

Ontario Line

Integrated Transit Oriented Communities – Pape Station

Draft Transportation Impact Assessment Study

Issued for Rezoning

North Site: 11-15 Gertrude Place
Toronto, Ontario

South Site: 670-710 Danforth Ave, 2-16 Eaton Avenue, 1-21 Lipton
Avenue
Toronto, Ontario

Contract RFS-2019-NAFC-110

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1 Introduction

HDR Corporation was retained by Metrolinx to undertake a Transportation Impact Study (TIS) and Parking Assessment for two proposed mixed-use Transit Oriented Community (TOC) developments to be located on the future Pape Ontario Line Station. Ontario Line runs north-south along the east side of Pape Avenue in the vicinity of Pape Station.

The north site property is located at the east end of Gertrude Place and the south site property is located on the north-west corner of the intersection of Danforth Avenue and Eaton Avenue, as shown in **Figure 1**. The sites are currently occupied by existing buildings which contain residential houses, general retail-commercial employment uses including restaurant, pharmacy, barbershop, and other small businesses. With the construction of Ontario Line, the proposed south building would sit above the station headhouse lobby on the north side of Danforth Avenue.

The proposed redevelopment consists of two sites:

- **North Site:** 11-15 Gertrude Place
 - 25 residential units
 - 420 square metres gross floor area (SM GFA) of non-residential uses
- **South Site:** 670-710 Danforth Ave, 2-16 Eaton Avenue, 1-21 Lipton Avenue
 - 414 residential units
 - 1,730 square metres gross floor area (SM GFA) of retail space

The sites will be highly transit-oriented given the direct access to Ontario Line and the inherent mixed-use nature of the area, which includes employment uses and other commercial-retail and services that will support the residents. Considering the nature of the development, limited vehicular parking is proposed, and the site will leverage the transit availability in the area, as well as the expanded future transit availability with the construction of Ontario Line. In addition to being in close vicinity of a new higher order transit service, the south site will have direct internal access to the transit station. The north site will sit beside the emergency egress for the station but will not have direct access to the station inside the building.

The purpose of this report is to assess the impacts of the proposed developments on the surrounding transportation infrastructure from a multi-modal perspective and to identify potential mitigation in the form of geometric improvements, wayfinding, or signal timing adjustments. Traditionally the City uses a rule-of-thumb threshold of 100 two-way peak hour vehicle trips to determine the need for a transportation impact study for new development. While the developments are not anticipated to generate significant number of vehicle trips, the vast majority of trips generated by the developments will be pedestrian trips in the form of walk-in trips or transfers from surface transit routes. These non-vehicle trips will also affect the vehicle operations as a result of pedestrians using crosswalks, despite the station not being a large generator of primary vehicle trips. Therefore, pedestrian and cyclist trips generated by the proposed TOC development were added to the vehicle analysis to assess the impacts.

The traffic impact study report includes draft documentation of the following components:

- Existing Conditions
- Background Conditions
- Proposed TOC Trip Generation
- Future Total Conditions with TOCs & Future Pape Station
- Vehicular Operations Analysis
- Parking Assessment
- Loading Assessment
- Preliminary Findings and Next Steps



Figure 1: Study Area and Site Context

1.1 Scope of Work

The scope of work has been prepared in accordance with the **City of Toronto Guidelines for the Preparation of Transportation Impact Studies** (2013), and is as follows:

Study Area	<ul style="list-style-type: none"> • The streets surrounding the future TOC sites, including Pape Avenue, Danforth Avenue, Lipton Avenue, Eaton Avenue, Gertrude Place, Woodycrest Avenue, and the bus loop entrance north of existing Pape Station Hall.
Analysis Scenarios	<ul style="list-style-type: none"> • Existing 2022 Traffic Conditions • Future 2032 Background Conditions (10-year Horizon)

	<p><i>Includes 0.5% annual vehicle traffic background growth, and 1% annual active transportation background growth, plus other new development traffic and Pape Station trips.</i></p> <ul style="list-style-type: none"> • Future 2032 Total Conditions (10-year Horizon) <p><i>Includes future background traffic volumes plus trips generated by the proposed TOC developments.</i></p>
Analysis Time Periods	<p>The following time periods are proposed to be analyzed as they represent the peak trip generation times for the stations and the background pedestrian and cycling demand:</p> <ul style="list-style-type: none"> • Weekday AM peak hour between 7:00am and 9:00am • Weekday PM peak hour between 3:00pm and 6:00pm
Trip Generation	<ul style="list-style-type: none"> • TOC trips will be generated using the ITE Trip Generation 11th Edition based on the proposed development plan • Future Pape Station trips were generated based on the Metrolinx 2041 ridership and station forecasts, which were disaggregated into walking, cycling and transit trips. • Station pick-up drop-off (PUDO) trips were generated and assigned as vehicle traffic.
Parking and Loading Review	<p>A parking and loading assessment was undertaken for the proposed development using the City of Toronto Zoning By-law 569-2013 as the basis of the assessment, and in the context of the site as a transit-oriented community. A Transportation Demand Management (TDM) Plan has been developed to further support the proposed parking supply and to ensure a wholesome approach to transportation management that addresses the needs of all modes and achieves planning goals of encouraging multi-modal decision making through the provision of alternative and sustainable modes of travel, and reducing single-occupant vehicle use.</p>
External Network Multi-Modal Level of Service (MMLOS) Analysis	<p>Multi-Modal Level of Service (MMLOS) for the Pape TOC development has been reviewed under separate cover, in the report Ontario Line Pape Station Transportation Impact Study (Ontario Line Technical Advisor, April 25, 2022), which was submitted as part of a Site Plan Review package for the proposed station – referred herein as the "Station SPR".</p> <p>The Station SPR study assessed the 2041 horizon year, which is 9 years beyond the horizon year assessed in this report. While the station related pedestrian traffic may continue to grow, the TOC related pedestrian traffic will remain relatively constant based on the ultimate development of the site, and the presence of the proposed station.</p> <p>An MMLOS analysis for the 2041 horizon year is included in that assessment and incorporates site traffic generated by the proposed TOC development and for all modes of travel. The MMLOS assessment in the Station SPR is based on the City of Ottawa MMLOS Method for analysis of the surrounding pedestrian and cycling infrastructure, as well as a pedestrian analysis based on Fruin Level of Service methodology for sidewalks and transit waiting areas within the study area. This TOC report does not duplicate the SPR analysis findings but includes a high-level overview of the surrounding bicycle and pedestrian infrastructure.</p> <p>Please refer to the Station SPR report for detailed 2041 horizon year MMLOS assessment and Fruin Level of Service analysis of the study area, which includes the Pape TOC development.</p>

1.2 Intersection Operation and Analysis Methodology

Intersection operations were assessed for the study area intersections using the software program Synchro Traffic Signal Coordination Software Version 11, which employs methodology from the Highway Capacity Manual (HCM 2000) published by the Transportation Research Board National Research Council. Synchro can analyze both signalized and unsignalized intersections in a road corridor or network, taking into account the spacing, interaction, queues and operations between intersections.

The intersection analysis considers three separate measures of performance:

- The capacity of all intersection movements, represented by volume to capacity (v/c) ratio;
- The level of service (LOS) for all intersection turning movements as well as for the overall intersection. The overall intersection LOS is based on the average control delay per vehicle (weighted) for the various movements through the intersection; and
- The forecasted queue lengths (95th percentile queue length) and storage requirements.

LOS is an indicator of how long a vehicle must wait to complete a movement and is represented by a letter between 'A' and 'F', with 'F' being the longest delay. The volume to capacity (v/c) ratio is a theoretical measure of the degree of capacity utilized at an intersection. HCM definitions are summarized in **Table 1**.

Table 1: Highway Capacity Manual Level of Service Definitions

Level of Service (LOS)	Signalized Control Delay per Vehicle (s)	Unsignalized Control Delay per Vehicle (s)	Description
A	≤ 10	≤ 10	Ideal
B	> 10 and ≤ 20	> 10 and ≤ 15	Acceptable
C	> 20 and ≤ 35	> 15 and ≤ 25	Acceptable
D	> 35 and ≤ 55	> 25 and ≤ 35	Somewhat undesirable
E	> 55 and ≤ 80	> 35 and ≤ 50	Undesirable
F	> 80	> 50	Unacceptable

The analysis undertaken in this study also follows the **City of Toronto Guidelines for Using Synchro 9 (Including SimTraffic 9¹)** (March 18, 2016), **City of Toronto' Guidelines for the Preparation of Transportation Impact Studies²**, and **City of Toronto' Traffic Signal Operations Policies and Strategies³** (May 2015)³. Existing signal timing plans were received from the City and presented in **Appendix A**.

¹ https://www.toronto.ca/wp-content/uploads/2017/11/99bc-0_2016-04-28_Guidelines-for-Using-Synchro-9-Including-SimTraffic-9_Final-a.pdf

² <http://arris.ca/~arris2/ARCHIVE/traffic-impact-study-guidelines.pdf>

³ https://www.toronto.ca/wp-content/uploads/2017/11/91d6-0_2015-11-13_Traffic-Signal-Operations-Policies-and-Strategies_Final-a.pdf

2 Existing Conditions

2.1 Site Context

As shown in **Figure 1**, the north site property (11-15 Gertrude Place) is located at the east end of Gertrude Place and the south site property (670-710 Danforth Ave, 2-16 Eaton Avenue, 1-21 Lipton Avenue) is located on the northwest corner of the intersection of Danforth Avenue and Eaton Avenue. Existing TTC Pape Station is located at the northeast corner of Pape Avenue and Lipton Avenue intersection. Transit users could access the TTC Line 2 platforms via two entrances: the main entrance at Pape Avenue just north of Lipton Avenue, and the east entrance at the east end of Lipton Avenue cul de sac which connects to Eaton Avenue via a pedestrian path. The existing Pape Station site also accommodates a bus loop serving TTC lines 25A/B, 72A/B/C, 81, 300A/B, 325, and 925.

Two municipal parking lots are available adjacent to the existing Pape Station. One parking lot is located east of the station site and can be accessed via Lipton Avenue; the other is located west of the station site and has the entrance at Pape Avenue opposite Lipton Avenue.

2.2 Existing Road Network

The existing road network is presented in **Figure 2**, including existing traffic controls and lane configurations. All study roadways are under the jurisdiction of the City of Toronto. The existing road network is described below:

Pape Avenue	Pape Avenue is a two-way north-south arterial street with a posted speed limit of 40 km/h north and 30 km/h south of Danforth Avenue. It has a four-lane cross-section with sidewalks on both sides of the street. The curb lanes operate as HOV lanes (taxis, buses, and vehicles with no less than three persons) in both directions north of Danforth Avenue during weekday peak periods.
Danforth Avenue	Danforth Avenue is a two-way east-west arterial street with a posted speed limit of 40 km/h. In July 2020, dedicated bike lanes were installed along Danforth Ave, replacing the curb lanes in both directions. It currently operates with a two-lane cross-section with bike lanes, on-street parking, and sidewalks on both sides of the street.
Lipton Avenue	Lipton Avenue is a two-way local cul de sac street providing access to residential houses. It also serves the TTC bus lines and provides access/egress to/from Pape Station.
Eaton Avenue	Eaton Avenue is a one-way northbound-only local street north of Danforth Avenue. It has a posted speed limit of 30 km/h with sidewalks provided on both sides of the street.
Woodycrest Avenue	Woodycrest Avenue is a one-way southbound-only local street north of Danforth Avenue. It has a posted speed limit of 30 km/h with sidewalks provided on both sides of the street. The T-intersection at Danforth Avenue was recently implemented with traffic signals.

Gertrude Place

Gertrude Place is a one-way westbound-only local street east of Pape Avenue. It has a posted speed limit of 30 km/h with sidewalks provided on both sides of the street.

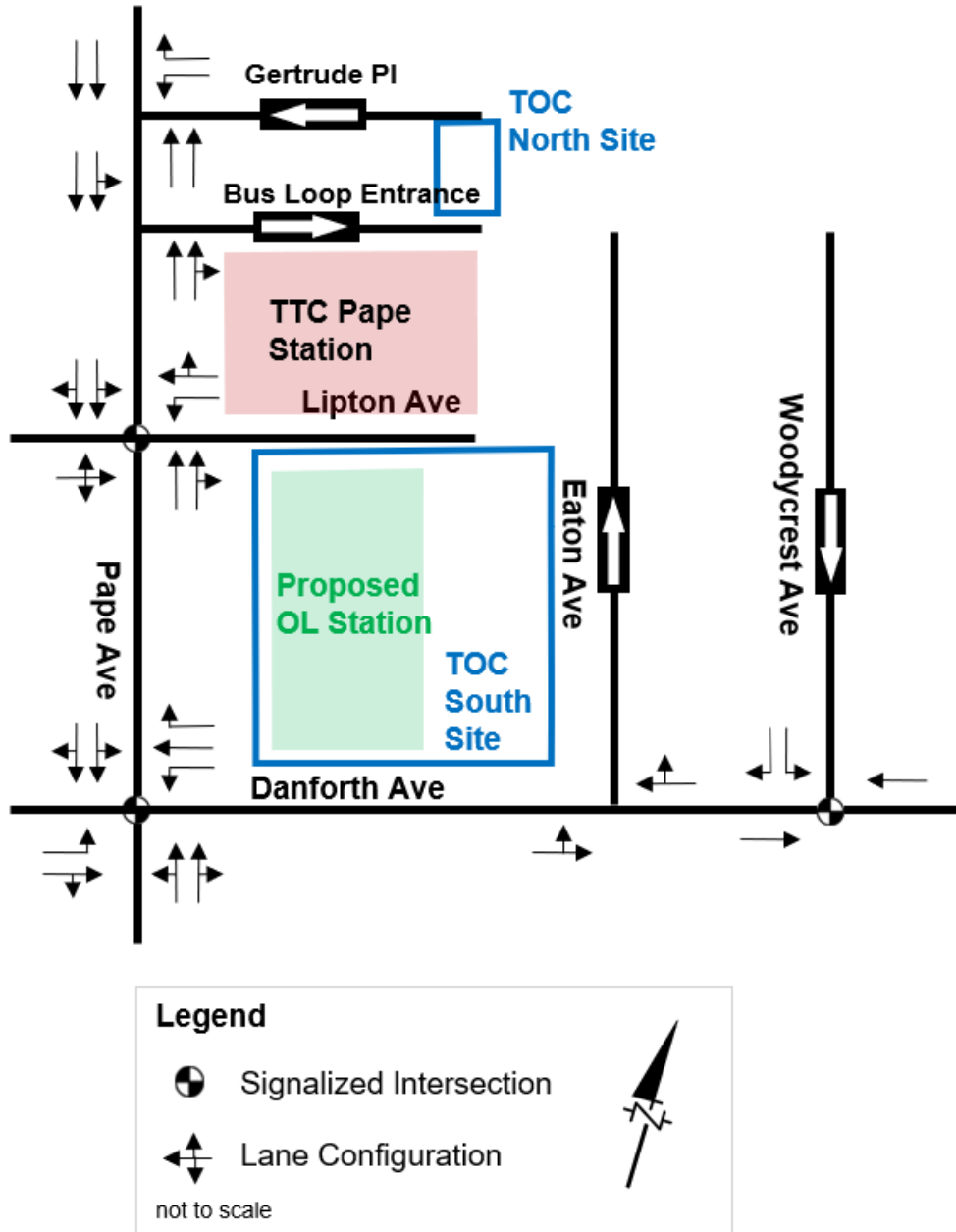


Figure 2: Existing Lane Configurations and Traffic Control

2.3 Existing Transit Services

The existing TTC Pape Station serves both Subway Line 2 (along Danforth Avenue) and surface transit routes (along Pape Avenue), and provides seamless transfers. Existing transit services are summarized in **Table 2**. Overall, there is a good transit network available in the broader study area. An excerpt from the TTC system map⁴ is shown in **Figure 3**.

The site is approximately 4 kilometres away from the nearest GO stations at Danforth Station.

Table 2: Transit Service Summary

Route #	Route Name	Route Description	Peak Hour Headways	Nearest Stops & Walking Distance
Subway Line 2	Bloor-Danforth	Generally in the east-west direction between Kipling Station and Kennedy Station	2-3 minutes	Pape & Lipton (0 m)
25A/B	Don Mills	Generally in the north-south direction between Pape Station and Steeles Avenue	6 minutes	Pape & Lipton (0 m)
72A/B/C	Pape	Generally in the north-south direction between Pape Station and Commissioners Street, and between Pape Station and Union Station	1-9 minutes	Pape & Lipton (0 m)
81	Thornccliffe Park	Generally in the north-south direction between Pape Station and the Thornccliffe Park Drive area	4-5 minutes	Pape & Lipton (0 m)
300A/B	Bloor-Danforth	Night route generally in the east-west direction between Kennedy Station, the area of Warden Avenue and Danforth Avenue, the area of The West Mall and Burnhamthorpe Road, and Toronto Pearson International Airport	4-5 minutes	Pape & Danforth (100 m)
325	Don Mills	Night route generally in the north-south direction between the area of Steeles Avenue East and Don Mills Road, and the area of Eastern Avenue and Carlaw Avenue	30 minutes	Pape & Lipton (0 m)
925	Don Mills Express	Express route generally in the north-south direction between Pape Station and Steeles Avenue	9-10 minutes	Pape & Lipton (0 m)

⁴ TTC System Map for September 2022, <https://www.ttc.ca/routes-and-schedules/>

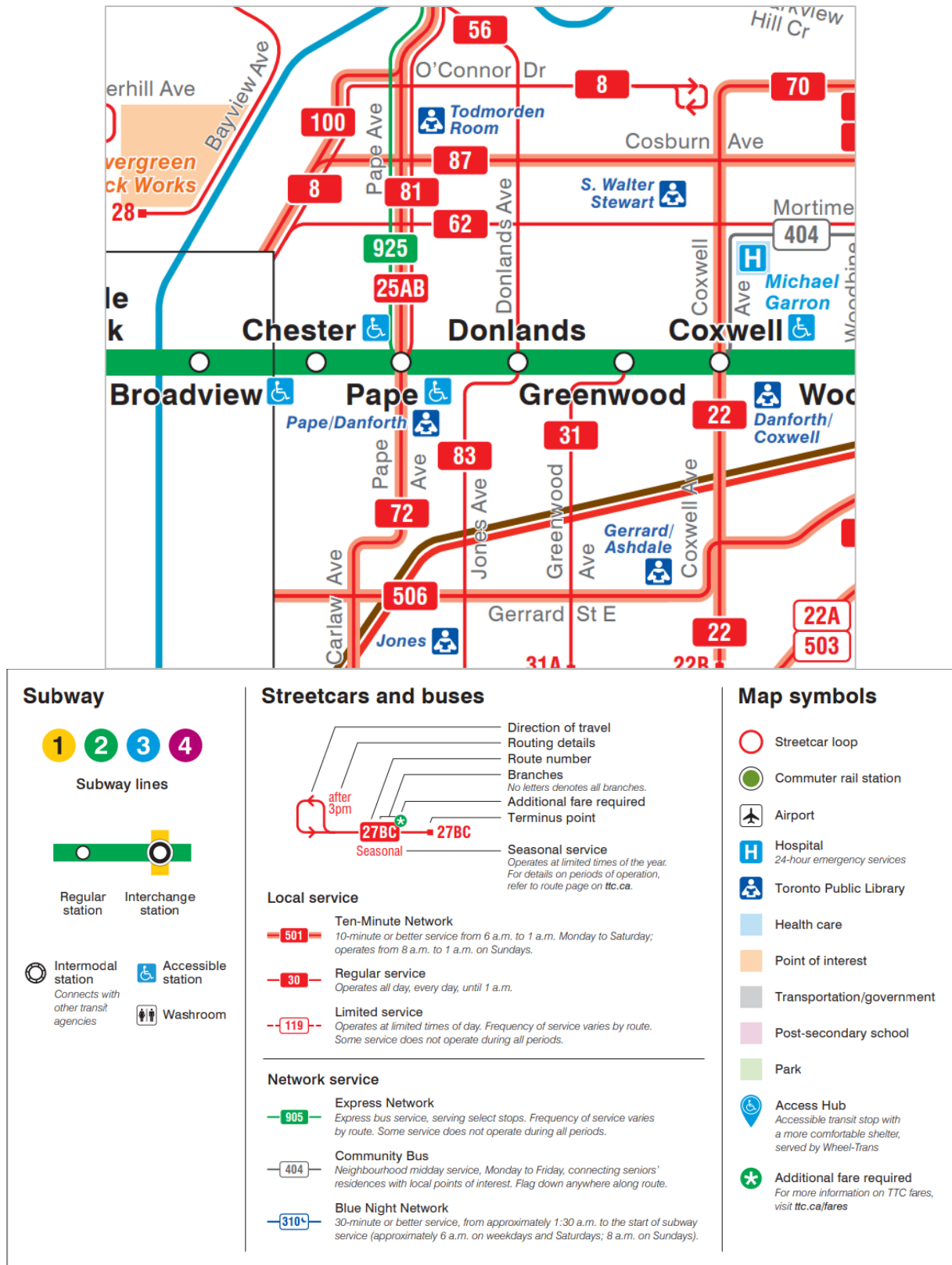


Figure 3: Existing Transit Service

2.4 Existing Cycling and Pedestrian Facilities

Dedicated cycling facilities are provided on both sides of Danforth Avenue. Pedestrian connectivity within the study area is good in terms of sidewalks, paths, and pedestrian crossings. All major streets have sidewalks on both sides. Ladder crosswalks are typically located on all legs of the signalized intersections within the study area. Generally, the sidewalks in the study area are 1.8 m or wider, but due to objects such as power poles, traffic signals, waste bins and street trees, the clear pedestrian zone may be narrower in many locations, as illustrated in **Figure 4**. The existing active transportation network is presented in **Figure 5**.

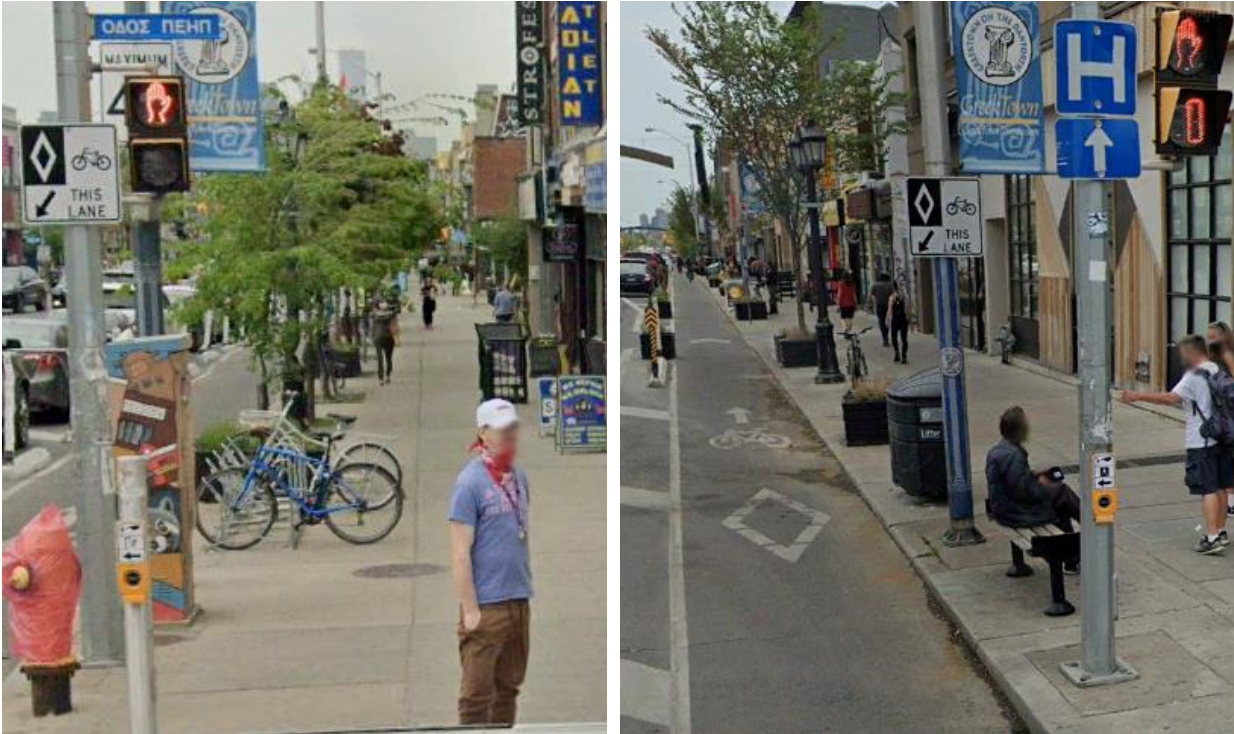


Figure 4: Sidewalks on Danforth Avenue (Left - north side of Danforth Avenue, looking west of Pape Avenue, Right - south side of Danforth Avenue, looking east of Pape Avenue)



Figure 5: Study Area Active Transportation Network

2.5 Existing Volumes

Traffic count sources for study area intersections are summarized in **Table 3** below. HDR used available traffic counts derived from the City's database. The existing volumes are described as being 2022 in order to relate them to the future horizon year (2032). However, they represent typical pre-pandemic traffic volumes/conditions, as they were developed using pre-pandemic volumes that were adjusted to represent a 'typical' existing (2022) condition.

Table 3: Traffic Count Source

Intersection	Count Source / Date
Pape Ave and Danforth Ave	City of Toronto Traffic Count Database - 2015
Pape Ave and Lipton Ave	City of Toronto Traffic Count Database - 2018
Danforth Ave and Woodycrest Ave	City of Toronto Traffic Count Database - 2017
Danforth Ave and Eaton Ave	City of Toronto Traffic Count Database - 2017

Individual intersection peak hour traffic volumes were used in the study analysis, which is more conservative than calculating a global peak hour. Volume balancing between intersections was also reviewed. It is noted that traffic volumes on Danforth Avenue represent a pre-pandemic condition, when the corridor operated with a four-lane cross-section. However, in July 2020, dedicated bike lanes were installed along Danforth Ave, replacing the curb lanes in both directions. Existing (2022) road capacity is reduced from 4-lane to 2-lane cross-section and likely the east-west through vehicular volumes are expected to reduce. Therefore, a reduction factor of 50% was assumed to be applied to the east-west through traffic volumes for the peak-hour-peak-direction to reflect the road diet condition.

Additional turning movement counts were collected in June 2022 for Pape Avenue and Danforth Avenue intersection. The 2022 traffic counts show lower vehicular and pedestrian volumes than the pre-pandemic volumes (with 50% reduction for the east-west through volumes). Therefore, the 2022 traffic counts were not used in this study.

Figure 6 shows the existing volumes (vehicles, pedestrians, bicycles) at the study area intersections.

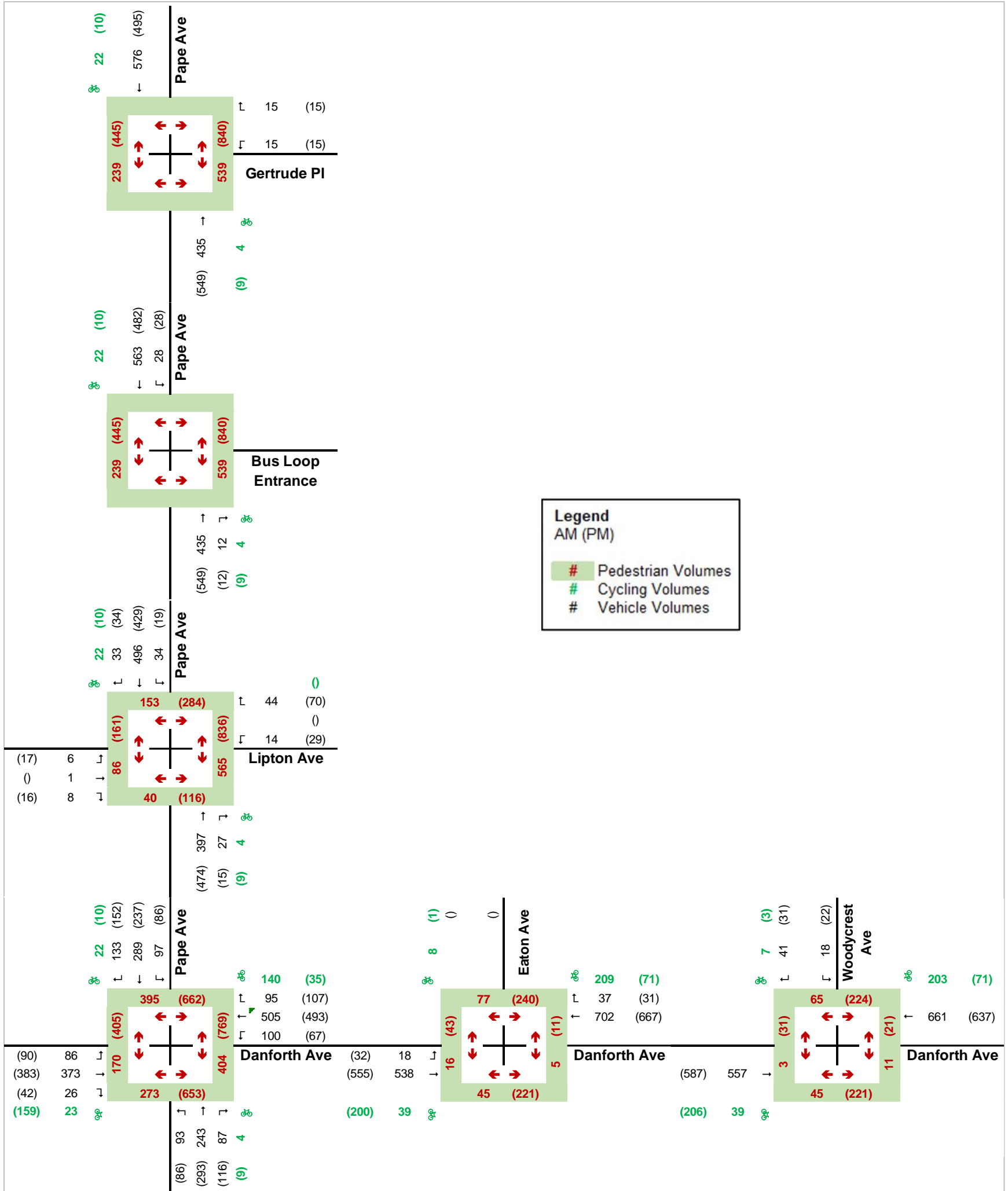


Figure 6: Existing Volumes at Intersections

2.6 Existing Operations

Based on the existing volumes and network, traffic and pedestrian operations were assessed. **Table 4** summarizes the level-of-service (LOS) and volume/capacity ratio (v/c ratio) for each movement under existing conditions. Detailed HCM 2000 results and reports for all study area intersections are provided in **Appendix B**. A lane utilization factor of 0.75 was used in Synchro model for Pape Avenue, considering the HOV lane implementation during peak periods.

Table 4: 2022 Existing Traffic Conditions – Summary

Intersection and Movement		Lanes	Storage (m)	AM Peak Hour			PM Peak Hour		
				LOS	v/c	95 th Q	LOS	v/c	95 th Q
Pape Ave & Danforth Ave		-	-	D	0.93	-	D	0.92	-
Eastbound	Left	1	45	C	0.51	28	C	0.46	27
	Through-Right	1	85	C	0.69	93	C	0.68	93
Westbound	Left	1	45	C	0.42	30	C	0.28	25
	Through	1	130	C	0.82	141	D	0.76	125
	Right	1	60	C	0.11	8	E	0.12	19
Northbound	Left-Through-Right	1	75	F	1.02	93	C	0.78	62
Southbound	Left-Through-Right	1	60	D	0.82	87	F	1.12	101
Pape Ave & Lipton Ave		-	-	B	0.32	-	B	0.28	-
Eastbound	Left-Through-Right	1	10	C	0.03	6	C	0.03	4
Westbound	Left	1	40	C	0.08	8	C	0.17	12
	Through-Right	1	40	C	0.06	7	C	0.16	14
Northbound	Through-Right	2	60	B	0.28	46	A	0.31	26
Southbound	Left-Through-Right	1	25	A	0.41	45	A	0.32	35
Danforth Ave & Eaton Ave		-	-	A	-	-	A	-	-
Eastbound	Left-Through	1	130	A	0.06	2	A	0.06	2
Westbound	Through-Right	1	95	A	0.7	0	A	0.46	0
Danforth Ave & Woodycrest Ave		-	-	A	0.53	-	A	0.49	-
Eastbound	Through	1	95	A	0.51	97	A	0.5	41
Westbound	Through	1	80	A	0.59	93	A	0.54	81
Southbound	Left	1	35	D	0.11	9	D	0.13	10
Pape Ave & Bus Loop Entrance		-	-	A	-	-	A	-	-
Northbound	Through-Right	2	25	A	0.18	0	A	0.22	0
Southbound	Left-Through	2	30	A	0.24	2	A	0.19	4
Pape Ave & Gertrude PI		-	-	A	-	-	A	-	-
Northbound	Through	2	30	A	0.14	0	A	0.16	0
Southbound	Through	2	190	A	0.18	0	A	0.15	0
Westbound	Left	1	15	F	0.19	6	F	0.62	14
	Right	1	50	D	0.08	2	F	0.26	7

Note: LOS = level of service; v/c = volume to capacity ratio; 95th Q = 95th Percentile Queue using HCM 2000, and Pedestrian Crosswalk LOS using HCM 2010. Critical movements are highlighted in red as defined by the City's TIS Guidelines.

Under existing traffic conditions, all study area intersections are operating at an overall LOS D or better. All the individual movements are operating at LOS D or better, except for the northbound movements (LOS F) at Pape Avenue and Danforth Avenue intersection during morning peak hour and southbound movements (LOS F) and westbound right movement (LOS E) during afternoon peak hour. Westbound movements from Gertrude Place to Pape Avenue are operating with some delay (LOS F) due to high pedestrian crossing volumes on the east leg (over 500/800 pedestrians during morning/afternoon peak hour).

3 Future Background Conditions

3.1 Planned Improvements

Based on the City of Toronto's Ongoing Infrastructure & Construction Projects list⁵, no project is expected in the vicinity of the proposed station site. Additionally, any improvements are not anticipated to significantly affect the intersection lane configurations and/or operations at the study area intersections, and therefore no changes were made to the future Synchro model based on this project.

3.2 Background Volumes

3.2.1 Base Background Growth

Based on experience and a review of general traffic patterns in the adjacent Riverdale area, traffic demand within this area has remained relatively stable, despite variations in traffic patterns. To assess worst-case growth conditions, a base background vehicular growth rate of 0.5% was applied to all study intersections and is considered a conservative assumption. A growth rate of 1% was applied to all pedestrian and bicycle volumes.

3.2.2 Background Developments

Nearby background developments were reviewed. As shown in **Figure 7**, a total of nine development applications were found within a 250 m radius of the study site, with six applications currently under review or being appealed and three approved/closed.

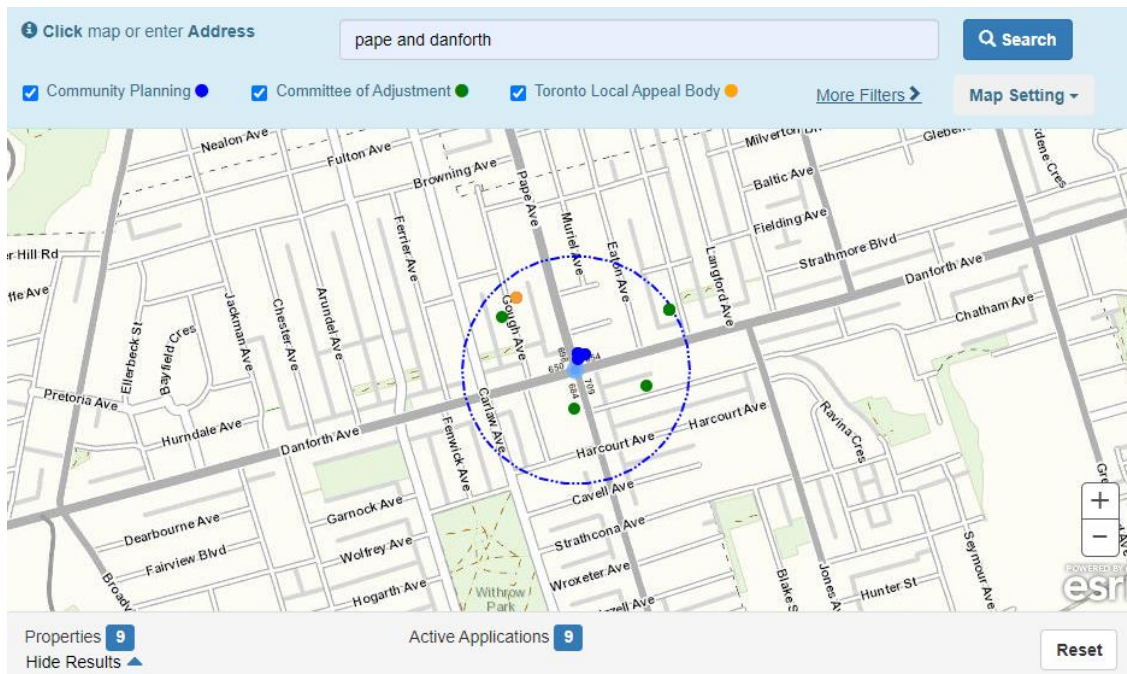


Figure 7: Adjacent Background Developments for Consideration

⁵ <https://www.toronto.ca/community-people/get-involved/public-consultations/infrastructure-projects/>

3.2.3 2032 OL Pape Station Traffic Demands

The OL Pape Station has been included as a layer of background growth, and walking and transit trips to/from the station were generated. Future 2041 station trips during morning peak hour were estimated based on forecasts provided by Travel Demand Modelling Team. The analysis was originally conducted using a previous iteration⁶ of the station trip forecasts provided by Metrolinx. The most recent station forecasts⁷ for surface entry/egress station trips were received in August 2021.

The 2041 station trips during morning peak hour were adjusted to reflect the 2032 horizon year using a 1% per annum reverse growth rate from 2041 to 2032. To generate station trips for the 2032 afternoon peak hour, the 2032 morning demand matrix was transposed, along with the directions (i.e., morning trip from southbound bus to OL southbound entrance was transposed as afternoon trip from OL northbound to northbound bus). This reflects the assumption that the predominant trip patterns during both peak hours will be reversed and primarily commuter-based.

Table 5 shows the future station trips. Considering the future Pape Station will be a major transfer station between Line 2 and OL, all the pedestrian trips transferring between Line 2 and OL are considered to take place within the station and have minor impacts to the surrounding network. Existing bus loop at Pape Station will be providing service for emergency shuttles only; future bus route(s) along Pape Avenue will be using the existing on-street stops. Of the walk trips directly from/to OL station, 10% were assumed to be cycle trips (based on 2016 TTS data for Pape Station zone) and 90% were assumed to be pedestrian trips. Additional pick-up and drop-off (PUDO) trips were also estimated and to be conservative, to make up an additional 5% of trips from/to the station (based on 2016 TTS data for Pape Station zone).

Table 5: Future Station Trips

Mode	AM	PM
Walk Trips from/to OL Station	1,017	1,017
Cycle Trips from/to OL Station	113	113
Transfer (Walk) Trips between OL and Bus Route	130	130
Transfer (Walk) Trips between Line 2 and Bus Route	130	130
Transfer (Walk) Trips between OL and Line 2 *	8,600	8,600
Additional PUDO	57	57

Note: * Considered to be within the station

⁶ OnCorr Express Test – Exhibition ON V2 (July 24), PSOS v1/v2

⁷ OL Post PDBC 100cap40tph PSOS v3

Future walk trips to/from the OL station were assumed to be equally distributed to all the directions based on the residential land use density near the site. The assumed distribution for walk trips are shown in **Table 6** and

Table 7 for cycle and PUDO trips. Future transfer (walk) trips between OL and surface bus routes, and between Line 2 and surface bus routes were assumed to take the shortest path between the station entrances and the on-street bus stops.

Table 6: Assumed Trip Distribution – Walk Trips

Mode	Time Period	Direction								Total
		NE		NW		SE		SW		
		25%		25%		25%		25%		
		Pape East	Danforth North	Pape West	Danforth North	Danforth South	Pape East	Danforth South	Pape West	
Walk Trips	AM/PM	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	100%

Table 7: Assumed Trip Distribution – Cycle and PUDO Trips

Mode	Time Period	Direction				Total
		Pape North	Pape South	Danforth East	Danforth West	
Cycle Trips	AM/PM	25%	25%	25%	25%	100%
PUDO	AM/PM	25%	25%	25%	25%	100%

The resulting future (2032) station trips are shown in **Figure 8**.

3.2.4 Total Background Traffic

Figure 9 shows the resulting total future background traffic volumes, which include the base background traffic and Ontario Line Pape Station background traffic.

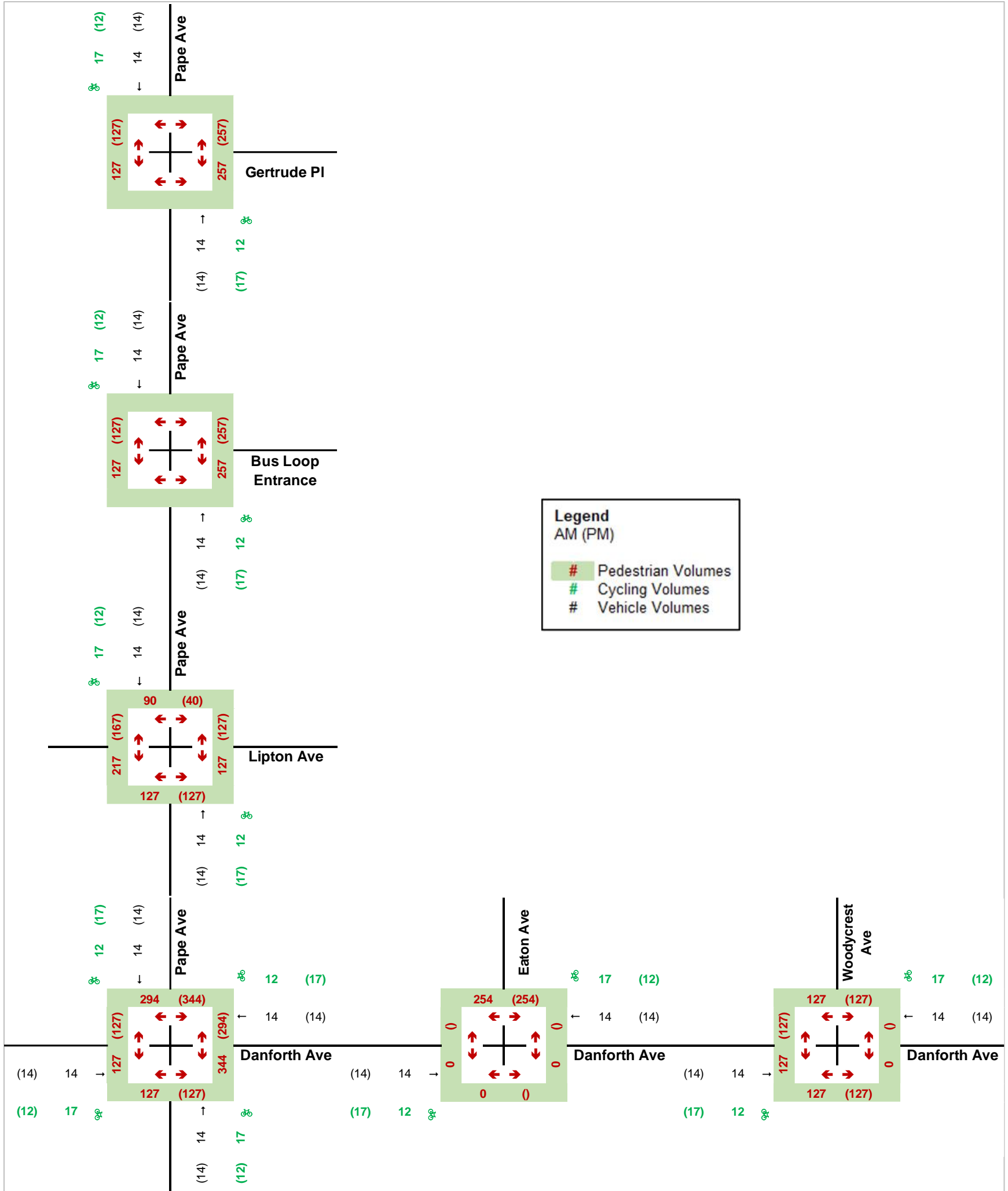


Figure 8: 2032 Station Site Trips

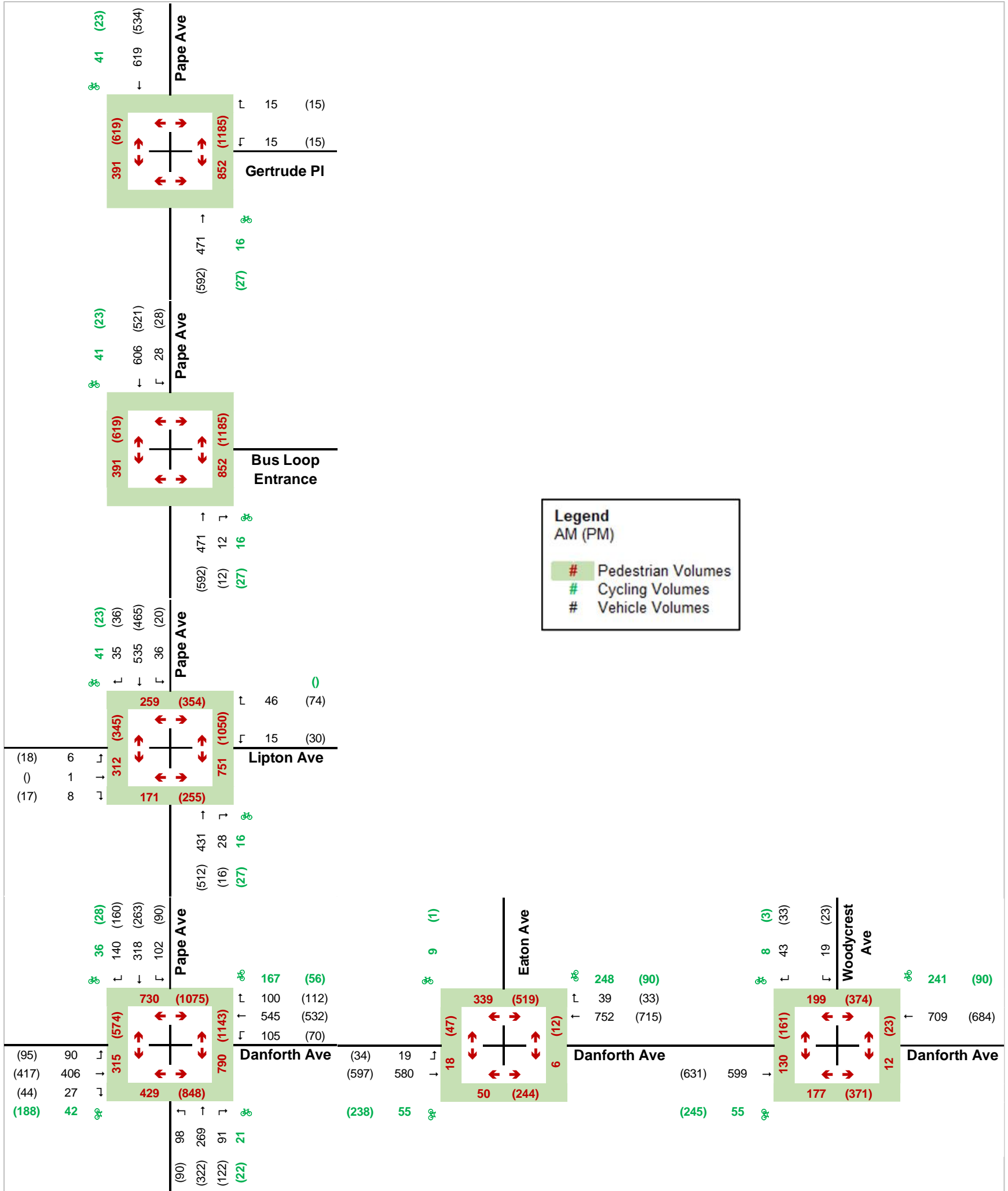


Figure 9: 2032 Total Background Traffic Volumes

3.3 Future Background Traffic Operations

Table 8 summarizes the LOS and v/c ratio for movements under future background conditions based on the forecasted future volumes. Signal timing split optimization was performed to the model, but the cycle length was maintained as the existing.

Table 8: 2032 Background Traffic Conditions – Summary

Intersection and Movement		Lanes	Storage (m)	AM Peak Hour			PM Peak Hour		
				LOS	v/c	95 th Q	LOS	v/c	95 th Q
Pape Ave & Danforth Ave		-	-	D	1.02		D	0.99	-
Eastbound	Left	1	45	D	0.69	41	E	0.76	42
	Through-Right	1	85	D	0.79	121	D	0.83	125
Westbound	Left	1	45	C	0.55	35	C	0.42	25
	Through	1	130	D	0.93	167	D	0.92	156
	Right	1	60	C	0.13	8	E	0.15	21
Northbound	Left-Through-Right	1	75	F	1.06	101	C	0.69	57
Southbound	Left-Through-Right	1	60	D	0.93	108	E	1.07	105
Pape Ave & Lipton Ave		-	-	B	0.36		B	0.33	-
Eastbound	Left-Through-Right	1	10	C	0.02	6	B	0.03	3
Westbound	Left	1	40	C	0.08	8	C	0.14	11
	Through-Right	1	40	C	0.07	7	C	0.17	12
Northbound	Through-Right	2	60	B	0.33	50	B	0.43	38
Southbound	Left-Through-Right	1	25	B	0.49	58	B	0.45	55
Danforth Ave & Eaton Ave		-	A	-			A	-	-
Eastbound	Left-Through	1	130	A	0.10	3	A	0.09	3
Westbound	Through-Right	1	95	A	0.75	0	A	0.49	0
Danforth Ave & Woodycrest Ave		-	-	A	0.57		A	0.53	-
Eastbound	Through	1	95	A	0.55	102	A	0.54	34
Westbound	Through	1	80	A	0.63	108	A	0.58	92
Southbound	Left	1	35	D	0.12	9	D	0.13	10
Pape Ave & Bus Loop Entrance		-	A	-			A	-	-
Northbound	Through-Right	2	25	A	0.20	0	A	0.24	0
Southbound	Left-Through	2	30	A	0.26	4	C	0.25	7
Pape Ave & Gertrude PI		-	A	-			B	-	-
Northbound	Through	2	30	A	0.15	0	A	0.18	0
Southbound	Through	2	190	A	0.20	0	A	0.16	0
Westbound	Left	1	15	F	0.73	16	F	1.50	21
	Right	1	50	C	0.28	8	F	0.57	14

Note: LOS = level of service; v/c = volume to capacity ratio; 95th Q = 95th Percentile Queue using HCM 2000, and Pedestrian Crosswalk LOS using HCM 2010. Critical movements are highlighted in red as defined by the City's TIS Guidelines.

Under future background conditions, all movements are expected to operate at LOS D or better with residual capacity at Pape Avenue and Lipton Avenue intersection, and at Danforth Avenue and Woodycrest Avenue intersection. However, the intersection at Pape Avenue and Danforth Avenue is expected to operate at an overall LOS D with a few critical movements (i.e.,

movements with LOS E/F or v/c ratio over 0.85). The addition of background traffic from multiple modes has resulted in over-capacity conditions at this intersection during both peak hours. In general, the 95th percentile queue lengths for those turns with dedicated turning lanes (i.e., eastbound left, westbound left, and westbound right movements) are expected to be within the available storage length; the queue lengths for through or shared left/through/right movements are expected to extend to the upstream intersection.

4 Future Total Conditions

4.1 Proposed TOC Developments

4.1.1 Conceptual Site Plan

The site statistics for both sites are presented in **Table 9** below and the conceptual ground floor plans for the sites are shown in **Figure 10** and **Figure 11**. The site traffic projections and the traffic analysis were conducted based on the proposed number of residential units and non-residential Gross Floor Area (GFA) as of the November 7th, 2022, plans for the north and south sites.

Table 9: Site Plan Statistics

Proposal	Residential Units	General Commerce	
		Square Metres (SM)	Square Footage (SF)
North Site	25 units	420	4,521
South Site	414 units	1,730	18,622

The future OL Pape Station entrances are located at the south site, with at-grade pedestrian access to the station from the north, south, and east sides of the proposed building. The north site does not have direct access to the station inside the building.

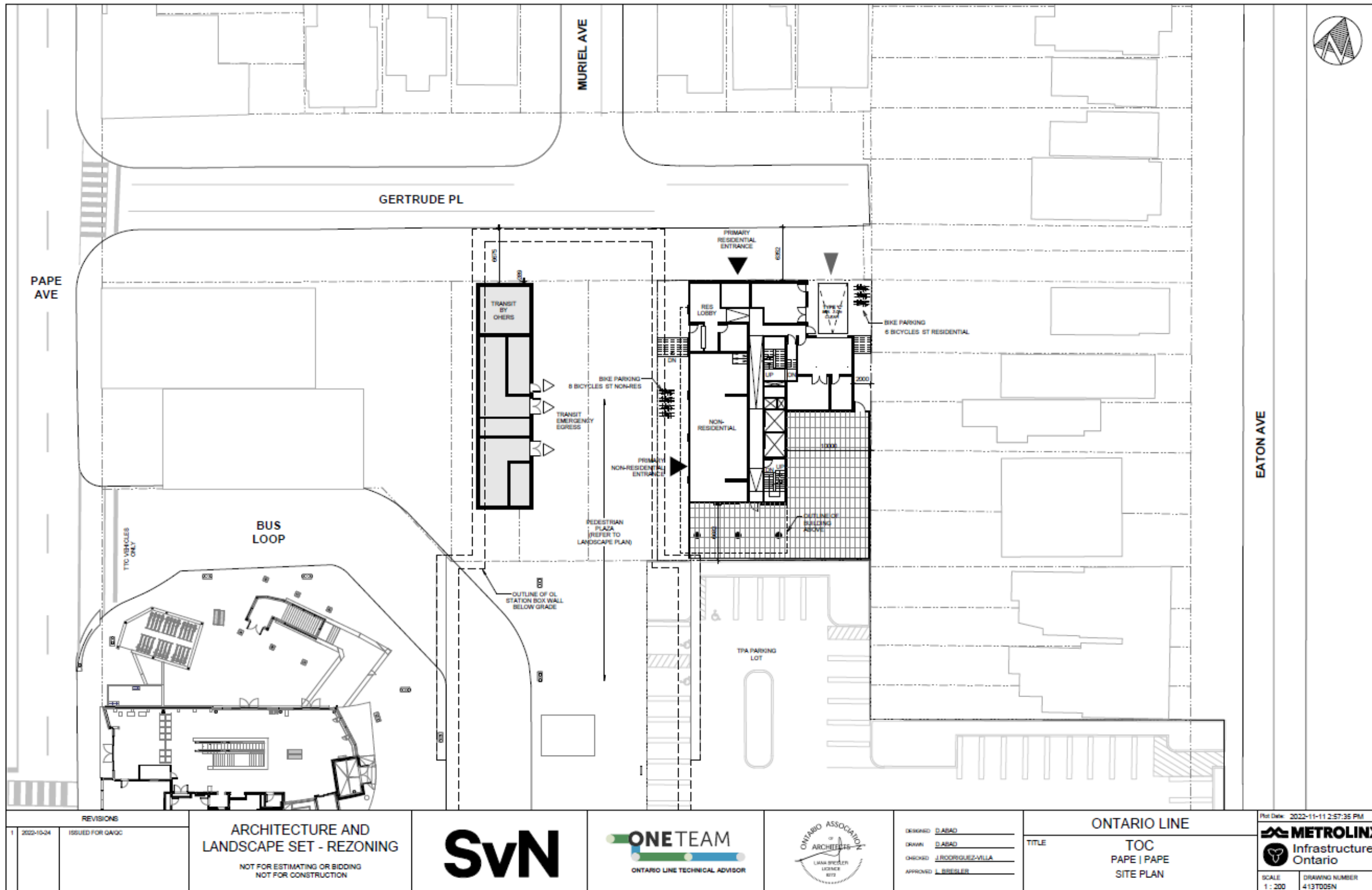


Figure 10: North Building Site Plan

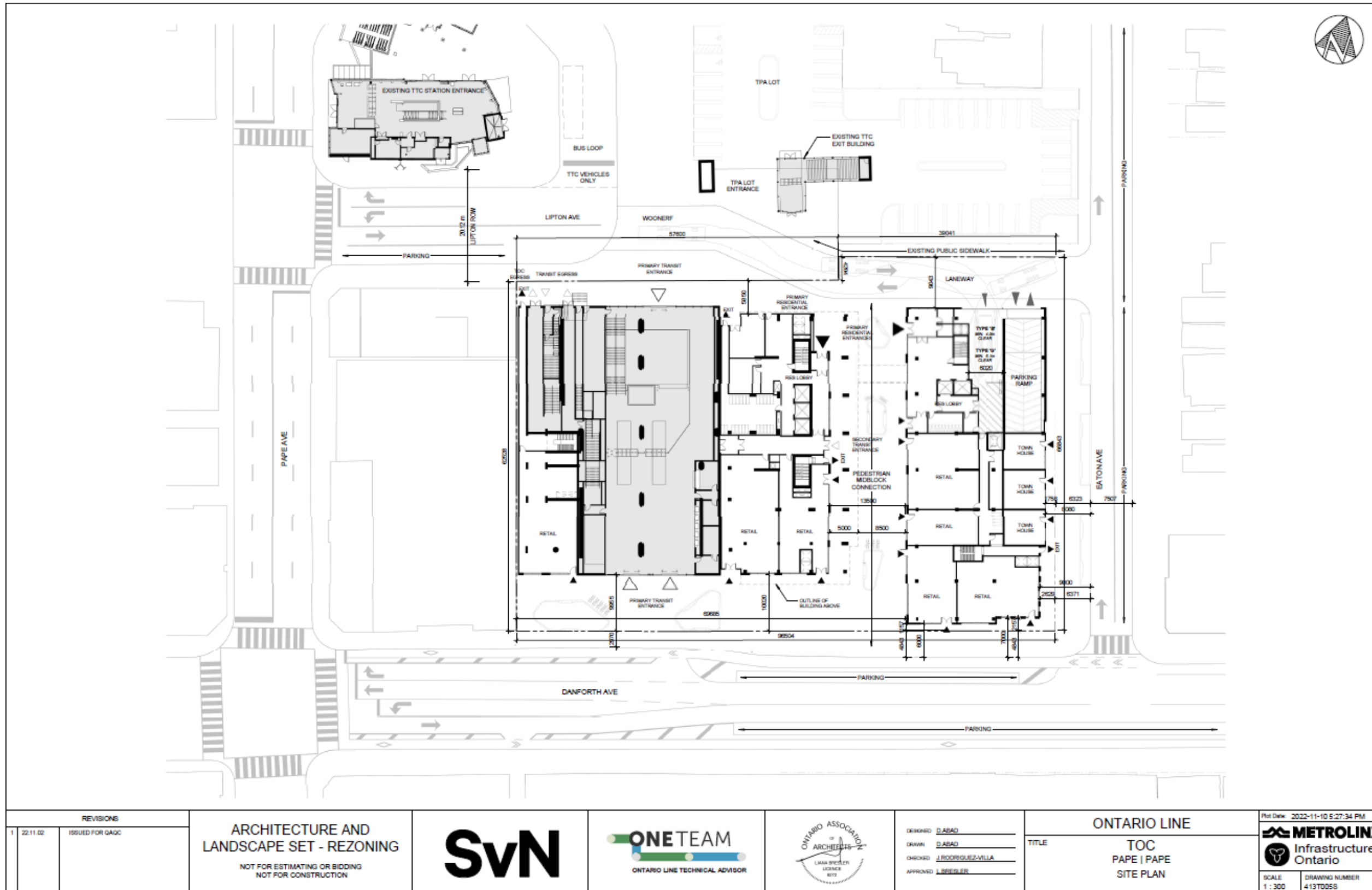


Figure 11: South Building Site Plan

4.1.2 Mode Splits

The 2016 Transportation Tomorrow Survey (TTS) was used to inform the mode split assumptions for the development using existing information for nearby residents. The TTS is a survey of households within the Greater Golden Horseshoe including the Greater Toronto Area that summarizes travel patterns and other related transportation information that can be used to aid in planning, such as mode splits. The 2016 TTS divides geographical areas into 'zones' for the purposes of determining trip patterns from one zone to another.

The mode split for the area was obtained through a review of TTS (2006) Zones 276, which is the zone containing the subject sites. The existing mode splits are presented in **Table 10**.

It is assumed that there will be no auto driver trips (0% auto drive mode share) for the north site since the proposed north site will have no available parking. The auto driver trips for the north site were repositioned to other mode shares using the proportional share of other modes from existing conditions. The proposed modified mode splits are summarized in **Table 11**.

Table 10: Existing Mode Splits (2016 TTS)

Mode	Existing Mode Splits							
	Residential				General Commerce/Retail			
	AM (In)	AM (Out)	PM (In)	PM (Out)	AM (In)	AM (Out)	PM (In)	PM (Out)
Transit	9%	38%	33%	12%	26%	12%	32%	32%
Walking	51%	20%	17%	27%	11%	7%	25%	13%
Cycling	8%	14%	16%	8%	0%	0%	1%	0%
Auto Passenger / Taxi / Rideshare	4%	5%	6%	14%	3%	0%	8%	10%
Auto Driver	28%	24%	29%	39%	59%	81%	34%	45%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Table 11: Modified Mode Splits

Mode	Modified Mode Splits							
	Residential				General Commerce/Retail			
	AM (In)	AM (Out)	PM (In)	PM (Out)	AM (In)	AM (Out)	PM (In)	PM (Out)
Transit	13%	50%	46%	20%	64%	62%	49%	58%
Walking	71%	26%	23%	44%	28%	38%	38%	24%
Cycling	11%	18%	22%	13%	0%	0%	1%	0%
Auto Passenger / Taxi / Rideshare	6%	6%	9%	23%	7%	0%	13%	19%
Auto Driver	0%	0%	0%	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Should future residents decide to own a vehicle, they will have to park their vehicle at nearby public or private parking lots. However, the apartments will be marketed toward those who do not own and do not desire to own a vehicle.

4.1.3 Site Trip Generation

Trip generations were estimated for the proposed development using the information provided in the Institute of Transportation Engineers (ITE) Trip Generation Informational Report (11th edition). Trip generation rates for Land Use 220/222 (Multifamily Housing – Low/High-Rise) and Land Use 814 (Variety Store) were used. The land use assumes "dense multi-use urban" conditions for both land uses. Residential trips were estimated based on the ITE line of best fit equation for the selected land use and setting. The commerce-related trips were estimated based on the average trip generation rates (since a lack of established fitted curve equation).

Table 12 shows the ITE trip generation rates used for each site, by land use, and it includes estimated person trips per vehicle trip. The purpose of generating person trips rather than vehicle trips was to be able to assign pedestrian, cycling and transit trips to the study network. It is assumed that there will be an increase in the rideshare mode, which includes services like Uber, Lyft as well as taxi service. **Table 13** and **Table 14** show the resulting trip generation by mode for the north and south sites, respectively. For a more conservative result, we have not assumed any interaction between the residential and non-residential components. Therefore, all non-residential trips are assumed to be primary trips and are being generated outside of the site.

Table 12: ITE Trip Generation Rates

Land Use	ITE LUC	Peak Hour	ITE Average Person Trip Rate	Equation	Entering	Exiting
Residential	220 Multi-family Low Rise	AM	0.54	$T = 0.70(X) + 0.97$	20%	80%
		PM	0.55	$T = 0.85(X) + 0.16$	53%	47%
	222 Multi-family High Rise	AM	0.65	$T = 0.67(X) - 3.32$	24%	76%
		PM	0.57	$T = 0.62(X) - 6.41$	59%	41%
General Commerce	814 Variety Store	AM	6.24	n/a	56%	44%
		PM	16.75	n/a	51%	49%

Table 13: Person Trip Generation by Mode-North Site

Land Use	AM Peak Hour			PM Peak Hour		
	Total	In	Out	Total	In	Out
Residential – LUC 220 Multifamily Low Rise						
Total	18	4	15	21	11	10
Transit	8	0	7	7	5	2
Walking	6	3	4	7	3	4
Cycling	3	0	3	4	3	1
Auto Passenger	1	0	1	3	1	2
Auto Driver	0	0	0	0	0	0
Non-residential – Assumed as LUC 814 Variety Store						
Total	28	16	12	76	39	37
Transit	18	10	8	40	19	22
Walking	9	4	5	23	15	9
Cycling	0	0	0	0	0	0
Auto Passenger	1	1	0	12	5	7
Auto Driver	0	0	0	0	0	0
North Site Total						
Total	47	19	27	97	50	47
Transit	26	11	15	48	24	24
Walking	16	7	9	30	17	13
Cycling	3	0	3	4	3	1
Auto Passenger	2	1	1	15	6	9
Auto Driver	0	0	0	0	0	0

Table 14: Person Trip Generation by Mode-South Site

Land Use	AM Peak Hour			PM Peak Hour		
	Total	In	Out	Total	In	Out
Residential – LUC 222 Multifamily High Rise						
Total	274	66	208	250	148	103
Transit	86	6	79	61	48	13
Walking	74	33	41	52	25	27
Cycling	34	5	29	32	23	8
Auto Passenger	13	3	10	24	9	14
Auto Driver	68	19	49	82	42	40
Commerce/Retail – LUC 814 Variety Store						
Total	116	65	51	310	158	152
Transit	23	17	6	100	51	49
Walking	11	7	4	59	39	20
Cycling	0	0	0	1	1	0
Auto Passenger	2	2	0	29	13	16
Auto Driver	80	38	41	122	54	68
South Site Total						
Total	390	130	259	560	306	255
Transit	108	23	85	161	99	61
Walking	85	41	45	111	64	47
Cycling	34	5	29	33	24	8
Auto Passenger	15	5	10	52	22	30
Auto Driver	147	57	90	204	96	108

4.1.4 Site Trip Distribution and Assignment

Future site trip distribution was estimated based on the existing trip distribution of the TTS Zone 276, as per information extracted from 2016 TTS data. Site trips were distributed for each mode of transportation for morning inbound/outbound and afternoon inbound/outbound conditions. These mode distributions are presented in **Table 15**.

Table 15: Estimated Person Trip Distribution

Mode	Time Period	Direction	Direction				Total
			North	East	South	West	
Walk	AM	In	10%	66%	10%	14%	100%
		Out	8%	44%	33%	16%	100%
	PM	In	23%	32%	25%	20%	100%
		Out	10%	39%	10%	41%	100%
Cycle	AM	In	15%	10%	10%	65%	100%
		Out	34%	18%	10%	38%	100%
	PM	In	26%	10%	12%	52%	100%
		Out	28%	10%	10%	52%	100%
Transit	AM	In	27%	36%	10%	26%	100%
		Out	11%	10%	10%	69%	100%
	PM	In	21%	3%	10%	66%	100%
		Out	27%	39%	5%	28%	100%
Auto	AM	In	53%	24%	9%	14%	100%
		Out	36%	27%	5%	32%	100%
	PM	In	31%	10%	10%	49%	100%
		Out	27%	15%	22%	36%	100%

The outbound auto trips were assigned to Lipton Avenue, as the existing Eaton Avenue is a northbound-only one-way street (for inbound direction). The site trips using transit mode (walking trips to/from transit platforms) were not assigned to the surface-level pedestrian network considering both sites have direct/indirect access to either the OL station, TTC subway station, or TTC bus stop platforms, which will have very minor impacts to pedestrian crossings at study area intersections.

It should also be noted that some of the walk-in transit trips to and from OL Pape Station (as described in Section 3.2.3) will include trips originated from the TOC. This overlap has not been accounted for as this will result in a slightly conservative estimate of future pedestrian trips due to the double counting of TOC trips. However, the TOC trips are marginal compared to the total number of pedestrian trips generated by Ontario Line and the slightly conservative overlap is not expected to significantly alter results. The site traffic volumes produced by the TOC sites are presented in **Figure 12**.

4.2 Future Total Volumes

The 2032 total traffic volumes, comprised of the future total background traffic plus TOC site traffic volumes, are shown in **Figure 13**.

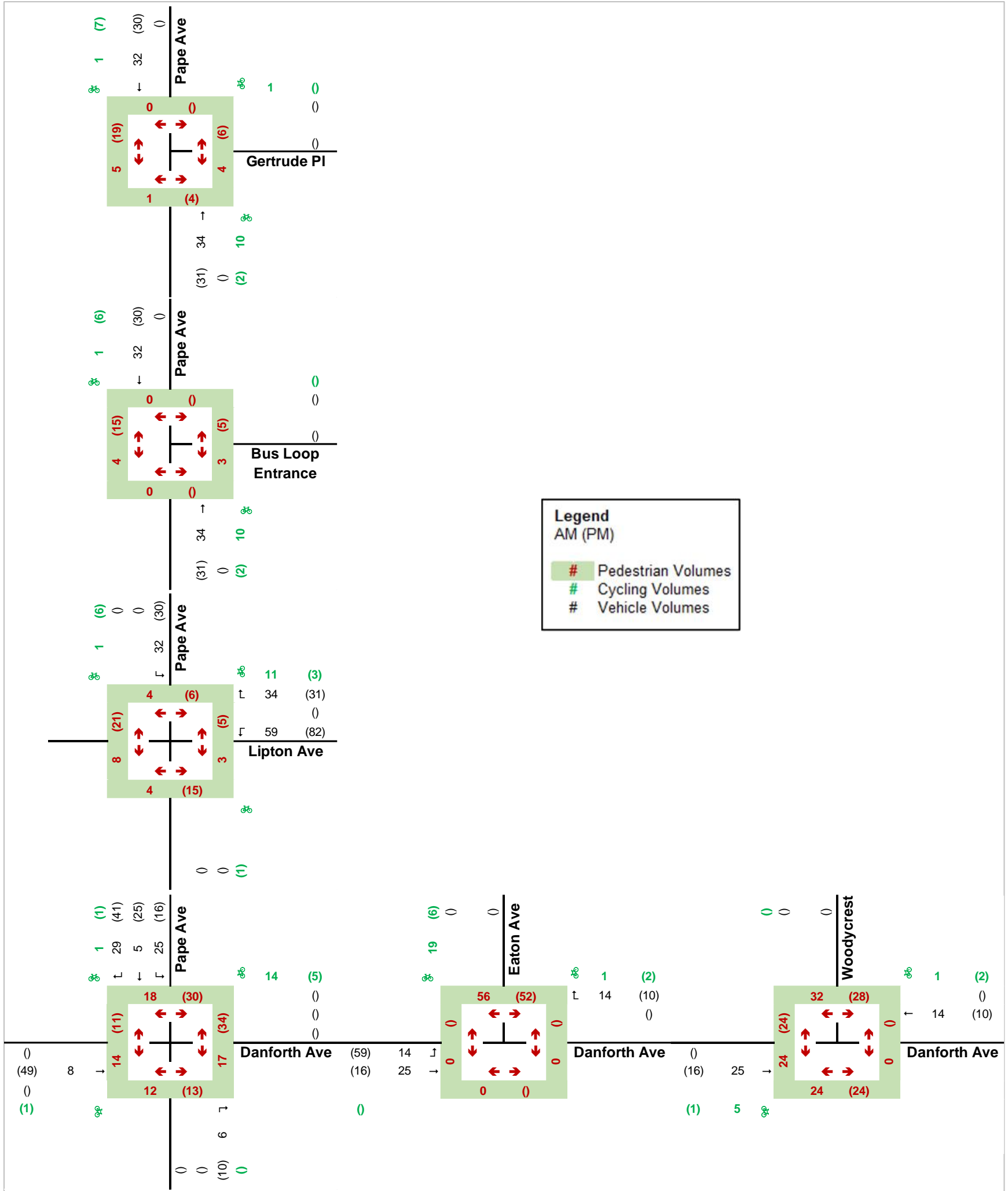


Figure 12: TOC Site Traffic Volumes

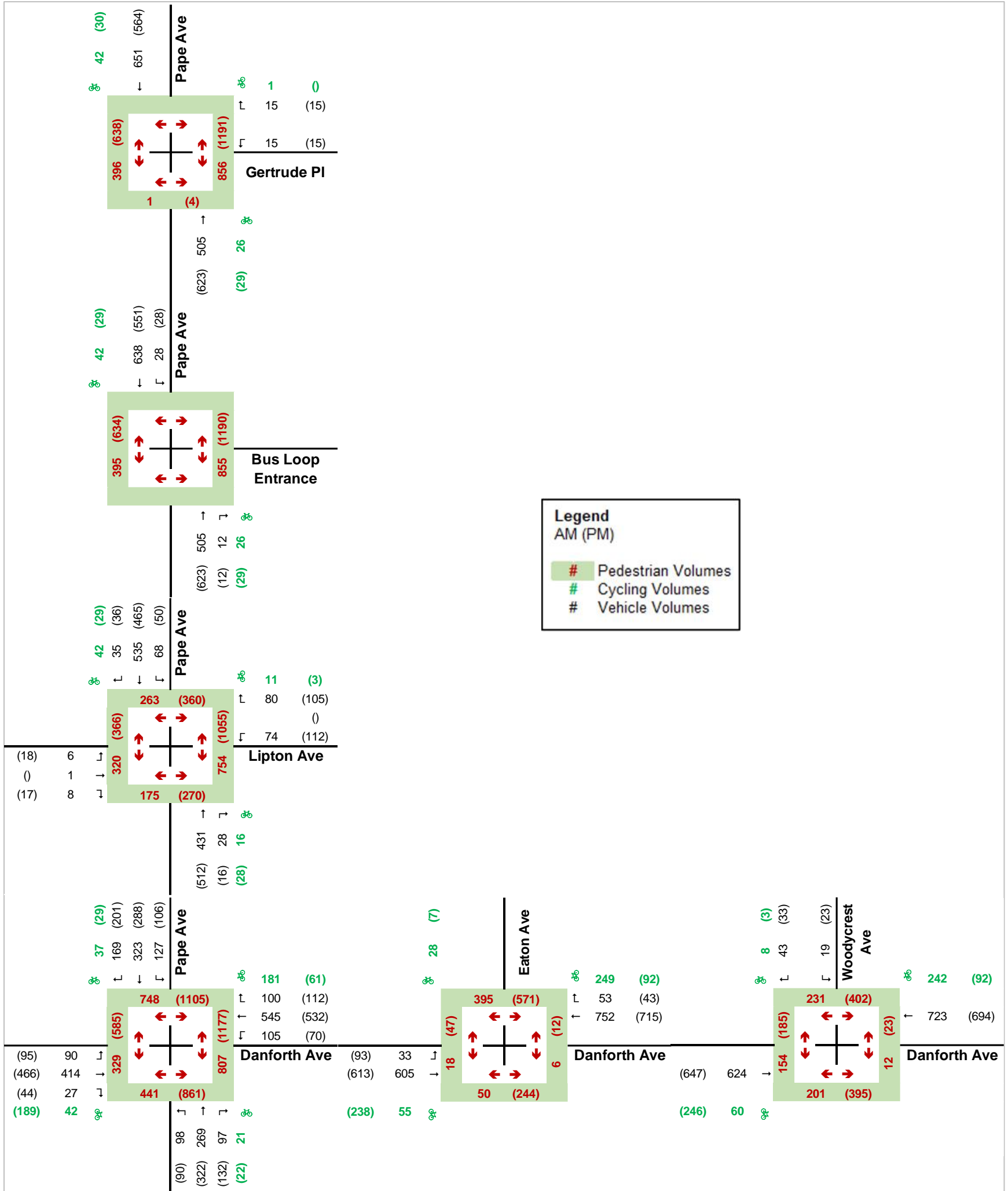


Figure 13: 2032 Total Traffic Volumes

4.3 Future Total Traffic Operations

Table 16 summarizes the future total traffic operations at the study area intersections. Signal timing split optimization was performed to the model, but the cycle length was maintained as the existing.

Table 16: 2032 Total Traffic Conditions– Summary

Intersection and Movement		Lanes	Storage (m)	AM Peak Hour			PM Peak Hour		
				LOS	v/c	95 th Q	LOS	v/c	95 th Q
Pape Ave & Danforth Ave		-	-	E	1.08	-	E	1.11	-
Eastbound	Left	1	45	E	0.76	42	F	1.04	48
	Through-Right	1	85	D	0.83	125	E	1.00	153
Westbound	Left	1	45	C	0.59	37	D	0.65	29
	Through	1	130	D	0.96	168	E	1.00	165
	Right	1	60	B	0.13	7	E	0.16	21
Northbound	Left-Through-Right	1	75	F	1.07	102	C	0.79	61
Southbound	Left-Through-Right	1	60	E	1.04	127	F	1.17	123
Pape Ave & Lipton Ave		-	-	B	0.52	-	B	0.53	-
Eastbound	Left-Through-Right	1	10	C	0.03	6	B	0.03	3
Westbound	Left	1	40	C	0.42	25	C	0.48	31
	Through-Right	1	40	C	0.22	16	C	0.29	19
Northbound	Through-Right	2	60	B	0.33	49	B	0.46	42
Southbound	Left-Through-Right	1	25	B	0.57	66	C	0.58	66
Danforth Ave & Eaton Ave		-	-	B	-	-	A	-	-
Eastbound	Left-Through	1	130	B	0.19	5	A	0.26	8
Westbound	Through-Right	1	95	B	0.76	0	A	0.50	0
Danforth Ave & Woodycrest Ave		-	-	A	0.58	-	A	0.53	-
Eastbound	Through	1	95	A	0.57	99	A	0.55	30
Westbound	Through	1	80	A	0.65	112	A	0.59	94
Southbound	Left	1	35	D	0.12	9	D	0.13	10
Pape Ave & Bus Loop Entrance		-	-	A	-	-	A	-	-
Northbound	Through-Right	2	25	A	0.21	0	A	0.25	0
Southbound	Left-Through	2	30	A	0.27	4	C	0.26	7
Pape Ave & Gertrude PI		-	-	A	-	-	A	-	-
Northbound	Through	2	30	A	0.16	0	A	0.19	0
Southbound	Through	2	190	A	0.21	0	A	0.17	0
Westbound	Left	1	15	F	0.81	17	F	1.65	22
	Right	1	50	F	0.30	8	F	0.58	14

Note: LOS = level of service; v/c = volume to capacity ratio; 95th Q = 95th Percentile Queue using HCM 2000, and Pedestrian Crosswalk LOS using HCM 2010. Critical movements are highlighted in red as defined by the City's TIS Guidelines.

Under future total conditions, all the intersections are expected to operate with higher v/c ratios and lower levels of service than the background conditions due to additional vehicular and pedestrian volumes generated by the TOC. However, all the intersections are expected to

operate within acceptable thresholds and with residual capacity, except for the Pape Avenue and Danforth Avenue intersection, which is expected to operate at/over capacity under the background traffic condition already. The westbound movements from Gertrude Place to Pape Avenue are expected to experience delays (LOS F) due to high pedestrian crossing volumes on the east leg (over 800/1,100 pedestrians during morning/afternoon peak hour).

5 Parking and Loading Assessment

This section of the report reviews the proposed parking supply and the requirements of the City-wide Zoning By-law 569-2013, as well as the recently published Zoning By-law 89-2022 (currently in-force). These by-laws include specific requirements for parking (bicycle and vehicle) as well as loading.

5.1 Policy Area Designations and Parking Requirements

The current city-wide Zoning By-law 569-2013 is typically applied to new developments throughout the City. The By-law includes multiple sets of vehicle parking rates with diminishing requirements for some areas that have better transit accessibility. Pape TOC sites fall under Policy Area 3, as shown in **Figure 14**.

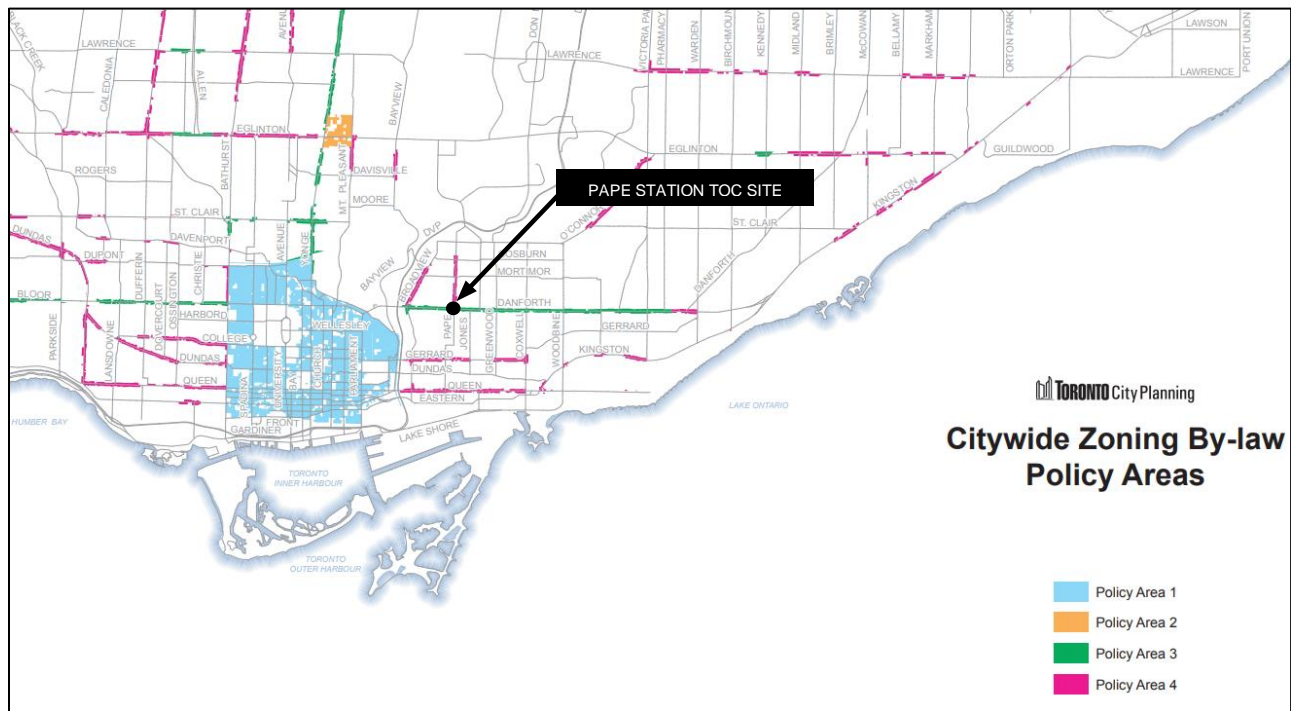


Figure 14: City of Toronto Policy Areas ⁸

5.2 Vehicle Parking Requirements (Zoning By-law 569-2013)

Vehicle parking requirements were reviewed using By-law 569-2013, and the requirements are shown in **Table 17** and **Table 18** for the north and south sites, respectively. In Policy Area 1 "CR" zones, parking is exempted for retail uses with total area less than the lot area. Although this site is in Policy Area 3, the site is still zoned CR and would meet the criteria for a parking exemption if zoned Policy Area 1. Therefore, we believe that the same exemption should apply to the subject development, but have shown the By-law requirements assuming it does not apply. The zoning by-law review is based on the latest conceptual site statistics.

⁸ <https://www.toronto.ca/wp-content/uploads/2017/10/96e8-City-Planning-Zoning-city-wide-Policy-Areas-zone-map.pdf>

Table 17: Vehicle Parking Zoning By-law 569-2013 Requirements – North Site

Building	Land Use	Size (Unit or SM)	By-law No. 569-2013 (other areas)	
			Rate	# Spaces Req.
North Site	Bachelor	0 units	0.8 / unit	0
	1-bed	15 units	0.9 / unit	13
	2-bed	5 units	1.0 / unit	5
	3-bed	5 units	1.2 / unit	6
	Visitors	25 units	0.2 / unit	5
	Non-Residential	420 SM	1.0 / 100SM ¹	4
Total Required			-	33
Total Proposed			-	0
Total Surplus / Deficit			-	-33

Table 18: Vehicle Parking Zoning By-law 569-2013 Requirements – South Site

Building	Land Use	Size (Unit or SM)	By-law No. 569-2013 (PA3)	
			Rate	# Spaces Req.
South Site	Bachelor	0 units	0.6 / unit	0
	1-bed	265 units	0.7 / unit	185
	2-bed	83 units	0.9 / unit	74
	3-bed	63 units	1.0 / unit	63
	TH	3 units	1.0 / unit	3
	Visitors	414 units	0.1 / unit	41
	Retail	1730 SM	1.0 / 100SM ¹	17
Total Required			-	383
Total Proposed			-	111
Total Surplus / Deficit			-	-272

Due to the limited site area and presence of the Ontario Line underneath each building, it would not be possible or realistically feasible to provide the by-law required minimum number of parking spaces at these locations without occupying the building podium, which would eliminate the retail-commercial uses. The north site is proposed to have no on-site dedicated vehicle parking and the south site is proposed to have 111 on-site parking spaces. These spaces will serve the residential visitors and the retail-commercial customers, but will not be intended to serve the residents of the buildings or transit riders.

Considering the urban trends, downtown location and access to transit, it is neither practical nor reasonable to provide the number of parking spaces required by the prevailing Zoning By-law for the proposed development. In recent years, City Council has acknowledged this and has adopted lower standards for approval for new developments in downtown, and more recently Council has approved the motion to eliminate parking minimums for residential multi-family dwellings. These actions have been bolstered by Ontario's New Five-Year Climate Change Action Plan and numerous other initiatives by the City of Toronto.

There has also been a decline in residential parking demand and vehicle ownership in the areas surrounding downtown Toronto. There have been developments constructed with 'zero' parking across North America, including downtown Toronto, where transit access is very high. This area is well served by transit, with access to the Ontario Line Pape Station, and will also be well served by a number of bus routes. Also, a very high transit-dependency is the fundamental characteristic of Transit Oriented Developments/Communities, as they promote reduced auto-dependency.

5.3 Vehicle Parking Requirements (Zoning By-law 89-2022)

In line with the City’s new approach to parking requirements, parking requirements for the new development were assessed in accordance with Zoning By-law 89-2022 and the shown in **Table 19** and **Table 20** for the north and south sites, respectively. The parking requirements according to the new By-law have been reviewed based on an understanding that it is Council’s intent to adopt the proposed approach to parking, which appears applicable to the functions of this new development.

According to the Parking Zone Areas Overlay Index Map, both sites fall within the boundaries of Parking Zone A. This new approach proposes maximum parking rates for residents, and a permitted range for visitor parking.

Table 19: Vehicle Parking Zoning By-law 89-2022 Requirements – North Site

Type	Units	By-law 89-2022 [Parking Zone A]		
		Rate	Minimum # Spaces	Maximum # Spaces
Bachelor (<45 sqm)	0 units	0.3 spaces per unit	n/a	0
1-bed	15 units	0.5 spaces per unit		7
2-bed	5 units	0.8 spaces per unit		4
3-bed	5 units	1.0 spaces per unit		5
Maximum Resident				16
Visitor Minimum	25 units	2.0 +0.01 /unit	2	-
Visitor Maximum		1.0 /unit (first 5 units) + 0.1 /unit (6 th unit onwards)	-	7
Proposed Visitor Parking			0 (not between 2 and 7 ✖)	
Proposed Resident Parking			0 (less than 16 ✔)	
General Commerce	420 SM	3.5 spaces / 100 SM GFA (Maximum)	14 spaces maximum	

Table 20: Vehicle Parking Zoning By-law 89-2022 Requirements – South Site

Type	Units	By-law 89-2022 [Parking Zone A]		
		Rate	Minimum # Spaces	Maximum # Spaces
Bachelor (<45 sqm)	0 units	0.3 spaces per unit	n/a	0
1-bed	265 units	0.5 spaces per unit		132
2-bed	83 units	0.8 spaces per unit		66
3-bed	63 units	1.0 spaces per unit		63
Townhouse	3 units	0 spaces per unit		0
Maximum Resident				261
Visitor Minimum	414 units	2.0 + 0.01/unit	6	-
Visitor Maximum		1.0/unit (first 5 units) + 0.1/unit (6 th unit onwards)	-	45
Proposed Visitor Parking			0 (not between 6 and 45 ✖)	
Proposed Resident Parking			111 (less than 261 ✔)	
Retail Store	1730	3.5 spaces / 100 SM GFA (Maximum)	60 spaces maximum	

Although the proposed parking spaces do not meet the minimum requirements of the current By-law 569-2013, the By-law 89-2022 is more accurate in terms of the needs of the developments. Both sites of the new development meet the requirements for resident parking since the proposed residential parking spaces are fewer than the maximums allowed.

For the north site, the visitor parking is deficient by 2 parking spaces and would be oversupplied with even 7 parking spaces. Therefore, the requirement of 2 spaces can be accommodated in the 1-hour parking along Gertrude Place, Muriel Avenue, or in existing nearby public parking lots. The recommended parking rate would be 0.0 for visitors, residents, and commercial, but with surrounding parking to accommodate visitors.

For the south site, the visitor parking is deficient by 6 parking spaces and would be oversupplied with even 45 parking spaces. It is recommended to reallocate the parking for visitors if feasible:

- If 45 visitor parking spaces were provided to meet the By-law (89-2022) requirement, then the recommended visitor parking rate is 0.11 spaces / unit. The remaining goes to resident parking which would be 66 spaces or 0.16 spaces / unit for the recommended resident parking rate.

- Alternatively, if 41 visitor parking spaces were provided to meet the current By-law (569-2013), then the recommended visitor parking rate is 0.10 spaces / unit. The remaining goes to resident parking which would be 70 spaces or 0.17 spaces / unit for the recommended resident parking rate.

It is expected that the commercial activities would rely on surrounding public parking, so the recommended commerce parking rate is 0. The recommended parking rates are presented in **Table 21** for both sites (considering less visitor parking spaces to meet the current By-law 569-2013).

Table 21: Recommended Parking Rates

Component	Recommended Rate	Parking Spaces
North Site		
North Site – Residents	0 – Use surrounding public parking	0
North Site – Visitors	0 – Use surrounding public parking	0
North Site – Commerce	0 – Use surrounding public parking	0
South Site		
South Site – Residents	0.17 / unit	70
South Site – Visitors	0.10 / unit	41
South Site – Retail	0 – Use surrounding public parking	0

Accessible parking requirements were reviewed based on the new by-laws. For the north site, the number of effective parking spaces associated with dwelling units is between 13 and 100, therefore 1 accessible parking spaces are required. For the south site, the number of effective parking spaces associated with dwelling units is more than 100, thus 11 accessible spaces are required. **Table 22** and **Table 23** show the calculation of effective parking and required accessible parking for the north site and south site respectively.

Table 22: North Site Effective Parking Rates for Accessible Parking

Type	Units	By-law No. 89-2022	
		Rate	Effective Spaces
Bachelor (<45 sqm)	0 units	0.3 spaces per unit	0
1-bed	15 units	0.5 spaces per unit	7
2-bed	5 units	0.8 spaces per unit	4
3-bed	5 units	1.0 spaces per unit	5
Visitor	25 units	0.1 spaces per unit	2
Retail Store	420 SM	spaces / 100 SM GFA (effective)	4
Total Effective			22
Total Parking Provided			0
Greater of the Above (Actual Effective)			22
Required Accessible Parking (if the number of effective parking spaces is 13 to 100, a minimum of 1 accessible parking space for every 25 effective parking spaces)			1 accessible parking spaces required
Accessible Parking Provided			0 spaces
Surplus/Deficit			-1 spaces

Table 23: South Site Effective Parking Rates for Accessible Parking

Type	Units	By-law No. 89-2022	
		Rate	Effective Spaces
Bachelor (<45 sqm)	0 units	0.3 spaces per unit	0
1-bed	265 units	0.5 spaces per unit	132
2-bed	83 units	0.8 spaces per unit	66
3-bed	63 units	1.0 spaces per unit	63
Townhouse	3 units	0 spaces per unit	0
Visitor	414 units	0.1 spaces per unit	41
Retail Store	1730 SM	1.0 spaces / 100 SM GFA (effective)	17
Total Effective			319
Total Parking Provided			111
Greater of the Above (Actual Effective)			319
Required Accessible Parking (if the number of effective parking spaces is more than 100, a minimum of 5 accessible parking spaces plus 1 accessible parking space for every 50 effective parking spaces)			11 accessible parking spaces required
Accessible Parking Provided			5 spaces
Surplus/Deficit			-6 spaces

5.4 Vehicle Ownership Rates in the Surrounding Area

A review of auto-ownership rates in the immediate area was performed using the same Transportation Tomorrow Survey zones discussed in **Section 4**. The average auto-ownership rate is 0.46 vehicles per household for apartment and townhome units and 1.14 vehicles per

unit for regular homes. The lowest auto-ownership rate was 0.28 vehicles per apartment/townhome unit in zone 273 which is the zone south of Danforth Avenue and east of Pape Avenue. Overall, this does indicate that there are some areas where less than, or approximately three quarters of the units have a vehicle, indicating that there are some units with zero vehicles.

5.5 Zero Parking / Elimination of Parking Minimums

5.5.1 Elimination of Parking Minimums: Toronto

The City already allows for the elimination of parking minimums for some land uses within Policy Area PA4 as per Zoning By-law 5690-2013, when the interior floor area of all the uses does not exceed 1.0 times the area of the lot. This acknowledges that some uses cannot provide parking, and more importantly, can be sustained without any on-site parking. Although residential land uses are not included, the By-law does acknowledge that some people will either rely on public parking to visit the use, or will be a walk-in trip without any vehicle.

Recently, the Chief Planner and Executive Director of City Planning put out a Report for Action dated January 5, 2021. The Report is entitled Proposed Review of Parking Requirements for New Development⁹. The report essentially outlines the rationale and support for the elimination of parking minimum. The report provides examples of some of City Council's recent decisions which recognize that the current automobile parking standards represent a barrier to the City achieving its housing vision. For example:

- *"In relation to the Queen Street West Planning Study - Bathurst Street to Roncesvalles Avenue, Council removed automobile parking requirements for various forms of development within the study area in order to facilitate the conservation of heritage buildings, and to support Public Realm, Built Form and Transportation objectives. (URL: <http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2020.TE14.5>)*
- *In 2018, City Council requested City Planning to report on exempting low rise apartment buildings from parking requirements in some cases, and other potential incentives to promote purpose-built rentals in Neighbourhoods-designated areas (URL: <http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2018.PG27.5>)."*

The report makes the following recommendations regarding the elimination of parking minimums:

- ***A shift in focus from minimums to maximums*** will further support and encourage land- and cost-efficient forms of development which do not include extensive automobile parking.
- ***Limiting the supply of automobile parking and increasing the supply of bicycle parking*** will encourage transportation alternatives to automobiles and support the City's policies related to reducing automobile dependence.

⁹ <https://www.toronto.ca/legdocs/mmis/2021/ph/bqrd/backgroundfile-159784.pdf>

- **Removing automobile parking minimums** or reducing the number of land uses for which parking rates are specified may simplify the zoning requirements, allowing for easier understanding and application.
- Consideration of replacing minimum automobile parking requirements with parking supply guidelines;
- **Identification of other mobility infrastructure required if automobile parking requirements are reduced or removed and mechanisms to pay for it;**
- Development of **new parking policy area boundaries** to better reflect areas with good alternatives to automobile travel, such as **high-quality transit service;**
- **Development of an approach to adjust parking requirements without a zoning by-law amendment as new transit infrastructure enters service;**
- Identification of land uses and areas where the existing ZBL parking standards should be adjusted to meet the intent of the Official Plan by:
 - **Reducing or eliminating automobile parking minimums; • Reducing or introducing automobile parking maximums; or**
 - **Increasing bicycle parking minimums;**

The subject development is a perfect candidate for the elimination of parking minimums, since it achieves many of the goals listed above and meets many of the prerequisites for consideration. The sites will have direct transit access to Ontario Line and surface transit along Pape Avenue and Danforth Avenue. The sites excellent transit access will make it a perfect location to implement a no parking, truly transit-oriented community. With ample bicycle parking and access to surface cycling routes, the site will also be able to support a zero-vehicle culture by supporting other active modes of transportation.

Examples of Near-Zero Vehicle Parking Condominiums in Toronto

An existing condominium at 426 University Avenue in the City of Toronto just south of St Patrick subway station on the Yonge-University-Spadina subway line (Dundas Street at University Avenue) – referred to as "RCMI" due to it being integrated with the heritage façade of the Royal Canadian Military Institute – was built and began occupancy in 2014¹⁰.

The condominium building is 42 storeys tall and has 315 units, mostly comprised of one-bedroom and bachelor units. The building is equipped with 4 vehicle stacker parking spaces, plus one regular parking space. This allows for parking of up to 9 vehicles, all of which are dedicated car-share parking spaces. The building therefore relies entirely on use of car-sharing, as well as the available surrounding public parking supply for any overflow demand or visitor demand. The building also has 315 bicycle parking spaces which is one space for each unit. This demonstrates the ability for a building to rely on car-share and public parking.

Comparatively, the proposed TOC building will have even better (direct) transit access, will have more bicycle parking (on a spaces per unit basis), and will also have car-share available in the surrounding area but not directly in the TOC. Overall, the transportation option availability for the subject TOC is similar but more heavily weighted towards transit and cycling reliance.

¹⁰ <https://www.toronto.ca/legdocs/mmis/2009/te/bqrd/backgroundfile-21943.pdf>

5.5.2 Elimination of Parking Minimums

Brampton City Council has also recently passed a vote to enable Open Option Parking city-wide effective July 2, 2020¹¹. This means that developers can determine how much parking is required for a development based on market expectations. This allows the market to control the parking needs and to be more flexible to infrastructure changes. This also allows for reduced construction and unit costs when parking is not provided, which is considered in the market assessment when determining if and how much parking would be provided.

As mentioned above, the City of Toronto also recently approved a motion to eliminate parking minimums for multi-family dwellings. Although this has not been formally adopted into the By-law, it does demonstrate the shift towards a market-driven approach to parking which the subject TOC developments are well positioned to leverage and to be some of the first developments in the city to officially adopt this approach.

5.6 Public Parking

There is on-street parking available along Danforth Avenue that will accommodate short-term visitors. The nearest public ("Green P") parking is available at the west side of Pape Avenue and Lipton Avenue intersection, and at the east end of Lipton Avenue.

5.7 Vehicular Parking Supply

The total proposed vehicular parking supply for the north and south sites is zero and one-hundred and ten residential spaces, respectively. The sites will be heavily reliant on transit services to access jobs in the downtown core, and the proximity of amenities, which would be in the form of walking and cycling trips.

If there will be vehicles owned by future residents of the north site TOC development, these vehicles must use nearby parking lots and may also enter rental or sublet agreements with nearby private parking space owners. The south site will have sufficient spaces to meet the parking needs of the likely few residents who are vehicle owners. However, marketing efforts of the TOC development will focus on residents or businesses which are not vehicle reliant; the tenants and residents are expected to be those who do not own vehicles or do not intend on owning vehicles.

Parking requirements from the in-force City Zoning By-law were reviewed despite the City's action to eliminate vehicle parking minimums, as the By-law is still currently technically in-force.

5.8 Bicycle Parking Supply

Bicycle parking for the site will be provided in the form of short-term and long-term bicycle parking spaces. Short-term bicycle parking will be provided at-grade (internally or weather protected if outdoors), and will serve residential visitors, commercial patrons, and residents who are making short stops at home. Bicycle parking will be located at grade and below grade of the

¹¹ https://www.edmonton.ca/city_government/urban_planning_and_design/comprehensive-parking-review.aspx

north building, and at grade through the forth level for the south building. The bicycle parking supply is summarized in **Table 24** for both sites.

There are no bike share locations in the Greektown and/or Riverdale neighborhoods where both sites are located; residents and visitors of the Pape TOC will only have access to on-site bike parking spaces.

Table 24: Bicycle Parking Supply

Area	Bicycle Parking Space Type							Total
	Residence Long Term	Residential Short Term	Non-Residential Long Term	Non-Residential Short Term	Transit Long Term	Transit Short Term	Off-Site Bike Share	
North Site	26	6	2	8	0	0	0	42
South Site	406	42	4	10	0	0	0	462

5.9 Bicycle Parking Requirements

Bicycle parking requirements were reviewed for By-law 569-2013. Bicycle parking requirements for the north and south sites are summarized in **Table 25** and **Table 26**, respectively.

Between the two buildings, there will be 38 surplus long-term bicycle parking spaces, compared to the Zoning By-law requirement and 7 surplus for the short-term parking spaces. The north site has 11 surplus bicycle parking spaces, and the south site has 34 surplus bicycle parking spaces.

Table 25: Bicycle Parking Zoning By-law Requirements – North Site

Land Use		Unit or per 100 SM	By-law No. 569-2013			
			Long Term		Short Term	
			Rate	# Required	Rate	# Required
North Site	Residential	25 units	0.9 / unit	23	0.1 / unit	3
	Retail ¹	420 SM	0.2 / 100 SM	0 ¹	3+ 0.3 / 100 SM	5
Total Required			-	23	-	8
Proposed			-	28	-	14
Surplus / Deficit			-	+ 5	-	+ 6

Note: 1) According to By-law 569-2013, if a bicycle parking space is required for uses on a lot, other than a dwelling unit, and the total interior floor area of all such uses on that lot is 2000 square metres or less, then no bicycle parking space is required.

Table 26: Bicycle Parking Zoning By-law Requirements – South Site

Land Use		Unit or per 100 SM	By-law No. 569-2013			
			Long Term		Short Term	
			Rate	# Required	Rate	# Required
South Site	Residential	414 units	0.9 / unit	373	0.1 / unit	42
	Retail ¹	1730 SM	0.2 / 100 SM	4	3 + 0.3 / 100 SM	9
Total Required			-	377	-	51
Proposed			-	410	-	52
Surplus / Deficit			-	+ 33	-	+ 1

5.10 Loading Space Requirements

Loading space requirements of Zoning By-law 569-2013 were also reviewed. The loading space requirements and proposed configuration are shown in **Table 27** and **Table 28** for the north and south sites, respectively.

Table 27: Loading Spaces Required Based on By-Law Rates – North Site

Building	Land Use Type	Unit or SM	Loading space required and provided
North Site	Residential	25 units	None Required
	Retail	420 SM	None Required
	Total Required		None
	Total Provided		1 Type 'C'

Table 28: Loading Spaces Required Based on By-Law Rates – South Site

Building	Land Use Type	Unit or SM	Loading space required and provided
South Site	Residential	414 units	1 Type 'G'
	Retail	1730 SM	1 Type 'B'
	Total Required		1 Type 'G' + 1 Type 'B'
	Total Provided		1 Type 'G' (shared with Type 'B')

The dimensions of the proposed loadings spaces meet the By-law requirements, with the dimensions of each type listed below.

Type 'G'

- Minimum Length: 13.0 metres
- Minimum Width: 4.0 metres
- Minimum Clearance: 6.1 metres

Type 'B'

- Minimum Length: 11.0 metres
- Minimum Width: 3.5 metres
- Minimum Clearance: 4.0 metres

The north building will be equipped with a Type 'C' loading space although the residential and retail use do not reach the minimum levels required for loading space provision.

The south site will be equipped with one Type 'G' loading space, which will be shared with the Type 'B' loading space, satisfying the loading space requirements as indicated in **Table 28**.

Loading Swept Path Analysis

The loading area was tested using AutoTURN software (AutoCAD-assisted software) to check the loading space accessibility for anticipated design vehicles entering the site. The largest vehicles anticipated to enter the south site are a medium sized delivery or moving truck (Medium Single Unit or "MSU"), as well as a City of Toronto front-end loader refuse collection truck. Loading space is not required for the north site; however, one Type 'C' loading space is provided. It is expected that regular pickup would continue as it currently does on Gertrude Place (i.e., the existing curb pickup will be maintained).

The swept path analysis at the south site is shown in Error! Reference source not found. **Figure 15** for the refuse collection truck. Although the laneway will be able to operate two-ways, the trucks are expected to enter from and exit to the west via Lipton Avenue.

The anticipated design vehicles will be able to navigate to the proposed loading area, load or unload as needed, and then exit the site without conflicting with any obstructions as long as the building manager properly schedules refuse collection pick-up and ensures the correct design vehicles are using the loading area.

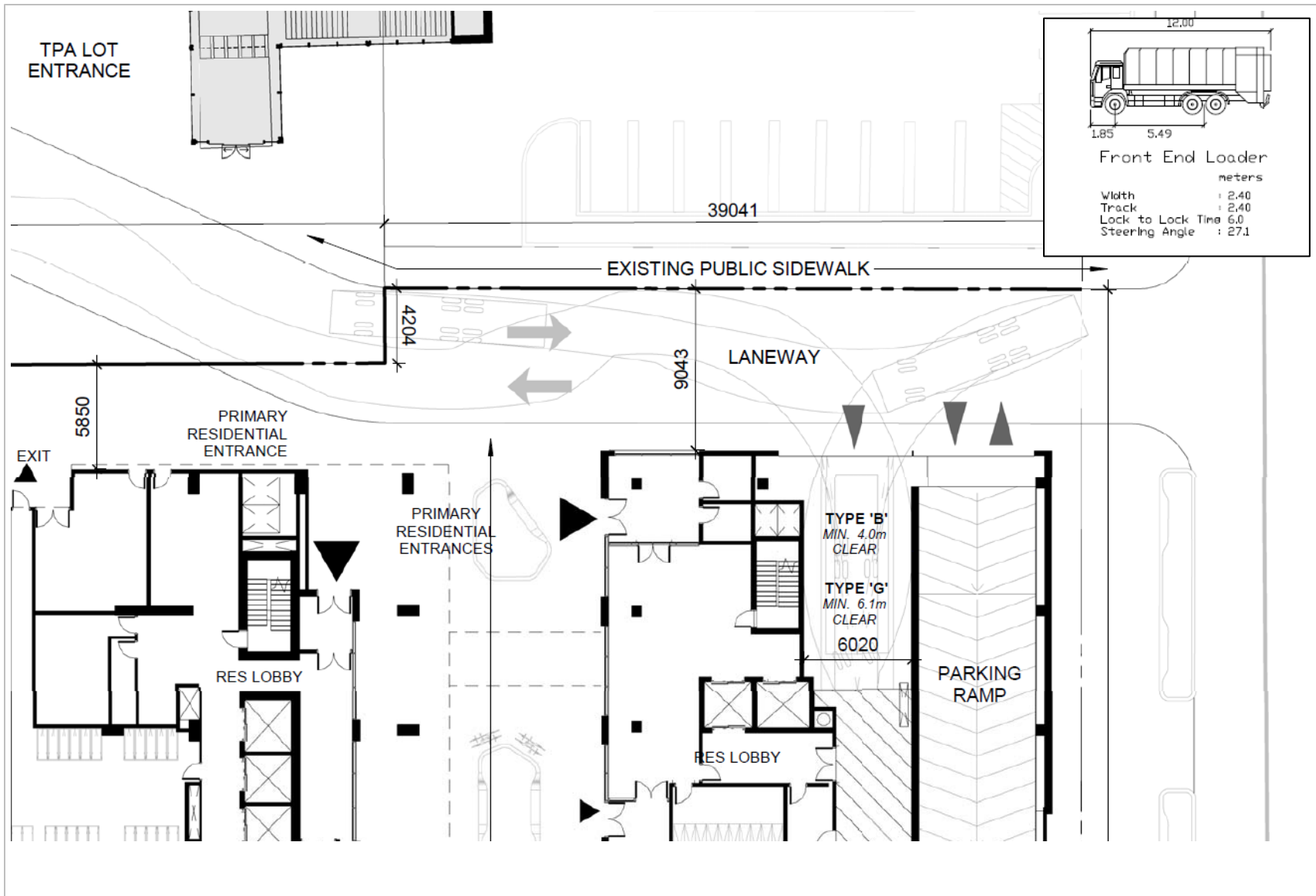


Figure 15: Swept Path Analysis – South Site – Front End Loader

5.11 Travel Demand Management ('TDM')

Transportation Demand Management (TDM) measures are methods employed to reduce the traffic impacts of a development through the reduction of Single-Occupant Vehicle (SOV) trips as well as the encouragement of more sustainable forms of travel and more efficient use of the transportation network for all modes of travel.

TDM measures can be 'hard measures', such as infrastructure like bicycle parking, or can be 'soft measures' such as policies that allow for working-from-home or flex hours. TDM measures must also be tied to the surrounding transportation network context of the development. For example, bicycle parking will be ineffective if there is no surrounding bicycle infrastructure like bicycle lanes, multi-use paths, or a lack of bicycle parking at the ultimate destination. For this reason, successful TDM implementation requires a united effort and coordination between the City and developers.

Hard measures are physically infrastructure improvements that encourage alternative modes of travel and mode shifts away from single-occupant vehicles. This can include the provision of bicycle parking or enhanced pedestrian and cyclist facilities on-site including shower and change facilities for employment uses.

Soft measures are programs or policies, such as unbundling or condo units to parking spaces, work-from-home policies, transit subsidies, carpooling assistance etcetera. In many cases, hard and soft measures work together and provide mutual benefit. For instance, transit pass subsidies are soft measures, but when paired with hard measures like improved waiting areas, they can have a greater impact on mode choice.

The Toronto Green Standard (TGS V4 Tier 3) requires measures that will support a 15% or greater reduction in single-occupancy vehicle (SOV) trips.

For the subject site, the general context of the area as a mixed-use environment with excellent transit access and future access to the Ontario Line, will have an impact on the potential TDM measures. In fact, the inherent nature of the area and the presence of the Ontario Line and surface transit routes along both roadways adjacent to the development will make this location an excellent candidate to benefit from transit oriented design and TDM. The area is also well served by the city cycling infrastructure network and should be able to support a higher cycling modal split.

The mixed-use nature of downtown allows for synergy and mixed-use interactions between the proposed residential towers, as well as the ancillary retail at the ground floor, and the surrounding retail-commercial and services that are in the area.

Regardless of the ability for the development to leverage TDM initiatives, the strongest TDM measure will be the fact that both residential towers will have very limited vehicular parking provided. Therefore, nearly all vehicle trips generated by the development will be pick-up/drop-off or taxi/rideshare trips. The occupancy of the buildings will be market-driven, meaning that residents who decide to purchase units in this building will want to be car-free and many will live and work in close proximity, thus relying on transit, walking, and cycling to get around.

5.11.1 Local and Regional Transit Accessibility

As already discussed, there is excellent transit coverage within the vicinity of the site even without the construction of Ontario Line. TTC surface transit is provided in the form of buses along Pape Avenue (in mixed traffic). Additionally, both of north-south bus routes (Route 25 and Route 81) provide direct access to the Toronto subway system along Line 2 (Pape Avenue Station). Transit stops are located directly at the intersection of Pape Avenue and Danforth Avenue, and all stops are within 100 metres walking distance from each building.

Pape Avenue subway station is located in close proximity to both sites. With Ontario Line, subway access will be directly accessible by residents from within the building. Residents of the south building will not need to leave the building to access the Ontario Line, and residents of the north building will only need to cross the parking lot at the east end of Lipton Avenue. Ontario Line riders will be able to transfer at TTC Pape Avenue Station.

The study area already has a fairly high non-vehicle modal split at 59% non-auto drive and this is expected to increase in general due to the increase in transit availability. The site itself will further benefit and leverage this proximity and access.

5.11.2 Transit Pass Subsidies

Residents and tenants of the buildings may be given transit pass subsidies that will further encourage the use of transit as a primary mode, and will attract those who wish to rely on transit and will utilize the transit passes. The subsidies can be provided in the form of reduced cost passes, or can be provided in the form of subsidies to residents. Details will need to be developed with the developer.

5.11.3 Real-Time Transit Information

Real-time transit service updates may be provided in the lobby area of each residential tower. The real-time displays will include arrival time for the nearest transit stops for each of the primary transit services expected to serve the development. The real-time displays could allow residents to time leaving their buildings to reduce the amount of time standing at each transit stop, thus making transit more attractive. These displays may be located in the residential lobby in the south building or in the transit lobby in the north building where they are likely to be placed regardless.

5.11.4 Pedestrian and Cycling Connections

The north site residents will need to cross the parking lot at the east end of Lipton Avenue to access the Ontario Line Pape Station. The south site will sit in between Danforth Ave and Lipton Ave adjacent to the proposed Ontario Line Station providing convenient access to the station for transit riders.

There are dedicated bicycle lanes eastbound and westbound along Danforth Avenue. The City's broader cycling network can be accessed from these roadways.

Bicycles are also allowed on the TTC subway system (subway and buses) outside of peak periods. Residents will be able to bring their bicycles on the subway and use them to complete the last leg of their trips, if it is conducive to their needs.

5.11.5 Bicycle Parking

The building will be equipped with long-term bicycle parking that will be available to all residents. Long-term bicycle parking ensures that residents are encouraged to own bicycles in the first place by providing them with easily accessible, secure and sheltered bicycle parking. A portion of the long-term bicycle parking can be utilized as short-term bicycle parking for visitors. The bicycle parking will be placed in safe, well lit, accessible areas at ground level. This will encourage visitors to feel cycling is a viable option.

Bikeshare is also available within the general area. There is a bikeshare station within walking distance (as discussed in **Section 5.8**), which amounts to a total bike share availability of 18 spaces within 200 metres. These will also be available for use by residents and visitors if they use the bikeshare services. Bikeshare spaces are considered usable if they are occupied or empty, as they can be used by residents or visitors when leaving the site (bicycle is available) or when returning (there is a free "dock").

5.11.6 Unbundled Resident Parking

Bundling parking spaces with unit sales, whether intended or not intended, results in the building being marketed to drivers and vehicle owners. For those who do not own vehicles and do not wish to own a parking space, these hidden costs are forced on them and at the very least result in unwanted effort required to rent out and seek a renter for the parking space in an effort to recuperate lost money.

Therefore, unbundling further benefits the developer as well as the community because the building will automatically be marketed to and attract those who do not drive as a primary form of transportation. This theoretically reduces parking requirements for the building, reduces the amount of congestion on the surrounding road network, and allows for more efficient site design and use of the transportation network.

Unbundled parking could lead to a potential 10% to the residential parking rates.¹² Therefore, removing vehicle parking altogether is likely to have an even greater impact on the tenantry, as owning a vehicle and parking on site will not be viable. The building will be marketed and will find most interest from those who do not and have no interest in owning vehicles.

5.11.7 Car-Share Services

Car-share services are an effective way to reduce auto dependency and parking needs for both residential and non-residential developments, by providing vehicles that can be used by residents and tenants on an as-needed basis. The result is that the development will attract those who do not own vehicles and typically rely on alternative forms of transportation, thus reducing the number of parking spaces required on site and attracting residents and tenants that will generally produce fewer vehicle trips, but will still occasionally require a vehicle.

For some development proposals, the City of Toronto has accepted proposals that suggest that for each car-share parking space provided on site, the development will be able to reduce the

¹² https://www.vtppi.org/park_man.pdf

parking supply by 3 parking spaces. This is another example of the City accepting TDM measures to reduce the parking supply.

There will be six and ten carshares available at the north and south sites, respectively. Providing one to two spaces at each site will allow occasional drivers access to vehicles.

5.11.8 Summary of Transportation Demand Management

The following summarizes the measures that will support a 15% or greater reduction in single occupancy vehicle (SOV) trips as required by the Toronto Green Standard (Version 3):

- Convenient access to Ontario Line from both sites;
- Transit passes or subsidies provided to all residents of the building including the commercial-retail components;
- Proximity to surface transit routes along Pape Avenue and Danforth Avenue;
- Real-time transit information;
- Location in a mixed-use city environment to promote walking trips;
- Availability carshare services; and,
- Unbundled resident parking due to no vehicle parking provision.

6 Preliminary Findings and Next Steps

6.1 Traffic Forecasts

The OL Pape Station is estimated to add 1,390 walking, cycle, and transit transfer trips to the study area intersections by 2032. The proposed TOC developments (north and south sites) are expected to add a combined total of 430 and 665 trips for the morning and afternoon peak hour, respectively, with a majority of these trips being vehicular and pedestrian trips destined to/from the sites. The TOC's contribution to the total traffic volumes at Danforth Avenue and Pape Avenue intersection is presented in **Table 29**. The TOC is expected to contribute 2-5% to the total traffic volumes at this intersection under the 2032 total traffic conditions.

Table 29: TOC Transportation Contribution at Danforth/Pape Intersection

Period	Pedestrian Volumes	Vehicular Volumes	Bicycle Volumes
AM Peak Hour	2%	3%	5%
PM Peak Hour	2%	5%	3%

The OL Pape Station contribution of total traffic volumes at Danforth Avenue and Pape Avenue intersection is summarized in **Table 30**. The station itself is expected to account for approximately 38% and 24% of the pedestrian volumes at this intersection in the morning and afternoon peak hour, respectively. The east and north legs will carry the largest number of pedestrians – up to approximately 1,200 during afternoon peak hour, of which the station accounts for 350 per hour. The total hourly intersection pedestrian crossing volume is expected to be in the range of 3,700 people during afternoon peak hour.

For bicycle volumes, the station is expected to account for approximately 21% and 19% at this intersection in the morning and afternoon peak hour, respectively. The additional PUDO trips generated by the station are expected to account for 2% of the total vehicular traffic at this intersection.

Table 30: OL Pape Station Transportation Contribution at Danforth/Pape Intersection

Period	Pedestrian Volumes	Vehicular Volumes	Bicycle Volumes
AM Peak Hour	38%	2%	21%
PM Peak Hour	24%	2%	19%

6.2 Traffic Capacity and Operations

Under existing conditions and future background conditions, the Pape Avenue and Danforth Avenue intersection is expected to operate at an overall LOS D and v/c ratio approaching/at 1.0; the addition of background traffic from multiple modes would result in over-capacity conditions

at this intersection during both peak hours. A few movements are expected to operate at LOS E/F or with v/c ratio over 0.90. All the other study area intersections are expected to operate within acceptable thresholds and there is capacity to accommodate further traffic and non-vehicle demand growth beyond the TOC development with the inclusion of traffic generated by Ontario Line.

Under future total traffic conditions, the Pape Avenue and Danforth Avenue intersection is expected to operate over capacity with slightly higher v/c ratios than the background conditions. All the other intersections are expected to operate within acceptable thresholds and with residual capacity. The westbound movements from Gertrude Place to Pape Avenue are expected to experience delays (LOS F) due to high pedestrian crossing volumes on the east leg (over 800/1,100 pedestrians during morning/afternoon peak hour).

The analysis demonstrates that the TOC will have marginal impacts on traffic operations.

Due to the large number of pedestrian trips generated by the station, the Station SPR study includes a multi-modal level of service analysis following the City of Ottawa MMLOS, methodology which focuses on available infrastructure, as well as the Fruin pedestrian level of service analysis methodology, through static calculations at the sidewalks and transit waiting areas, to determine potential hotspots. The analysis in the Station SPR was performed using 2041 station transfer volumes, and therefore is indicative of the potential impacts from the continuing growth of pedestrians related to the station. The pedestrian traffic generated by the TOC will be using the station, however, that pedestrian traffic will remain relatively constant after 100% occupancy, and a minor component of the overall station demand.

Some options for localized improvements were discussed for consideration, such as increasing sidewalk widths or increasing sidewalk areas by removing street furniture and parking spaces, as well as widening crosswalk widths or providing "intersection bulbs" where feasible. However, in light of the existing urban context and constraints in the study area, there were limited opportunities for infrastructure improvements and substantial mitigation measures. Additional recommendations included the need for monitoring pedestrian demand levels after the station is open and operating.

6.3 Parking

Vehicle Parking

The vehicular parking requirements based on By-law 569-2013 are 33 and 383 for the north and south sites, respectively. However, the north and south site propose 0 and 111 parking spaces, respectively. Although the proposed parking spaces do not meet the minimum requirements of the current By-law 569-2013, we believe the By-law 89-2022 is more accurate in terms of the needs of the developments.

When requirements for By-law 89-2022 are considered, the proposed parking spaces meet the requirements for resident parking but not visitor parking. For the north site, the requirement of 2 visitor parking spaces can be accommodated in the 1-hour parking along Gertrude Place, Muriel Avenue, or in existing nearby public parking lots. It is also possible to propose shared parking

spaces between the north and south sites (the south site with proposed parking spaces would need to be constructed first for the shared parking to be viable). For the south site, it is recommended to reallocate the parking for visitors if feasible. It is also expected that the commercial activities would rely on surrounding public parking, so the recommended commerce parking rate is 0. The recommended parking rates are presented in **Table 21** for both sites.

In a location with extensive transit and active-transportation options, the recommended parking rates should be adequate for the location. The buildings will be marketed to those who do not own vehicles and wish to rely on other alternative modes of travel. Furthermore, this offers a great opportunity for the City to implement the elimination of parking minimums in an urban, transit-oriented environment.

Residents who wish to own vehicles can rent parking spaces from nearby lots or from other condominium owners who have spaces but do not use them. There are several websites that provide listings of available rental and sublet agreements of privately owned parking spaces. This will always remain an option for residents and allows for efficient use of the existing supply that may otherwise be underutilized.

Bicycle Parking

The bicycle parking requirements based on By-law 569-2013 are 31 and 428 for the north and south sites, respectively. The bicycle parking provided at both sites is in surplus for both long term and short term needs compared to the requirement and will serve all anticipated needs.

6.4 Loading

Loading space is not required for the north site; however, one Type 'C' loading space is provided. It is expected that regular pickup would continue as it currently does on Gertrude Place (i.e., the existing curb pickup will be maintained).

One Type 'G' loading space is provided for the south site, which will be shared as a Type 'B' loading space. A medium single unit moving/delivery truck and a City of Toronto front end loader was tested for the south site. The building manager will need to coordinate so that the loading space is not in use when refuse collection is scheduled or the pickup will be missed since it is provided by the City. The Type 'B' loading space at the south site must not be occupied when a refuse truck needs to enter the space due to maneuverability constraints.



Appendix A: Signal Timing Plans

LOCATION:	Danforth Ave & Pape Ave	ATO (District) / WARD:	1 (Toronto & East York) / 14
MODE/COMMENT:	FT, Primary to TCS2461, 2-Wire Polara APS & LPI	COMPUTER SYSTEM:	TransSuite
TCS:	345	CONTROLLER/CABINET TYPE:	Econolite ASC/3-2100 / TS2T1
PREPARED BY/DATE:	CIMA+ / February 22, 2021	CONFLICT FLASH:	Red & Red
CHECKED BY/DATE:	Ameneh Dialameh / February 24, 2021	DESIGN WALK SPEED:	1.0 m/s (FDW based on full crossing at 1.2 m/s)
IMPLEMENTATION DATE:	July 28, 2021	CHANNEL/DROP:	4020/18
		CONTROLLER FIRMWARE:	2.47.1



NEMA Phase	Local Plan System Plan	OFF	AM	PM	NGHT	WKND	DVP Closure	Phase Mode (Fixed/Demanded or Callable)	Remarks
		All Other Times	06:30-09:30 M-F	15:00-19:00 M-F	23:00-6:30 Daily	10:00-19:00 Sat & Sun			
		Pattern 1 Plan 1	Pattern 2 Plan 2	Pattern 3 Plan 3	Pattern 4 Plan 4	Pattern 5 Plan 5			
1 	WLK FDW MIN MAX1 AMB ALR SPLIT								Pedestrian Minimums: EWWK = 7 sec, EWFD = 13 sec NSWK = 7 sec, NSFD = 17 sec This signal (designated as the Primary) is interconnected by hardware to the intersection of Pape & Lipton (TCS 2461 - designated as the Auxiliary). The hardware interconnect is used to ensure simultaneous amber for NS traffic is provided during all times. A pulse is sent from this Master signal to the Auxiliary signal at the beginning of the NSFD to ensure the NSY and ALR are served concurrently.
2 Danforth Ave 	DLY GRN WLK FDW MIN MAX1 AMB ALR SPLIT	5 7 13 15 31 3.0 2.9						Fixed Split shown includes 5 sec EW LPI	APS on during full walk periods when activated by Push Button when no arrows are display. Extended push Activation = 3 seconds. EW Leading Pedestrian Interval - EWWK comes up 5 sec before EW vehicle green
3 	WLK FDW MIN MAX1 AMB ALR SPLIT							Fixed	
4 Pape Ave 	WLK FDW MIN MAX1 AMB ALR SPLIT							Fixed	
5 	WLK FDW MIN MAX1 AMB ALR SPLIT								
6 Danforth Ave 	DLY GRN WLK FDW MIN MAX1 AMB ALR SPLIT	5 7 13 15 31 3.0 2.9						Fixed Split shown includes 5 sec EW LPI	
7 	WLK FDW MIN MAX1 AMB ALR SPLIT							Fixed	
8 Pape Ave 	WLK FDW MIN MAX1 AMB ALR SPLIT							Fixed	
	CL OF	74 43	90 25	90 22	66 56	84 2	94 6		

NOTE:

LOCATION: Pape Ave & Lipton Ave / Private Access
 TCS: 2461
 MODE/COMMENT: FT, Auxiliary to TCS 0345 with 2-Wire Polara APS
 PREPARED BY/DATE: RanaJamil Iftikhar / February 7, 2020
 CHECKED BY/DATE: Masoud Ramezani / February 24, 2020
 IMPLEMENTATION DATE: May 12, 2020

ATO / DISTRICT / WARD: Area 1 / Scarborough / Ward 14
 COMPUTER SYSTEM: TransSuite
 CONTROLLER/CABINET TYPE: Peek ATC-1000 / TS2T1
 CONFLICT FLASH: Red & Red
 DESIGN WALK SPEED: 1.0 m/s (FDW based on full crossing @ 1.2 m/s)
 CHANNEL/DROP:
 CONTROLLER FIRMWARE: 3.018.2976



NEMA Phase	Local Plan Split Table	OFF	AM	PM	NGHT	WKND	DVP Closure	Phase Mode (Fixed / Demanded / Callable)	Remarks
		All Other Times	06:30-09:30 M-F	15:00-19:00 M-F	23:00-06:30 Daily	10:00-19:00 Sat & Sun			
		Pattern 1 Split 1	Pattern 2 Split 2	Pattern 3 Split 3	Pattern 4 Split 4	Pattern 5 Split 5			
1 	WLK FDW MIN MAX1 AMB ALR SPLIT								Pedestrian Minimums: NSWK = 7 sec., NSFD = 17 sec. EWWK = 7 sec., EWFD = 13 sec. Side Street Passage Time = 3 sec. This signal (designated as the Auxiliary) is interconnected by hardware to the intersection of Danforth & Pape (TCS 0345 - designated as the Primary). The hardware interconnect is used to ensure coordination is provided during all times.
2 	WLK 7 FDW 17 MIN 24 MAX1 36 AMB 4 ALR 4 SPLIT	44	64	64	40	58	68	Fixed	While the interconnect is active, this signal operates Free and rests in NSG/NSWK, waiting for a pulse from TCS 345. Once the pulse is received, the NSFD start. If there is loss of interconnect, the signal will run the coordinated plans.
3 	WLK FDW MIN MAX1 AMB ALR SPLIT								Extended Push Activation = 3 seconds. APS on during FULL WALK duration of NSWK & EWWK periods when activated by Push Button.
4 	WLK 7 FDW 13 MIN 20 MAX1 20 AMB 3 ALR 3 SPLIT	26	26	26	26	26	26	Fixed	
5 	WLK FDW MIN MAX1 AMB ALR SPLIT								
6 	WLK 7 FDW 17 MIN 24 MAX1 36 AMB 4 ALR 4 SPLIT	44	64	64	40	58	68	Fixed	
7 	WLK FDW MIN MAX1 AMB ALR SPLIT								
8 	WLK 7 FDW 13 MIN 20 MAX1 20 AMB 3 ALR 3 SPLIT	26	26	26	26	26	26	Fixed	
	CL OF	70 67	90 31	90 59	66 16	84 29	94 32		(Offsets only used during loss of interconnect. See Remarks for instructions)

NOTES: Optically programmable signal heads installed for NB on January 19, 2021

LOCATION:	Danforth Ave & Woodycrest Ave	ATO (District) / WARD:	1 (Toronto & East York) / 14
MODE/COMMENT:	SAP with PR, 2 Wire Polara APS & LPI	COMPUTER SYSTEM:	TransSuite
TCS:	2478	CONTROLLER / CABINET:	Econolite Cobalt / TS2T1
PREPARED BY/DATE:	C/IMA+ / February 22, 2021	CONFLICT FLASH:	Red & Red
CHECKED BY/DATE:	Ameneh Dialameh / February 24, 2021	DESIGN WALK SPEED:	1.0 m/s (FDW based on full crossing at 1.2 m/s)
IMPLEMENTATION DATE:	July 28, 2021	CHANNEL / DROP:	5025/30
		FIRMWARE VERSION:	32.63.10



NEMA Phase	Local Plan System Plan	OFF	AM	PM	NGHT	WKND	DVP Closure	Phase Mode (Fixed/Demanded/Callabe)	Remarks
		All Other Times	06:30-09:30 M-F	15:00-19:00 M-F	23:00-06:30 Daily	10:00-19:00 Sat & Sun			
		Pattern 1 Plan 1	Pattern 2 Plan 2	Pattern 3 Plan 3	Pattern 4 Plan 4	Pattern 5 Plan 5			
1 	WLK FDW MIN MAX1 AMB ALR SPLIT								Pedestrian Minimums: EWWK = 7 sec, EWFD = 7 sec NSWK = 7 sec, NSFDF = 14 sec NS phase is callable by vehicle and/or pedestrian actuation. If a vehicle and / or pedestrian call is received, the maximum NSG is served. The NSWK & NSFDF are displayed on the pedestrian signal heads if a vehicle and /or pedesrian call is received
2 	WLK 7 FDW 7 MIN 14 MAX1 40 AMB 3.0 ALR 2.4 SPLIT							Fixed	APS on during 7 seconds of EWWK and NSWK when activated by pushbuttons Extended Push Activation = 3 seconds Phase 2 & 6 Amber programmed to serve simultaneous to Phase 2 & 6 Amber at TCS346 under TransSuite Control
3 	WLK FDW MIN MAX1 AMB ALR SPLIT								NS Leading Pedestrian Interval - NSWK comes up 5 sec before NS vehicle green
4 	DLY GRN 5 WLK 7 FDW 14 MIN 16 MAX1 16 AMB 3.0 ALR 3.6 SPLIT							Callable by Pushbutton; Split shown includes 5 sec NS LPI	
5 	WLK FDW MIN MAX1 AMB ALR SPLIT								
6 	WLK 7 FDW 7 MIN 14 MAX1 40 AMB 3.0 ALR 2.4 SPLIT							Fixed	
7 	WLK FDW MIN MAX1 AMB ALR SPLIT								
8 	DLY GRN 5 WLK 7 FDW 14 MIN 16 MAX1 16 AMB 3.0 ALR 3.6 SPLIT							Callable by Trafficam and/or pushbutton Split shown includes 5 sec NS LPI	
	CL OF	74 19	90 67	90 45	66 11	84 15	94 30		

NOTES: Woodycrest Ave is one-way (SB) street.
T intersection- north leg only



Appendix B: Synchro Analysis Reports

Lanes, Volumes, Timings

3: Danforth Ave & Pape Ave

Existing AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	373	26	100	505	95	93	243	87	97	289	133
Future Volume (vph)	85	373	26	100	505	95	93	243	87	97	289	133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0		0.0	40.0		60.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (m)	45.0			25.0			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	*0.75	0.95	0.95	*0.75	0.95
Ped Bike Factor	0.90	0.98		0.87		0.62		0.86			0.88	
Frt		0.990				0.850		0.969			0.962	
Flt Protected	0.950			0.950				0.989			0.991	
Satd. Flow (prot)	1700	1462	0	1767	1566	1521	0	2250	0	0	2314	0
Flt Permitted	0.261			0.374				0.677			0.604	
Satd. Flow (perm)	422	1462	0	607	1566	939	0	1491	0	0	1356	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5				130		25			15	
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		204.9			146.6			93.5			84.3	
Travel Time (s)		18.4			13.2			8.4			7.6	
Confl. Peds. (#/hr)	395		273	273		395	170		404	404		170
Confl. Bikes (#/hr)			23			140			4			22
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
Heavy Vehicles (%)	5%	6%	4%	1%	2%	5%	0%	4%	6%	3%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	12	0	0	12	0
Parking (#/hr)		10			10							
Adj. Flow (vph)	91	401	28	108	543	102	100	261	94	104	311	143
Shared Lane Traffic (%)												
Lane Group Flow (vph)	91	429	0	108	543	102	0	455	0	0	558	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)		8.0			8.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.01	1.25	1.01	1.01	1.25	1.01	1.01	1.05	1.01	1.01	1.05	1.01
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	

Lanes, Volumes, Timings

3: Danforth Ave & Pape Ave

Existing AM

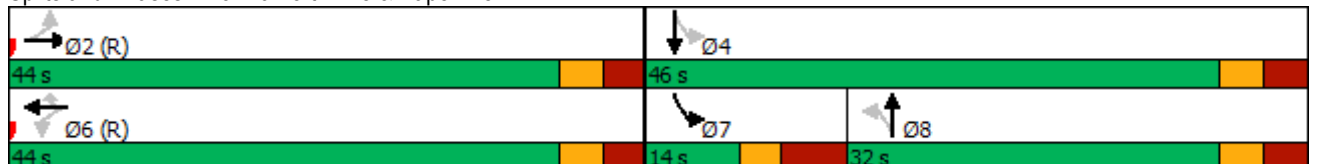


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases		2			6			8		7	4	
Permitted Phases	2			6		6	8			4		
Detector Phase	2	2		6	6	6	8	8		7	4	
Switch Phase												
Minimum Initial (s)	15.0	15.0		15.0	15.0	15.0	24.0	24.0		6.0	24.0	
Minimum Split (s)	27.0	27.0		27.0	27.0	27.0	32.0	32.0		13.5	32.0	
Total Split (s)	44.0	44.0		44.0	44.0	44.0	32.0	32.0		14.0	46.0	
Total Split (%)	48.9%	48.9%		48.9%	48.9%	48.9%	35.6%	35.6%		15.6%	51.1%	
Maximum Green (s)	38.1	38.1		38.1	38.1	38.1	25.8	25.8		6.5	39.8	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.9	2.9		2.9	2.9	2.9	3.2	3.2		4.5	3.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max	C-Max	Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	13.0	13.0		13.0	13.0	13.0	17.0	17.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)	38.1	38.1		38.1	38.1	38.1		25.8			39.8	
Actuated g/C Ratio	0.42	0.42		0.42	0.42	0.42		0.29			0.44	
v/c Ratio	0.51	0.69		0.42	0.82	0.22		1.02			0.81	
Control Delay	31.5	28.0		22.6	33.7	3.8		80.7			33.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			51.8	
Total Delay	31.5	28.0		22.6	33.7	3.8		80.7			85.0	
LOS	C	C		C	C	A		F			F	
Approach Delay		28.6			28.1			80.7			85.0	
Approach LOS		C			C			F			F	

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	25 (28%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle:	90
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	1.02
Intersection Signal Delay:	52.6
Intersection LOS:	D
Intersection Capacity Utilization:	99.2%
ICU Level of Service:	F
Analysis Period (min):	15
* User Entered Value	

Splits and Phases: 3: Danforth Ave & Pape Ave



Lanes, Volumes, Timings
9: Pape Ave & Lipton Ave

Existing AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕			↕	
Traffic Volume (vph)	6	1	8	14	0	44	0	397	27	34	496	33
Future Volume (vph)	6	1	8	14	0	44	0	397	27	34	496	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.75	0.95	0.95	*0.75	0.95
Ped Bike Factor		0.89		0.95	0.79			0.96			0.97	
Frt		0.924			0.850			0.990			0.991	
Flt Protected		0.982		0.950							0.997	
Satd. Flow (prot)	0	1643	0	1190	804	0	0	2583	0	0	2730	0
Flt Permitted		0.924		0.747							0.886	
Satd. Flow (perm)	0	1433	0	886	804	0	0	2583	0	0	2378	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9			61			11			10	
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		48.1			71.1			84.3			47.5	
Travel Time (s)		4.3			6.4			7.6			4.3	
Confl. Peds. (#/hr)	153		40	40		153	86		565	565		86
Confl. Bikes (#/hr)									4			22
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
Heavy Vehicles (%)	0%	0%	0%	50%	0%	56%	0%	4%	0%	0%	1%	0%
Adj. Flow (vph)	6	1	9	15	0	47	0	427	29	37	533	35
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	16	0	15	47	0	0	456	0	0	605	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)		8.0			10.0			8.0			12.0	
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)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2			2		1	2	
Detector Template	Left	Thru		Left	Thru			Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5			30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8			1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8						6		
Detector Phase	4	4		8	8			2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0			24.0		24.0	24.0	

Lanes, Volumes, Timings
9: Pape Ave & Lipton Ave

Existing AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	26.0	26.0		26.0	26.0			32.0		32.0	32.0	
Total Split (s)	26.0	26.0		26.0	26.0			64.0		64.0	64.0	
Total Split (%)	28.9%	28.9%		28.9%	28.9%			71.1%		71.1%	71.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0			56.0		56.0	56.0	
Yellow Time (s)	3.0	3.0		3.0	3.0			4.0		4.0	4.0	
All-Red Time (s)	3.0	3.0		3.0	3.0			4.0		4.0	4.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		6.0		6.0	6.0			8.0			8.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max			C-Max		C-Max	C-Max	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	
Flash Dont Walk (s)	13.0	13.0		13.0	13.0			17.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0			0		0	0	
Act Effct Green (s)		20.0		20.0	20.0			56.0			56.0	
Actuated g/C Ratio		0.22		0.22	0.22			0.62			0.62	
v/c Ratio		0.05		0.08	0.21			0.28			0.41	
Control Delay		19.4		29.1	8.0			15.7			9.5	
Queue Delay		0.0		0.0	0.0			1.0			0.1	
Total Delay		19.4		29.1	8.0			16.7			9.5	
LOS		B		C	A			B			A	
Approach Delay		19.4			13.1			16.7			9.5	
Approach LOS		B			B			B			A	

Intersection Summary

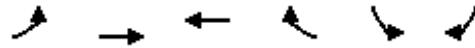
Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	31 (34%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle:	60
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.41
Intersection Signal Delay:	12.7
Intersection LOS:	B
Intersection Capacity Utilization:	69.2%
ICU Level of Service:	C
Analysis Period (min):	15
* User Entered Value	

Splits and Phases: 9: Pape Ave & Lipton Ave



Lanes, Volumes, Timings
11: Danforth Ave & Woodycrest Ave

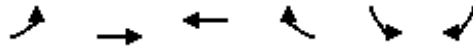
Existing AM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↓	←
Traffic Volume (vph)	0	557	661	0	18	41
Future Volume (vph)	0	557	661	0	18	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor					0.98	0.96
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	0	1507	1551	0	1608	1551
Flt Permitted					0.950	
Satd. Flow (perm)	0	1507	1551	0	1570	1493
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						43
Link Speed (k/h)		40	40		40	
Link Distance (m)		108.9	125.1		75.8	
Travel Time (s)		9.8	11.3		6.8	
Confl. Peds. (#/hr)					11	3
Confl. Bikes (#/hr)						7
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	6%	3%	0%	11%	3%
Parking (#/hr)		10	10			
Adj. Flow (vph)	0	586	696	0	19	43
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	586	696	0	19	43
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	8.0		8.0	
Two way Left Turn Lane						
Headway Factor	1.01	1.25	1.25	1.01	1.01	1.01
Turning Speed (k/h)	24			14	24	14
Number of Detectors		2	2		1	1
Detector Template		Thru	Thru		Left	Right
Leading Detector (m)		30.5	30.5		6.1	6.1
Trailing Detector (m)		0.0	0.0		0.0	0.0
Detector 1 Position(m)		0.0	0.0		0.0	0.0
Detector 1 Size(m)		1.8	1.8		6.1	6.1
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	0.0
Detector 1 Queue (s)		0.0	0.0		0.0	0.0
Detector 1 Delay (s)		0.0	0.0		0.0	0.0
Detector 2 Position(m)		28.7	28.7			
Detector 2 Size(m)		1.8	1.8			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type		NA	NA		Prot	Perm
Protected Phases		2	6		4	
Permitted Phases						4
Detector Phase		2	6		4	4
Switch Phase						

Lanes, Volumes, Timings
11: Danforth Ave & Woodycrest Ave

Existing AM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Initial (s)		14.0	14.0		16.0	16.0
Minimum Split (s)		27.0	27.0		27.6	27.6
Total Split (s)		62.0	62.0		28.0	28.0
Total Split (%)		68.9%	68.9%		31.1%	31.1%
Maximum Green (s)		56.6	56.6		21.4	21.4
Yellow Time (s)		3.0	3.0		3.0	3.0
All-Red Time (s)		2.4	2.4		3.6	3.6
Lost Time Adjust (s)		0.0	0.0		0.0	0.0
Total Lost Time (s)		5.4	5.4		6.6	6.6
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Recall Mode		C-Max	C-Max		None	None
Walk Time (s)			7.0		7.0	7.0
Flash Dont Walk (s)			7.0		14.0	14.0
Pedestrian Calls (#/hr)			0		0	0
Act Effct Green (s)		73.2	73.2		16.0	16.0
Actuated g/C Ratio		0.81	0.81		0.18	0.18
v/c Ratio		0.48	0.55		0.07	0.14
Control Delay		8.2	8.1		31.6	11.5
Queue Delay		0.0	0.0		0.0	0.0
Total Delay		8.2	8.1		31.6	11.5
LOS		A	A		C	B
Approach Delay		8.2	8.1		17.6	
Approach LOS		A	A		B	

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	67 (74%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle:	65
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.55
Intersection Signal Delay:	8.5
Intersection Capacity Utilization	58.5%
Analysis Period (min)	15
Intersection LOS:	A
ICU Level of Service	B

Splits and Phases: 11: Danforth Ave & Woodycrest Ave



HCM Signalized Intersection Capacity Analysis

3: Danforth Ave & Pape Ave

Existing AM




















Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↖	↗		↖	↗	↗		↕			↕		
Traffic Volume (vph)	85	373	26	100	505	95	93	243	87	97	289	133	
Future Volume (vph)	85	373	26	100	505	95	93	243	87	97	289	133	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2		
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		*0.75			*0.75		
Frbp, ped/bikes	1.00	0.98		1.00	1.00	0.62		0.88			0.91		
Flpb, ped/bikes	0.90	1.00		0.87	1.00	1.00		0.97			0.98		
Frt	1.00	0.99		1.00	1.00	0.85		0.97			0.96		
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99			0.99		
Satd. Flow (prot)	1537	1462		1541	1566	939		2178			2261		
Flt Permitted	0.26	1.00		0.37	1.00	1.00		0.68			0.60		
Satd. Flow (perm)	423	1462		606	1566	939		1490			1377		
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	
Adj. Flow (vph)	91	401	28	108	543	102	100	261	94	104	311	143	
RTOR Reduction (vph)	0	3	0	0	0	59	0	18	0	0	8	0	
Lane Group Flow (vph)	91	426	0	108	543	43	0	437	0	0	550	0	
Confl. Peds. (#/hr)	395		273	273		395	170		404	404		170	
Confl. Bikes (#/hr)			23			140			4			22	
Heavy Vehicles (%)	5%	6%	4%	1%	2%	5%	0%	4%	6%	3%	4%	2%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	12	0	0	12	0	
Parking (#/hr)		10			10								
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA		
Protected Phases		2			6			8		7	4		
Permitted Phases	2			6		6	8			4			
Actuated Green, G (s)	38.1	38.1		38.1	38.1	38.1		25.8			39.8		
Effective Green, g (s)	38.1	38.1		38.1	38.1	38.1		25.8			39.8		
Actuated g/C Ratio	0.42	0.42		0.42	0.42	0.42		0.29			0.44		
Clearance Time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0		
Lane Grp Cap (vph)	179	618		256	662	397		427			672		
v/s Ratio Prot		0.29			c0.35						c0.06		
v/s Ratio Perm	0.22			0.18		0.05		c0.29			0.30		
v/c Ratio	0.51	0.69		0.42	0.82	0.11		1.02			0.82		
Uniform Delay, d1	19.1	21.1		18.2	22.9	15.7		32.1			21.9		
Progression Factor	1.00	1.00		0.91	0.95	1.51		1.00			1.18		
Incremental Delay, d2	10.0	6.2		4.8	10.6	0.5		49.8			10.0		
Delay (s)	29.0	27.3		21.4	32.4	24.1		81.9			35.9		
Level of Service	C	C		C	C	C		F			D		
Approach Delay (s)		27.6			29.7			81.9			35.9		
Approach LOS		C			C			F			D		
Intersection Summary													
HCM 2000 Control Delay			41.1									HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.93										
Actuated Cycle Length (s)			90.0									Sum of lost time (s)	19.6
Intersection Capacity Utilization			99.2%									ICU Level of Service	F
Analysis Period (min)			15										
c	Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Pape Ave & Lipton Ave

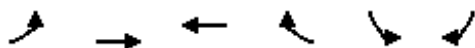
Existing AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	1	8	14	0	44	0	397	27	34	496	33
Future Volume (vph)	6	1	8	14	0	44	0	397	27	34	496	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		6.0	6.0			8.0			8.0	
Lane Util. Factor		1.00		1.00	1.00			*0.75			*0.75	
Frbp, ped/bikes		0.96		1.00	0.79			0.96			0.99	
Flpb, ped/bikes		0.93		0.95	1.00			1.00			0.98	
Frt		0.92		1.00	0.85			0.99			0.99	
Flt Protected		0.98		0.95	1.00			1.00			1.00	
Satd. Flow (prot)		1523		1127	804			2584			2677	
Flt Permitted		0.92		0.75	1.00			1.00			0.89	
Satd. Flow (perm)		1434		886	804			2584			2378	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	6	1	9	15	0	47	0	427	29	37	533	35
RTOR Reduction (vph)	0	7	0	0	37	0	0	4	0	0	4	0
Lane Group Flow (vph)	0	9	0	15	10	0	0	452	0	0	601	0
Confl. Peds. (#/hr)	153		40	40		153	86		565	565		86
Confl. Bikes (#/hr)									4			22
Heavy Vehicles (%)	0%	0%	0%	50%	0%	56%	0%	4%	0%	0%	1%	0%
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8						6		
Actuated Green, G (s)		20.0		20.0	20.0			56.0			56.0	
Effective Green, g (s)		20.0		20.0	20.0			56.0			56.0	
Actuated g/C Ratio		0.22		0.22	0.22			0.62			0.62	
Clearance Time (s)		6.0		6.0	6.0			8.0			8.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		318		196	178			1607			1479	
v/s Ratio Prot					0.01			0.17				
v/s Ratio Perm		0.01		c0.02							c0.25	
v/c Ratio		0.03		0.08	0.06			0.28			0.41	
Uniform Delay, d1		27.4		27.7	27.6			7.8			8.6	
Progression Factor		1.00		1.00	1.00			2.00			1.00	
Incremental Delay, d2		0.2		0.8	0.6			0.3			0.8	
Delay (s)		27.6		28.5	28.2			15.9			9.4	
Level of Service		C		C	C			B			A	
Approach Delay (s)		27.6			28.3			15.9			9.4	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM 2000 Control Delay			13.3			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.32									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)		14.0				
Intersection Capacity Utilization			69.2%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

11: Danforth Ave & Woodycrest Ave

Existing AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↙	↘
Traffic Volume (vph)	0	557	661	0	18	41
Future Volume (vph)	0	557	661	0	18	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.4	5.4		6.6	6.6
Lane Util. Factor		1.00	1.00		1.00	1.00
Frbp, ped/bikes		1.00	1.00		1.00	0.95
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		1507	1551		1608	1472
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		1507	1551		1608	1472
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	586	696	0	19	43
RTOR Reduction (vph)	0	0	0	0	0	38
Lane Group Flow (vph)	0	586	696	0	19	5
Confl. Peds. (#/hr)					11	3
Confl. Bikes (#/hr)						7
Heavy Vehicles (%)	0%	6%	3%	0%	11%	3%
Parking (#/hr)		10	10			
Turn Type		NA	NA		Prot	Perm
Protected Phases		2	6		4	
Permitted Phases						4
Actuated Green, G (s)		68.4	68.4		9.6	9.6
Effective Green, g (s)		68.4	68.4		9.6	9.6
Actuated g/C Ratio		0.76	0.76		0.11	0.11
Clearance Time (s)		5.4	5.4		6.6	6.6
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1145	1178		171	157
v/s Ratio Prot		0.39	c0.45		c0.01	
v/s Ratio Perm						0.00
v/c Ratio		0.51	0.59		0.11	0.03
Uniform Delay, d1		4.2	4.7		36.3	36.0
Progression Factor		1.25	1.00		1.00	1.00
Incremental Delay, d2		1.4	2.2		0.3	0.1
Delay (s)		6.7	6.9		36.6	36.1
Level of Service		A	A		D	D
Approach Delay (s)		6.7	6.9		36.3	
Approach LOS		A	A		D	

Intersection Summary

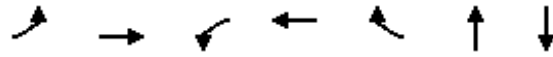
HCM 2000 Control Delay	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Queues

3: Danforth Ave & Pape Ave

Existing AM



Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	91	429	108	543	102	455	558
v/c Ratio	0.51	0.69	0.42	0.82	0.22	1.02	0.81
Control Delay	31.5	28.0	22.6	33.7	3.8	80.7	33.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	51.8
Total Delay	31.5	28.0	22.6	33.7	3.8	80.7	85.0
Queue Length 50th (m)	11.3	58.1	13.8	87.2	1.7	~52.2	56.6
Queue Length 95th (m)	27.9	92.3	29.8	#140.1	m7.7	#92.2	#86.5
Internal Link Dist (m)		180.9		122.6		69.5	60.3
Turn Bay Length (m)	40.0		40.0		60.0		
Base Capacity (vph)	178	621	256	662	472	445	691
Starvation Cap Reductn	0	0	0	0	0	0	201
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.69	0.42	0.82	0.22	1.02	1.14

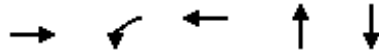
Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Queues

9: Pape Ave & Lipton Ave

Existing AM



Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	16	15	47	456	605
v/c Ratio	0.05	0.08	0.21	0.28	0.41
Control Delay	19.4	29.1	8.0	15.7	9.5
Queue Delay	0.0	0.0	0.0	1.0	0.1
Total Delay	19.4	29.1	8.0	16.7	9.5
Queue Length 50th (m)	1.0	2.1	0.0	41.5	31.4
Queue Length 95th (m)	6.0	7.2	6.5	m45.6	44.6
Internal Link Dist (m)	24.1		47.1	60.3	23.5
Turn Bay Length (m)					
Base Capacity (vph)	325	196	226	1611	1483
Starvation Cap Reductn	0	0	0	860	0
Spillback Cap Reductn	0	0	0	0	135
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.05	0.08	0.21	0.61	0.45

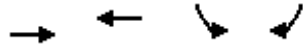
Intersection Summary

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

Queues

11: Danforth Ave & Woodycrest Ave

Existing AM



Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	586	696	19	43
v/c Ratio	0.48	0.55	0.07	0.14
Control Delay	8.2	8.1	31.6	11.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	8.2	8.1	31.6	11.5
Queue Length 50th (m)	66.3	58.7	2.8	0.0
Queue Length 95th (m)	m96.6	93.0	8.7	8.5
Internal Link Dist (m)	84.9	101.1	51.8	
Turn Bay Length (m)				
Base Capacity (vph)	1226	1261	382	387
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.48	0.55	0.05	0.11

Intersection Summary

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

HCM Unsignalized Intersection Capacity Analysis

17: Pape Ave & Bus Loop Entrance

Existing AM

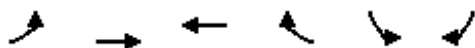


Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↑↑			↑↑
Traffic Volume (veh/h)	0	0	435	12	28	563
Future Volume (Veh/h)	0	0	435	12	28	563
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	0	0	468	13	30	605
Pedestrians	539					
Lane Width (m)	0.0					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)	48					
pX, platoon unblocked	0.95	0.95			0.95	
vC, conflicting volume	1376	780			1020	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1282	652			906	
tC, single (s)	6.8	6.9			6.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			3.2	
p0 queue free %	100	100			91	
cM capacity (veh/h)	137	393			334	
Direction, Lane #	NB 1	NB 2	SB 1	SB 2		
Volume Total	312	169	232	403		
Volume Left	0	0	30	0		
Volume Right	0	13	0	0		
cSH	1700	1700	334	1700		
Volume to Capacity	0.18	0.10	0.09	0.24		
Queue Length 95th (m)	0.0	0.0	2.2	0.0		
Control Delay (s)	0.0	0.0	3.7	0.0		
Lane LOS					A	
Approach Delay (s)	0.0		1.3			
Approach LOS						
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			36.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

19: Danforth Ave & Eaton Ave

Existing AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕			
Traffic Volume (veh/h)	18	538	702	37	0	0
Future Volume (Veh/h)	18	538	702	37	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.62	0.62	0.62	0.62	0.62	0.62
Hourly flow rate (vph)	29	868	1132	60	0	0
Pedestrians		16	5		77	
Lane Width (m)		3.5	3.5		0.0	
Walking Speed (m/s)		1.1	1.1		1.1	
Percent Blockage		1	0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		147	109			
pX, platoon unblocked	0.80				0.90	0.80
vC, conflicting volume	1269				2170	1255
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1213				1757	1196
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				100	100
cM capacity (veh/h)	469				78	180
Direction, Lane #	EB 1	WB 1				
Volume Total	897	1192				
Volume Left	29	0				
Volume Right	0	60				
cSH	469	1700				
Volume to Capacity	0.06	0.70				
Queue Length 95th (m)	1.5	0.0				
Control Delay (s)	2.0	0.0				
Lane LOS	A					
Approach Delay (s)	2.0	0.0				
Approach LOS						
Intersection Summary						
Average Delay		0.9				
Intersection Capacity Utilization		57.0%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

21: Pape Ave & Gertrude PI

Existing AM



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	15	15	435	0	0	576
Future Volume (Veh/h)	15	15	435	0	0	576
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	16	16	468	0	0	619
Pedestrians	539					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.1					
Percent Blockage	48					
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)	87					
pX, platoon unblocked	0.97	0.97			0.97	
vC, conflicting volume	1316	773			1007	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1260	699			941	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	81	92			100	
cM capacity (veh/h)	82	194			373	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	16	16	234	234	310	310
Volume Left	16	0	0	0	0	0
Volume Right	0	16	0	0	0	0
cSH	82	194	1700	1700	1700	1700
Volume to Capacity	0.19	0.08	0.14	0.14	0.18	0.18
Queue Length 95th (m)	5.1	2.0	0.0	0.0	0.0	0.0
Control Delay (s)	59.1	25.2	0.0	0.0	0.0	0.0
Lane LOS	F	D				
Approach Delay (s)	42.2		0.0		0.0	
Approach LOS	E					
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			25.9%		ICU Level of Service	A
Analysis Period (min)	15					

Lanes, Volumes, Timings
3: Danforth Ave & Pape Ave

Existing PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	383	42	67	493	107	86	293	116	86	237	152
Future Volume (vph)	90	383	42	67	493	107	86	293	116	86	237	152
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0		0.0	40.0		60.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (m)	45.0			25.0			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	*0.75	0.95	0.95	*0.75	0.95
Ped Bike Factor	0.87	0.96		0.83		0.57		0.81			0.77	
Frt		0.985				0.850		0.965			0.952	
Flt Protected	0.950			0.950				0.991			0.991	
Satd. Flow (prot)	1733	1490	0	1750	1566	1597	0	2151	0	0	2061	0
Flt Permitted	0.300			0.368				0.625			0.718	
Satd. Flow (perm)	474	1490	0	564	1566	914	0	1311	0	0	1400	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8				125		4			52	
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		204.9			146.6			93.5			84.3	
Travel Time (s)		18.4			13.2			8.4			7.6	
Confl. Peds. (#/hr)	662		653	653		662	405		769	769		405
Confl. Bikes (#/hr)			159			35			9			10
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	3%	1%	0%	2%	2%	0%	2%	3%	1%	1%	4%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	12	0	0	12	0
Parking (#/hr)		10			10							
Adj. Flow (vph)	92	391	43	68	503	109	88	299	118	88	242	155
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	434	0	68	503	109	0	505	0	0	485	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)		8.0			8.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.01	1.25	1.01	1.01	1.25	1.01	1.01	1.05	1.01	1.01	1.05	1.01
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	

Lanes, Volumes, Timings
3: Danforth Ave & Pape Ave

Existing PM

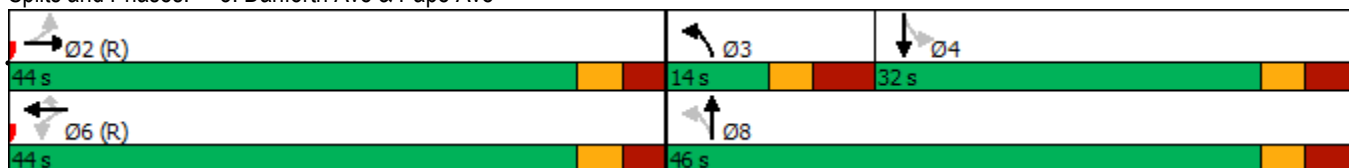


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Type	Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		Perm	NA	
Protected Phases	2			6			3			8		
Permitted Phases	2			6		6		8		4		
Detector Phase	2	2		6	6	6	3	8		4	4	
Switch Phase												
Minimum Initial (s)	15.0	15.0		15.0	15.0	15.0	6.0	24.0		24.0	24.0	
Minimum Split (s)	27.0	27.0		27.0	27.0	27.0	13.1	32.0		32.0	32.0	
Total Split (s)	44.0	44.0		44.0	44.0	44.0	14.0	46.0		32.0	32.0	
Total Split (%)	48.9%	48.9%		48.9%	48.9%	48.9%	15.6%	51.1%		35.6%	35.6%	
Maximum Green (s)	38.1	38.1		38.1	38.1	38.1	6.9	39.8		25.8	25.8	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.9	2.9		2.9	2.9	2.9	4.1	3.2		3.2	3.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2	
Lead/Lag							Lead			Lag		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max	C-Max	Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0	7.0		7.0		7.0	7.0	
Flash Dont Walk (s)	13.0	13.0		13.0	13.0	13.0		17.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0	0		0		0	0	
Act Effct Green (s)	38.1	38.1		38.1	38.1	38.1		39.8			25.8	
Actuated g/C Ratio	0.42	0.42		0.42	0.42	0.42		0.44			0.29	
v/c Ratio	0.46	0.68		0.29	0.76	0.24		0.77			1.11	
Control Delay	27.9	27.4		30.9	40.1	11.6		29.1			99.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Delay	27.9	27.4		30.9	40.1	11.6		29.1			99.6	
LOS	C	C		C	D	B		C			F	
Approach Delay	27.5			34.7			29.1			99.6		
Approach LOS	C			C			C			F		

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 22 (24%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.11
 Intersection Signal Delay: 46.0
 Intersection LOS: D
 Intersection Capacity Utilization 98.6%
 ICU Level of Service F
 Analysis Period (min) 15
 * User Entered Value

Splits and Phases: 3: Danforth Ave & Pape Ave



Lanes, Volumes, Timings
9: Pape Ave & Lipton Ave

Existing PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕			↕	
Traffic Volume (vph)	17	0	16	28	0	70	0	474	15	19	429	34
Future Volume (vph)	17	0	16	28	0	70	0	474	15	19	429	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.75	0.95	0.95	*0.75	0.95
Ped Bike Factor		0.78		0.85	0.68			0.98			0.96	
Frt		0.935			0.850			0.995			0.989	
Flt Protected		0.975		0.950							0.998	
Satd. Flow (prot)	0	1575	0	1137	644	0	0	2541	0	0	2694	0
Flt Permitted		0.861		0.736							0.918	
Satd. Flow (perm)	0	1186	0	749	644	0	0	2541	0	0	2444	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		61			61			5			13	
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		48.1			71.1			84.3			49.7	
Travel Time (s)		4.3			6.4			7.6			4.5	
Confl. Peds. (#/hr)	284		116	116		284	161		836	836		161
Confl. Bikes (#/hr)									9			10
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	57%	0%	68%	0%	8%	7%	0%	1%	0%
Adj. Flow (vph)	17	0	16	29	0	71	0	484	15	19	438	35
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	33	0	29	71	0	0	499	0	0	492	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)		8.0			10.0			8.0			12.0	
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)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2			2		1	2	
Detector Template	Left	Thru		Left	Thru			Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5			30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8			1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		4			8			2			6	

Lanes, Volumes, Timings
9: Pape Ave & Lipton Ave

Existing PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8						6		
Detector Phase	4	4		8	8			2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0			24.0		24.0	24.0	
Minimum Split (s)	26.0	26.0		26.0	26.0			32.0		32.0	32.0	
Total Split (s)	26.0	26.0		26.0	26.0			64.0		64.0	64.0	
Total Split (%)	28.9%	28.9%		28.9%	28.9%			71.1%		71.1%	71.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0			56.0		56.0	56.0	
Yellow Time (s)	3.0	3.0		3.0	3.0			4.0		4.0	4.0	
All-Red Time (s)	3.0	3.0		3.0	3.0			4.0		4.0	4.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		6.0		6.0	6.0			8.0			8.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max			C-Max		C-Max	C-Max	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	
Flash Dont Walk (s)	13.0	13.0		13.0	13.0			17.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0			0		0	0	
Act Effct Green (s)		20.0		20.0	20.0			56.0			56.0	
Actuated g/C Ratio		0.22		0.22	0.22			0.62			0.62	
v/c Ratio		0.11		0.17	0.37			0.32			0.32	
Control Delay		3.6		31.6	16.3			6.8			8.5	
Queue Delay		0.0		0.0	0.0			0.6			0.0	
Total Delay		3.6		31.6	16.3			7.4			8.5	
LOS		A		C	B			A			A	
Approach Delay		3.6			20.8			7.4			8.5	
Approach LOS		A			C			A			A	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 59 (66%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.37
 Intersection Signal Delay: 9.0
 Intersection Capacity Utilization 55.8%
 Analysis Period (min) 15
 * User Entered Value

Splits and Phases: 9: Pape Ave & Lipton Ave



Lanes, Volumes, Timings
 11: Danforth Ave & Woodycrest Ave

Existing PM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	↘
Traffic Volume (vph)	0	587	637	0	22	31
Future Volume (vph)	0	587	637	0	22	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor					0.95	0.91
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	0	1566	1581	0	1638	1551
Flt Permitted					0.950	
Satd. Flow (perm)	0	1566	1581	0	1564	1412
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						32
Link Speed (k/h)		40	40		40	
Link Distance (m)		108.9	125.1		75.8	
Travel Time (s)		9.8	11.3		6.8	
Confl. Peds. (#/hr)					21	31
Confl. Bikes (#/hr)						3
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	2%	1%	0%	9%	3%
Parking (#/hr)		10	10			
Adj. Flow (vph)	0	599	650	0	22	32
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	599	650	0	22	32
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	8.0		8.0	
Two way Left Turn Lane						
Headway Factor	1.01	1.25	1.25	1.01	1.01	1.01
Turning Speed (k/h)	24			14	24	14
Number of Detectors		2	2		1	1
Detector Template		Thru	Thru		Left	Right
Leading Detector (m)		30.5	30.5		6.1	6.1
Trailing Detector (m)		0.0	0.0		0.0	0.0
Detector 1 Position(m)		0.0	0.0		0.0	0.0
Detector 1 Size(m)		1.8	1.8		6.1	6.1
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	0.0
Detector 1 Queue (s)		0.0	0.0		0.0	0.0
Detector 1 Delay (s)		0.0	0.0		0.0	0.0
Detector 2 Position(m)		28.7	28.7			
Detector 2 Size(m)		1.8	1.8			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type		NA	NA		Prot	Perm

Lanes, Volumes, Timings
 11: Danforth Ave & Woodycrest Ave

Existing PM

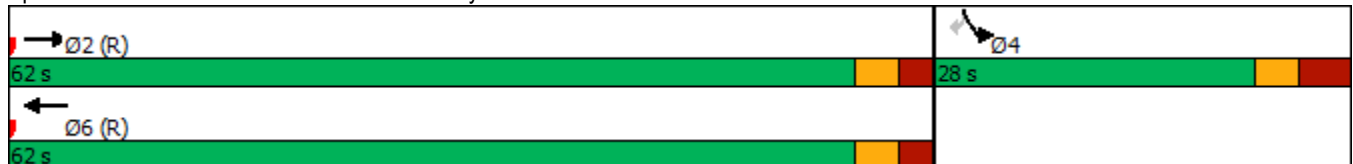


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases		2	6		4	
Permitted Phases						4
Detector Phase		2	6		4	4
Switch Phase						
Minimum Initial (s)		14.0	14.0		16.0	16.0
Minimum Split (s)		19.4	19.4		27.6	27.6
Total Split (s)		62.0	62.0		28.0	28.0
Total Split (%)		68.9%	68.9%		31.1%	31.1%
Maximum Green (s)		56.6	56.6		21.4	21.4
Yellow Time (s)		3.0	3.0		3.0	3.0
All-Red Time (s)		2.4	2.4		3.6	3.6
Lost Time Adjust (s)		0.0	0.0		0.0	0.0
Total Lost Time (s)		5.4	5.4		6.6	6.6
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Recall Mode		C-Max	C-Max		None	None
Walk Time (s)			7.0		7.0	7.0
Flash Dont Walk (s)			7.0		14.0	14.0
Pedestrian Calls (#/hr)			0		0	0
Act Effct Green (s)		73.2	73.2		16.0	16.0
Actuated g/C Ratio		0.81	0.81		0.18	0.18
v/c Ratio		0.47	0.51		0.08	0.12
Control Delay		5.5	7.2		31.8	12.5
Queue Delay		0.0	0.0		0.0	0.0
Total Delay		5.5	7.2		31.8	12.5
LOS		A	A		C	B
Approach Delay		5.5	7.2		20.4	
Approach LOS		A	A		C	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 45 (50%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.51
 Intersection Signal Delay: 7.0
 Intersection LOS: A
 Intersection Capacity Utilization 59.5%
 ICU Level of Service B
 Analysis Period (min) 15






















Splits and Phases: 11: Danforth Ave & Woodycrest Ave



HCM Signalized Intersection Capacity Analysis

3: Danforth Ave & Pape Ave


















Existing PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	383	42	67	493	107	86	293	116	86	237	152
Future Volume (vph)	90	383	42	67	493	107	86	293	116	86	237	152
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		*0.75			*0.75	
Frbp, ped/bikes	1.00	0.96		1.00	1.00	0.57		0.84			0.82	
Flpb, ped/bikes	0.87	1.00		0.83	1.00	1.00		0.98			0.94	
Frt	1.00	0.99		1.00	1.00	0.85		0.96			0.95	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99			0.99	
Satd. Flow (prot)	1500	1490		1457	1566	914		2108			1933	
Flt Permitted	0.30	1.00		0.37	1.00	1.00		0.62			0.72	
Satd. Flow (perm)	474	1490		565	1566	914		1329			1400	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	92	391	43	68	503	109	88	299	118	88	242	155
RTOR Reduction (vph)	0	5	0	0	0	63	0	2	0	0	37	0
Lane Group Flow (vph)	92	429	0	68	503	46	0	503	0	0	448	0
Confl. Peds. (#/hr)	662		653	653		662	405		769	769		405
Confl. Bikes (#/hr)			159			35			9			10
Heavy Vehicles (%)	3%	1%	0%	2%	2%	0%	2%	3%	1%	1%	4%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	12	0	0	12	0
Parking (#/hr)		10			10							
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		Perm	NA	
Protected Phases		2			6		3	8				4
Permitted Phases	2			6		6	8			4		
Actuated Green, G (s)	38.1	38.1		38.1	38.1	38.1		39.8			25.8	
Effective Green, g (s)	38.1	38.1		38.1	38.1	38.1		39.8			25.8	
Actuated g/C Ratio	0.42	0.42		0.42	0.42	0.42		0.44			0.29	
Clearance Time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	200	630		239	662	386		647			401	
v/s Ratio Prot		0.29			c0.32			c0.06				
v/s Ratio Perm	0.19			0.12		0.05		0.28			c0.32	
v/c Ratio	0.46	0.68		0.28	0.76	0.12		0.78			1.12	
Uniform Delay, d1	18.6	21.0		17.0	22.1	15.8		21.3			32.1	
Progression Factor	1.00	1.00		1.55	1.43	4.03		1.00			0.78	
Incremental Delay, d2	7.4	5.9		2.7	7.4	0.6		8.9			79.9	
Delay (s)	26.0	26.9		29.0	38.9	64.1		30.2			104.8	
Level of Service	C	C		C	D	E		C			F	
Approach Delay (s)		26.8			41.9			30.2			104.8	
Approach LOS		C			D			C			F	
Intersection Summary												
HCM 2000 Control Delay			49.5									HCM 2000 Level of Service D
HCM 2000 Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			90.0								19.2	
Intersection Capacity Utilization			98.6%									ICU Level of Service F
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Pape Ave & Lipton Ave

Existing PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	0	16	28	0	70	0	474	15	19	429	34
Future Volume (vph)	17	0	16	28	0	70	0	474	15	19	429	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		6.0	6.0			8.0			8.0	
Lane Util. Factor		1.00		1.00	1.00			*0.75			*0.75	
Frbp, ped/bikes		0.92		1.00	0.68			0.98			0.98	
Flpb, ped/bikes		0.85		0.85	1.00			1.00			0.99	
Frt		0.93		1.00	0.85			1.00			0.99	
Flt Protected		0.97		0.95	1.00			1.00			1.00	
Satd. Flow (prot)		1342		967	644			2542			2658	
Flt Permitted		0.86		0.74	1.00			1.00			0.92	
Satd. Flow (perm)		1186		749	644			2542			2446	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	17	0	16	29	0	71	0	484	15	19	438	35
RTOR Reduction (vph)	0	26	0	0	47	0	0	2	0	0	5	0
Lane Group Flow (vph)	0	7	0	29	24	0	0	497	0	0	487	0
Confl. Peds. (#/hr)	284		116	116		284	161		836	836		161
Confl. Bikes (#/hr)									9			10
Heavy Vehicles (%)	0%	0%	0%	57%	0%	68%	0%	8%	7%	0%	1%	0%
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8						6		
Actuated Green, G (s)		20.0		20.0	20.0			56.0			56.0	
Effective Green, g (s)		20.0		20.0	20.0			56.0			56.0	
Actuated g/C Ratio		0.22		0.22	0.22			0.62			0.62	
Clearance Time (s)		6.0		6.0	6.0			8.0			8.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		263		166	143			1581			1521	
v/s Ratio Prot					0.04			0.20				
v/s Ratio Perm		0.01		c0.04							c0.20	
v/c Ratio		0.03		0.17	0.16			0.31			0.32	
Uniform Delay, d1		27.4		28.3	28.3			8.0			8.0	
Progression Factor		1.00		1.00	1.00			0.79			1.00	
Incremental Delay, d2		0.2		2.3	2.5			0.4			0.6	
Delay (s)		27.6		30.6	30.7			6.8			8.6	
Level of Service		C		C	C			A			A	
Approach Delay (s)		27.6			30.7			6.8			8.6	
Approach LOS		C			C			A			A	
Intersection Summary												
HCM 2000 Control Delay			10.3					HCM 2000 Level of Service			B	
HCM 2000 Volume to Capacity ratio			0.28									
Actuated Cycle Length (s)			90.0					Sum of lost time (s)		14.0		
Intersection Capacity Utilization			55.8%					ICU Level of Service			B	
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Signalized Intersection Capacity Analysis

11: Danforth Ave & Woodycrest Ave

Existing PM

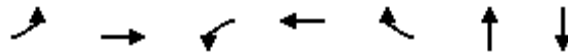


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	↗
Traffic Volume (vph)	0	587	637	0	22	31
Future Volume (vph)	0	587	637	0	22	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.4	5.4		6.6	6.6
Lane Util. Factor		1.00	1.00		1.00	1.00
Frbp, ped/bikes		1.00	1.00		1.00	0.91
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		1566	1581		1638	1404
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		1566	1581		1638	1404
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	599	650	0	22	32
RTOR Reduction (vph)	0	0	0	0	0	29
Lane Group Flow (vph)	0	599	650	0	22	3
Confl. Peds. (#/hr)					21	31
Confl. Bikes (#/hr)						3
Heavy Vehicles (%)	0%	2%	1%	0%	9%	3%
Parking (#/hr)		10	10			
Turn Type		NA	NA		Prot	Perm
Protected Phases		2	6		4	
Permitted Phases						4
Actuated Green, G (s)		68.4	68.4		9.6	9.6
Effective Green, g (s)		68.4	68.4		9.6	9.6
Actuated g/C Ratio		0.76	0.76		0.11	0.11
Clearance Time (s)		5.4	5.4		6.6	6.6
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1190	1201		174	149
v/s Ratio Prot		0.38	c0.41		c0.01	
v/s Ratio Perm						0.00
v/c Ratio		0.50	0.54		0.13	0.02
Uniform Delay, d1		4.2	4.4		36.4	36.0
Progression Factor		0.84	1.00		1.00	1.00
Incremental Delay, d2		1.1	1.8		0.3	0.1
Delay (s)		4.6	6.2		36.7	36.1
Level of Service		A	A		D	D
Approach Delay (s)		4.6	6.2		36.3	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			6.7		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.49			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			59.5%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

Queues

3: Danforth Ave & Pape Ave

Existing PM



Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	92	434	68	503	109	505	485
v/c Ratio	0.46	0.68	0.29	0.76	0.24	0.77	1.11
Control Delay	27.9	27.4	30.9	40.1	11.6	29.1	99.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.9	27.4	30.9	40.1	11.6	29.1	99.6
Queue Length 50th (m)	11.1	58.2	11.0	92.9	3.8	40.6	~46.6
Queue Length 95th (m)	26.4	92.1	m24.2	124.3	18.1	#61.4	#100.9
Internal Link Dist (m)		180.9		122.6		69.5	60.3
Turn Bay Length (m)	40.0		40.0		60.0		
Base Capacity (vph)	200	635	238	662	459	654	438
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.46	0.68	0.29	0.76	0.24	0.77	1.11

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

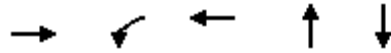
Queue shown is maximum after two cycles.

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

Queues

9: Pape Ave & Lipton Ave

Existing PM



Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	33	29	71	499	492
v/c Ratio	0.11	0.17	0.37	0.32	0.32
Control Delay	3.6	31.6	16.3	6.8	8.5
Queue Delay	0.0	0.0	0.0	0.6	0.0
Total Delay	3.6	31.6	16.3	7.4	8.5
Queue Length 50th (m)	0.0	4.1	1.4	15.8	23.5
Queue Length 95th (m)	3.2	11.6	13.3	m25.7	34.1
Internal Link Dist (m)	24.1		47.1	60.3	25.7
Turn Bay Length (m)					
Base Capacity (vph)	311	166	190	1582	1525
Starvation Cap Reductn	0	0	0	687	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.11	0.17	0.37	0.56	0.32

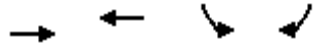
Intersection Summary

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

Queues

11: Danforth Ave & Woodycrest Ave

Existing PM



Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	599	650	22	32
v/c Ratio	0.47	0.51	0.08	0.12
Control Delay	5.5	7.2	31.8	12.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	5.5	7.2	31.8	12.5
Queue Length 50th (m)	27.7	51.4	3.2	0.0
Queue Length 95th (m)	m40.4	80.1	9.6	7.5
Internal Link Dist (m)	84.9	101.1	51.8	
Turn Bay Length (m)				
Base Capacity (vph)	1273	1286	389	360
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.47	0.51	0.06	0.09

Intersection Summary

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

HCM Unsignalized Intersection Capacity Analysis

17: Pape Ave & Bus Loop Entrance

Existing PM



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↑↑			↑↑
Traffic Volume (veh/h)	0	0	549	12	28	482
Future Volume (Veh/h)	0	0	549	12	28	482
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	0	560	12	29	492
Pedestrians	840					
Lane Width (m)	0.0					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)	50					
pX, platoon unblocked	0.93	0.93			0.93	
vC, conflicting volume	1710	1126			1412	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1617	991			1298	
tC, single (s)	6.8	6.9			6.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			3.2	
p0 queue free %	100	100			85	
cM capacity (veh/h)	76	232			196	
Direction, Lane #	NB 1	NB 2	SB 1	SB 2		
Volume Total	373	199	193	328		
Volume Left	0	0	29	0		
Volume Right	0	12	0	0		
cSH	1700	1700	196	1700		
Volume to Capacity	0.22	0.12	0.15	0.19		
Queue Length 95th (m)	0.0	0.0	3.9	0.0		
Control Delay (s)	0.0	0.0	7.7	0.0		
Lane LOS	A					
Approach Delay (s)	0.0		2.8			
Approach LOS						
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			36.6%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

19: Danforth Ave & Eaton Ave

Existing PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔			
Traffic Volume (veh/h)	32	555	667	31	0	0
Future Volume (Veh/h)	32	555	667	31	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	36	617	741	34	0	0
Pedestrians		43	11		240	
Lane Width (m)		3.5	3.5		0.0	
Walking Speed (m/s)		1.1	1.1		1.1	
Percent Blockage		4	1		0	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		147	109			
pX, platoon unblocked	0.83				0.89	0.83
vC, conflicting volume	1015				1698	1041
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	918				1302	950
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				100	100
cM capacity (veh/h)	626				147	253
Direction, Lane #	EB 1	WB 1				
Volume Total	653	775				
Volume Left	36	0				
Volume Right	0	34				
cSH	626	1700				
Volume to Capacity	0.06	0.46				
Queue Length 95th (m)	1.4	0.0				
Control Delay (s)	1.6	0.0				
Lane LOS	A					
Approach Delay (s)	1.6	0.0				
Approach LOS						
Intersection Summary						
Average Delay		0.7				
Intersection Capacity Utilization		73.0%		ICU Level of Service		C
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

21: Pape Ave & Gertrude PI

Existing PM



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	15	15	549	0	0	495
Future Volume (Veh/h)	15	15	549	0	0	495
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	15	15	560	0	0	505
Pedestrians	840					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.1					
Percent Blockage	74					
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)	87					
pX, platoon unblocked	0.95	0.95			0.95	
vC, conflicting volume	1652	1120			1400	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1584	1024			1319	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	38	74			100	
cM capacity (veh/h)	24	57			130	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	15	15	280	280	252	252
Volume Left	15	0	0	0	0	0
Volume Right	0	15	0	0	0	0
cSH	24	57	1700	1700	1700	1700
Volume to Capacity	0.62	0.26	0.16	0.16	0.15	0.15
Queue Length 95th (m)	14.1	6.9	0.0	0.0	0.0	0.0
Control Delay (s)	287.2	89.3	0.0	0.0	0.0	0.0
Lane LOS	F	F				
Approach Delay (s)	188.3		0.0		0.0	
Approach LOS	F					
Intersection Summary						
Average Delay	5.2					
Intersection Capacity Utilization	25.2%		ICU Level of Service		A	
Analysis Period (min)	15					

Lanes, Volumes, Timings
3: Danforth Ave & Pape Ave

2032 Total Background - AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	406	27	105	545	100	98	269	91	102	318	140
Future Volume (vph)	90	406	27	105	545	100	98	269	91	102	318	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0		0.0	40.0		60.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (m)	45.0			25.0			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	*0.75	0.95	0.95	*0.75	0.95
Ped Bike Factor		0.98		0.87		0.53		0.82			0.83	
Frt		0.991				0.850		0.970			0.962	
Flt Protected	0.950			0.950				0.989			0.991	
Satd. Flow (prot)	1700	1460	0	1767	1566	1521	0	2188	0	0	2194	0
Flt Permitted	0.196			0.318				0.664			0.598	
Satd. Flow (perm)	351	1460	0	517	1566	813	0	1399	0	0	1265	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				130		25			1	
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		204.9			146.6			93.5			84.3	
Travel Time (s)		18.4			13.2			8.4			7.6	
Confl. Peds. (#/hr)	730		429	429		730	315		790	790		315
Confl. Bikes (#/hr)			42			167			21			36
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
Heavy Vehicles (%)	5%	6%	4%	1%	2%	5%	0%	4%	6%	3%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	12	0	0	12	0
Parking (#/hr)		10			10							
Adj. Flow (vph)	97	437	29	113	586	108	105	289	98	110	342	151
Shared Lane Traffic (%)												
Lane Group Flow (vph)	97	466	0	113	586	108	0	492	0	0	603	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)		8.0			8.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.01	1.25	1.01	1.01	1.25	1.01	1.01	1.05	1.01	1.01	1.05	1.01
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	

Lanes, Volumes, Timings
3: Danforth Ave & Pape Ave

2032 Total Background - AM

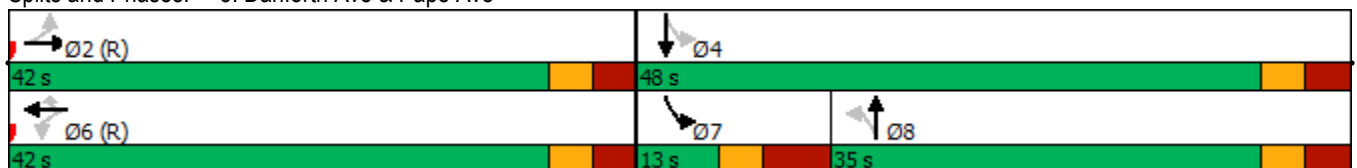


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Type	Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases	2			6			8			7	4	
Permitted Phases	2			6		6	8			4		
Detector Phase	2	2		6	6	6	8	8		7	4	
Switch Phase												
Minimum Initial (s)	15.0	15.0		15.0	15.0	15.0	24.0	24.0		5.5	24.0	
Minimum Split (s)	27.0	27.0		27.0	27.0	27.0	32.0	32.0		13.0	32.0	
Total Split (s)	42.0	42.0		42.0	42.0	42.0	35.0	35.0		13.0	48.0	
Total Split (%)	46.7%	46.7%		46.7%	46.7%	46.7%	38.9%	38.9%		14.4%	53.3%	
Maximum Green (s)	36.1	36.1		36.1	36.1	36.1	28.8	28.8		5.5	41.8	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.9	2.9		2.9	2.9	2.9	3.2	3.2		4.5	3.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max	C-Max	Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0			7.0	
Flash Dont Walk (s)	13.0	13.0		13.0	13.0	13.0	17.0	17.0			17.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0			0	
Act Effct Green (s)	36.1	36.1		36.1	36.1	36.1		28.8			41.8	
Actuated g/C Ratio	0.40	0.40		0.40	0.40	0.40		0.32			0.46	
v/c Ratio	0.69	0.79		0.55	0.93	0.27		1.06			0.92	
Control Delay	51.5	35.3		29.8	47.9	4.4		89.2			45.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			48.8	
Total Delay	51.5	35.3		29.8	47.9	4.4		89.2			94.3	
LOS	D	D		C	D	A		F			F	
Approach Delay		38.1			39.6			89.2			94.3	
Approach LOS		D			D			F			F	

Intersection Summary


















Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 25 (28%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.06
 Intersection Signal Delay: 62.5
 Intersection LOS: E
 Intersection Capacity Utilization 101.4%
 ICU Level of Service G
 Analysis Period (min) 15
 * User Entered Value

Splits and Phases: 3: Danforth Ave & Pape Ave



Lanes, Volumes, Timings
9: Pape Ave & Lipton Ave

2032 Total Background - AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	1	8	15	0	46	0	431	28	36	535	35
Future Volume (vph)	6	1	8	15	0	46	0	431	28	36	535	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.75	0.95	0.95	*0.75	0.95
Ped Bike Factor		0.89		0.77	0.68			0.96			0.95	
Frt		0.924			0.850			0.991			0.991	
Flt Protected		0.982		0.950							0.997	
Satd. Flow (prot)	0	1643	0	1190	701	0	0	2579	0	0	2673	0
Flt Permitted		0.931		0.747							0.879	
Satd. Flow (perm)	0	1445	0	724	701	0	0	2579	0	0	2309	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9			61			10			9	
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		48.1			71.1			84.3			47.5	
Travel Time (s)		4.3			6.4			7.6			4.3	
Confl. Peds. (#/hr)	153		40	171		259	86		751	751		312
Confl. Bikes (#/hr)									16			41
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
Heavy Vehicles (%)	0%	0%	0%	50%	0%	56%	0%	4%	0%	0%	1%	0%
Adj. Flow (vph)	6	1	9	16	0	49	0	463	30	39	575	38
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	16	0	16	49	0	0	493	0	0	652	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)		8.0			10.0			8.0			12.0	
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)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2			2		1	2	
Detector Template	Left	Thru		Left	Thru			Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5			30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8			1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		4			8			2			6	

Lanes, Volumes, Timings
 9: Pape Ave & Lipton Ave

2032 Total Background - AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8						6		
Detector Phase	4	4		8	8			2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0			24.0		24.0	24.0	
Minimum Split (s)	26.0	26.0		26.0	26.0			32.0		32.0	32.0	
Total Split (s)	30.0	30.0		30.0	30.0			60.0		60.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%			66.7%		66.7%	66.7%	
Maximum Green (s)	24.0	24.0		24.0	24.0			52.0		52.0	52.0	
Yellow Time (s)	3.0	3.0		3.0	3.0			4.0		4.0	4.0	
All-Red Time (s)	3.0	3.0		3.0	3.0			4.0		4.0	4.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		6.0		6.0	6.0			8.0			8.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max			C-Max		C-Max	C-Max	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	
Flash Dont Walk (s)	13.0	13.0		13.0	13.0			17.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0			0		0	0	
Act Effct Green (s)		24.0		24.0	24.0			52.0			52.0	
Actuated g/C Ratio		0.27		0.27	0.27			0.58			0.58	
v/c Ratio		0.04		0.08	0.21			0.33			0.49	
Control Delay		17.2		26.3	7.8			17.5			12.5	
Queue Delay		0.0		0.0	0.0			1.4			0.4	
Total Delay		17.2		26.3	7.8			18.9			12.9	
LOS		B		C	A			B			B	
Approach Delay		17.2			12.3			18.9			12.9	
Approach LOS		B			B			B			B	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 31 (34%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.49
 Intersection Signal Delay: 15.3
 Intersection LOS: B
 Intersection Capacity Utilization 72.0%
 ICU Level of Service C
 Analysis Period (min) 15
 * User Entered Value

Splits and Phases: 9: Pape Ave & Lipton Ave



Lanes, Volumes, Timings
 11: Danforth Ave & Woodycrest Ave

2032 Total Background - AM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↓	↓
Traffic Volume (vph)	0	599	709	0	19	43
Future Volume (vph)	0	599	709	0	19	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor					0.97	0.70
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	0	1507	1551	0	1608	1551
Flt Permitted					0.950	
Satd. Flow (perm)	0	1507	1551	0	1567	1082
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						45
Link Speed (k/h)		40	40		40	
Link Distance (m)		108.9	125.1		75.8	
Travel Time (s)		9.8	11.3		6.8	
Confl. Peds. (#/hr)					12	130
Confl. Bikes (#/hr)						8
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	6%	3%	0%	11%	3%
Parking (#/hr)		10	10			
Adj. Flow (vph)	0	631	746	0	20	45
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	631	746	0	20	45
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	8.0		8.0	
Two way Left Turn Lane						
Headway Factor	1.01	1.25	1.25	1.01	1.01	1.01
Turning Speed (k/h)	24			14	24	14
Number of Detectors		2	2		1	1
Detector Template		Thru	Thru		Left	Right
Leading Detector (m)		30.5	30.5		6.1	6.1
Trailing Detector (m)		0.0	0.0		0.0	0.0
Detector 1 Position(m)		0.0	0.0		0.0	0.0
Detector 1 Size(m)		1.8	1.8		6.1	6.1
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	0.0
Detector 1 Queue (s)		0.0	0.0		0.0	0.0
Detector 1 Delay (s)		0.0	0.0		0.0	0.0
Detector 2 Position(m)		28.7	28.7			
Detector 2 Size(m)		1.8	1.8			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type		NA	NA		Prot	Perm

Lanes, Volumes, Timings
 11: Danforth Ave & Woodycrest Ave

2032 Total Background - AM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases		2	6		4	
Permitted Phases						4
Detector Phase		2	6		4	4
Switch Phase						
Minimum Initial (s)		14.0	14.0		16.0	16.0
Minimum Split (s)		27.0	27.0		28.0	28.0
Total Split (s)		62.0	62.0		28.0	28.0
Total Split (%)		68.9%	68.9%		31.1%	31.1%
Maximum Green (s)		56.6	56.6		21.4	21.4
Yellow Time (s)		3.0	3.0		3.0	3.0
All-Red Time (s)		2.4	2.4		3.6	3.6
Lost Time Adjust (s)		0.0	0.0		0.0	0.0
Total Lost Time (s)		5.4	5.4		6.6	6.6
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Recall Mode		C-Max	C-Max		None	None
Walk Time (s)			7.0		7.0	7.0
Flash Dont Walk (s)			7.0		14.0	14.0
Pedestrian Calls (#/hr)			0		0	0
Act Effct Green (s)		73.2	73.2		16.0	16.0
Actuated g/C Ratio		0.81	0.81		0.18	0.18
v/c Ratio		0.51	0.59		0.07	0.20
Control Delay		8.8	8.8		31.7	12.2
Queue Delay		0.0	0.0		0.0	0.0
Total Delay		8.8	8.8		31.7	12.2
LOS		A	A		C	B
Approach Delay		8.8	8.8		18.2	
Approach LOS		A	A		B	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 67 (74%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.59
 Intersection Signal Delay: 9.2
 Intersection Capacity Utilization 64.8%
 Analysis Period (min) 15
 Intersection LOS: A
 ICU Level of Service C






















Splits and Phases: 11: Danforth Ave & Woodycrest Ave



HCM Signalized Intersection Capacity Analysis

3: Danforth Ave & Pape Ave




















2032 Total Background - AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	406	27	105	545	100	98	269	91	102	318	140
Future Volume (vph)	90	406	27	105	545	100	98	269	91	102	318	140
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		*0.75			*0.75	
Frbp, ped/bikes	1.00	0.98		1.00	1.00	0.53		0.86			0.86	
Flpb, ped/bikes	1.00	1.00		0.87	1.00	1.00		0.95			0.97	
Frt	1.00	0.99		1.00	1.00	0.85		0.97			0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99			0.99	
Satd. Flow (prot)	1700	1460		1544	1566	813		2085			2139	
Flt Permitted	0.20	1.00		0.32	1.00	1.00		0.66			0.60	
Satd. Flow (perm)	351	1460		517	1566	813		1398			1290	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	97	437	29	113	586	108	105	289	98	110	342	151
RTOR Reduction (vph)	0	2	0	0	0	65	0	17	0	0	1	0
Lane Group Flow (vph)	97	464	0	113	586	43	0	475	0	0	602	0
Confl. Peds. (#/hr)	730		429	429		730	315		790	790		315
Confl. Bikes (#/hr)			42			167			21			36
Heavy Vehicles (%)	5%	6%	4%	1%	2%	5%	0%	4%	6%	3%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	12	0	0	12	0
Parking (#/hr)		10			10							
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		2			6			8		7		4
Permitted Phases	2			6		6	8			4		
Actuated Green, G (s)	36.1	36.1		36.1	36.1	36.1		28.8				41.8
Effective Green, g (s)	36.1	36.1		36.1	36.1	36.1		28.8				41.8
Actuated g/C Ratio	0.40	0.40		0.40	0.40	0.40		0.32				0.46
Clearance Time (s)	5.9	5.9		5.9	5.9	5.9		6.2				6.2
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0				3.0
Lane Grp Cap (vph)	140	585		207	628	326		447				651
v/s Ratio Prot		0.32			c0.37							c0.06
v/s Ratio Perm	0.28			0.22		0.05		c0.34				0.37
v/c Ratio	0.69	0.79		0.55	0.93	0.13		1.06				0.93
Uniform Delay, d1	22.4	23.7		20.7	25.8	17.0		30.6				22.6
Progression Factor	1.00	1.00		0.89	0.93	1.15		1.00				1.25
Incremental Delay, d2	24.6	10.6		9.5	22.0	0.8		60.2				19.5
Delay (s)	47.0	34.2		28.0	46.0	20.5		90.8				47.9
Level of Service	D	C		C	D	C		F				D
Approach Delay (s)		36.4			40.1			90.8				47.9
Approach LOS		D			D			F				D
Intersection Summary												
HCM 2000 Control Delay			51.3								HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			1.02									
Actuated Cycle Length (s)			90.0								Sum of lost time (s)	19.6
Intersection Capacity Utilization			101.4%								ICU Level of Service	G
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Pape Ave & Lipton Ave

2032 Total Background - AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	1	8	15	0	46	0	431	28	36	535	35
Future Volume (vph)	6	1	8	15	0	46	0	431	28	36	535	35
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		6.0	6.0			8.0			8.0	
Lane Util. Factor		1.00		1.00	1.00			*0.75			*0.75	
Frbp, ped/bikes		0.96		1.00	0.68			0.96			0.97	
Flpb, ped/bikes		0.93		0.77	1.00			1.00			0.98	
Frt		0.92		1.00	0.85			0.99			0.99	
Flt Protected		0.98		0.95	1.00			1.00			1.00	
Satd. Flow (prot)		1523		921	701			2578			2620	
Flt Permitted		0.93		0.75	1.00			1.00			0.88	
Satd. Flow (perm)		1444		724	701			2578			2309	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	6	1	9	16	0	49	0	463	30	39	575	38
RTOR Reduction (vph)	0	7	0	0	36	0	0	4	0	0	4	0
Lane Group Flow (vph)	0	9	0	16	13	0	0	489	0	0	648	0
Confl. Peds. (#/hr)	153		40	171		259	86		751	751		312
Confl. Bikes (#/hr)									16			41
Heavy Vehicles (%)	0%	0%	0%	50%	0%	56%	0%	4%	0%	0%	1%	0%
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8						6		
Actuated Green, G (s)		24.0		24.0	24.0			52.0			52.0	
Effective Green, g (s)		24.0		24.0	24.0			52.0			52.0	
Actuated g/C Ratio		0.27		0.27	0.27			0.58			0.58	
Clearance Time (s)		6.0		6.0	6.0			8.0			8.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		385		193	186			1489			1334	
v/s Ratio Prot					0.02			0.19				
v/s Ratio Perm		0.01		c0.02							c0.28	
v/c Ratio		0.02		0.08	0.07			0.33			0.49	
Uniform Delay, d1		24.4		24.7	24.7			9.9			11.2	
Progression Factor		1.00		1.00	1.00			1.74			1.00	
Incremental Delay, d2		0.1		0.8	0.7			0.3			1.3	
Delay (s)		24.5		25.6	25.4			17.6			12.4	
Level of Service		C		C	C			B			B	
Approach Delay (s)		24.5			25.4			17.6			12.4	
Approach LOS		C			C			B			B	
Intersection Summary												
HCM 2000 Control Delay			15.3			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.36									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)		14.0				
Intersection Capacity Utilization			72.0%			ICU Level of Service			C			
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Signalized Intersection Capacity Analysis

11: Danforth Ave & Woodycrest Ave

2032 Total Background - AM

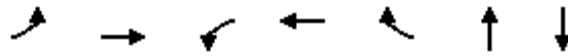


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	↘
Traffic Volume (vph)	0	599	709	0	19	43
Future Volume (vph)	0	599	709	0	19	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.4	5.4		6.6	6.6
Lane Util. Factor		1.00	1.00		1.00	1.00
Frbp, ped/bikes		1.00	1.00		1.00	0.69
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		1507	1551		1608	1065
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		1507	1551		1608	1065
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	631	746	0	20	45
RTOR Reduction (vph)	0	0	0	0	0	40
Lane Group Flow (vph)	0	631	746	0	20	5
Confl. Peds. (#/hr)					12	130
Confl. Bikes (#/hr)						8
Heavy Vehicles (%)	0%	6%	3%	0%	11%	3%
Parking (#/hr)		10	10			
Turn Type		NA	NA		Prot	Perm
Protected Phases		2	6		4	
Permitted Phases						4
Actuated Green, G (s)		68.4	68.4		9.6	9.6
Effective Green, g (s)		68.4	68.4		9.6	9.6
Actuated g/C Ratio		0.76	0.76		0.11	0.11
Clearance Time (s)		5.4	5.4		6.6	6.6
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1145	1178		171	113
v/s Ratio Prot		0.42	c0.48		c0.01	
v/s Ratio Perm						0.00
v/c Ratio		0.55	0.63		0.12	0.04
Uniform Delay, d1		4.5	5.0		36.4	36.1
Progression Factor		1.26	1.00		1.00	1.00
Incremental Delay, d2		1.6	2.6		0.3	0.2
Delay (s)		7.2	7.6		36.7	36.2
Level of Service		A	A		D	D
Approach Delay (s)		7.2	7.6		36.4	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			8.7		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.57			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			64.8%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

Queues

3: Danforth Ave & Pape Ave

2032 Total Background - AM



Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	97	466	113	586	108	492	603
v/c Ratio	0.69	0.79	0.55	0.93	0.27	1.06	0.92
Control Delay	51.5	35.3	29.8	47.9	4.4	89.2	45.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	48.8
Total Delay	51.5	35.3	29.8	47.9	4.4	89.2	94.3
Queue Length 50th (m)	13.5	68.6	15.5	100.1	2.1	~60.8	67.4
Queue Length 95th (m)	#39.5	#119.0	m33.7	#165.2	m7.3	#100.2	#108.9
Internal Link Dist (m)		180.9		122.6		69.5	60.3
Turn Bay Length (m)	40.0		40.0		60.0		
Base Capacity (vph)	140	588	207	628	403	464	658
Starvation Cap Reductn	0	0	0	0	0	0	236
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.79	0.55	0.93	0.27	1.06	1.43

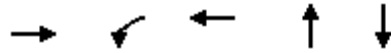
Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Queues

9: Pape Ave & Lipton Ave

2032 Total Background - AM



Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	16	16	49	493	652
v/c Ratio	0.04	0.08	0.21	0.33	0.49
Control Delay	17.2	26.3	7.8	17.5	12.5
Queue Delay	0.0	0.0	0.0	1.4	0.4
Total Delay	17.2	26.3	7.8	18.9	12.9
Queue Length 50th (m)	0.9	2.1	0.0	46.0	40.3
Queue Length 95th (m)	5.6	7.1	6.7	m49.2	57.2
Internal Link Dist (m)	24.1		47.1	60.3	23.5
Turn Bay Length (m)					
Base Capacity (vph)	391	193	231	1494	1337
Starvation Cap Reductn	0	0	0	769	0
Spillback Cap Reductn	0	0	0	0	256
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.04	0.08	0.21	0.68	0.60

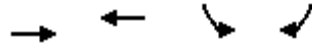
Intersection Summary

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

Queues

11: Danforth Ave & Woodcrest Ave

2032 Total Background - AM



Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	631	746	20	45
v/c Ratio	0.51	0.59	0.07	0.20
Control Delay	8.8	8.8	31.7	12.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	8.8	8.8	31.7	12.2
Queue Length 50th (m)	76.7	66.9	2.9	0.0
Queue Length 95th (m)	m101.9	107.2	9.0	9.0
Internal Link Dist (m)	84.9	101.1	51.8	
Turn Bay Length (m)				
Base Capacity (vph)	1226	1261	382	291
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.51	0.59	0.05	0.15

Intersection Summary

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

HCM Unsignalized Intersection Capacity Analysis
 17: Pape Ave & Bus Loop Entrance

2032 Total Background - AM



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↑↑			↓↑
Traffic Volume (veh/h)	0	0	471	12	28	606
Future Volume (Veh/h)	0	0	471	12	28	606
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	0	0	506	13	30	652
Pedestrians	852					
Lane Width (m)	0.0					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)	48					
pX, platoon unblocked	0.93	0.93			0.93	
vC, conflicting volume	1750	1112			1371	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1651	961			1242	
tC, single (s)	6.8	6.9			6.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			3.2	
p0 queue free %	100	100			86	
cM capacity (veh/h)	73	241			210	
Direction, Lane #	NB 1	NB 2	SB 1	SB 2		
Volume Total	337	182	247	435		
Volume Left	0	0	30	0		
Volume Right	0	13	0	0		
cSH	1700	1700	210	1700		
Volume to Capacity	0.20	0.11	0.14	0.26		
Queue Length 95th (m)	0.0	0.0	3.7	0.0		
Control Delay (s)	0.0	0.0	6.6	0.0		
Lane LOS	A					
Approach Delay (s)	0.0	2.4				
Approach LOS						
Intersection Summary						
Average Delay	1.4					
Intersection Capacity Utilization	37.9%		ICU Level of Service		A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
 19: Danforth Ave & Eaton Ave













2032 Total Background - AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔			
Traffic Volume (veh/h)	19	580	752	39	0	0
Future Volume (Veh/h)	19	580	752	39	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.62	0.62	0.62	0.62	0.62	0.62
Hourly flow rate (vph)	31	935	1213	63	0	0
Pedestrians		16	5		339	
Lane Width (m)		3.5	3.5		0.0	
Walking Speed (m/s)		1.1	1.1		1.1	
Percent Blockage		1	0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		147	109			
pX, platoon unblocked	0.77				0.87	0.77
vC, conflicting volume	1615				2586	1600
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1649				2161	1629
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	90				100	100
cM capacity (veh/h)	307				41	96
Direction, Lane #	EB 1	WB 1				
Volume Total	966	1276				
Volume Left	31	0				
Volume Right	0	63				
cSH	307	1700				
Volume to Capacity	0.10	0.75				
Queue Length 95th (m)	2.5	0.0				
Control Delay (s)	4.5	0.0				
Lane LOS	A					
Approach Delay (s)	4.5	0.0				
Approach LOS						
Intersection Summary						
Average Delay		1.9				
Intersection Capacity Utilization		60.0%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
 21: Pape Ave & Gertrude PI

2032 Total Background - AM

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (veh/h)	15	15	471	0	0	619
Future Volume (Veh/h)	15	15	471	0	0	619
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	16	16	506	0	0	666
Pedestrians	852					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.1					
Percent Blockage	75					
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)	87					
pX, platoon unblocked	0.95	0.95			0.95	
vC, conflicting volume	1691	1105			1358	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1618	999			1267	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	27	72			100	
cM capacity (veh/h)	22	57			130	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	16	16	253	253	333	333
Volume Left	16	0	0	0	0	0
Volume Right	0	16	0	0	0	0
cSH	22	57	1700	1700	1700	1700
Volume to Capacity	0.73	0.28	0.15	0.15	0.20	0.20
Queue Length 95th (m)	16.0	7.5	0.0	0.0	0.0	0.0
Control Delay (s)	346.2	92.1	0.0	0.0	0.0	0.0
Lane LOS	F	F				
Approach Delay (s)	219.1		0.0		0.0	
Approach LOS	F					
Intersection Summary						
Average Delay	5.8					
Intersection Capacity Utilization	27.1%		ICU Level of Service		A	
Analysis Period (min)	15					

Lanes, Volumes, Timings
3: Danforth Ave & Pape Ave

2032 Total Background - PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	95	417	44	70	532	112	90	322	122	90	263	160
Future Volume (vph)	95	417	44	70	532	112	90	322	122	90	263	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0		0.0	40.0		60.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (m)	45.0			25.0			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	*0.75	0.95	0.95	*0.75	0.95
Ped Bike Factor	0.86	0.95		0.84		0.46		0.91				0.75
Frt		0.986				0.850		0.966				0.953
Flt Protected	0.950			0.950				0.992				0.991
Satd. Flow (prot)	1733	1487	0	1750	1566	1597	0	2424	0	0	2020	0
Flt Permitted	0.215			0.292				0.635				0.704
Satd. Flow (perm)	339	1487	0	452	1566	742	0	1498	0	0	1337	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7				125						53
Link Speed (k/h)		40			40			40				40
Link Distance (m)		204.9			146.6			93.5				84.3
Travel Time (s)		18.4			13.2			8.4				7.6
Confl. Peds. (#/hr)	1075		848	848		1075	574		122	1143		574
Confl. Bikes (#/hr)			188			56			22			28
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	3%	1%	0%	2%	2%	0%	2%	3%	1%	1%	4%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	12	0	0	12	0
Parking (#/hr)		10			10							
Adj. Flow (vph)	97	426	45	71	543	114	92	329	124	92	268	163
Shared Lane Traffic (%)												
Lane Group Flow (vph)	97	471	0	71	543	114	0	545	0	0	523	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)		8.0			8.0			10.0				10.0
Two way Left Turn Lane												
Headway Factor	1.01	1.25	1.01	1.01	1.25	1.01	1.01	1.05	1.01	1.01	1.05	1.01
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7				28.7
Detector 2 Size(m)		1.8			1.8			1.8				1.8

Lanes, Volumes, Timings
3: Danforth Ave & Pape Ave

2032 Total Background - PM

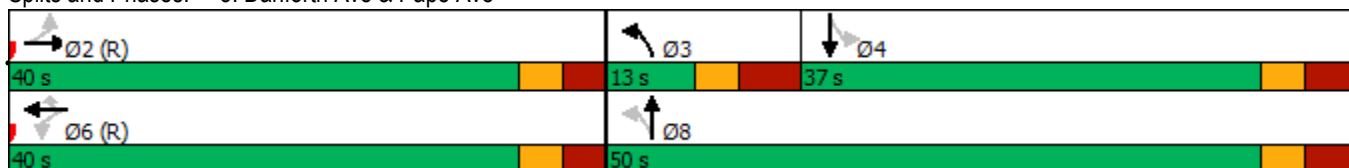


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Type	Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		Perm	NA	
Protected Phases	2			6			3			8		
Permitted Phases	2			6		6		8		4		
Detector Phase	2	2		6	6	6	3	8		4	4	
Switch Phase												
Minimum Initial (s)	15.0	15.0		15.0	15.0	15.0	5.9	24.0		24.0	24.0	
Minimum Split (s)	27.0	27.0		27.0	27.0	27.0	13.0	32.0		32.0	32.0	
Total Split (s)	40.0	40.0		40.0	40.0	40.0	13.0	50.0		37.0	37.0	
Total Split (%)	44.4%	44.4%		44.4%	44.4%	44.4%	14.4%	55.6%		41.1%	41.1%	
Maximum Green (s)	34.1	34.1		34.1	34.1	34.1	5.9	43.8		30.8	30.8	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.9	2.9		2.9	2.9	2.9	4.1	3.2		3.2	3.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2	
Lead/Lag							Lead			Lag		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max	C-Max	Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0	7.0		7.0		7.0	7.0	
Flash Dont Walk (s)	13.0	13.0		13.0	13.0	13.0		17.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0	0		0		0	0	
Act Effct Green (s)	34.1	34.1		34.1	34.1	34.1		43.8			30.8	
Actuated g/C Ratio	0.38	0.38		0.38	0.38	0.38		0.49			0.34	
v/c Ratio	0.76	0.83		0.42	0.92	0.32		0.68			1.06	
Control Delay	63.0	39.7		37.1	54.5	13.0		21.6			75.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			4.0	
Total Delay	63.0	39.7		37.1	54.5	13.0		21.6			79.1	
LOS	E	D		D	D	B		C			E	
Approach Delay	43.7			46.3				21.6			79.1	
Approach LOS	D			D				C			E	

Intersection Summary


















Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 22 (24%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.06
 Intersection Signal Delay: 47.2
 Intersection LOS: D
 Intersection Capacity Utilization 100.7%
 ICU Level of Service G
 Analysis Period (min) 15
 * User Entered Value

Splits and Phases: 3: Danforth Ave & Pape Ave



Lanes, Volumes, Timings
9: Pape Ave & Lipton Ave

2032 Total Background - PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	0	17	30	0	74	0	512	16	20	465	36
Future Volume (vph)	18	0	17	30	0	74	0	512	16	20	465	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.75	0.95	0.95	*0.75	0.95
Ped Bike Factor		0.72		0.71	0.66			0.98			0.95	
Frt		0.934			0.850			0.996			0.990	
Flt Protected		0.975		0.950							0.998	
Satd. Flow (prot)	0	1449	0	1137	627	0	0	2538	0	0	2654	0
Flt Permitted		0.880		0.734							0.912	
Satd. Flow (perm)	0	1105	0	620	627	0	0	2538	0	0	2396	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		61			61			4			9	
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		48.1			71.1			84.3			49.7	
Travel Time (s)		4.3			6.4			7.6			4.5	
Confl. Peds. (#/hr)	354		255	255		354			1050	836		345
Confl. Bikes (#/hr)									27			41
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	57%	0%	68%	0%	8%	7%	0%	1%	0%
Adj. Flow (vph)	18	0	17	31	0	76	0	522	16	20	474	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	35	0	31	76	0	0	538	0	0	531	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)		8.0			10.0			8.0			12.0	
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)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2			2		1	2	
Detector Template	Left	Thru		Left	Thru			Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5			30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8			1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		4			8			2			6	

Lanes, Volumes, Timings
9: Pape Ave & Lipton Ave

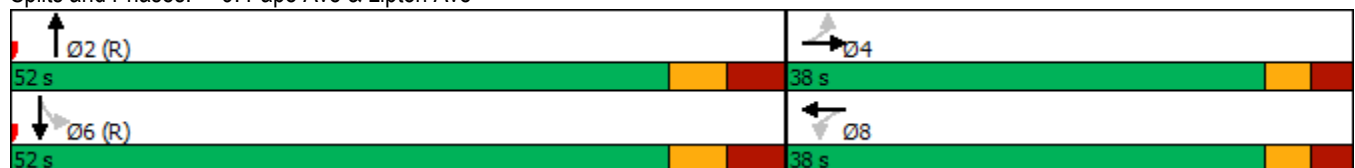
2032 Total Background - PM

	↖	→	↘	↙	←	↖	↙	↑	↘	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8						6		
Detector Phase	4	4		8	8			2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0			24.0		24.0	24.0	
Minimum Split (s)	26.0	26.0		26.0	26.0			32.0		32.0	32.0	
Total Split (s)	38.0	38.0		38.0	38.0			52.0		52.0	52.0	
Total Split (%)	42.2%	42.2%		42.2%	42.2%			57.8%		57.8%	57.8%	
Maximum Green (s)	32.0	32.0		32.0	32.0			44.0		44.0	44.0	
Yellow Time (s)	3.0	3.0		3.0	3.0			4.0		4.0	4.0	
All-Red Time (s)	3.0	3.0		3.0	3.0			4.0		4.0	4.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		6.0		6.0	6.0			8.0			8.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max			C-Max		C-Max	C-Max	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	
Flash Dont Walk (s)	13.0	13.0		13.0	13.0			17.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0			0		0	0	
Act Effct Green (s)		32.0		32.0	32.0			44.0			44.0	
Actuated g/C Ratio		0.36		0.36	0.36			0.49			0.49	
v/c Ratio		0.08		0.14	0.29			0.43			0.45	
Control Delay		2.6		21.9	10.9			11.6			16.4	
Queue Delay		0.0		0.0	0.0			0.9			0.2	
Total Delay		2.6		21.9	10.9			12.5			16.6	
LOS		A		C	B			B			B	
Approach Delay		2.6			14.1			12.5			16.6	
Approach LOS		A			B			B			B	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 59 (66%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.45
 Intersection Signal Delay: 14.1
 Intersection LOS: B
 Intersection Capacity Utilization 57.7%
 ICU Level of Service B
 Analysis Period (min) 15
 * User Entered Value

Splits and Phases: 9: Pape Ave & Lipton Ave



Lanes, Volumes, Timings
 11: Danforth Ave & Woodycrest Ave

2032 Total Background - PM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↓	↓
Traffic Volume (vph)	0	631	684	0	23	33
Future Volume (vph)	0	631	684	0	23	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor					0.95	0.64
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	0	1566	1581	0	1638	1551
Flt Permitted					0.950	
Satd. Flow (perm)	0	1566	1581	0	1557	991
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						34
Link Speed (k/h)		40	40		40	
Link Distance (m)		108.9	125.1		75.8	
Travel Time (s)		9.8	11.3		6.8	
Confl. Peds. (#/hr)					23	161
Confl. Bikes (#/hr)						3
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	2%	1%	0%	9%	3%
Parking (#/hr)		10	10			
Adj. Flow (vph)	0	644	698	0	23	34
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	644	698	0	23	34
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	8.0		8.0	
Two way Left Turn Lane						
Headway Factor	1.01	1.25	1.25	1.01	1.01	1.01
Turning Speed (k/h)	24			14	24	14
Number of Detectors		2	2		1	1
Detector Template		Thru	Thru		Left	Right
Leading Detector (m)		30.5	30.5		6.1	6.1
Trailing Detector (m)		0.0	0.0		0.0	0.0
Detector 1 Position(m)		0.0	0.0		0.0	0.0
Detector 1 Size(m)		1.8	1.8		6.1	6.1
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	0.0
Detector 1 Queue (s)		0.0	0.0		0.0	0.0
Detector 1 Delay (s)		0.0	0.0		0.0	0.0
Detector 2 Position(m)		28.7	28.7			
Detector 2 Size(m)		1.8	1.8			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type		NA	NA		Prot	Perm

Lanes, Volumes, Timings
 11: Danforth Ave & Woodycrest Ave

2032 Total Background - PM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases		2	6		4	
Permitted Phases						4
Detector Phase		2	6		4	4
Switch Phase						
Minimum Initial (s)		14.0	14.0		16.0	16.0
Minimum Split (s)		19.4	19.4		27.6	27.6
Total Split (s)		62.0	62.0		28.0	28.0
Total Split (%)		68.9%	68.9%		31.1%	31.1%
Maximum Green (s)		56.6	56.6		21.4	21.4
Yellow Time (s)		3.0	3.0		3.0	3.0
All-Red Time (s)		2.4	2.4		3.6	3.6
Lost Time Adjust (s)		0.0	0.0		0.0	0.0
Total Lost Time (s)		5.4	5.4		6.6	6.6
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Recall Mode		C-Max	C-Max		None	None
Walk Time (s)			7.0		7.0	7.0
Flash Dont Walk (s)			7.0		14.0	14.0
Pedestrian Calls (#/hr)			0		0	0
Act Effct Green (s)		73.2	73.2		16.0	16.0
Actuated g/C Ratio		0.81	0.81		0.18	0.18
v/c Ratio		0.51	0.54		0.08	0.17
Control Delay		5.0	7.8		31.8	13.2
Queue Delay		0.0	0.0		0.0	0.0
Total Delay		5.0	7.8		31.8	13.2
LOS		A	A		C	B
Approach Delay		5.0	7.8		20.7	
Approach LOS		A	A		C	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 45 (50%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.54
 Intersection Signal Delay: 7.1
 Intersection Capacity Utilization 63.5%
 Analysis Period (min) 15
 Intersection LOS: A
 ICU Level of Service B






















Splits and Phases: 11: Danforth Ave & Woodycrest Ave



HCM Signalized Intersection Capacity Analysis

3: Danforth Ave & Pape Ave


















2032 Total Background - PM

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	95	417	44	70	532	112	90	322	122	90	263	160	
Future Volume (vph)	95	417	44	70	532	112	90	322	122	90	263	160	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2		
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		*0.75			*0.75		
Frbp, ped/bikes	1.00	0.95		1.00	1.00	0.46		0.94			0.80		
Flpb, ped/bikes	0.86	1.00		0.84	1.00	1.00		0.98			0.93		
Frt	1.00	0.99		1.00	1.00	0.85		0.97			0.95		
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99			0.99		
Satd. Flow (prot)	1498	1486		1472	1566	742		2372			1883		
Flt Permitted	0.21	1.00		0.29	1.00	1.00		0.64			0.70		
Satd. Flow (perm)	338	1486		452	1566	742		1519			1338		
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	
Adj. Flow (vph)	97	426	45	71	543	114	92	329	124	92	268	163	
RTOR Reduction (vph)	0	4	0	0	0	71	0	0	0	0	35	0	
Lane Group Flow (vph)	97	467	0	71	543	43	0	545	0	0	488	0	
Confl. Peds. (#/hr)	1075		848	848		1075	574		122	1143		574	
Confl. Bikes (#/hr)			188			56			22			28	
Heavy Vehicles (%)	3%	1%	0%	2%	2%	0%	2%	3%	1%	1%	4%	3%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	12	0	0	12	0	
Parking (#/hr)		10			10								
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		Perm	NA		
Protected Phases		2			6		3	8				4	
Permitted Phases	2			6		6	8			4			
Actuated Green, G (s)	34.1	34.1		34.1	34.1	34.1		43.8			30.8		
Effective Green, g (s)	34.1	34.1		34.1	34.1	34.1		43.8			30.8		
Actuated g/C Ratio	0.38	0.38		0.38	0.38	0.38		0.49			0.34		
Clearance Time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0		
Lane Grp Cap (vph)	128	563		171	593	281		795			457		
v/s Ratio Prot		0.31			c0.35			c0.04					
v/s Ratio Perm	0.29			0.16		0.06		0.29			c0.36		
v/c Ratio	0.76	0.83		0.42	0.92	0.15		0.69			1.07		
Uniform Delay, d1	24.4	25.3		20.6	26.6	18.4		17.8			29.6		
Progression Factor	1.00	1.00		1.35	1.27	3.21		1.00			0.52		
Incremental Delay, d2	33.6	13.2		6.6	19.6	1.0		4.8			59.9		
Delay (s)	58.0	38.5		34.4	53.3	60.3		22.6			75.2		
Level of Service	E	D		C	D	E		C			E		
Approach Delay (s)		41.8			52.5			22.6			75.2		
Approach LOS		D			D			C			E		
Intersection Summary													
HCM 2000 Control Delay			48.1									HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.99										
Actuated Cycle Length (s)			90.0									Sum of lost time (s)	19.2
Intersection Capacity Utilization			100.7%									ICU Level of Service	G
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

9: Pape Ave & Lipton Ave

2032 Total Background - PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	0	17	30	0	74	0	512	16	20	465	36
Future Volume (vph)	18	0	17	30	0	74	0	512	16	20	465	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		6.0	6.0			8.0			8.0	
Lane Util. Factor		1.00		1.00	1.00			*0.75			*0.75	
Frbp, ped/bikes		0.85		1.00	0.66			0.98			0.96	
Flpb, ped/bikes		0.84		0.71	1.00			1.00			0.99	
Frt		0.93		1.00	0.85			1.00			0.99	
Flt Protected		0.97		0.95	1.00			1.00			1.00	
Satd. Flow (prot)		1225		802	627			2537			2621	
Flt Permitted		0.88		0.73	1.00			1.00			0.91	
Satd. Flow (perm)		1106		620	627			2537			2396	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	18	0	17	31	0	76	0	522	16	20	474	37
RTOR Reduction (vph)	0	23	0	0	39	0	0	2	0	0	5	0
Lane Group Flow (vph)	0	12	0	31	37	0	0	536	0	0	526	0
Confl. Peds. (#/hr)	354		255	255		354			1050	836		345
Confl. Bikes (#/hr)									27			41
Heavy Vehicles (%)	0%	0%	0%	57%	0%	68%	0%	8%	7%	0%	1%	0%
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8						6		
Actuated Green, G (s)		32.0		32.0	32.0			44.0			44.0	
Effective Green, g (s)		32.0		32.0	32.0			44.0			44.0	
Actuated g/C Ratio		0.36		0.36	0.36			0.49			0.49	
Clearance Time (s)		6.0		6.0	6.0			8.0			8.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		393		220	222			1240			1171	
v/s Ratio Prot					c0.06			0.21				
v/s Ratio Perm		0.01		0.05							c0.22	
v/c Ratio		0.03		0.14	0.17			0.43			0.45	
Uniform Delay, d1		18.9		19.7	19.9			14.9			15.1	
Progression Factor		1.00		1.00	1.00			0.71			1.00	
Incremental Delay, d2		0.1		1.3	1.6			0.9			1.2	
Delay (s)		19.1		21.0	21.5			11.5			16.3	
Level of Service		B		C	C			B			B	
Approach Delay (s)		19.1			21.3			11.5			16.3	
Approach LOS		B			C			B			B	
Intersection Summary												
HCM 2000 Control Delay			14.7					HCM 2000 Level of Service			B	
HCM 2000 Volume to Capacity ratio			0.33									
Actuated Cycle Length (s)			90.0					Sum of lost time (s)		14.0		
Intersection Capacity Utilization			57.7%					ICU Level of Service			B	
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Signalized Intersection Capacity Analysis

11: Danforth Ave & Woodycrest Ave

2032 Total Background - PM

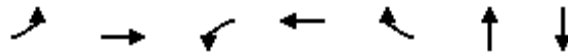


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	↘
Traffic Volume (vph)	0	631	684	0	23	33
Future Volume (vph)	0	631	684	0	23	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.4	5.4		6.6	6.6
Lane Util. Factor		1.00	1.00		1.00	1.00
Frbp, ped/bikes		1.00	1.00		1.00	0.64
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		1566	1581		1638	985
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		1566	1581		1638	985
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	644	698	0	23	34
RTOR Reduction (vph)	0	0	0	0	0	30
Lane Group Flow (vph)	0	644	698	0	23	4
Confl. Peds. (#/hr)					23	161
Confl. Bikes (#/hr)						3
Heavy Vehicles (%)	0%	2%	1%	0%	9%	3%
Parking (#/hr)		10	10			
Turn Type		NA	NA		Prot	Perm
Protected Phases		2	6		4	
Permitted Phases						4
Actuated Green, G (s)		68.4	68.4		9.6	9.6
Effective Green, g (s)		68.4	68.4		9.6	9.6
Actuated g/C Ratio		0.76	0.76		0.11	0.11
Clearance Time (s)		5.4	5.4		6.6	6.6
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1190	1201		174	105
v/s Ratio Prot		0.41	c0.44		c0.01	
v/s Ratio Perm						0.00
v/c Ratio		0.54	0.58		0.13	0.03
Uniform Delay, d1		4.4	4.6		36.4	36.0
Progression Factor		0.70	1.00		1.00	1.00
Incremental Delay, d2		1.1	2.1		0.3	0.1
Delay (s)		4.2	6.7		36.8	36.2
Level of Service		A	A		D	D
Approach Delay (s)		4.2	6.7		36.4	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			6.8		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.53			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			63.5%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

Queues

3: Danforth Ave & Pape Ave

2032 Total Background - PM



Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	97	471	71	543	114	545	523
v/c Ratio	0.76	0.83	0.42	0.92	0.32	0.68	1.06
Control Delay	63.0	39.7	37.1	54.5	13.0	21.6	75.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	4.0
Total Delay	63.0	39.7	37.1	54.5	13.0	21.6	79.1
Queue Length 50th (m)	14.3	71.4	12.1	101.6	4.5	39.8	~63.2
Queue Length 95th (m)	#41.7	#124.3	m24.4	#155.1	20.9	56.7	#104.6
Internal Link Dist (m)		180.9		122.6		69.5	60.3
Turn Bay Length (m)	40.0		40.0		60.0		
Base Capacity (vph)	128	567	171	593	358	798	492
Starvation Cap Reductn	0	0	0	0	0	0	5
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.83	0.42	0.92	0.32	0.68	1.07

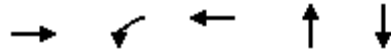
Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Queues

9: Pape Ave & Lipton Ave

2032 Total Background - PM

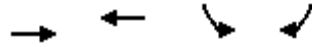


Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	35	31	76	538	531
v/c Ratio	0.08	0.14	0.29	0.43	0.45
Control Delay	2.6	21.9	10.9	11.6	16.4
Queue Delay	0.0	0.0	0.0	0.9	0.2
Total Delay	2.6	21.9	10.9	12.5	16.6
Queue Length 50th (m)	0.0	3.6	1.7	24.8	37.6
Queue Length 95th (m)	2.9	10.1	11.8	38.0	54.2
Internal Link Dist (m)	24.1		47.1	60.3	25.7
Turn Bay Length (m)					
Base Capacity (vph)	432	220	262	1242	1175
Starvation Cap Reductn	0	0	0	418	0
Spillback Cap Reductn	3	0	0	0	155
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.08	0.14	0.29	0.65	0.52
Intersection Summary					

Queues

11: Danforth Ave & Woodcrest Ave

2032 Total Background - PM













Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	644	698	23	34
v/c Ratio	0.51	0.54	0.08	0.17
Control Delay	5.0	7.8	31.8	13.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	5.0	7.8	31.8	13.2
Queue Length 50th (m)	24.5	58.1	3.4	0.0
Queue Length 95th (m)	m33.9	91.3	9.9	7.9
Internal Link Dist (m)	84.9	101.1	51.8	
Turn Bay Length (m)				
Base Capacity (vph)	1273	1286	389	261
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.51	0.54	0.06	0.13

Intersection Summary

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

HCM Unsignalized Intersection Capacity Analysis
 17: Pape Ave & Bus Loop Entrance

2032 Total Background - PM

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (veh/h)	0	0	592	12	28	521
Future Volume (Veh/h)	0	0	592	12	28	521
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	0	604	12	29	532
Pedestrians	1185					
Lane Width (m)	0.0					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)	50					
pX, platoon unblocked	0.89	0.89			0.89	
vC, conflicting volume	2119	1493			1801	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2007	1302			1649	
tC, single (s)	6.8	6.9			6.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			3.2	
p0 queue free %	100	100			75	
cM capacity (veh/h)	35	137			116	
Direction, Lane #	NB 1	NB 2	SB 1	SB 2		
Volume Total	403	213	206	355		
Volume Left	0	0	29	0		
Volume Right	0	12	0	0		
cSH	1700	1700	116	1700		
Volume to Capacity	0.24	0.13	0.25	0.21		
Queue Length 95th (m)	0.0	0.0	7.0	0.0		
Control Delay (s)	0.0	0.0	17.4	0.0		
Lane LOS					C	
Approach Delay (s)	0.0			6.4		
Approach LOS						
Intersection Summary						
Average Delay			3.1			
Intersection Capacity Utilization			38.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 19: Danforth Ave & Eaton Ave

2032 Total Background - PM















Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔			
Traffic Volume (veh/h)	34	597	715	33	0	0
Future Volume (Veh/h)	34	597	715	33	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	38	663	794	37	0	0
Pedestrians		43	11		519	
Lane Width (m)		3.5	3.5		0.0	
Walking Speed (m/s)		1.1	1.1		1.1	
Percent Blockage		4	1		0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		147	109			
pX, platoon unblocked	0.81				0.85	0.81
vC, conflicting volume	1350				2082	1374
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1314				1676	1345
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	91				100	100
cM capacity (veh/h)	431				80	144
Direction, Lane #	EB 1	WB 1				
Volume Total	701	831				
Volume Left	38	0				
Volume Right	0	37				
cSH	431	1700				
Volume to Capacity	0.09	0.49				
Queue Length 95th (m)	2.2	0.0				
Control Delay (s)	2.7	0.0				
Lane LOS	A					
Approach Delay (s)	2.7	0.0				
Approach LOS						
Intersection Summary						
Average Delay		1.2				
Intersection Capacity Utilization		76.8%		ICU Level of Service		D
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

21: Pape Ave & Gertrude PI

2032 Total Background - PM

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (veh/h)	15	15	592	0	0	534
Future Volume (Veh/h)	15	15	592	0	0	534
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	15	15	604	0	0	545
Pedestrians	1185					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.1					
Percent Blockage	80					
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)	87					
pX, platoon unblocked	0.91	0.91			0.91	
vC, conflicting volume	2062	1487			1789	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1963	1328			1662	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	43			100	
cM capacity (veh/h)	10	26			71	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	15	15	302	302	272	272
Volume Left	15	0	0	0	0	0
Volume Right	0	15	0	0	0	0
cSH	10	26	1700	1700	1700	1700
Volume to Capacity	1.50	0.57	0.18	0.18	0.16	0.16
Queue Length 95th (m)	20.6	13.4	0.0	0.0	0.0	0.0
Control Delay (s)	984.1	256.1	0.0	0.0	0.0	0.0
Lane LOS	F	F				
Approach Delay (s)	620.1		0.0		0.0	
Approach LOS	F					
Intersection Summary						
Average Delay	15.8					
Intersection Capacity Utilization	26.4%		ICU Level of Service		A	
Analysis Period (min)	15					

Lanes, Volumes, Timings
3: Danforth Ave & Pape Ave

2032 Total Background + TOC - AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	414	27	105	545	100	98	269	97	127	323	169
Future Volume (vph)	90	414	27	105	545	100	98	269	97	127	323	169
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0		0.0	40.0		60.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (m)	45.0			25.0			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	*0.75	0.95	0.95	*0.75	0.95
Ped Bike Factor		0.98		0.88		0.53		0.81			0.81	
Fr _t		0.991				0.850		0.969			0.959	
Fl _t Protected	0.950			0.950				0.990			0.990	
Satd. Flow (prot)	1700	1461	0	1767	1566	1521	0	2167	0	0	2152	0
Fl _t Permitted	0.183			0.300				0.646			0.580	
Satd. Flow (perm)	327	1461	0	490	1566	803	0	1352	0	0	1198	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				130		27			1	
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		204.9			146.6			93.5			84.3	
Travel Time (s)		18.4			13.2			8.4			7.6	
Confl. Peds. (#/hr)	748		441	441		748	329		807	807		329
Confl. Bikes (#/hr)			42			181			21			37
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
Heavy Vehicles (%)	5%	6%	4%	1%	2%	5%	0%	4%	6%	3%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	12	0	0	12	0
Parking (#/hr)		10			10							
Adj. Flow (vph)	97	445	29	113	586	108	105	289	104	137	347	182
Shared Lane Traffic (%)												
Lane Group Flow (vph)	97	474	0	113	586	108	0	498	0	0	666	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)		8.0			8.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.01	1.25	1.01	1.01	1.25	1.01	1.01	1.05	1.01	1.01	1.05	1.01
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	

Lanes, Volumes, Timings

3: Danforth Ave & Pape Ave

2032 Total Background + TOC - AM

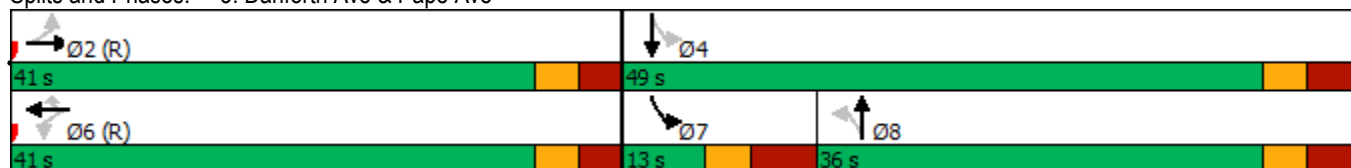


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Type	Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases	2			6			8			7	4	
Permitted Phases	2			6		6	8			4		
Detector Phase	2	2		6	6	6	8	8		7	4	
Switch Phase												
Minimum Initial (s)	15.0	15.0		15.0	15.0	15.0	24.0	24.0		5.5	24.0	
Minimum Split (s)	27.0	27.0		27.0	27.0	27.0	32.0	32.0		13.0	32.0	
Total Split (s)	41.0	41.0		41.0	41.0	41.0	36.0	36.0		13.0	49.0	
Total Split (%)	45.6%	45.6%		45.6%	45.6%	45.6%	40.0%	40.0%		14.4%	54.4%	
Maximum Green (s)	35.1	35.1		35.1	35.1	35.1	29.8	29.8		5.5	42.8	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.9	2.9		2.9	2.9	2.9	3.2	3.2		4.5	3.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max	C-Max	Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0			7.0	
Flash Dont Walk (s)	13.0	13.0		13.0	13.0	13.0	17.0	17.0			17.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0			0	
Act Effct Green (s)	35.1	35.1		35.1	35.1	35.1		29.8			42.8	
Actuated g/C Ratio	0.39	0.39		0.39	0.39	0.39		0.33			0.48	
v/c Ratio	0.76	0.83		0.59	0.96	0.28		1.07			1.04	
Control Delay	63.6	39.0		33.6	53.6	4.4		91.9			68.8	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			25.3	
Total Delay	63.6	39.0		33.6	53.6	4.4		91.9			94.1	
LOS	E	D		C	D	A		F			F	
Approach Delay	43.2			44.2				91.9			94.1	
Approach LOS	D			D				F			F	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 25 (28%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.07
 Intersection Signal Delay: 66.4
 Intersection Capacity Utilization 101.8%
 Analysis Period (min) 15
 * User Entered Value

Splits and Phases: 3: Danforth Ave & Pape Ave



Lanes, Volumes, Timings
9: Pape Ave & Lipton Ave

2032 Total Background + TOC - AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕			↕	
Traffic Volume (vph)	6	1	8	74	0	80	0	431	28	68	535	35
Future Volume (vph)	6	1	8	74	0	80	0	431	28	68	535	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.75	0.95	0.95	*0.75	0.95
Ped Bike Factor		0.77		0.77	0.68			0.96			0.93	
Frt		0.924			0.850			0.991			0.992	
Flt Protected		0.982		0.950							0.995	
Satd. Flow (prot)	0	1471	0	1190	695	0	0	2578	0	0	2676	0
Flt Permitted		0.923		0.747							0.801	
Satd. Flow (perm)	0	1240	0	719	695	0	0	2578	0	0	2076	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9			61			10			9	
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		48.1			71.1			84.3			47.5	
Travel Time (s)		4.3			6.4			7.6			4.3	
Confl. Peds. (#/hr)	263		175	175		263	320		754	754		320
Confl. Bikes (#/hr)						11			16			42
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
Heavy Vehicles (%)	0%	0%	0%	50%	0%	56%	0%	4%	0%	0%	1%	0%
Adj. Flow (vph)	6	1	9	80	0	86	0	463	30	73	575	38
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	16	0	80	86	0	0	493	0	0	686	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)		8.0			10.0			8.0			12.0	
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)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2			2		1	2	
Detector Template	Left	Thru		Left	Thru			Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5			30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8			1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		4			8			2			6	

Lanes, Volumes, Timings
9: Pape Ave & Lipton Ave

2032 Total Background + TOC - AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8						6		
Detector Phase	4	4		8	8			2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0			24.0		24.0	24.0	
Minimum Split (s)	26.0	26.0		26.0	26.0			32.0		32.0	32.0	
Total Split (s)	30.0	30.0		30.0	30.0			60.0		60.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%			66.7%		66.7%	66.7%	
Maximum Green (s)	24.0	24.0		24.0	24.0			52.0		52.0	52.0	
Yellow Time (s)	3.0	3.0		3.0	3.0			4.0		4.0	4.0	
All-Red Time (s)	3.0	3.0		3.0	3.0			4.0		4.0	4.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		6.0		6.0	6.0			8.0			8.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max			C-Max		C-Max	C-Max	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	
Flash Dont Walk (s)	13.0	13.0		13.0	13.0			17.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0			0		0	0	
Act Effct Green (s)		24.0		24.0	24.0			52.0			52.0	
Actuated g/C Ratio		0.27		0.27	0.27			0.58			0.58	
v/c Ratio		0.05		0.42	0.37			0.33			0.57	
Control Delay		17.3		35.4	16.2			17.7			14.1	
Queue Delay		0.0		0.0	0.0			1.5			0.8	
Total Delay		17.3		35.4	16.2			19.1			15.0	
LOS		B		D	B			B			B	
Approach Delay		17.3			25.4			19.1			15.0	
Approach LOS		B			C			B			B	

Intersection Summary

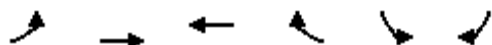
Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 31 (34%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.57
 Intersection Signal Delay: 17.8 Intersection LOS: B
 Intersection Capacity Utilization 75.0% ICU Level of Service D
 Analysis Period (min) 15
 * User Entered Value

Splits and Phases: 9: Pape Ave & Lipton Ave



Lanes, Volumes, Timings
11: Danforth Ave & Woodycrest Ave

2032 Total Background + TOC - AM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	↗
Traffic Volume (vph)	0	624	723	0	19	43
Future Volume (vph)	0	624	723	0	19	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor					0.97	0.65
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	0	1507	1551	0	1608	1551
Flt Permitted					0.950	
Satd. Flow (perm)	0	1507	1551	0	1567	1008
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						45
Link Speed (k/h)		40	40		40	
Link Distance (m)		108.9	125.1		75.8	
Travel Time (s)		9.8	11.3		6.8	
Confl. Peds. (#/hr)	231			231	12	153
Confl. Bikes (#/hr)				242		8
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	6%	3%	0%	11%	3%
Parking (#/hr)		10	10			
Adj. Flow (vph)	0	657	761	0	20	45
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	657	761	0	20	45
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	8.0		8.0	
Two way Left Turn Lane						
Headway Factor	1.01	1.25	1.25	1.01	1.01	1.01
Turning Speed (k/h)	24			14	24	14
Number of Detectors		2	2		1	1
Detector Template		Thru	Thru		Left	Right
Leading Detector (m)		30.5	30.5		6.1	6.1
Trailing Detector (m)		0.0	0.0		0.0	0.0
Detector 1 Position(m)		0.0	0.0		0.0	0.0
Detector 1 Size(m)		1.8	1.8		6.1	6.1
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	0.0
Detector 1 Queue (s)		0.0	0.0		0.0	0.0
Detector 1 Delay (s)		0.0	0.0		0.0	0.0
Detector 2 Position(m)		28.7	28.7			
Detector 2 Size(m)		1.8	1.8			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type		NA	NA		Prot	Perm

Lanes, Volumes, Timings
 11: Danforth Ave & Woodycrest Ave

2032 Total Background + TOC - AM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases		2	6		4	
Permitted Phases						4
Detector Phase		2	6		4	4
Switch Phase						
Minimum Initial (s)		14.0	14.0		16.0	16.0
Minimum Split (s)		27.0	27.0		27.6	27.6
Total Split (s)		62.0	62.0		28.0	28.0
Total Split (%)		68.9%	68.9%		31.1%	31.1%
Maximum Green (s)		56.6	56.6		21.4	21.4
Yellow Time (s)		3.0	3.0		3.0	3.0
All-Red Time (s)		2.4	2.4		3.6	3.6
Lost Time Adjust (s)		0.0	0.0		0.0	0.0
Total Lost Time (s)		5.4	5.4		6.6	6.6
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Recall Mode		C-Max	C-Max		None	None
Walk Time (s)			7.0		7.0	7.0
Flash Dont Walk (s)			7.0		14.0	14.0
Pedestrian Calls (#/hr)			0		0	0
Act Effct Green (s)		73.2	73.2		16.0	16.0
Actuated g/C Ratio		0.81	0.81		0.18	0.18
v/c Ratio		0.54	0.60		0.07	0.21
Control Delay		8.9	9.1		31.7	12.5
Queue Delay		0.0	0.0		0.0	0.0
Total Delay		8.9	9.1		31.7	12.5
LOS		A	A		C	B
Approach Delay		8.9	9.1		18.4	
Approach LOS		A	A		B	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 67 (74%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.60
 Intersection Signal Delay: 9.4
 Intersection LOS: A
 Intersection Capacity Utilization 65.5%
 ICU Level of Service C
 Analysis Period (min) 15






















Splits and Phases: 11: Danforth Ave & Woodycrest Ave



HCM Signalized Intersection Capacity Analysis

3: Danforth Ave & Pape Ave


















2032 Total Background + TOC - AM

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	90	414	27	105	545	100	98	269	97	127	323	169	
Future Volume (vph)	90	414	27	105	545	100	98	269	97	127	323	169	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2		
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		*0.75			*0.75		
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.53		0.85			0.85		
Flpb, ped/bikes	1.00	1.00		0.88	1.00	1.00		0.96			0.97		
Frt	1.00	0.99		1.00	1.00	0.85		0.97			0.96		
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99			0.99		
Satd. Flow (prot)	1700	1460		1551	1566	803		2071			2091		
Flt Permitted	0.18	1.00		0.30	1.00	1.00		0.65			0.58		
Satd. Flow (perm)	328	1460		489	1566	803		1351			1226		
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	
Adj. Flow (vph)	97	445	29	113	586	108	105	289	104	137	347	182	
RTOR Reduction (vph)	0	2	0	0	0	66	0	18	0	0	1	0	
Lane Group Flow (vph)	97	472	0	113	586	42	0	480	0	0	665	0	
Confl. Peds. (#/hr)	748		441	441		748	329		807	807		329	
Confl. Bikes (#/hr)			42			181			21			37	
Heavy Vehicles (%)	5%	6%	4%	1%	2%	5%	0%	4%	6%	3%	4%	2%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	12	0	0	12	0	
Parking (#/hr)		10			10								
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA		
Protected Phases		2			6			8		7		4	
Permitted Phases	2			6		6	8			4			
Actuated Green, G (s)	35.1	35.1		35.1	35.1	35.1		29.8			42.8		
Effective Green, g (s)	35.1	35.1		35.1	35.1	35.1		29.8			42.8		
Actuated g/C Ratio	0.39	0.39		0.39	0.39	0.39		0.33			0.48		
Clearance Time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0		
Lane Grp Cap (vph)	127	569		190	610	313		447			635		
v/s Ratio Prot		0.32			c0.37						c0.06		
v/s Ratio Perm	0.30			0.23		0.05		0.36			c0.43		
v/c Ratio	0.76	0.83		0.59	0.96	0.13		1.07			1.05		
Uniform Delay, d1	23.8	24.7		21.8	26.8	17.7		30.1			23.6		
Progression Factor	1.00	1.00		0.88	0.91	1.08		1.00			1.12		
Incremental Delay, d2	34.6	13.1		12.4	27.1	0.8		63.7			46.2		
Delay (s)	58.4	37.8		31.5	51.5	19.9		93.8			72.6		
Level of Service	E	D		C	D	B		F			E		
Approach Delay (s)		41.3			44.5			93.8			72.6		
Approach LOS		D			D			F			E		
Intersection Summary													
HCM 2000 Control Delay			60.8									HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio			1.08										
Actuated Cycle Length (s)			90.0									Sum of lost time (s)	19.6
Intersection Capacity Utilization			101.8%									ICU Level of Service	G
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

9: Pape Ave & Lipton Ave

2032 Total Background + TOC - AM

														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Traffic Volume (vph)	6	1	8	74	0	80	0	431	28	68	535	35		
Future Volume (vph)	6	1	8	74	0	80	0	431	28	68	535	35		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Total Lost time (s)		6.0		6.0	6.0			8.0			8.0			
Lane Util. Factor		1.00		1.00	1.00			*0.75			*0.75			
Frbp, ped/bikes		0.86		1.00	0.68			0.96			0.97			
Flpb, ped/bikes		0.90		0.77	1.00			1.00			0.96			
Frt		0.92		1.00	0.85			0.99			0.99			
Flt Protected		0.98		0.95	1.00			1.00			0.99			
Satd. Flow (prot)		1319		915	695			2578			2577			
Flt Permitted		0.92		0.75	1.00			1.00			0.80			
Satd. Flow (perm)		1240		720	695			2578			2075			
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93		
Adj. Flow (vph)	6	1	9	80	0	86	0	463	30	73	575	38		
RTOR Reduction (vph)	0	7	0	0	45	0	0	4	0	0	4	0		
Lane Group Flow (vph)	0	9	0	80	41	0	0	489	0	0	682	0		
Confl. Peds. (#/hr)	263		175	175		263	320		754	754		320		
Confl. Bikes (#/hr)						11			16			42		
Heavy Vehicles (%)	0%	0%	0%	50%	0%	56%	0%	4%	0%	0%	1%	0%		
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA			
Protected Phases		4			8			2			6			
Permitted Phases	4			8						6				
Actuated Green, G (s)		24.0		24.0	24.0			52.0			52.0			
Effective Green, g (s)		24.0		24.0	24.0			52.0			52.0			
Actuated g/C Ratio		0.27		0.27	0.27			0.58			0.58			
Clearance Time (s)		6.0		6.0	6.0			8.0			8.0			
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0			
Lane Grp Cap (vph)		330		192	185			1489			1198			
v/s Ratio Prot					0.06			0.19						
v/s Ratio Perm		0.01		c0.11							c0.33			
v/c Ratio		0.03		0.42	0.22			0.33			0.57			
Uniform Delay, d1		24.4		27.2	25.7			9.9			12.0			
Progression Factor		1.00		1.00	1.00			1.76			1.00			
Incremental Delay, d2		0.2		6.5	2.8			0.3			2.0			
Delay (s)		24.5		33.8	28.5			17.7			13.9			
Level of Service		C		C	C			B			B			
Approach Delay (s)		24.5			31.0			17.7			13.9			
Approach LOS		C			C			B			B			
Intersection Summary														
HCM 2000 Control Delay			17.5									HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio			0.52											
Actuated Cycle Length (s)			90.0								14.0			
Intersection Capacity Utilization			75.0%										ICU Level of Service	D
Analysis Period (min)			15											
c	Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

11: Danforth Ave & Woodcrest Ave

2032 Total Background + TOC - AM

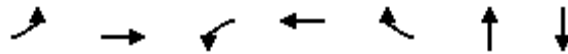


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	↘
Traffic Volume (vph)	0	624	723	0	19	43
Future Volume (vph)	0	624	723	0	19	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.4	5.4		6.6	6.6
Lane Util. Factor		1.00	1.00		1.00	1.00
Frbp, ped/bikes		1.00	1.00		1.00	0.64
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		1507	1551		1608	992
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		1507	1551		1608	992
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	657	761	0	20	45
RTOR Reduction (vph)	0	0	0	0	0	40
Lane Group Flow (vph)	0	657	761	0	20	5
Confl. Peds. (#/hr)	231			231	12	153
Confl. Bikes (#/hr)				242		8
Heavy Vehicles (%)	0%	6%	3%	0%	11%	3%
Parking (#/hr)		10	10			
Turn Type		NA	NA		Prot	Perm
Protected Phases		2	6		4	
Permitted Phases						4
Actuated Green, G (s)		68.4	68.4		9.6	9.6
Effective Green, g (s)		68.4	68.4		9.6	9.6
Actuated g/C Ratio		0.76	0.76		0.11	0.11
Clearance Time (s)		5.4	5.4		6.6	6.6
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1145	1178		171	105
v/s Ratio Prot		0.44	c0.49		c0.01	
v/s Ratio Perm						0.00
v/c Ratio		0.57	0.65		0.12	0.05
Uniform Delay, d1		4.6	5.1		36.4	36.1
Progression Factor		1.23	1.00		1.00	1.00
Incremental Delay, d2		1.7	2.7		0.3	0.2
Delay (s)		7.3	7.8		36.7	36.3
Level of Service		A	A		D	D
Approach Delay (s)		7.3	7.8		36.4	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			8.9		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.58			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			65.5%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

Queues

3: Danforth Ave & Pape Ave

2032 Total Background + TOC - AM



Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	97	474	113	586	108	498	666
v/c Ratio	0.76	0.83	0.59	0.96	0.28	1.07	1.04
Control Delay	63.6	39.0	33.6	53.6	4.4	91.9	68.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	25.3
Total Delay	63.6	39.0	33.6	53.6	4.4	91.9	94.1
Queue Length 50th (m)	14.3	71.8	15.8	100.5	2.1	~62.1	~73.2
Queue Length 95th (m)	#41.9	#125.3	m#36.8	#167.9	m6.9	#101.5	#127.3
Internal Link Dist (m)		180.9		122.6		69.5	60.3
Turn Bay Length (m)	40.0		40.0		60.0		
Base Capacity (vph)	127	572	191	610	392	465	642
Starvation Cap Reductn	0	0	0	0	0	0	172
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.83	0.59	0.96	0.28	1.07	1.42

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

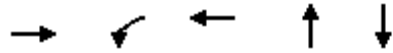
Queue shown is maximum after two cycles.

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

Queues

9: Pape Ave & Lipton Ave

2032 Total Background + TOC - AM



Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	16	80	86	493	686
v/c Ratio	0.05	0.42	0.37	0.33	0.57
Control Delay	17.3	35.4	16.2	17.7	14.1
Queue Delay	0.0	0.0	0.0	1.5	0.8
Total Delay	17.3	35.4	16.2	19.1	15.0
Queue Length 50th (m)	0.9	11.4	3.3	45.8	45.5
Queue Length 95th (m)	5.7	25.3	16.1	m48.8	65.7
Internal Link Dist (m)	24.1		47.1	60.3	23.5
Turn Bay Length (m)					
Base Capacity (vph)	337	191	230	1493	1203
Starvation Cap Reductn	0	0	0	777	0
Spillback Cap Reductn	0	0	0	0	250
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.05	0.42	0.37	0.69	0.72

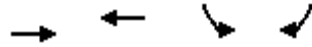
Intersection Summary

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

Queues

11: Danforth Ave & Woodcrest Ave

2032 Total Background + TOC - AM



Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	657	761	20	45
v/c Ratio	0.54	0.60	0.07	0.21
Control Delay	8.9	9.1	31.7	12.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	8.9	9.1	31.7	12.5
Queue Length 50th (m)	81.0	69.5	2.9	0.0
Queue Length 95th (m)	m99.0	112.0	9.0	9.0
Internal Link Dist (m)	84.9	101.1	51.8	
Turn Bay Length (m)				
Base Capacity (vph)	1226	1261	382	273
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.54	0.60	0.05	0.16

Intersection Summary

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

HCM Unsignalized Intersection Capacity Analysis

17: Pape Ave & Bus Loop Entrance

2032 Total Background + TOC - AM



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↑↑			↑↑
Traffic Volume (veh/h)	0	0	505	12	28	637
Future Volume (Veh/h)	0	0	505	12	28	637
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	0	0	543	13	30	685
Pedestrians	855					
Lane Width (m)	0.0					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)	48					
pX, platoon unblocked	0.93	0.93			0.93	
vC, conflicting volume	1807	1133			1411	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1712	985			1285	
tC, single (s)	6.8	6.9			6.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			3.2	
p0 queue free %	100	100			85	
cM capacity (veh/h)	65	232			198	
Direction, Lane #	NB 1	NB 2	SB 1	SB 2		
Volume Total	362	194	258	457		
Volume Left	0	0	30	0		
Volume Right	0	13	0	0		
cSH	1700	1700	198	1700		
Volume to Capacity	0.21	0.11	0.15	0.27		
Queue Length 95th (m)	0.0	0.0	4.0	0.0		
Control Delay (s)	0.0	0.0	7.1	0.0		
Lane LOS	A					
Approach Delay (s)	0.0	2.6				
Approach LOS						
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization			39.7%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 19: Danforth Ave & Eaton Ave













2032 Total Background + TOC - AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↶			
Traffic Volume (veh/h)	33	605	752	53	0	0
Future Volume (Veh/h)	33	605	752	53	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.62	0.62	0.62	0.62	0.62	0.62
Hourly flow rate (vph)	53	976	1213	85	0	0
Pedestrians		18	6		395	
Lane Width (m)		3.5	3.5		0.0	
Walking Speed (m/s)		1.1	1.1		1.1	
Percent Blockage		2	1		0	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		147	109			
pX, platoon unblocked	0.76				0.86	0.76
vC, conflicting volume	1693				2738	1668
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1753				2317	1721
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	81				100	100
cM capacity (veh/h)	276				29	83
Direction, Lane #	EB 1	WB 1				
Volume Total	1029	1298				
Volume Left	53	0				
Volume Right	0	85				
cSH	276	1700				
Volume to Capacity	0.19	0.76				
Queue Length 95th (m)	5.3	0.0				
Control Delay (s)	10.1	0.0				
Lane LOS	B					
Approach Delay (s)	10.1	0.0				
Approach LOS						
Intersection Summary						
Average Delay		4.5				
Intersection Capacity Utilization		73.3%		ICU Level of Service		D
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
 21: Pape Ave & Gertrude PI

2032 Total Background + TOC - AM

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (veh/h)	15	15	505	0	0	651
Future Volume (Veh/h)	15	15	505	0	0	651
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	16	16	543	0	0	700
Pedestrians	856		1			
Lane Width (m)	3.5		3.5			
Walking Speed (m/s)	1.1		1.1			
Percent Blockage	76		0			
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)	87					
pX, platoon unblocked	0.95	0.95			0.95	
vC, conflicting volume	1750	1128			1399	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1680	1023			1309	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	19	70			100	
cM capacity (veh/h)	20	54			123	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	16	16	272	272	350	350
Volume Left	16	0	0	0	0	0
Volume Right	0	16	0	0	0	0
cSH	20	54	1700	1700	1700	1700
Volume to Capacity	0.81	0.30	0.16	0.16	0.21	0.21
Queue Length 95th (m)	16.9	7.9	0.0	0.0	0.0	0.0
Control Delay (s)	407.0	98.1	0.0	0.0	0.0	0.0
Lane LOS	F	F				
Approach Delay (s)	252.6		0.0		0.0	
Approach LOS	F					
Intersection Summary						
Average Delay			6.3			
Intersection Capacity Utilization			28.0%		ICU Level of Service	A
Analysis Period (min)			15			

Lanes, Volumes, Timings
3: Danforth Ave & Pape Ave

2032 Total Background + TOC - PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	95	466	44	70	532	112	90	322	132	106	288	201
Future Volume (vph)	95	466	44	70	532	112	90	322	132	106	288	201
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0		0.0	40.0		60.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (m)	45.0			25.0			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	*0.75	0.95	0.95	*0.75	0.95
Ped Bike Factor	0.87	0.96		0.87		0.46		0.77			0.73	
Fr _t		0.987				0.850		0.964			0.949	
Fl _t Protected	0.950			0.950				0.992			0.991	
Satd. Flow (prot)	1733	1494	0	1750	1566	1597	0	2042	0	0	1968	0
Fl _t Permitted	0.171			0.197				0.621			0.697	
Satd. Flow (perm)	272	1494	0	317	1566	729	0	1242	0	0	1288	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6				125					66	
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		204.9			146.6			93.5			84.3	
Travel Time (s)		18.4			13.2			8.4			7.6	
Confl. Peds. (#/hr)	1105		861	861		1105	585		1177	1177		585
Confl. Bikes (#/hr)			189			61			22			29
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	3%	1%	0%	2%	2%	0%	2%	3%	1%	1%	4%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	12	0	0	12	0
Parking (#/hr)		10			10							
Adj. Flow (vph)	97	476	45	71	543	114	92	329	135	108	294	205
Shared Lane Traffic (%)												
Lane Group Flow (vph)	97	521	0	71	543	114	0	556	0	0	607	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)		8.0			8.0			10.0			10.0	
Two way Left Turn Lane												
Headway Factor	1.01	1.25	1.01	1.01	1.25	1.01	1.01	1.05	1.01	1.01	1.05	1.01
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	

Lanes, Volumes, Timings

3: Danforth Ave & Pape Ave

2032 Total Background + TOC - PM

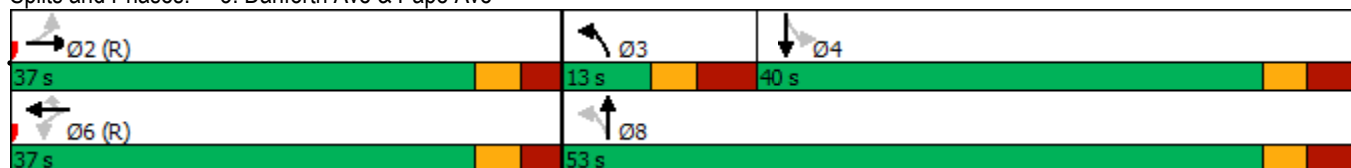


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Type	Cl+Ex			Cl+Ex				Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0				0.0			0.0	
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		Perm	NA	
Protected Phases	2			6			3	8			4	
Permitted Phases	2			6		6	8			4		
Detector Phase	2	2		6	6	6	3	8		4	4	
Switch Phase												
Minimum Initial (s)	15.0	15.0		15.0	15.0	15.0	5.9	24.0		24.0	24.0	
Minimum Split (s)	27.0	27.0		27.0	27.0	27.0	13.0	32.0		32.0	32.0	
Total Split (s)	37.0	37.0		37.0	37.0	37.0	13.0	53.0		40.0	40.0	
Total Split (%)	41.1%	41.1%		41.1%	41.1%	41.1%	14.4%	58.9%		44.4%	44.4%	
Maximum Green (s)	31.1	31.1		31.1	31.1	31.1	5.9	46.8		33.8	33.8	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.9	2.9		2.9	2.9	2.9	4.1	3.2		3.2	3.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2	
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max	C-Max	Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0	7.0		7.0		7.0	7.0	
Flash Dont Walk (s)	13.0	13.0		13.0	13.0	13.0		17.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0	0		0		0	0	
Act Effct Green (s)	31.1	31.1		31.1	31.1	31.1		46.8			33.8	
Actuated g/C Ratio	0.35	0.35		0.35	0.35	0.35		0.52			0.38	
v/c Ratio	1.04	1.00		0.65	1.00	0.34		0.79			1.16	
Control Delay	140.3	71.1		59.7	73.7	13.4		25.9			107.8	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.1	
Total Delay	140.3	71.1		59.7	73.7	13.4		25.9			107.9	
LOS	F	E		E	E	B		C			F	
Approach Delay		82.0			62.9			25.9			107.9	
Approach LOS		F			E			C			F	

Intersection Summary


















Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 22 (24%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 130
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.16
 Intersection Signal Delay: 70.3
 Intersection LOS: E
 Intersection Capacity Utilization 101.9%
 ICU Level of Service G
 Analysis Period (min) 15
 * User Entered Value

Splits and Phases: 3: Danforth Ave & Pape Ave



Lanes, Volumes, Timings
9: Pape Ave & Lipton Ave

2032 Total Background + TOC - PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	0	17	112	0	105	0	512	16	50	465	36
Future Volume (vph)	18	0	17	112	0	105	0	512	16	50	465	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.75	0.95	0.95	*0.75	0.95
Ped Bike Factor		0.72		0.70	0.66			0.98			0.93	
Frt		0.934			0.850			0.996			0.990	
Flt Protected		0.975		0.950							0.995	
Satd. Flow (prot)	0	1446	0	1137	624	0	0	2538	0	0	2652	0
Flt Permitted		0.874		0.734							0.820	
Satd. Flow (perm)	0	1102	0	617	624	0	0	2538	0	0	2117	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		61			61			3			8	
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		48.1			71.1			84.3			49.7	
Travel Time (s)		4.3			6.4			7.6			4.5	
Confl. Peds. (#/hr)	360		270	270		360	366		1055	1055		366
Confl. Bikes (#/hr)						3			28			29
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	57%	0%	68%	0%	8%	7%	0%	1%	0%
Adj. Flow (vph)	18	0	17	114	0	107	0	522	16	51	474	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	35	0	114	107	0	0	538	0	0	562	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)		8.0			10.0			8.0			12.0	
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)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2			2		1	2	
Detector Template	Left	Thru		Left	Thru			Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5			30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8			1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		4			8			2			6	

Lanes, Volumes, Timings
9: Pape Ave & Lipton Ave

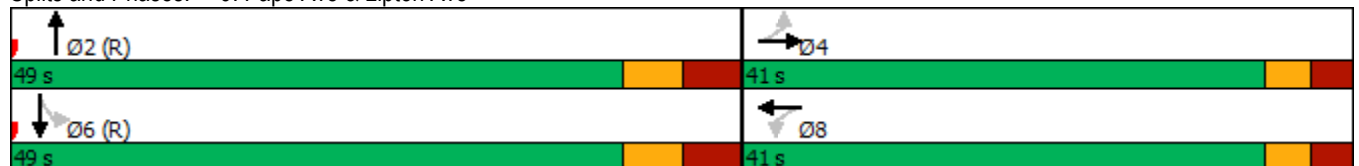
2032 Total Background + TOC - PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8						6		
Detector Phase	4	4		8	8			2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0			24.0		24.0	24.0	
Minimum Split (s)	26.0	26.0		26.0	26.0			32.0		32.0	32.0	
Total Split (s)	41.0	41.0		41.0	41.0			49.0		49.0	49.0	
Total Split (%)	45.6%	45.6%		45.6%	45.6%			54.4%		54.4%	54.4%	
Maximum Green (s)	35.0	35.0		35.0	35.0			41.0		41.0	41.0	
Yellow Time (s)	3.0	3.0		3.0	3.0			4.0		4.0	4.0	
All-Red Time (s)	3.0	3.0		3.0	3.0			4.0		4.0	4.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)		6.0		6.0	6.0			8.0			8.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max			C-Max		C-Max	C-Max	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0		7.0	7.0	
Flash Dont Walk (s)	13.0	13.0		13.0	13.0			17.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0			0		0	0	
Act Effct Green (s)		35.0		35.0	35.0			41.0			41.0	
Actuated g/C Ratio		0.39		0.39	0.39			0.46			0.46	
v/c Ratio		0.08		0.48	0.38			0.46			0.58	
Control Delay		2.3		28.9	14.2			14.3			20.9	
Queue Delay		0.0		0.0	0.0			1.4			0.4	
Total Delay		2.3		28.9	14.2			15.7			21.2	
LOS		A		C	B			B			C	
Approach Delay		2.3			21.7			15.7			21.2	
Approach LOS		A			C			B			C	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 59 (66%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.58
 Intersection Signal Delay: 18.6
 Intersection Capacity Utilization 75.0%
 Analysis Period (min) 15
 * User Entered Value

Splits and Phases: 9: Pape Ave & Lipton Ave



Lanes, Volumes, Timings
 11: Danforth Ave & Woodycrest Ave

2032 Total Background + TOC - PM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	↘
Traffic Volume (vph)	0	647	694	0	23	33
Future Volume (vph)	0	647	694	0	23	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor					0.95	0.59
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	0	1566	1581	0	1638	1551
Flt Permitted					0.950	
Satd. Flow (perm)	0	1566	1581	0	1557	916
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						34
Link Speed (k/h)		40	40		40	
Link Distance (m)		108.9	125.1		75.8	
Travel Time (s)		9.8	11.3		6.8	
Confl. Peds. (#/hr)	402			402	23	184
Confl. Bikes (#/hr)				92		3
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	2%	1%	0%	9%	3%
Parking (#/hr)		10	10			
Adj. Flow (vph)	0	660	708	0	23	34
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	660	708	0	23	34
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.5	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		5.0	8.0		8.0	
Two way Left Turn Lane						
Headway Factor	1.01	1.25	1.25	1.01	1.01	1.01
Turning Speed (k/h)	24			14	24	14
Number of Detectors		2	2		1	1
Detector Template		Thru	Thru		Left	Right
Leading Detector (m)		30.5	30.5		6.1	6.1
Trailing Detector (m)		0.0	0.0		0.0	0.0
Detector 1 Position(m)		0.0	0.0		0.0	0.0
Detector 1 Size(m)		1.8	1.8		6.1	6.1
Detector 1 Type		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)		0.0	0.0		0.0	0.0
Detector 1 Queue (s)		0.0	0.0		0.0	0.0
Detector 1 Delay (s)		0.0	0.0		0.0	0.0
Detector 2 Position(m)		28.7	28.7			
Detector 2 Size(m)		1.8	1.8			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type		NA	NA		Prot	Perm

Lanes, Volumes, Timings
 11: Danforth Ave & Woodycrest Ave

2032 Total Background + TOC - PM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases		2	6		4	
Permitted Phases						4
Detector Phase		2	6		4	4
Switch Phase						
Minimum Initial (s)		14.0	14.0		16.0	16.0
Minimum Split (s)		19.4	19.4		27.6	27.6
Total Split (s)		62.0	62.0		28.0	28.0
Total Split (%)		68.9%	68.9%		31.1%	31.1%
Maximum Green (s)		56.6	56.6		21.4	21.4
Yellow Time (s)		3.0	3.0		3.0	3.0
All-Red Time (s)		2.4	2.4		3.6	3.6
Lost Time Adjust (s)		0.0	0.0		0.0	0.0
Total Lost Time (s)		5.4	5.4		6.6	6.6
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Recall Mode		C-Max	C-Max		None	None
Walk Time (s)			7.0		7.0	7.0
Flash Dont Walk (s)			7.0		14.0	14.0
Pedestrian Calls (#/hr)			0		0	0
Act Effct Green (s)		73.2	73.2		16.0	16.0
Actuated g/C Ratio		0.81	0.81		0.18	0.18
v/c Ratio		0.52	0.55		0.08	0.18
Control Delay		5.0	8.0		31.8	13.5
Queue Delay		0.0	0.0		0.0	0.0
Total Delay		5.0	8.0		31.8	13.5
LOS		A	A		C	B
Approach Delay		5.0	8.0		20.9	
Approach LOS		A	A		C	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 45 (50%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.55
 Intersection Signal Delay: 7.1
 Intersection LOS: A
 Intersection Capacity Utilization 64.0%
 ICU Level of Service C
 Analysis Period (min) 15






















Splits and Phases: 11: Danforth Ave & Woodycrest Ave



HCM Signalized Intersection Capacity Analysis

3: Danforth Ave & Pape Ave


















2032 Total Background + TOC - PM

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	95	466	44	70	532	112	90	322	132	106	288	201	
Future Volume (vph)	95	466	44	70	532	112	90	322	132	106	288	201	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2		
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		*0.75			*0.75		
Frbp, ped/bikes	1.00	0.96		1.00	1.00	0.46		0.79			0.78		
Flpb, ped/bikes	0.87	1.00		0.87	1.00	1.00		0.98			0.93		
Frt	1.00	0.99		1.00	1.00	0.85		0.96			0.95		
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99			0.99		
Satd. Flow (prot)	1509	1495		1530	1566	729		2006			1833		
Flt Permitted	0.17	1.00		0.20	1.00	1.00		0.62			0.70		
Satd. Flow (perm)	272	1495		317	1566	729		1255			1289		
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	
Adj. Flow (vph)	97	476	45	71	543	114	92	329	135	108	294	205	
RTOR Reduction (vph)	0	4	0	0	0	75	0	0	0	0	41	0	
Lane Group Flow (vph)	97	517	0	71	543	39	0	556	0	0	566	0	
Confl. Peds. (#/hr)	1105		861	861		1105	585		1177	1177		585	
Confl. Bikes (#/hr)			189			61			22			29	
Heavy Vehicles (%)	3%	1%	0%	2%	2%	0%	2%	3%	1%	1%	4%	3%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	12	0	0	12	0	
Parking (#/hr)		10			10								
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		Perm	NA		
Protected Phases		2			6		3	8				4	
Permitted Phases	2			6		6	8			4			
Actuated Green, G (s)	31.1	31.1		31.1	31.1	31.1		46.8			33.8		
Effective Green, g (s)	31.1	31.1		31.1	31.1	31.1		46.8			33.8		
Actuated g/C Ratio	0.35	0.35		0.35	0.35	0.35		0.52			0.38		
Clearance Time (s)	5.9	5.9		5.9	5.9	5.9		6.2			6.2		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0		
Lane Grp Cap (vph)	93	516		109	541	251		701			484		
v/s Ratio Prot		0.35			0.35			c0.05					
v/s Ratio Perm	c0.36			0.22		0.05		0.36			c0.44		
v/c Ratio	1.04	1.00		0.65	1.00	0.16		0.79			1.17		
Uniform Delay, d1	29.4	29.4		24.9	29.4	20.4		17.6			28.1		
Progression Factor	1.00	1.00		1.24	1.18	2.87		1.00			0.60		
Incremental Delay, d2	105.5	40.1		24.0	37.6	1.2		9.0			93.7		
Delay (s)	134.9	69.6		54.9	72.4	59.7		26.6			110.7		
Level of Service	F	E		D	E	E		C			F		
Approach Delay (s)		79.8			68.7			26.6			110.7		
Approach LOS		E			E			C			F		
Intersection Summary													
HCM 2000 Control Delay			72.3									HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio			1.11										
Actuated Cycle Length (s)			90.0									Sum of lost time (s)	19.2
Intersection Capacity Utilization			101.9%									ICU Level of Service	G
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

9: Pape Ave & Lipton Ave

2032 Total Background + TOC - PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	0	17	112	0	105	0	512	16	50	465	36
Future Volume (vph)	18	0	17	112	0	105	0	512	16	50	465	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		6.0	6.0			8.0			8.0	
Lane Util. Factor		1.00		1.00	1.00			*0.75			*0.75	
Frbp, ped/bikes		0.85		1.00	0.66			0.98			0.96	
Flpb, ped/bikes		0.85		0.70	1.00			1.00			0.97	
Frt		0.93		1.00	0.85			1.00			0.99	
Flt Protected		0.97		0.95	1.00			1.00			1.00	
Satd. Flow (prot)		1231		798	624			2536			2571	
Flt Permitted		0.87		0.73	1.00			1.00			0.82	
Satd. Flow (perm)		1104		617	624			2536			2118	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	18	0	17	114	0	107	0	522	16	51	474	37
RTOR Reduction (vph)	0	21	0	0	37	0	0	2	0	0	4	0
Lane Group Flow (vph)	0	14	0	114	70	0	0	536	0	0	558	0
Confl. Peds. (#/hr)	360		270	270		360	366		1055	1055		366
Confl. Bikes (#/hr)						3			28			29
Heavy Vehicles (%)	0%	0%	0%	57%	0%	68%	0%	8%	7%	0%	1%	0%
Turn Type	Perm	NA		Perm	NA			NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8						6		
Actuated Green, G (s)		35.0		35.0	35.0			41.0			41.0	
Effective Green, g (s)		35.0		35.0	35.0			41.0			41.0	
Actuated g/C Ratio		0.39		0.39	0.39			0.46			0.46	
Clearance Time (s)		6.0		6.0	6.0			8.0			8.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		429		239	242			1155			964	
v/s Ratio Prot					0.11			0.21				
v/s Ratio Perm		0.01		c0.18							c0.26	
v/c Ratio		0.03		0.48	0.29			0.46			0.58	
Uniform Delay, d1		17.0		20.6	18.9			16.9			18.1	
Progression Factor		1.00		1.00	1.00			0.78			1.00	
Incremental Delay, d2		0.1		6.7	3.0			0.9			2.5	
Delay (s)		17.2		27.3	21.9			14.1			20.6	
Level of Service		B		C	C			B			C	
Approach Delay (s)		17.2			24.7			14.1			20.6	
Approach LOS		B			C			B			C	
Intersection Summary												
HCM 2000 Control Delay			18.6					HCM 2000 Level of Service			B	
HCM 2000 Volume to Capacity ratio			0.53									
Actuated Cycle Length (s)			90.0					Sum of lost time (s)		14.0		
Intersection Capacity Utilization			75.0%					ICU Level of Service			D	
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Signalized Intersection Capacity Analysis

11: Danforth Ave & Woodcrest Ave

2032 Total Background + TOC - PM

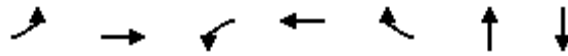


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	↗
Traffic Volume (vph)	0	647	694	0	23	33
Future Volume (vph)	0	647	694	0	23	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.4	5.4		6.6	6.6
Lane Util. Factor		1.00	1.00		1.00	1.00
Frbp, ped/bikes		1.00	1.00		1.00	0.59
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		1566	1581		1638	911
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		1566	1581		1638	911
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	660	708	0	23	34
RTOR Reduction (vph)	0	0	0	0	0	30
Lane Group Flow (vph)	0	660	708	0	23	4
Confl. Peds. (#/hr)	402			402	23	184
Confl. Bikes (#/hr)				92		3
Heavy Vehicles (%)	0%	2%	1%	0%	9%	3%
Parking (#/hr)		10	10			
Turn Type		NA	NA		Prot	Perm
Protected Phases		2	6		4	
Permitted Phases						4
Actuated Green, G (s)		68.4	68.4		9.6	9.6
Effective Green, g (s)		68.4	68.4		9.6	9.6
Actuated g/C Ratio		0.76	0.76		0.11	0.11
Clearance Time (s)		5.4	5.4		6.6	6.6
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1190	1201		174	97
v/s Ratio Prot		0.42	c0.45		c0.01	
v/s Ratio Perm						0.00
v/c Ratio		0.55	0.59		0.13	0.04
Uniform Delay, d1		4.5	4.7		36.4	36.1
Progression Factor		0.74	1.00		1.00	1.00
Incremental Delay, d2		0.8	2.1		0.3	0.2
Delay (s)		4.1	6.8		36.8	36.2
Level of Service		A	A		D	D
Approach Delay (s)		4.1	6.8		36.4	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			6.7		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.53			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			64.0%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

Queues

3: Danforth Ave & Pape Ave

2032 Total Background + TOC - PM



Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	97	521	71	543	114	556	607
v/c Ratio	1.04	1.00	0.65	1.00	0.34	0.79	1.16
Control Delay	140.3	71.1	59.7	73.7	13.4	25.9	107.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay	140.3	71.1	59.7	73.7	13.4	25.9	107.9
Queue Length 50th (m)	~18.2	~88.6	13.0	~103.2	4.5	40.0	~77.4
Queue Length 95th (m)	#48.0	#153.9	m#28.9	#165.0	20.9	#60.9	#123.2
Internal Link Dist (m)		180.9		122.6		69.5	60.3
Turn Bay Length (m)	40.0		40.0		60.0		
Base Capacity (vph)	93	520	109	541	333	706	524
Starvation Cap Reductn	0	0	0	0	0	0	6
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	1.04	1.00	0.65	1.00	0.34	0.79	1.17

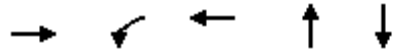
Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Queues

9: Pape Ave & Lipton Ave

2032 Total Background + TOC - PM



Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	35	114	107	538	562
v/c Ratio	0.08	0.48	0.38	0.46	0.58
Control Delay	2.3	28.9	14.2	14.3	20.9
Queue Delay	0.0	0.0	0.0	1.4	0.4
Total Delay	2.3	28.9	14.2	15.7	21.2
Queue Length 50th (m)	0.0	14.5	5.1	27.3	45.6
Queue Length 95th (m)	2.8	31.3	18.9	m42.0	66.3
Internal Link Dist (m)	24.1		47.1	60.3	25.7
Turn Bay Length (m)					
Base Capacity (vph)	465	239	279	1157	968
Starvation Cap Reductn	0	0	0	404	0
Spillback Cap Reductn	2	0	0	0	98
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.08	0.48	0.38	0.71	0.65

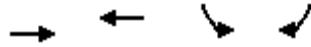
Intersection Summary

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

Queues

11: Danforth Ave & Woodcrest Ave

2032 Total Background + TOC - PM



Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	660	708	23	34
v/c Ratio	0.52	0.55	0.08	0.18
Control Delay	5.0	8.0	31.8	13.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	5.0	8.0	31.8	13.5
Queue Length 50th (m)	25.1	59.7	3.4	0.0
Queue Length 95th (m)	m29.4	93.9	9.9	7.9
Internal Link Dist (m)	84.9	101.1	51.8	
Turn Bay Length (m)				
Base Capacity (vph)	1273	1286	389	243
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.52	0.55	0.06	0.14







Intersection Summary

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

HCM Unsignalized Intersection Capacity Analysis

17: Pape Ave & Bus Loop Entrance

2032 Total Background + TOC - PM

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↑↑			↑↑
Traffic Volume (veh/h)	0	0	623	12	28	551
Future Volume (Veh/h)	0	0	623	12	28	551
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	0	636	12	29	562
Pedestrians	1190					
Lane Width (m)	0.0					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)	50					
pX, platoon unblocked	0.88	0.88			0.88	
vC, conflicting volume	2171	1514			1838	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2057	1309			1678	
tC, single (s)	6.8	6.9			6.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			3.2	
p0 queue free %	100	100			74	
cM capacity (veh/h)	32	134			111	
Direction, Lane #	NB 1	NB 2	SB 1	SB 2		
Volume Total	424	224	216	375		
Volume Left	0	0	29	0		
Volume Right	0	12	0	0		
cSH	1700	1700	111	1700		
Volume to Capacity	0.25	0.13	0.26	0.22		
Queue Length 95th (m)	0.0	0.0	7.4	0.0		
Control Delay (s)	0.0	0.0	18.9	0.0		
Lane LOS					C	
Approach Delay (s)	0.0			6.9		
Approach LOS						
Intersection Summary						
Average Delay			3.3			
Intersection Capacity Utilization			39.3%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 19: Danforth Ave & Eaton Ave













2032 Total Background + TOC - PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕			
Traffic Volume (veh/h)	93	613	715	43	0	0
Future Volume (Veh/h)	93	613	715	43	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	103	681	794	48	0	0
Pedestrians		47	12		571	
Lane Width (m)		3.5	3.5		0.0	
Walking Speed (m/s)		1.1	1.1		1.1	
Percent Blockage		4	1		0	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		147	109			
pX, platoon unblocked	0.80				0.80	0.80
vC, conflicting volume	1413				2288	1436
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1392				1930	1420
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	74				100	100
cM capacity (veh/h)	400				43	129
Direction, Lane #	EB 1	WB 1				
Volume Total	784	842				
Volume Left	103	0				
Volume Right	0	48				
cSH	400	1700				
Volume to Capacity	0.26	0.50				
Queue Length 95th (m)	7.7	0.0				
Control Delay (s)	8.6	0.0				
Lane LOS	A					
Approach Delay (s)	8.6	0.0				
Approach LOS						
Intersection Summary						
Average Delay		4.2				
Intersection Capacity Utilization		99.5%		ICU Level of Service		F
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
 21: Pape Ave & Gertrude PI

2032 Total Background + TOC - PM

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (veh/h)	15	15	623	0	0	564
Future Volume (Veh/h)	15	15	623	0	0	564
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	15	15	636	0	0	576
Pedestrians	1191		4			
Lane Width (m)	3.5		3.5			
Walking Speed (m/s)	1.1		1.1			
Percent Blockage	80		0			
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)	87					
pX, platoon unblocked	0.90	0.90			0.90	
vC, conflicting volume	2119	1509			1827	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2017	1336			1691	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	42			100	
cM capacity (veh/h)	9	26			69	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	15	15	318	318	288	288
Volume Left	15	0	0	0	0	0
Volume Right	0	15	0	0	0	0
cSH	9	26	1700	1700	1700	1700
Volume to Capacity	1.65	0.58	0.19	0.19	0.17	0.17
Queue Length 95th (m)	21.1	13.6	0.0	0.0	0.0	0.0
Control Delay (s)	1112.6	264.4	0.0	0.0	0.0	0.0
Lane LOS	F	F				
Approach Delay (s)	688.5		0.0		0.0	
Approach LOS	F					
Intersection Summary						
Average Delay			16.6			
Intersection Capacity Utilization			27.2%		ICU Level of Service	A
Analysis Period (min)			15			