Capacity Utilization			31.2%		ICU Level of Service	A
Analysis Period (min)			15			



# HCM Unsignalized Intersection Capacity Analysis

## 21: Forest Avenue & Site Access 2

10-27-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		4			1	
Traffic Volume (veh/h)	2	81	0	0	5	0
Future Volume (Veh/h)	2	81	0	0	5	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	88	0	0	5	0
<b>Pedestrians</b>						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	0				92	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				92	0
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1636				912	1091
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>SB 1</b>				
Volume Total	90	5				
Volume Left	2	5				
Volume Right	0	0				
cSH	1636	912				
Volume to Capacity	0.00	0.01				
Queue Length 95th (m)	0.0	0.1				
Control Delay (s)	0.2	9.0				
Lane LOS	A	A				
Approach Delay (s)	0.2	9.0				
Approach LOS		A				
<b>Intersection Summary</b>						
Average Delay			0.6			
Intersection Capacity Utilization			14.4%		ICU Level of Service	A
Analysis Period (min)			15			

# HCM Unsignalized Intersection Capacity Analysis

## 23: Site Access 3 & Young Street



















10-27-2023



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	↘	↙
Traffic Volume (veh/h)	59	17	3	122	28	10
Future Volume (Veh/h)	59	17	3	122	28	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	64	18	3	133	30	11
<b>Pedestrians</b>						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			82		212	73
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			82		212	73
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	99
cM capacity (veh/h)			1528		779	995
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	82	136	41			
Volume Left	0	3	30			
Volume Right	18	0	11			
cSH	1700	1528	827			
Volume to Capacity	0.05	0.00	0.05			
Queue Length 95th (m)	0.0	0.0	1.2			
Control Delay (s)	0.0	0.2	9.6			
Lane LOS		A	A			
Approach Delay (s)	0.0	0.2	9.6			
Approach LOS			A			
<b>Intersection Summary</b>						
Average Delay			1.6			
Intersection Capacity Utilization			18.8%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings  
3: John Street South & Young Street

10-27-2023

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	45	22	24	58	27	33	696	20	25	577	41
Future Volume (vph)	20	45	22	24	58	27	33	696	20	25	577	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	15.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1785	1738	0	0	1761	0	0	3323	0	0	3471	0
Flt Permitted	0.517				0.919			0.902			0.906	
Satd. Flow (perm)	954	1738	0	0	1612	0	0	2999	0	0	3148	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		23			19			5			14	
Link Speed (k/h)		40			40			50			50	
Link Distance (m)		56.2			95.6			98.8			61.1	
Travel Time (s)		5.1			8.6			7.1			4.4	
Confl. Peds. (#/hr)	17		52	52		17	46		38	38		46
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	5%	0%	0%	0%	7%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	4
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	21	71	0	0	117	0	0	796	0	0	685	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			2			6	
Permitted Phases	8			4			2			6		
Detector Phase	8	8		4	4		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.7	24.7		23.5	23.5		28.7	28.7		28.7	28.7	
Total Split (s)	30.0	30.0		30.0	30.0		60.0	60.0		60.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%		66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	24.3	24.3		25.5	25.5		54.3	54.3		54.3	54.3	
Yellow Time (s)	3.3	3.3		3.5	3.5		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.4	2.4		1.0	1.0		2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	-1.0	-1.0			-1.0			-1.0			-1.0	
Total Lost Time (s)	4.7	4.7			3.5			4.7			4.7	

Lanes, Volumes, Timings  
 3: John Street South & Young Street

10-27-2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	8.0	8.0		8.0	8.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	12.2	12.2			13.1			72.5			72.5	
Actuated g/C Ratio	0.14	0.14			0.15			0.81			0.81	
v/c Ratio	0.16	0.28			0.47			0.33			0.27	
Control Delay	36.7	27.8			35.3			3.7			3.3	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	36.7	27.8			35.3			3.7			3.3	
LOS	D	C			D			A			A	
Approach Delay		29.8			35.3			3.7			3.3	
Approach LOS		C			D			A			A	
Queue Length 50th (m)	3.5	8.0			16.7			18.1			14.4	
Queue Length 95th (m)	10.1	19.7			32.0			31.7			25.5	
Internal Link Dist (m)		32.2			71.6			74.8			37.1	
Turn Bay Length (m)	15.0											
Base Capacity (vph)	268	505			488			2416			2538	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.08	0.14			0.24			0.33			0.27	

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	28 (31%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle:	55
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.47
Intersection Signal Delay:	7.1
Intersection LOS:	A
Intersection Capacity Utilization:	65.5%
ICU Level of Service:	C
Analysis Period (min):	15

Splits and Phases: 3: John Street South & Young Street



# HCM Unsignalized Intersection Capacity Analysis

## 6: John Street South & Forest Avenue

10-27-2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔						↕			↕	
Traffic Volume (veh/h)	36	35	31	0	0	0	0	660	27	15	522	0
Future Volume (Veh/h)	36	35	31	0	0	0	0	660	27	15	522	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	37	36	32	0	0	0	0	680	28	15	538	0
Pedestrians		18			19			17			19	
Lane Width (m)		3.5			0.0			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			1			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)											99	
pX, platoon unblocked	0.98	0.98	0.98	0.98	0.98		0.98					
vC, conflicting volume	945	1313	304	1079	1299	392	556			727		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	903	1278	249	1039	1264	392	506			727		
tC, single (s)	7.5	6.6	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	83	77	96	100	100	100	100			98		
cM capacity (veh/h)	219	155	721	139	162	603	1033			886		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>	<b>SB 2</b>							
Volume Total	105	453	255	194	359							
Volume Left	37	0	0	15	0							
Volume Right	32	0	28	0	0							
cSH	236	1700	1700	886	1700							
Volume to Capacity	0.45	0.27	0.15	0.02	0.21							
Queue Length 95th (m)	17.1	0.0	0.0	0.4	0.0							
Control Delay (s)	32.0	0.0	0.0	0.9	0.0							
Lane LOS	D			A								
Approach Delay (s)	32.0	0.0		0.3								
Approach LOS	D											
<b>Intersection Summary</b>												
Average Delay			2.6									
Intersection Capacity Utilization			45.0%			ICU Level of Service				A		
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 9: Catharine Street South & Young Street















10-27-2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔						↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	106	13	27	90	0	0	0	0	18	81	18
Future Volume (vph)	0	106	13	27	90	0	0	0	0	18	81	18
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	120	15	31	102	0	0	0	0	20	92	20
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>SB 1</b>									
Volume Total (vph)	135	133	132									
Volume Left (vph)	0	31	20									
Volume Right (vph)	15	0	20									
Hadj (s)	-0.05	0.05	-0.06									
Departure Headway (s)	4.3	4.4	4.4									
Degree Utilization, x	0.16	0.16	0.16									
Capacity (veh/h)	804	779	764									
Control Delay (s)	8.1	8.3	8.3									
Approach Delay (s)	8.1	8.3	8.3									
Approach LOS	A	A	A									
<b>Intersection Summary</b>												
Delay			8.2									
Level of Service			A									
Intersection Capacity Utilization			33.4%	ICU Level of Service								A
Analysis Period (min)			15									

















HCM Unsignalized Intersection Capacity Analysis  
 10: Catharine Street South & Forest Avenue

10-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	57	18	0	0	0	0	0	0	43	66	0
Future Volume (vph)	0	57	18	0	0	0	0	0	0	43	66	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	0	66	21	0	0	0	0	0	0	50	77	0
Direction, Lane #	EB 1	SB 1										
Volume Total (vph)	87	127										
Volume Left (vph)	0	50										
Volume Right (vph)	21	0										
Hadj (s)	-0.12	0.08										
Departure Headway (s)	4.1	4.2										
Degree Utilization, x	0.10	0.15										
Capacity (veh/h)	856	839										
Control Delay (s)	7.5	7.9										
Approach Delay (s)	7.5	7.9										
Approach LOS	A	A										
<b>Intersection Summary</b>												
Delay			7.7									
Level of Service			A									
Intersection Capacity Utilization			27.5%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 13: Walnut Street South & Young Street
















10-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	12	80	20	11	90	17	16	37	11	17	52	5
Future Volume (vph)	12	80	20	11	90	17	16	37	11	17	52	5
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	13	86	22	12	97	18	17	40	12	18	56	5
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	121	127	69	79								
Volume Left (vph)	13	12	17	18								
Volume Right (vph)	22	18	12	5								
Hadj (s)	-0.07	-0.04	-0.06	0.01								
Departure Headway (s)	4.3	4.3	4.5	4.6								
Degree Utilization, x	0.15	0.15	0.09	0.10								
Capacity (veh/h)	799	786	749	737								
Control Delay (s)	8.1	8.1	7.9	8.1								
Approach Delay (s)	8.1	8.1	7.9	8.1								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.1									
Level of Service			A									
Intersection Capacity Utilization			27.9%	ICU Level of Service	A							
Analysis Period (min)			15									











HCM Unsignalized Intersection Capacity Analysis  
 14: Walnut Street South & Forest Avenue

10-27-2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	26	21	43	0	0	0	0	36	3	9	78	0
Future Volume (vph)	26	21	43	0	0	0	0	36	3	9	78	0
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
Hourly flow rate (vph)	29	23	48	0	0	0	0	40	3	10	87	0
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total (vph)	100	43	97									
Volume Left (vph)	29	0	10									
Volume Right (vph)	48	3	0									
Hadj (s)	-0.19	-0.04	0.06									
Departure Headway (s)	4.0	4.2	4.2									
Degree Utilization, x	0.11	0.05	0.11									
Capacity (veh/h)	865	829	831									
Control Delay (s)	7.5	7.4	7.8									
Approach Delay (s)	7.5	7.4	7.8									
Approach LOS	A	A	A									
Intersection Summary												
Delay			7.6									
Level of Service			A									
Intersection Capacity Utilization			32.2%	ICU Level of Service								A
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 17: Catharine Street South & Existing Access

10-27-2023

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	4	0	0	0	7	114
Future Volume (Veh/h)	4	0	0	0	7	114
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	0	0	0	8	124
Pedestrians	20		20			20
Lane Width (m)	3.5		0.0			3.5
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	2		0			2
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	180	40			20	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	180	40			20	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			99	
cM capacity (veh/h)	797	1004			1583	
<b>Direction, Lane #</b>	<b>WB 1</b>	<b>SB 1</b>				
Volume Total	4	132				
Volume Left	4	8				
Volume Right	0	0				
cSH	797	1583				
Volume to Capacity	0.01	0.01				
Queue Length 95th (m)	0.1	0.1				
Control Delay (s)	9.5	0.5				
Lane LOS	A	A				
Approach Delay (s)	9.5	0.5				
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay			0.7			
Intersection Capacity Utilization			26.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis  
 19: Forest Avenue & Site Access

10-27-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		4			1	
Traffic Volume (veh/h)	5	95	0	0	3	0
Future Volume (Veh/h)	5	95	0	0	3	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	103	0	0	3	0
Pedestrians		20	20		20	
Lane Width (m)		3.5	0.0		3.5	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		2	0		2	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	20				153	40
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	20				153	40
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1583				827	1004
Direction, Lane #	EB 1	SB 1				
Volume Total	108	3				
Volume Left	5	3				
Volume Right	0	0				
cSH	1583	827				
Volume to Capacity	0.00	0.00				
Queue Length 95th (m)	0.1	0.1				
Control Delay (s)	0.4	9.4				
Lane LOS	A	A				
Approach Delay (s)	0.4	9.4				
Approach LOS		A				
<b>Intersection Summary</b>						
Average Delay			0.6			
Intersection Capacity Utilization			23.9%		ICU Level of Service	A
Analysis Period (min)			15			

# HCM Unsignalized Intersection Capacity Analysis

## 21: Forest Avenue & Site Access 2

10-27-2023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		4			1	
Traffic Volume (veh/h)	5	93	0	0	2	0
Future Volume (Veh/h)	5	93	0	0	2	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	101	0	0	2	0
<b>Pedestrians</b>						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	0				111	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				111	0
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1636				888	1091
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>SB 1</b>				
Volume Total	106	2				
Volume Left	5	2				
Volume Right	0	0				
cSH	1636	888				
Volume to Capacity	0.00	0.00				
Queue Length 95th (m)	0.1	0.1				
Control Delay (s)	0.4	9.1				
Lane LOS	A	A				
Approach Delay (s)	0.4	9.1				
Approach LOS		A				
<b>Intersection Summary</b>						
Average Delay			0.5			
Intersection Capacity Utilization			15.2%		ICU Level of Service	A
Analysis Period (min)			15			

# HCM Unsignalized Intersection Capacity Analysis

## 23: Site Access 3 & Young Street

10-27-2023



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	91	33	6	105	24	10
Future Volume (Veh/h)	91	33	6	105	24	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	99	36	7	114	26	11
<b>Pedestrians</b>						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			135		245	117
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			135		245	117
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		97	99
cM capacity (veh/h)			1462		744	941
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	135	121	37			
Volume Left	0	7	26			
Volume Right	36	0	11			
cSH	1700	1462	793			
Volume to Capacity	0.08	0.00	0.05			
Queue Length 95th (m)	0.0	0.1	1.2			
Control Delay (s)	0.0	0.5	9.8			
Lane LOS		A	A			
Approach Delay (s)	0.0	0.5	9.8			
Approach LOS			A			
<b>Intersection Summary</b>						
Average Delay			1.4			
Intersection Capacity Utilization			20.4%	ICU Level of Service	A	
Analysis Period (min)			15			