
*Municipal Class Environmental Assessment for
Road Improvements near Derry Road East and Alstep Drive:
Environmental Study Report*

Appendix C: Transportation Assessment Report



Transportation Assessments

Bombardier Aerospace – Pearson

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Municipal Class Environmental Assessment
for Road Improvements near
Derry Road East and Alstep Drive

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1. Introduction

1.1. Overview

Bombardier Aerospace (Bombardier), the Region of Peel (Region) and the City of Mississauga (City) have initiated a Schedule 'C' Municipal Class Environmental Assessment (EA) in accordance with the Municipal Engineers Association's Municipal Class EA process for the roadway improvements on Derry Road (Regional Road 5) from Bramalea Road to Menkes Drive and for the extension of Alstep Drive.

EXP has been retained by Bombardier Aerospace to assist with its industrial development on the parcel of land situated just north of the Toronto Pearson International Airport at 1890 Alstep Drive, Mississauga, Ontario. The land is owned by the Government of Canada and administered by the Greater Toronto Airports Authority (GTAA). The development will generate an increase in traffic, which will have an impact on the existing roadway network. To accommodate the increase in traffic demands, improvements to the infrastructures will be required. As such, a Class EA is being undertaken as per the Municipal Engineers Association (MEA) Class EA Manual (October 2000, as amended in 2007, 2011 & 2015).

The Class EA Study will examine alternatives for local intersection improvements along Derry Road to address short- and long-term transportation needs related to planned growth to the year 2031. The Study will look at opportunities to facilitate movement of vehicles, transit, goods movement, walking and cycling within the Study Area.

This report documents the transportation need and justification for intersection improvements and the extension of Alstep Drive, as part of the Municipal Class EA process, and specifically:

- ◆ Develops a vision for the study area that supports the creation of a multi-modal network through consideration of the needs for Active Transportation (AT), and all vehicle types;
- ◆ Examines the implications of development plans on this study area; and
- ◆ Establishes storage lane requirements for the signalized intersections within the Study Area.

1.2. Class EA Study Area

The study area for this Class EA is primarily along Derry Road East (185 metres (m) west of Menkes Drive and 450 m east of Bramalea Road) and Bramalea Road (485 m south of Derry Road East and 410 m north of Derry Road East). The study area comprises of two existing signalized intersections on Derry Road, local municipal roads, and multiple accesses, including the Fed-Ex facility, that are expected to be impacted from the 1890 Alstep Drive development. The study area is depicted in **Figure 1**.



Figure 1 - Study Area for Derry Rd Class EA

2. Planning Context

The following studies, projects and initiatives provide a planning context for the Bombardier Aerospace Class EA:

2.1. A Place to Grow: Growth Plan for the Greater Golden Horseshoe

A Place to Grow: Growth Plan for the Greater Golden Horseshoe (Growth Plan) is Ontario's plan for managing growth and development in the Greater Golden Horseshoe (GGH) in a way that "supports economic prosperity, protects the environment, and helps communities achieve a high quality of life¹." The Growth Plan was originally released in 2006 and most recently updated in 2019.

2.2. Provincial Policy Statement

The Provincial Policy Statement (PPS) is a provincial policy document that provides direction on land use planning and development. It was first issued under Section 3 of the Planning Act in 2005. The current PPS came into effect May 1, 2020 and replaces 2014 PPS.

2.3. Metrolinx "The Big Move" – Regional Transportation Plan for the GTHA

The Big Move is a multi-modal long-range regional transportation plan that provides strategic direction for planning, designing and building a transportation network to enhance quality of life, environment, and prosperity of people who live in the region.

2.4. Region of Peel Official Plan

The Region of Peel's Official Plan (ROP) includes policies to better serve development of the transportation network including Transportation Demand Management (TDM) policies and programs to improve and enhance travel alternatives and reduce traffic congestion. The ROP's Schedules E and F identify Derry Road as a Major Road with mid-block ROW requirements of 45 m, which is consistent with the MiOP.

2.5. Region of Peel Long Range Transportation Master Plan

In June 2019, the Region's Long-Range Transportation Plan (LRTMP) was endorsed by Peel's Regional Council. The LRTMP identifies Derry Road East as being part of the Region's existing pedestrian and cycling network. The LRTMP does not identify any road widenings or other road improvements in the project study area. However, the Hurontario Light Rail Transit (HuLRT) project will begin operations during the build-out year. The MiWay routes (42 and 104) are expected to have connections to the LRT.

2.6. Region of Peel Active Transportation Plan

The Active Transportation Plan (November 2011) has developed policies that support more walking and cycling in the Region and recommends network improvements to expand the existing pedestrian and cycling networks. The plan is encouraging active transportation facilities to be accommodated within all regional road corridors to provide safe and convenient access to adjacent land uses and destinations and

¹ Government of Ontario. A Place to Grow: Growth plan for the Greater Golden Horseshoe. <https://www.ontario.ca/document/place-grow-growth-plan-greater-golden-horseshoe>.

connect with existing and planned transit services to be used by all citizens, especially persons with disabilities and other priority group. The study identifies improvements along some sections of Derry Road to enhance active transportation experience.

2.7. Region of Peel Strategic Goods Movement Network Study (April 2013)

The Strategic Goods Movement Network study developed a systematic route network throughout Peel Region. The study identifies Derry Road as primary truck route connecting goods manufacturers with destinations and highways.

2.8. Vision Zero

Vision Zero is the Region's road safety strategic plan. The purpose of Vision Zero is to prevent people from getting severely injured or killed in motor vehicle collisions in Peel Region. The vision of Vision Zero is zero fatal and severe injury collisions for all users, with the goal of a 10% reduction in fatal and severe injury collisions by 2022.

2.9. City of Mississauga Official Plan

The policies of the City of Mississauga's Official Plan (MiOP) apply to all lands within the City of Mississauga, except for those owned by the Federal Crown or the Provincial Crown. A portion of this study area is owned by the Federal Crown; therefore, the policies of the MiOP do not apply to those specific lands. The paragraphs below describe the portions of the MiOP that are applicable to this project.

Road Network

Derry Road East and Bramalea Road (north of Derry Road) are all identified roads in the MiOP. Schedules 5 and 8 of the MiOP provide the following designations and Right-of-Way width (ROW):

- Derry Road East: Regional Arterial with a 45 m ROW; and
- Bramalea Road (north of Derry Road): Major Collector with 30 m ROW.

Active Transportation

Schedule 7 (Long Term Cycling Routes) of the MiOP identifies Derry Road East as a Primary On-Road / Boulevard Route (Regional).

Urban System

Based on the City's MiOP Schedule 1 (Urban System), there are four different land classifications within the project study area: Corridor, Airport Special Purpose Area, Employment Area, and Green System. These classifications are depicted in **Figure 2**.



Figure 2 - City of Mississauga Urban System in Project Study Area

2.10. City of Mississauga Cycling Master Plan

The City of Mississauga City Council ratified its 2018 Cycling Master Plan (MiCMP) on July 4th, 2018. The MiCMP identifies the section of Derry Road East within the study area as an area recommended for On-Road Facility Upgrades (the specific upgrades are not specified but would be based on a bicycle facility design guide recommended in Section 6.5 of the MiCMP). The MiCMP also shows a future bike lane running along Telford Way to Derry Road East and a Multi-use Trail running along Bramalea Road north of Derry Road East.

2.11. City of Mississauga Zoning By-law No. 0225-2007

The Class EA study area includes multiple zoning designations. The purposes of these designations are as follows: Employment Zone (E2 and E3), Commercial Zone (C1 to C5), Greenlands Zone (G1), Open Space Zone 2 (OS2), and Airport Zone (AP).

3. Existing Conditions

3.1. Road Network

The boundary road network within the study area is outlined below. On-street parking is prohibited on all roadways. Truck traffic is allowed on all roadways.

Derry Road (Regional Road 5) is an east-west Regional arterial road under jurisdiction of the Region of Peel. The road has an existing six-lane urban cross section with a posted speed limit of 70 km/h. Derry Road is signalized at Bramalea Road and Menkes Drive with auxiliary left-turn and right-turn only lanes on at the intersections in the study area. There are no sidewalks provided on either side of the road. There is a multi-use trail on the south side of Derry Road.

Bramalea Road is a north-south collector road under the jurisdiction of the City of Mississauga. The urban cross section varies from two lanes to a maximum of five lanes within the study area. North of Derry Road, the road has an existing five-lane urban cross section with auxiliary left and right turn lanes at the intersection. South of Derry Road the cross section tapered from four to two lanes. The road maintains a speed limit of 50 km/h. Bramalea Road is signalized at Derry Road with auxiliary left-turn lanes. Sidewalks are present on both sides of the road, north of Derry Road. On the section, south of Derry, sidewalk is incomplete.

Menkes Drive is a north-south local road under the jurisdiction of the City of Mississauga. Menkes Drive maintains a speed limit of 50 km/h. It consists of a 3-lane urban cross section with sidewalk provided on the east side of the road.

Telford Way is a north-south local road under the jurisdiction of the City of Mississauga. Telford Way maintains a speed limit of 50 km/h. It consists of a 3-lane urban cross section with sidewalk provided on the west side of the road.

Alstep Drive is an east-west local industrial road under the jurisdiction of the City of Mississauga. Alstep Drive maintains a speed limit of 50 km/h. It consists of a 3-lane urban cross section with sidewalk provided on the north side of the road.

Menway Court is a north-south local industrial road under the jurisdiction of the City of Mississauga and maintains a speed limit of 50 km/h. It consists of a 3-lane urban cross section with sidewalk provided on the east side of the road.

Three privately owned accesses on Bramalea Road, south of Derry Road, leading to the Fed-Ex Distribution Centre, were included as part of the study area. Their inclusion is to ensure changes to the site-generated traffic wouldn't excessively impact operations at the facility.

Figure 3 illustrates the existing lane configuration and traffic control on all streets within the study area.

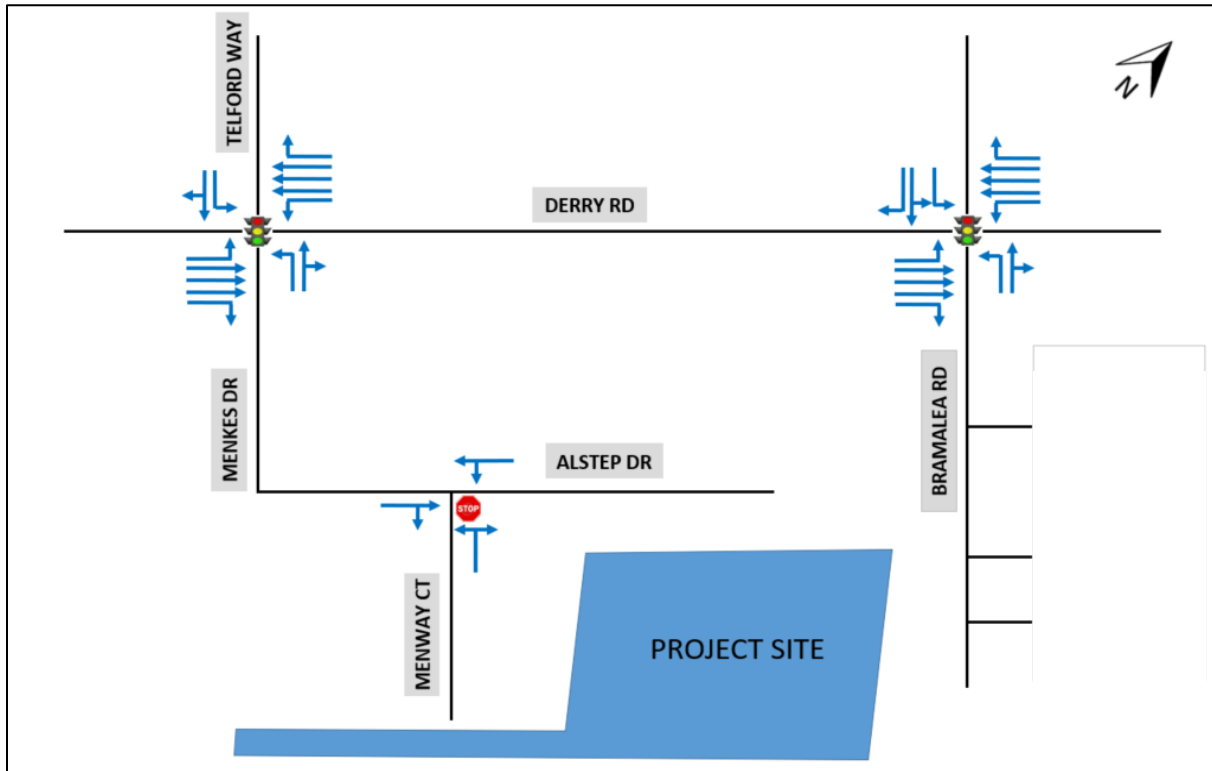


Figure 3 - Existing Lane Configuration and Traffic Control in the Study Area

3.2. Development Environs

The subject site is located on the west side of Bramalea Road south of the Derry Road East intersection, in the City of Mississauga. The site is situated within proximity of a variety of land uses readily accessible to pedestrians, including but not limited to:

- Local transit stops (Derry Road at Bramalea Road) approximately 250 m away;
- Commercial area, including gas stations and restaurants located approximately 800 m west; and;
- Local cycling network along Derry Road is located approximately 250 m to the north via Derry Road and Bramalea Road.

The subject site's location provides access to the arterial roadway network and exposes future Bombardier Employees to frequent transit service.

3.3. Transit and Active Transportation Network

In May 2010, Peel Region launched a program called Walk and Roll Peel. The program provides information and support to encourage residents to start cycling and walking more. The report recommends that Peel Region support area municipalities in the extension and implementation of public biking and walking infrastructure. The Active Transportation Plan suggests that walking and biking infrastructure should be accommodated within all regional road corridors to provide access to adjacent land uses and connection to destinations.

Pedestrian and Cycling Network

Pedestrian and cycling infrastructure are outlined in **Figure 4**. A narrow asphalt strip is provided above the curb in all locations where proper sidewalks or pathways are not provided.

Amenities at the Bramalea Road and Derry Road E intersection include high visibility crosswalks (in the north, west, and south approaches) and connections to existing bus stops. On Bramalea Road, north of Derry Road E, there is a sidewalk with a wide grass boulevard on the west side, and a multiuse pathway abutting the road on the east side.

At the Menkes Drive, Telford Way and Derry Road E intersection, high visibility pedestrian crosswalks are provided in all four approaches. A sidewalk with a wide grass boulevard is present on Telford Way's west side as well as on Menkes Drive's east side.



Figure 4 - Pedestrian and Bicycle Network in the Study Area

On Alstep Drive, a standard sidewalk with a grass boulevard exists on the north side of the street and rounds the cul-de-sac. The same exists on the east side of Menway Court, however the sidewalk ends at the cul-de-sac.

Cycling connections are provided via the multi-use pathways on south side of Derry Road E and east side of Bramalea Road. No on-street cycling infrastructure exists in the study area.

Transit Network

The project site will be within walking distance to MiWay and Brampton Transit bus stops, specially near the intersection of Derry Road E & Bramalea Road. All the transit routes operate within proximity to the

site with bus stops for each route. Shelters are provided for bus stops on Derry Road. **Figure 5** displays the transit connections within proximity to the development.

- Miway 42: Derry – West/East route between Meadowvale Town Centre and Westwood Square. Expected every 12 minutes during the study peak hours, Monday through Saturday. Connection to Malton GO Station.
- Miway 104: Derry Express – West/East route between Meadowvale Town Centre and Westwood Square. Expected every 15 minutes during the study peak hours, weekdays only. Connection to Malton GO Station.



Figure 5 - Transit Network in the Study Area

- Brampton Transit 15: Bramalea – North/South route between Bramalea Road & Inspire Boulevard (in Caledon) and Telford Way & Tranmere Drive. Expected every 20 minutes during the study peak hours on weekdays. Connections to the Bramalea GO Station and Bramalea Bus Terminal.
- Brampton Transit 115: Airport Express – North/South route between Bramalea Bus Terminal and Pearson Airport Terminal 1. Expected every 25 minutes during the study peak hours on weekdays. Only makes boarding trips when travelling northbound, and alighting trips when travelling southbound.

3.4. Existing Pavement Condition

The pavement quality the entire corridor appears to be in good condition. A geotechnical investigation is on-going as part of this Class EA study to identify the current pavement structure on Derry Road East.

3.5. Pavement Markings

The entire study area is paved with painted lane markings conforming to OTM Book 11 – Markings and Delineation. A site visit conducted in June 2019 reveals the following information regarding the existing conditions of the lane markings:

- At the intersection of Derry Road with Bramalea Road, the pavement markings at all approaches appear to be clearly marked and show noticeable deterioration. The stop bars and crosswalks are clearly visible on all approaches.
- At the intersection of Derry Road with Menkes Drive, the pavement markings at all approaches appear to be clearly marked and show noticeable deterioration. The stop bars and crosswalks are clearly visible on all approaches.

3.6. Planned Capital Works

Based on review of Approving Agencies' Capital Plans and through consultation, it was identified that the study area's road network would remain the same. There are no network road improvements planned within the study area that will affect area traffic within the 2031 horizon year. In addition, there are no pedestrian and cycling improvements expected to take place in the study area. However, the Hurontario Light Rail Transit (HuLRT) project will begin operations during the build-out year. The MiWay routes (42 and 104) are expected to have connections to the LRT. It is acknowledged that automobile volumes may be reduced once the HuLRT is operational.

The City of Mississauga has requested that the Site's traffic impact analysis include the extension of Alstep Drive from the current cul-de-sac to Bramalea Road in the future road network. Any potential extension of Alstep Drive would follow the existing right-of-way allowance and the intersection of the Alstep Drive extension and Bramalea Road would be offset from the FedEx truck entrance.

It should be noted that any requirement for the extension of Alstep Drive is not due to traffic generated by the Bombardier Aerospace development. An additional access from the development to Bramalea Road could be created by rearranging the internal road network and parking lot layout, thereby accommodating similar traffic volumes as by the Alstep Drive extension. There may even be a benefit to an access aligning with the FedEx truck entrance, in terms of intersection spacing.

The justification for the extension of Alstep Drive stems from City's desire to create a finer grid road network and to provide network options for existing traffic. While this is understood as a transportation engineering principle it is evident that the demand for this additional road link is limited.

Traffic originating from properties on Alstep Drive or Menway Court traveling to the east would be expected to use an extension to Alstep Drive if the total travel time could be reduced. A sensitivity analysis was conducted to that effect and is presented further in this report.

There are several planned road studies in proximity to the study area.

- Truck Friendly Measures Study (for Derry and Dixie Rd): This study is being done on Derry Road and concerns the possibility of truck friendly measures (i.e. truck only lane, etc.). On Dixie Road, this may include Truck Signal Priority (signal optimization for trucks).

- Bus Priority Measures Feasibility Study for Derry Road: Metrolinx is studying the feasibility of bus priority measures (i.e. queue jumps, etc.) on Derry Road in the study area.
- Long Combination Vehicles Study: as part of the action items from the Region's Long Combination Vehicles Study, intersection improvements to facilitate turning movement of LCVs will be examined on Regional roads including Derry, Dixie, and Airport.
- MyWay planning improvements in the northwest quadrant of the Derry Road and Bramalea Road intersection.

3.7. Roadway Design Criteria

A summary of the design criteria to be utilized in the preliminary design for the Derry Road Class EA study is presented in **Table 1** and a detailed version is shown in **Exhibit F**.

Table 1 - Roadway Design Criteria

		Derry Rd	Bramalea Rd	Menkes Dr	Alstep Dr	Menway Ct
DESIGN PARAMETERS	DESIGN STANDARD REFERENCE	DESIGN STANDARDS	DESIGN STANDARDS	DESIGN STANDARDS	DESIGN STANDARDS	DESIGN STANDARDS
Road Classification Design Vehicle	TAC Table 2.6.2	6 Lane UAD90	6 Lane UAD90	3 Lane UCU	3 Lane ULU	2 Lane ULU
	Peel Region	WB-20	WB-20	WB-20	WB-20	WB-20
Posted Speed		70 km/h	70 km/h	50 km/h	50 km/h	50 km/h
Design Speed		90 km/h	90 km/h	60 km/h	60 km/h	60 km/h
Min. Stopping Sight Distance	TAC Table 2.5.2	160m	160m	85m	85m	85m
Equivalent Min. 'K' Factor Crest	TAC Table 3.3.2	39	39	11	11	11
Equivalent Min. 'K' Factor Sag	TAC Table 3.3.5	15-20	15-20	8-9	8-9	8-9
Max. Grade	TAC Table 3.3.1	6%	6%	6%	6%	6%
Min. Grade	TAC Section 3.3.2.5	0.5%	0.5%	0.5%	0.5%	0.5%
Min. Radius	TAC Table 3.2.4	2620m (Normal Crown)	2620m (Normal Crown)	1290 (Normal Crown)	1290 (Normal Crown)	1290 (Normal Crown)
Lane Width	TAC Table 4.2.3	3.5m Through lane 3.5m Curb Lane 3.5m Dual Left Lane	3.5m Through lane 3.5m Curb Lane 3.5m Dual Left Lane	3.3m Through lane 3.35m Curb Lane 3.5m Dual Left Lane	3.95m Curb Lane 4.50m Two-Way-Left Turn Lane	4.9m
Median Width	TAC Section 4.5.2	2.0m	2.0m	2.0m	2.0m	2.0m
-Right Turn Lane Taper -Right Turn Lane Deceleration Length	TAC Table 10.6.2	80m 160m	80m 160m	14:1 40m	14:1 40m	14:1 40m
-Left Turn Lane Taper -Left Turn Lane Deceleration Length	TAC Table 9.17.1	27:1 160m	27:1 160m	15:1 85m	15:1 85m	15:1 85m

3.8. Existing Traffic Data

Turning Movement Counts (TMC) were conducted by a contractor on February 19, 2019 for a time frame, which encompasses the weekday morning and afternoon peak hour period and starts from 6:00AM to 7:00PM. To better understand the traffic pattern in the study area, TMC were taken at signalized intersections, at accesses along Bramalea Road and at the unsignalized intersection at Alstep Drive and Menway Court. The recorded TMC were balanced to remove differences between intersections when there are no accesses between them. The recorded traffic data are provided in **Appendix A**.

The peak hour traffic, within the study area, is generally oriented towards the employment areas closer to the airport and the central areas of the GTHA. The traffic pattern was analyzed using 24-hour Automated Traffic Recorder (ATR) data collected by the contractor at locations along Derry Road, between Menkes Drive and Bramalea Road. The hourly traffic travelling through Derry Road near the site, in 15-minute intervals, was plotted as shown in **Figure 6**.

The existing AM and PM peak hours are from 7:30 to 8:30 AM and from 4:30 to 5:30 PM. However, both peaks are prolonged and 'flat' (for example, from 2:00PM to 6:00PM volumes are relatively constant). In contrast, the site peak hours are from 6:15 to 7:15 AM and from 2:45 to 3:45 PM.

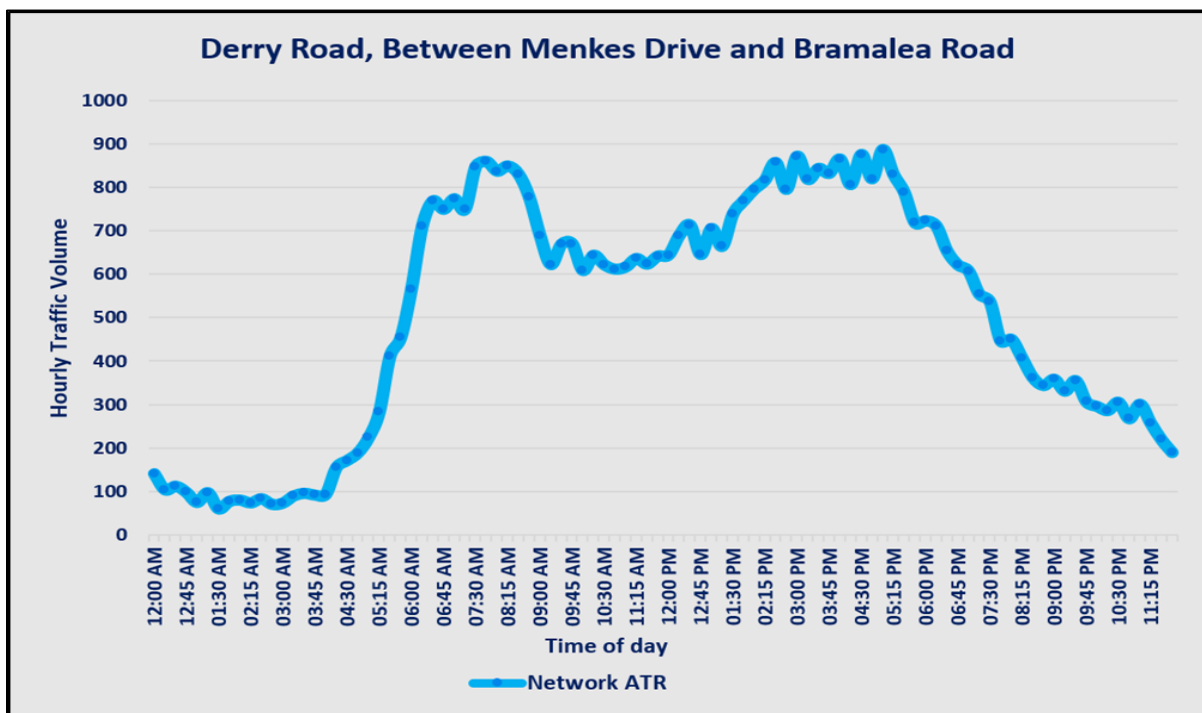


Figure 6 - Hourly Distribution of Traffic

The estimated daily traffic along the roadway network is as follow:

- Derry Road (Regional Road 5) has a two-way daily traffic of about 49,100 vpd.
- Bramalea Road (north of Derry Road) has a two-way daily traffic of about 15,500 vpd.

- Menkes Drive has a two-way daily traffic of about 3,200 vpd.
- Alstep Drive has a two-way daily traffic of about 1,000 vpd.
- Menway Court has a two-way daily traffic of less than 1,000 vpd.

3.9. Study Peak Hour

As the site’s peak and network existing peak hours do not coincide, it became essential to develop the appropriate AM and PM peak hours to be used in the study. During the morning hours (6:00 to 8:00 AM) and during the afternoon hours (2:00 to 6:00PM), existing roadway TMC at intersections near the site were added to the site auto-generated trips.

It appears that during the adjacent roadway peak hours, the few vehicles that will be entering and leaving the site would not have a considerable impact on the existing roadway peaks. Instead, the existing TMCs combined to the site’s traffic show a shift to earlier AM and PM peak hours (as seen in **Figure 7**). The traffic volumes for the 2019 Network Peak are depicted in **Exhibit 1**.

The combined or Study AM and PM peak hours are from 6:45 to 7:45 AM and from 3:00 to 4:00 PM. This report analyzes the traffic condition based on the **Study peak hours**. A complete Traffic Impact Study has been submitted to the City and Region in January 2020.

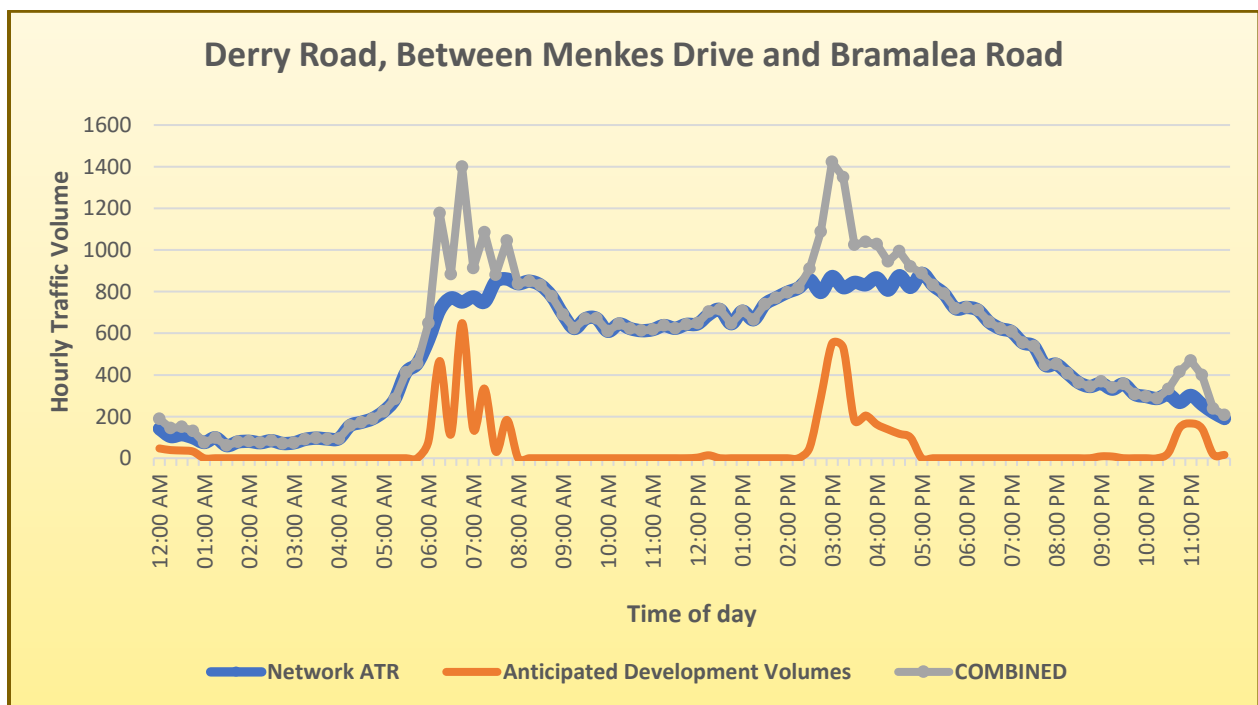


Figure 7 - Study Peak Hour Traffic

4. Traffic Operations Analysis

4.1. Traffic Operation Analysis Approach and Methodology

Sections 5 and 8 of this report detail the traffic operations analysis conducted for the signalized intersections along Derry Road and the unsignalized intersections along Bramalea Road and Alstep Drive within the Study Area. This analysis was completed for both build-out (2022) and future (2031) conditions during the weekday morning (AM) and afternoon (PM) peak hours to characterize operating conditions and identify locations requiring attention. The methodologies applied for the intersection traffic operations analyses are described as follows:

4.2. Intersection Analysis

Intersection level of service (LOS) is a recognized method of quantifying the efficiency of traffic flow at intersections. It is based on the delay experienced by individual vehicles executing various movements (Left, Thru, and Right) heading to a specific direction².

The intersection analysis considered two separate measures of performance: the LOS for each turning movement and the volume to capacity ratio (v/c) for each intersection. The delay is related to the number of vehicles desiring to make a movement, compared to the estimated capacity for that movement. The capacity is based on several criteria related to the opposing traffic flows.

LOS is divided into six possible ratings. The highest – or best – possible rating is LOS A, under which the average total delay is equal or less than 10.0 seconds per vehicle. When the average delay exceeds 80 seconds at signalized intersections, the movement is classed as LOS F, or a failed condition, and potential remedial measures are to be proposed and implemented.

The quality of traffic operations at the signalized and two-way STOP-controlled intersections was also assessed based on the v/c ratio. See **Table 2** for a summary of the HCM delay thresholds. The assessment comprises the following elements:

Table 2 - HCM Delay Threshold

Level of Service (LOS)	Signalized Intersection Average Total Delay (sec/veh)	Unsignalized Intersection Average Total Delay (sec/veh)
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

² Left=L; Thru=T; and Right=R

Northbound=NB; Southbound=SB; Eastbound=EB; and Westbound=WB; Westbound Left Turn=WBL

According to the Peel Region’s Capacity Analysis Policy, exclusive movements with v/c ratio exceeding 1 must be identified. Also, v/c ratios for overall intersection operations, through movements or shared through/turning movements equal to 0.9 or above must be reported.

For the purpose of this traffic study, all existing and future intersections will be used for the traffic operations analysis. The traffic analysis was conducted using the Synchro 10 software package, which uses the HCM methodology. The operation of the intersections in the study area were evaluated using the lane configuration and traffic control along with the related peak hour traffic volumes illustrated in **Figure 3**.

The capacity analysis used the assumptions and thresholds for Region of Peel and City of Mississauga intersections as described in **Table 3**. Traffic movements or intersections that exceed the thresholds noted above are considered “critical movements”.

It is also noted that queue lengths are based on an assumed vehicle and spacing length of 7 metres. The 95th percentile queue lengths are reported as the “%ile BackofQ(95%) veh/ln” in the HCM 6th Edition Synchro signalized reports and as “HCM 95th %ile Q(veh)” for Synchro unsignalized reports.

Table 3 - Regional and Municipal Capacity Analysis Guidelines

Intersections Operations	Region of Peel	City of Mississauga
Signalized Intersections		
V/C ratios	Less than or equal to 0.90 for the overall intersection operations, through movements or shared through/turning movements	Less than or equal to 0.85 for the overall intersection operations, through movements or shared through/turning movements
	Be less than 1.00 for exclusive movements	Be less than 0.90 for exclusive movements
95 th percentile Queue Lengths	Not exceed available lane storage for individual movements	Not exceed available lane storage for individual movements
Peak hour factors	Equal to 1.00 to assess existing conditions for all movements on all approaches	
Ideal Saturation Flow	Based on the Synchro default value of 1,900 vphpl for all movements	1,860 for advanced Left; 1,900 for through lanes; and 1,640 for right turn lanes
Vehicle Length	7.0 m	7.0 m
Unsignalized Intersections		
LOS	“E” or better for the overall intersection operations	“E” or better for the overall intersection operations
95 th percentile Queue Lengths	Not exceed available lane storage for individual movements	Not exceed available lane storage for individual movements

5. Existing Traffic Conditions

5.1. Existing Traffic Operations at Intersections

The existing (2019) condition analysis results are presented below in **Table 4** for signalized and unsignalized intersections in the study area as well as the critical driveway along Bramalea Road. A complete Synchro report for the existing conditions are provided in **Appendix B**.

AM Peak Hour Analysis

Under existing conditions during the morning Study peak hour (from 6:45 to 7:45 AM), both signalized intersections along Derry Road operate within acceptable LOS range and under capacity, with an overall LOS B and a v/c ratio less than 1. The 95th queue is less than the existing storage lengths for the EB, WB, SB, and NB left turn lanes. The NB and SB left turn movements experienced longer delays with LOS E or F. The v/c ration is below the threshold values. This is typical for minor roads crossing a major arterial like Derry Road, where most time is allocated for the EB and WB through movements.

Table 4 - Existing (2019) Traffic Condition

Analysis Period	Control	Intersection	Overall		Critical Movement(s)					
			LOS	Delay (s)	Mvmt	v/c	Delay	LOS	95 th Queue ³ (m)	Storage Capacity (m)
AM PEAK	Signalized	Bramalea Rd & Derry Rd E	B	19.9	EBL	0.51	12.2	B	38	210
					WBL	0.09	18.7	B	5	200
					NBL	0.24	81.5	F	7	89
					NBTR	0.36	86.8	F	10	130
					SBL	0.73	71.3	E	80	210
		Derry Rd E & Menkes Dr/Telford W	B	11.2	EBL	0.30	6.6	A	16	210
					WBL	0.21	8.4	A	6	115
					NBL	0.12	63.5	E	9	26
	Stop Control	Alstep Dr & Menway Ct	A	1.5	NBLTR	0.01	9.7	A	0	-
					Bramalea Rd & FedEx Truck Ent	A	7.2	WBLR	0.01	9.3
PM PEAK	Signalized	Bramalea Rd & Derry Rd E	C	25.1				EBL	0.76	24.5
					WBL	0.2	22.5	C	14	200
					NBL	0.67	89.9	F	40	89
					NBTR	0.73	94.7	F	43	130
					SBL	0.61	67.4	E	70	210
		Derry Rd E & Menkes Dr/Telford W	B	17.4	EBL	0.55	29.8	C	52	210
					WBL	0.2	9.6	A	7	115
					NBL	0.49	75.7	E	42	26
	Stop Control	Alstep Dr & Menway Ct	A	2.5	SBLTR	0.01	9.9	A	0	-
					Bramalea Rd & Fed-Ex Truck Ent	A	2.2	WBLR	0.02	9.0

³ 95thile Back of Queue from the Synchro output (in vehicle per lane) is multiplied by 7, which is an average length per vehicle, to get Queue Length in metres used on this Table. This note is valid for all subsequent tables in this report.

Unsignalized intersections within the study area operate at acceptable LOS and under capacity, with queue lengths less than 10 m.

PM Peak Hour Analysis

Under existing conditions during the afternoon Study peak hour (from 3:00 to 4:00 PM), both signalized intersections along Derry Road operate within acceptable LOS range and under capacity, with an overall LOS C or better and a v/c ratio less than 1. The 95th queue is less than the existing storage lengths for the EB, WB, SB, and NB left turn lanes. The NB and SB left turn movements experienced longer delays with LOS E or F. The v/c ration is also below the threshold values. This is typical for minor roads crossing a major arterial like Derry Road, where most time is allocated for the EB and WB through movements, to show longer delays.

Unsignalized intersections within the study area operate at acceptable LOS and under capacity, with queue lengths less 10 m.

The analysis was also conducted at a later morning and afternoon peak, which corresponds to the network study peak hours, from 7:30 to 8:30 AM and from 4:30 to 5:30 PM. In the morning from 7:30 to 8:30 AM, all intersections within the study area operate at an acceptable LOS with v/c ratios less than 0.90 and queue lengths less than the existing storage.

During the study PM peak 4:30 to 5:30 PM, all intersections operate at an acceptable LOS with v/c ratio less than 0.90 and queue lengths less than the existing storage.

6. Collision Analysis & Safety Performance Review

The collision analysis, presented in this section, was performed along the study area for the five-year period from 2014 to 2018. The analysis is based on a summary of police collision reports, which was provided to us by the Region of Peel and the City of Mississauga for the five-year period covering January 2014 to December 2018.

The study area includes three (3) signalized intersections, two (2) unsignalized intersections, segment of roadways between the intersections and three (3) major drive accesses along Bramalea Road. The collision data were analyzed, including collision location, collision severity, initial impact type, road surface condition, light and environmental conditions, vehicle manoeuvre, driver action, direction of travel and sequence of events.

The collisions were tabulated and analyzed to identify collision patterns, probable causes, and countermeasures to be considered during the Class EA process. The detailed collision analysis of intersections and road segments is presented in **Appendix E**.

6.1. Collision Summary

A total of 190 collisions with 30 injuries and no fatalities were reported within the project limits during the five-year study period. As shown in **Figure 8**, the most prevalent collision types were rear end, turning movement, and sideswipe collisions, which accounted for approximately 37%, 33%, and 14% of the total collisions, respectively. The remaining collision types, including approaching, angle, Single Motor Vehicle (SMV), and unknown accounted for the remaining 16% of the collisions. Three collisions involved pedestrians and no collision involved bicyclists. One collision involved a parked vehicle on Bramalea south.

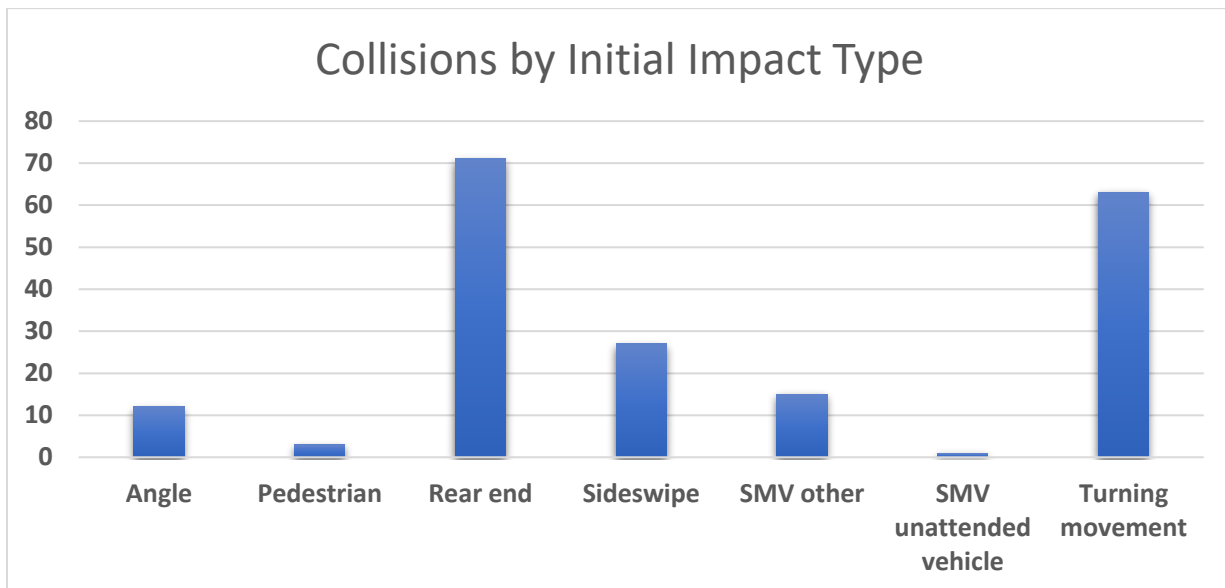


Figure 8 - Total Collisions by Initial Impact Type

Angle and turning collisions indicate a breakdown in the right-of-way. These collisions, involving stopping or slowing vehicles, may be attributable to motorists forcing their way into the through traffic. They usually have waited too long to make a turn and would not yield to the through traffic. These collisions may be attributable to speed and traffic congestion

Angle and turning collisions indicate a breakdown in the right-of-way. These collisions, involving stopping or slowing vehicles, may be attributable to motorists forcing their way into the through traffic. They usually have waited too long to make a turn and would not yield to the through traffic. These collisions may be attributable to speed and traffic congestion.

The rear end collisions involved vehicles stopping or slowing down for traffic. In addition to traffic congestion, these crashes may be attributable to high travel speeds, high number of access points, and driver’s distraction. Vehicles turning to and from access driveways, such as Shell, will slow down the vehicles behind. Sudden braking or stopping coupled with vehicles travelling too close together raises the chances of rear end collisions.

Sideswipe collision may be attributable to traffic congestion, speed, avoidance maneuvers, or driver inattention. The fixed object collisions may be attributable to weather, avoidance maneuvers, speed, or a lack of attention from the driver.

Between 2014 and 2018, collisions occurrence varies from 32 to 42 collisions per year, with the 42 collisions peak in 2015 and 2017. As shown in **Figure 9**, there was a peak in injury collisions in 2018.

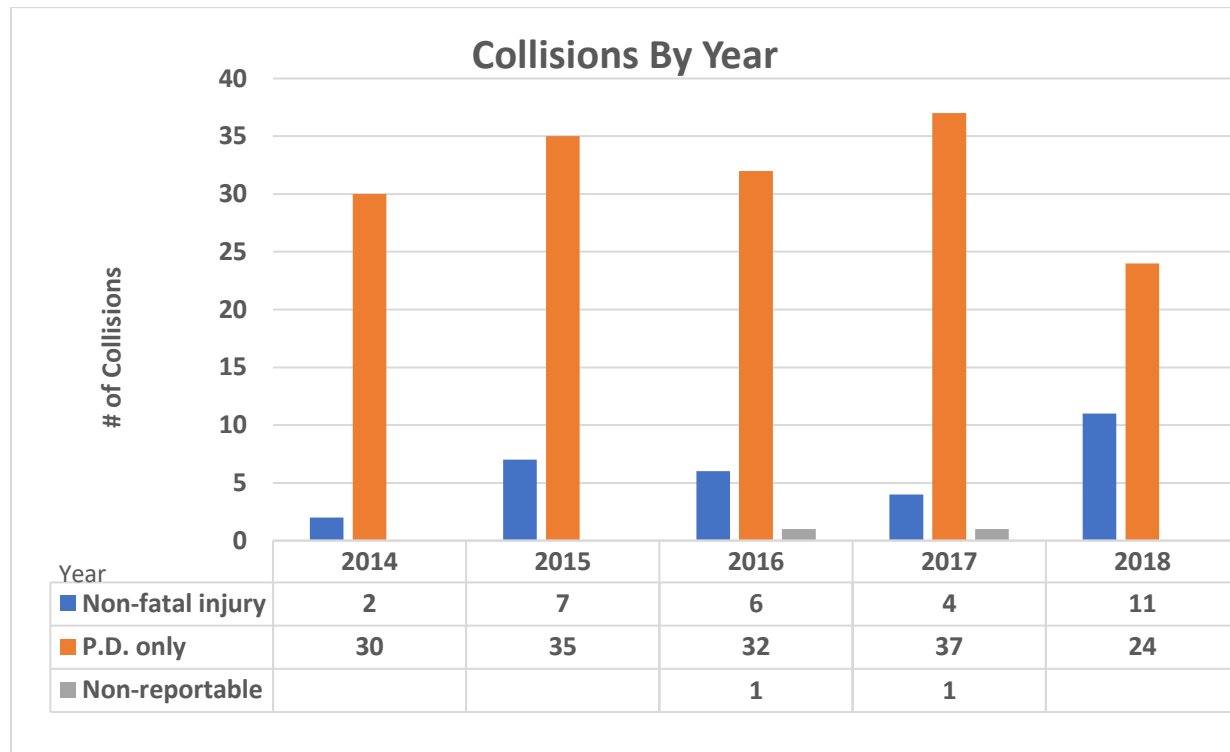


Figure 9 - Collision Summary by Year and Severity

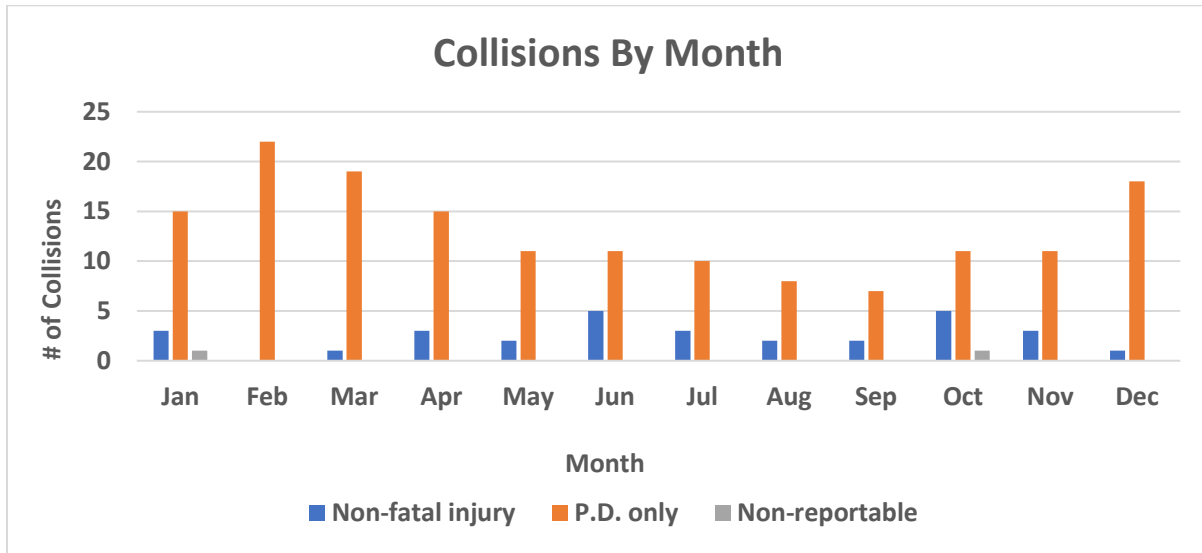


Figure 10 - Collision Summary by Year and Severity

Furthermore, the collision analysis indicated 81% of all collisions occurred on a dry roadway surface. Approximately 18% of the collisions are wet weather related; they occurred on wet roadway surface (11%) and on a snowy or icy pavement (8%).

This statistic, illustrated in **Figure 11**, demonstrates that roadway surface conditions may not be a significant cause for the collisions occurring within the project limits.

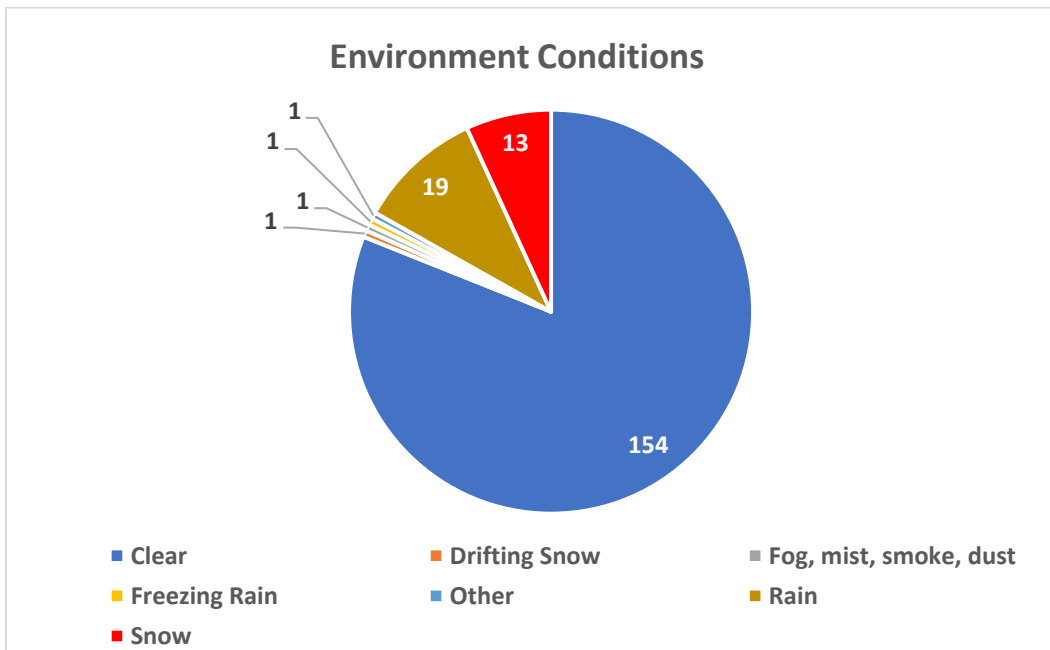


Figure 11 - Road Surface Condition

Most of the collisions occurred during daylight conditions (70%) with a smaller portion of collisions occurring during dawn/dusk (6%) or dark (24%) conditions.

This statistic, illustrated in **Figure 12**, demonstrates that lighting conditions may not be a significant cause for the collisions occurring within the project limits.

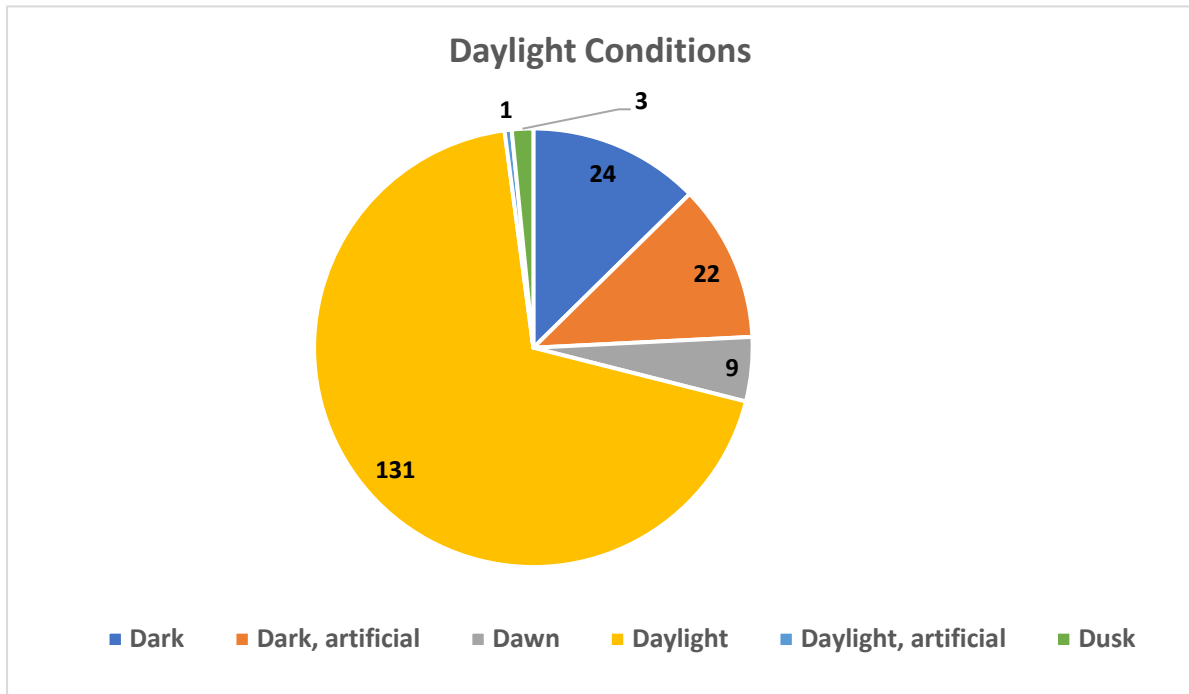


Figure 12 – Daylight Conditions

Collision by Location and Type

Table 5 shows the type of collision broken down by location proportioned by initial impact type. A total of 148 collisions occurred at intersection and 42 along mid-block sections.

As expected, approximately 170 collisions occurred along Derry Road, with 80% of them at the two signalized intersections. There are no reported collisions on Alstep Drive and Menway Court.

The pedestrian collision at Bramalea Road occurred when a transit bus making a SB right turn movement hit a pedestrian on the crosswalk. No injury was reported for this collision.

A pedestrian collision occurred on the west crosswalk of the Derry Road and Menkes Drive/Telford Way intersection. A NB vehicle making a left turn hit the pedestrian, resulting in a non-fatal injury.

Two pedestrian collisions occurred on the west crosswalk of the Derry Road and Menkes Drive/Telford Way intersection. NB vehicle making a left turn hit the pedestrians, resulting in non-fatal injuries.

Table 5 - Total Collision Summary by Location and Type

	Angle	Pedestrians	Rear End	Sideswipe	SMV Other	SMV Unattended	Turning	Total
Intersections								
Bramalea Rd & Boylen Rd / Logistics Dr	3		1				7	11
Bramalea Rd & Derry Rd	4	1	31	10	4	0	28	78
Derry Rd & Telford Way / Menkes Dr	4	2	17	7	3	0	25	58
Telford Way & Tranmere Dr							1	1
Total for Intersection Collisions	11	3	49	17	7	0	61	148
Collision Frequency by Type (%)	7%	2%	33%	11%	5%	0%	41%	100%
Midblock Sections								
Bramalea Rd between Derry Rd & Logistics Dr / Baylen Rd					1		2	3
Bramalea Rd between North Service Rd & Derry Rd			1	1	1			3
Derry Rd between Bramalea Rd & Vanguard Rd			4	1	3			8
Derry Rd between Bramalea Rd & Telford Way / Menkes Dr	1	0	15	5	1	1		23
Derry Rd between Dixie Rd & Telford Way / Menkes Dr			1	2				3
Menkes Drive between Derry Rd & Alstep Dr			0	1				1
Telford Way between Derry Rd / Menkes Dr & Tranmere Dr			1					1
Total for Mid-Block Collisions	1	0	22	10	6	1	2	42
Collision Frequency by Type (%)	2%	0%	52%	24%	14%	2%	5%	100%
Total Collisions within the Study Area	12	3	71	27	13	1	63	190

Collision by Location and Severity of Injury

Table 6 shows the collisions broken down by location proportioned by severity type of injury. Approximately 30 collisions resulted in non-fatal injuries. Of these collisions, 90% occurred along Derry Road, with 60% of them at the two signalized intersections. There are no fatal collisions reported within

the study area. There were three pedestrian collisions, which occurred at the signalized intersection and resulted in non-fatal injuries.

Table 6 - Non-Fatal Injury by Location and Collision Type

	Fatal Collision	Non-fatal Injury Collision	Property Damage (P.D.) only	Non-Reported	Total Collisions	Percentage of Total Collisions
Intersections						
Bramalea Rd & Boylen Rd / Logistics Dr		2	9		11	6%
Bramalea Rd & Derry Rd	0	8	68	2	78	41%
Derry Rd & Telford Way / Menkes Dr		10	48		58	30.5%
Telford Way & Tranmere Dr			1		1	0.5%
Total for Intersection Collisions	0	20	126	2	148	78%
Midblock Sections						
Bramalea Rd between Derry Rd & Logistics Dr / Baylen Rd			3		3	1.6%
Bramalea Rd between North Service Rd & Derry Rd	0	1	2	0	3	1.6%
Derry Rd between Bramalea Rd & Vanguard Rd		2	6		8	4.4%
Derry Rd between Bramalea Rd & Telford Way / Menkes Dr		6	17		23	12%
Derry Rd between Dixie Rd & Telford Way / Menkes Dr		1	2		3	1.6%
Menkes Drive between Derry Rd & Alstep Dr			1		1	0.5%
Telford Way between Derry Rd / Menkes Dr & Tranmere Dr			1		1	0.5%
Total for Mid-Block Collisions	0	10	32	0	42	22%
Total Collisions within the Study Area	0	30	158	2	190	100%

The results of the crash analysis revealed that the predominant crash types were rear end and turning movement collisions. These crashes mostly occurred on dry roadway surface during daylight hours. This pattern generally indicates a lack of capacity and failure to obey the posted speed limit.

6.2. Safety Performance Review

Table 7 - presents the network screening results provided by the Region for the main regional intersections and road segments within the study area. Network screening first determines the observed number of collisions and the number of collisions predicted by the SPFs developed or calibrated for the Region, for the same time period. The expected number of collisions for the location is then calculated using the Empirical Bayes method, and taking into account the number of observed collisions and the number of predicted collisions at the location. Finally, the potential for safety improvement (PSI) is calculated as the difference between the expected number of collisions and the predicted number of collisions. If the expected number of collisions is lower than the predicted number of collisions, the PSI takes the value 0.

As shown below, for the Region, the collisions were divided into *Severe*, which is a combination of all collisions causing injuries or fatalities, and *PDO*, which accounts for all collisions causing property damages only. The *All* category includes all collisions.

The PSI values were also divided into *Severe*, *PDO*, and *All*. In this case, the value of the PSI_{Severe} also takes into account the proportion of fatal and injury collisions on the network, at similar locations, as well as the social cost of fatal and injury collisions. **Table 7** shows that, for the period used for the network screening.

Table 7 - Network Screening Results

Observed Collisions			Predicted Collisions		Expected Collisions			PSI			Rank
Severe	PDO	All	Severe	PDO	Severe	PDO	All	Severe	PDO	All	
Derry Road and Menkes Drive/Telford Way											
7	42	49	7.94	37	7.22	41.57	48.79	0	4.56	4.56	187
Derry Road and Bramalea Road											
10	60	70	11.85	60.42	10.31	60.02	70.34	0	0	0	396
Derry Road and Vanguard Road											
1	5	6	1.93	8.64	1.37	5.55	6.92	0	0	0	396
Derry Road between Menkes Drive/Telford Way and Bramalea Road											
5	17	22	2.55	13.7	3.51	16.7	20.2	0.96	2.92	7.55	82

- The intersection of Derry Road and Menkes Drive/Telford Way performed better than predicted for severe collisions, but worse than predicted for PDO collisions. It obtained a PSI_{Severe} of 0, but a positive PSI_{PDO} . The intersection ranked 187th within the Region.
- The road segment of Derry Road between Menkes Drive/Telford Way and Bramalea Road performed worse than predicted for severe collisions and worse than predicted for PDO collisions. It obtained positive PSI values. The road segment ranked 82nd within the Region.
- The intersection of Derry Road and Bramalea Road performed better than predicted for all types of collisions and obtained a PSI of 0.

- The intersection of Derry Road and Vanguard Road performed better than predicted for all types of collisions and obtained a PSI of 0.
- The observed number of collisions for the period of 2014 to 2018 was not compared to the predicted or expected number of collisions for the same period, as the information required for this analysis was not provided by the Region.

6.3. Field Observations

A site visit is planned for Phase 3 of this study. Observations will be made to determine traffic patterns and driver behaviour along the roadways. Insights will be made to confirm the traffic flow and conditions were accurate with our assumptions.

6.4. Safety-Related Findings

The findings presented in this section are based solely on the collision analysis. These findings may be adjusted based on the results of the safety performance review and the site visit. Based on the collision analysis completed:

- The intersection of Derry Road and Menkes Drive/Telford Way appears to have a higher proportion of turning collisions involving EB and WB vehicles and rear end collisions involving EB or WB vehicles. None of the collisions seems to may have been attributable to poor environmental and lighting conditions.
- The intersection of Derry Road and Bramalea Road appears to have a higher proportion of turning collisions involving EB and WB vehicles and rear end collisions involving EB, WB, or SB vehicles. None of the collisions seems to may have been attributable to poor environmental and lighting conditions.
- The intersection of Bramalea Road and Boylen Road/Logistics Drive appears to have a higher proportion of angle and turning collisions involving EB and NB/SB vehicles and NB and SB vehicles. None of the collisions seems to may have been attributable to poor environmental and lighting conditions. The intersection appears to have been signalized after the 5-year period reviewed, potentially mitigating the collisions observed during our review.
- The intersection of Telford Way and Tranmere Drive had no identified collision pattern, with only one collision in the five-year period;
- The road segment of Derry Road between the western study area limit and Menkes Drive/Telford Way had no identified collision patterns. The collisions observed included: sideswipe collisions between WB vehicles and rear-end collision between EB vehicles.
- The road segment of Derry Road between Menkes Drive/Telford Way and Bramalea Road appears to have a higher proportion of rear-end collisions involving EB or WB vehicles and sideswipe collisions involving EB or WB vehicles.
- The road segment of Derry Road between Bramalea Road and the eastern study area limit appears to have a higher proportion of rear-end collisions involving WB vehicles and single motor vehicle (SMV) collisions involving EB or WB vehicles.
- The road segment of Alstep Drive between Menkes Drive and Menway Court had no reported collision in the five-year period.

- The road segment of Telford Way between Derry Road and Tranmere Drive had no identified collision pattern, with only one collision in the five-year period;
- The road segment of Bramalea Road between North Service Road and Derry Road had no identified collision patterns. The collisions observed included a rear end collision involving SB vehicles, a collision with a parked vehicle; and a SMV collision involving a SB vehicle.
- The road segment of Bramalea Road between Derry Road and Boylen Road/Logistics Drive had no identified collision patterns. The collisions observed included turning movement involving NB vehicles and SB and WB vehicles. A SMV also involved a SB vehicle.
- The road segment of Menkes Drive between Alstep Drive and Derry Road had no identified collision pattern, with only one collision in the five-year period;

6.5. Potential Countermeasures

Table 8 - Design and Operational Recommendations for Derry Road and Bramalea Road

Potential Contributing Factor	Design and/or Operational Considerations	Potential Safety Benefit
Right Angle / Turning Collisions		
Clearance Interval	Re-evaluate signal timing	Remove the Dilemma Zone Reduction of collisions with potentially severe injuries
Disobey Traffic Control Improper Turn	Address driver error through education and enforcement	Reduction of collisions with potentially severe injuries Work with Peel Regional Police to educate/enforce.
Sideswipe Collisions		
Inappropriate Gap Acceptance	Install intersection conflict warning system, to assist drivers in accepting appropriate gaps	Activated systems are available, or a static system using signs can assist drivers in judging the gap. No CMF available.
Speeding Improper Lane Change Evasive Manoeuvres	Address driver error through education and enforcement	Work with Peel Regional Police to educate/enforce.
Rear End Collisions		
Clearance Interval	Re-evaluate signal timing	Remove the Dilemma Zone
Traffic congestion	Review signal operations	Reduction of collisions with potentially severe injuries
Poor Road Surface Friction	Resurface pavement	CMF = 1.01 for All CMF = 0.95 for Fatal & Serious Injury
Speeding Distracted Driving	Address driver error through education and enforcement	Work with Peel Regional Police to educate/enforce.

Table 9 - Design and Operational Recommendations for Derry Road and Menkes Drive

Potential Contributing Factor	Related Design and/or Operational Considerations	Expected Safety Benefit
Rear End Collisions		
Clearance Interval	Re-evaluate signal timing	Remove the Dilemma Zone
Traffic congestion	Review signal operations	Reduction of collisions with potentially severe injuries
Poor Road Surface Friction	Resurface pavement	CMF = 1.01 for All CMF = 0.95 for Fatal & Serious Injury
Speeding Distracted Driving	Address driver error through education and enforcement	Work with Peel Regional Police to educate/enforce. No CMF available.
Right Angle/Turning Collisions		
Inadequate Clearance Interval	Modify change plus clearance interval to ITE 1985 Proposed Recommended Practice	CMF = 0.96 for Angle CMF = 0.92 for All
Speeding Disobey Traffic Control Improper Turn	Address driver error through education and enforcement	Work with Peel Regional Police to educate/enforce. No CMF available.
Pedestrian Collisions		
Speeding Evasive Manoeuvres Disobey Traffic Control Improper Turn	Address driver error through education and enforcement Review pedestrian clearance interval	Work with Peel Regional Police to educate/enforce. No CMF available.

7. Future (2022) Traffic Conditions

7.1. Future Traffic Volumes

The analysis of traffic condition for the year 2022 (site opening year) and 2031 horizon year is based on forecasted turning movement counts in the study area. A 2% growth rate has been applied to the 2019 turning movement counts to forecast 2022 and 2031 background traffic volumes as shown in **Exhibit 2** and **Exhibit 4** respectively. The 2% growth rate has been confirmed by the Region and City to be used for this study.

The projected future total traffic conditions in the weekday AM and PM peak study hours, for the 2022 and 2031 planning horizon, were derived by combining the future background traffic volumes with the trips generated by the proposed development. The 2022 future total traffic volumes for the weekday AM and PM peak hours at the study area intersections are summarized in **Exhibit 3**. The 2031 future total traffic volumes for the weekday AM and PM peak hours at the study area intersections are shown in **Exhibit 5**.

Using Synchro 10, the traffic operations for the study area was examined for the study peak as **Table 5**. Critical movements are displayed for all intersections; ones which violate the capacity criteria as outlined in **Section 4.2** are highlighted in red. The detailed Synchro reports can be found in **Appendices C and D**, showing the remaining movements with their respective results.

7.2. 2022 Future Background Intersection Operations

AM Peak Hour Analysis

Under year 2022 future background conditions, during the morning study peak hour (from 6:45 to 7:45 AM), the signalized intersection of Derry Road and Menkes Drive operates within acceptable LOS range and under capacity, with an overall LOS B. The 95th queue is less than the existing storage lengths for the EB, WB, SB, and NB left turn lanes. The v/c ratio is below the threshold values. The NB and SB left turn movements experienced longer delays with LOS E. This is typical for minor roads crossing a major arterial like Derry Road, where most time is allocated for the EB and WB through movements.

Under year 2022 future background conditions, during the morning study peak hour (from 6:45 to 7:45 AM), the signalized intersections of Derry Road and Bramalea Road operates within acceptable LOS range and under capacity, with an overall LOS C. The 95th queue is less than the existing storage lengths for the EB, WB, SB, and NB left turn lanes. The v/c ratio is below the threshold values. The NB and SB left turn movements experienced longer delays with LOS F. This is typical for minor roads crossing a major arterial like Derry Road, where most time is allocated for the EB and WB through movements.

Unsignalized intersections within the study area operate at acceptable LOS and under capacity, with queue lengths less than 10 m.

PM Peak Hour Analysis

Under year 2022 future background conditions, during the afternoon study peak hour (from 3:00 to 4:00 PM), the signalized intersections along Derry Road operates within acceptable LOS range and under

capacity, with an overall LOS B and C. The 95th queue is less than the existing storage lengths for the EB, WB, SB, and NB left turn lanes. The NB and SB left turn movements experienced longer delays with LOS E. The v/c ratio is below the threshold values. Unsignalized intersections within the study area operate at acceptable LOS and under capacity, with queue lengths less than 10 m.

Table 10 - 2022 Background Traffic Operations (from 6:45 to 7:45 AM & from 3:00 to 4:00 PM)

Analysis Period	Control	Intersection	Overall		Critical Movement(s)					
			LOS	Delay (s)	Mvmt	v/c	Delay	LOS	95 th Queue (m)	Storage Capacity (m)
AM PEAK	Signalized	Bramalea Rd & Derry Rd E	C	21	EBL	0.57	14.0	B	42	210
					WBL	0.10	21.0	C	6	200
					NBL	0.25	81.5	F	8	89
					NBTR	0.38	86.9	F	11	-
					SBL	0.74	71.2	E	91	210
					SBTR	0.00	0.0	A	0	-
		Derry Rd E & Menkes Dr/Telford W	B	11.9	EBL	0.34	7.2	A	18	110
					WBL	0.24	9.6	A	7	115
					NBL	0.13	63.1	E	11	26
					NBTR	0.37	69.9	E	12	-
	Stop Control	Alstep Dr & Menway Ct	A	1.5	NBLTR	0.01	9.7	A	0	-
					Bramalea Rd & FedEx Truck Ent	A	5.5	NBLTR	0.00	0.0
		WBLTR	0.01	9.3	A			0	-	
		SBLTR	0.01	7.9	A	0	-			
PM PEAK	Signalized	Bramalea Rd & Derry Rd E	C	27.2	EBL	0.84	35.1	D	80	210
					WBL	0.23	25.9	C	17	200
					NBL	0.68	89.7	F	46	89
					NBTR	0.74	95.2	F	50	-
					SBL	0.62	66.6	E	79	210
					SBTR	0.00	0.0	A	0	-
		Derry Rd E & Menkes Dr/Telford W	B	18.2	EBL	0.64	39.8	D	69	110
					WBL	0.23	10.8	B	8	115
					NBL	0.52	76.4	E	49	26
					SBL	0.38	66.7	E	45	26
	Stop Control	Alstep Dr & Menway Ct	A	2.5	NBLTR	0.03	9.4	A	1	-
					Bramalea Rd & Fed-Ex Truck Ent	A	2.2	NBLTR	0.00	0.0
		WBLTR	0.02	9.1	A			1	-	
		SBLTR	0.02	8.0	A	0	-			

7.3. 2022 Future Total Intersection Operations

AM Peak Hour Analysis

Under year 2022 future total conditions, during the morning study peak hour (from 6:45 to 7:45 AM), the signalized intersection of Derry Road and Menkes Drive operates within acceptable LOS range and under capacity, with an overall LOS B. The 95th queue is less than the existing storage lengths for the EB, WB, SB, and NB left turn lanes. The v/c ratio is below the threshold values. The NB and SB left turn movements experienced longer delays with LOS E. This is typical for minor roads crossing a major arterial like Derry Road, where most time is allocated for the EB and WB through movements.

Under year 2022 future total conditions, during the morning study peak hour, the signalized intersections of Derry Road and Bramalea Road starts showing increasing delays with an overall LOS E. The WBL is over capacity with a LOS F, a 95th queue longer than the existing storage lengths and a v/c ratio exceeding the threshold values. The NBTR is approaching capacity with a LOS F. The 95th queue is less than the existing storage lengths for the EB, SB, and NB left turn lanes. The v/c ratio is below the threshold values for most movements.

Unsignalized intersections within the study area operate at acceptable LOS and under capacity, with queue lengths less than 10 m.

PM Peak Hour Analysis

Under year 2022 future background conditions, during the afternoon study peak hour (from 3:00 to 4:00 PM), the signalized intersection of Derry Road and Menkes Drive operates with a failed LOS and over capacity. The 95th queue is less than the existing storage lengths for the EB and WB SB left turn lanes. The NB and SB left turn movement exceed their storage capacity. The NB and EB left turn movements experienced longer delays with LOS F. The v/c ratio is below the threshold values.

Under year 2022 future total conditions, during the afternoon study peak hour, the signalized intersections of Derry Road and Bramalea Road failed with an overall LOS F. The EB and WB are near capacity with a LOS E, a 95th queue longer than the existing storage lengths and a v/c ratio exceeding the threshold values. The NB is congested with a LOS F. The 95th queue is less than the existing storage lengths for the EB, SB, and NB left turn lanes. The v/c ratio is below the threshold values for some movements.

The unsignalized intersection of Alstep Drive and Bramalea Road operates with a failed LOS and over capacity. Its EBLTR movement shows a LOS F with v/c ratio greater than 2 and 95th queue exceeding the distance between Bramalea Road and the North Access to the Site,

All other unsignalized intersections near the site operate at acceptable LOS and under capacity, with queue lengths less than 10 m.

Table 11 - 2022 Future Total Traffic Operations (from 6:45 to 7:45 AM & from 3:00 to 4:00 PM)

Analysis Period	Control	Intersection	Overall		Critical Movement(s)					
			LOS	Delay (s)	Mvmt	v/c	Delay	LOS	95 th Queue (m)	Storage Capacity (m)
AM PEAK	Signalized	Bramalea Rd & Derry Rd E	E	74.4	EBL	0.65	24.8	C	62	210
					WBL	2.02	541.2	F	363	200
					NBL	0.10	67.4	E	6	89
					NBTR	0.85	109.0	F	61	-
					SBLL	0.74	72.6	E	114	210
					SBTR	0.77	73.8	E	133	-
		Derry Rd E & Menkes Dr/Telford W	B	15.4	EBL	0.36	8.9	A	21	110
					WBL	0.25	12.0	B	8	115
					NBL	0.54	69.4	E	58	26
					NBTR	0.30	62.3	E	11	26
	Alstep Dr & Menway Ct	A	1.6	NBLTR	0.10	16.8	C	2	-	
				NBL	0.14	18.3	C	4	-	
				NBR	0.05	9.9	A	1	-	
				EBTR	0.00	0.0	A	0	-	
North Access & Alstep Drive	A	3.9	WBLT	0.17	8.7	A	5	-		
			NBLTR	0.02	8.6	A	1	-		
			SBLTR	0.01	8.0	A	0	-		
			SBLTR	0.01	8.0	A	0	-		
PM PEAK	Signalized	Bramalea Rd & Derry Rd E	F	322.4	EBL	0.92	58.8	E	90	210
					WBL	0.61	59.7	E	55	200
					WBT	0.70	40.0	D	170	-
					NBL	1.80	460.6	F	266	89
					NBTR	5.28	2017.6	F	725	-
					SBLL	0.42	53.9	D	74	210
		Derry Rd E & Menkes Dr/Telford W	F	94.1	EBL	0.63	83.6	F	93	110
					WBL	0.03	13.9	B	10	115
					NBL	0.24	673.3	F	540	26
					NBTR	0.24	51.4	D	47	26
	Alstep Dr & Menway Ct	A	4	SBL	0.24	59.2	E	43	26	
				SBTR	0.24	54.9	D	71	-	
				NBLTR	0.31	13.3	B	10	-	
				NBL	0.34	13.5	B	11	-	
North Access & Alstep Drive	A	8.3	NBR	0.42	11.9	B	16	-		
			EBTR	0.00	0.0	A	0	-		
			WBLT	0.02	7.6	A	1	-		
			WBLT	0.02	7.6	A	1	-		
Bramalea Rd & Fed-Ex Truck Ent	A	3	NBLTR	0.10	8.5	A	2	-		
			SBLTR	0.02	8.6	A	1	-		

7.4. Future 2022 'Base' Scenario Analysis

EXP conducted an additional traffic operations analysis to determine the most practical solution for traffic operation efficiency. It involved signal timing optimization and geometric modifications at the signalized intersections. The signal timing plans were optimized with an adjustment to the peak hour factor applied to all movements and a 1900 v/h/l saturation flow rate as per Peel Region guidelines. Note that signal timing optimizations include optimization of splits, however cycle lengths have been maintained to retain progression along the major roads. Turning lanes were added or extended at intersections. **Table 12** shows the analysis results of the 2022 'Base' scenario condition.

The table provides the LOS, v/c ratios and delays for the critical movements, as well as the overall intersection for both the AM and PM peak hours. Movements with calculated v/c ratios in excess of 0.90 or locations with LOS E or F are highlighted. The detailed Synchro reports can be found in **Appendix E**, showing the remaining movements with their respective results.

Table 12 - 2022 build-out Year with Added LT lane and Split Phasing at Bramalea/Derry

Analysis Period	Control	Intersection	Overall		Critical Movement(s)					
			LOS	Delay (s)	Mvmt	v/c	Delay	LOS	95 th Queue (m)	Storage Capacity (m)
AM PEAK	Signalized	Bramalea Rd & Derry Rd E	D	51	EBLL	0.83	83	F	63	210
					WBLL	0.85	87	F	77	200
					NBL	0.27	78	E	14	89
					NBR	1.62	452	F	42	130
					SBLL	0.59	58	E	84	210
		Derry Rd E & Menkes Dr/Telford W	B	18	EBL	0.37	11	B	28	210
					WBL	0.50	19	B	21	115
					NBLL	0.78	89	F	28	125
	Stop Control	Alstep Dr & Menway Ct	A	0	NBLTR	0.04	16	-	7	-
					Bramalea Rd & Fed-Ex Truck Ent			WBTR	0.01	10
PM PEAK	Signalized	Bramalea Rd & Derry Rd E	F	94	EBLL	1.00	132	F	49	210
					WBLL	0.78	106	F	21	200
					NBL	0.86	85	F	119	89
					NBR	1.69	394	F	42	130
					SBLL	0.42	54	D	42	210
		Derry Rd E & Menkes Dr/Telford W	D	40	EBL	0.77	43	D	49	210
					WBL	0.35	25	C	21	115
					NBLL	0.91	85	F	119	125
	Stop Control	Alstep Dr & Menway Ct	A	1	NBLTR	0.10	14	-	7	-
					Bramalea Rd & Fed-Ex Truck Ent	A	1	WBTR	0.03	12

The analysis shows some operation improvements at the intersections. However, the delay and LOS for the EB, WB, and NB are still very high, and some other movements are approaching capacity. The following improvements have been considered to address these capacity deficiencies:

8. 2031 Future Intersection Operations

8.1. 2031 Future Background Intersection Operations

AM Peak Hour Analysis

Under year 2031 future background conditions, during the morning study peak hour, the signalized intersections along Derry Road operates within acceptable LOS range and under capacity, with an overall LOS B and C. The 95th queue is less than the existing storage lengths for the EB and WB left turn lanes. Movements in the NB and SB approaches experienced longer delays with LOS E and F. The v/c ratio is below the threshold values. Unsignalized intersections within the study area operate at acceptable LOS and under capacity, with queue lengths less than 10 m.

Using Synchro 10, the traffic operations for the study area was examined for the study peak as **Table 13**. Critical movements are displayed for all intersections; ones which violate the capacity criteria as outlined in **Section 4.2** are highlighted in red. The detailed Synchro reports can be found in **Appendix G**, showing the remaining movements with their respective results.

Table 13 - 2031 Future Total Traffic Operations (from 6:45 to 7:45 AM & from 3:00 to 4:00 PM)

Analysis Period	Control	Intersection	Overall		Critical Movement(s)					
			LOS	Delay (s)	Mvmt	v/c	Delay	LOS	95 th Queue (m)	Storage Capacity (m)
AM PEAK	Signalized	Bramalea Rd & Derry Rd E	C	25.1	NBL	0.28	81.4	F	14	89
					NBTR	0.41	87.1	F	14	
					SBL	0.79	72.5	E	105	210
		Derry Rd E & Menkes Dr/Telford W	B	14.8	NBL	0.15	61.9	E	14	26
					NBTR	0.40	69.0	E	14	26
					SBL	0.22	67.7	E	21	-
SBTR	0.17	58.3	E	7	26					
PM PEAK	Signalized	Bramalea Rd & Derry Rd E	D	37.9	EBL	0.95	80.5	F	14	210
					NBL	0.71	90.6	F	56	89
					NBTR	0.78	99.7	F	63	-
					SBL	0.65	65.0	E	84	210
		Derry Rd E & Menkes Dr/Telford W	C	25.6	EBL	1.07	141.8	F	119	110
					NBL	0.60	79.1	E	56	26
					SBL	0.42	65.6	E	49	26
					SBTR	0.61	61.1	E	84	-

PM Peak Hour Analysis

Under year 2031 future background conditions, during the afternoon study peak hour, the signalized intersections along Derry Road operates within acceptable LOS range and under capacity, with an overall LOS D and C. The 95th queue is less than the existing storage lengths for the WB left turn lanes. The 95th queue is less than the existing storage lengths for the EB, NB, and SB left turn lanes. The NB and SB movements experienced longer delays with LOS E of F. The v/c ratio is below the threshold values for most movements. V/C ratio is greater than the recommended values for the EB left turn lanes at both intersections. Unsignalized intersections within the study area operate at acceptable LOS and under capacity, with queue lengths less than 10 m.

8.2. 2031 Future Total Intersection Operations

AM Peak Hour Analysis

During the morning study peak hour, the signalized intersection of Derry and Bramalea Road operates with a failed LOS range and over capacity, with an overall LOS F. The 95th queue is longer than the existing storage lengths for the EB and WB left turn lanes. Movements in the NB and SB approaches experienced longer delays with LOS E and F. The v/c ratio is below the threshold values. Unsignalized intersections within the study area operate at acceptable LOS and under capacity, with queue lengths less than 10 m. **Table 14** shows the analysis results and the detailed Synchro reports can be found in **Appendix H**.

Table 14 - 2031 Future Total Traffic Operations

Analysis Period	Control	Intersection	Overall		Critical Movement(s)					
			LOS	Delay (s)	Mvmt	v/c	Delay	LOS	95th Queue (m)	Storage Capacity (m)
AM PEAK	Signalized	Bramalea Rd & Derry Rd E	F	104.1	EBL	0.90	58.1	E	94	210
					WBL	2.95	967.8	F	423	200
					NBL	0.11	67.2	E	8	89
					NBTR	0.85	108.9	F	62	-
					SBL	0.83	81.3	F	135	210
		SBTR	0.88	86.6	F	163	-			
		Derry Rd E & Menkes Dr/Telford W	B	17.9	NBL	0.56	69.4	E	59	26
					NBTR	0.35	62.8	E	14	-
SBL	0.19				63.4	E	21	26		
PM PEAK	Signalized	Bramalea Rd & Derry Rd E	F	313.6	EBL	1.02	110.6	F	177	210
					WBL	0.94	135.4	F	80	200
					WBT	0.96	63.4	E	247	-
					NBL	1.89	499.6	F	285	89
					NBTR	5.44	2091.6	F	746	-
		Derry Rd E & Menkes Dr/Telford W	F	113.7	EBL	1.32	247.3	F	160	110
					NBL	2.76	882.1	F	594	26
					SBL	0.39	62.7	E	52	26
					0.57	57.9	E	84	-	

PM Peak Hour Analysis

During the afternoon study peak hour, the signalized intersections along Derry Road operates with a failed LOS and over capacity, with an overall LOS F. For some left turn lanes, the 95th queue is longer than the existing storage lengths. The NB and SB movements experienced longer delays with LOS E of F. The v/c ratio is above the threshold values for most movements. V/C ratio is greater than the recommended values for the EB left turn lanes at both intersections. Unsignalized intersections within the study area operate at acceptable LOS and under capacity, with queue lengths less than 10 m.

9. Year 2031 Evaluation of Intersection Operations

The recommendations and improvements resulting from the 2022 analysis with improvements (**Section 7.4**) have been carried forward in the analysis for 2031. The following improvements were assumed for the 2031 'Base' Scenario analysis. They only include addition of auxiliary lanes for some specific movements at the signalized intersections, such as:

- Adding auxiliary left turn lane (EB and WB) at the Derry and Bramalea intersection;
- Adding auxiliary left turn lane (NB) at the Derry and Menkes intersection;
- TDM Measures; and
- Traffic signals optimization.

These improvements are consistent with the alternative designs that are under selection in the EA process.

It is understood that intersection optimization may not provide the best progression along Derry Road. This was taken under consideration, when conducting the analysis to allow better traffic flow and progression along the roadway. However, while the traffic signal splits have been optimized, cycle lengths have been maintained to improve progression. Additionally, two options will be used to conduct the analysis and evaluate the practicality of each alternative. Details can be found in **Appendix I**.

Under all future scenarios, the roadway pavement for Menkes Drive would be increased to approximately 14 metres at the intersection of Derry Road. Based on a walk time of 1.2 metres / second, the minimum pedestrian crossing time would be 19 seconds (7 second minimum walk time and 12 second flashing don't walk time). Under the existing signal timing plans, a crossing time of 23 seconds is provided and carried forward for all future alternatives. This would meet the minimum required crossing time.

Under the future scenarios, the roadway pavement for Bramalea Road would be increase to approximately 20 to 21.28 metres at the intersection with Derry Road. The minimum east-west pedestrian crossing time would be 24.8 seconds. Based on the existing signal timing plans for this intersection, a crossing time of 29 seconds is provided and would therefore meet the minimum requirements. This minimum crossing time has been carried for all future alternatives.

Using Synchro 10, the traffic operations for the study area were examined for the 2031 study peak as **Table 15**. Critical movements are displayed for all intersections; ones which violate the capacity criteria as outlined in **Section 4.2** are highlighted in red.

- Based Scenario and TDM Measures

- Improve Intersection Operations
- Extend Alstep Drive

9.1. Base Scenario and TDM Measures

With this option, in addition to the auxiliary lanes and the optimized signal timing, the NB-SB phases at Bramalea remains split. A NB right turn lane is added at Bramalea Road. **Table 15** shows the analysis results and the detailed Synchro reports can be found in **Appendix I-1**.

AM Peak Hour Analysis

The signalized intersection of Derry Road and Bramalea Road operates with an acceptable LOS D. The WB left turn lane 95th queue is longer than the existing storage length. It shows a LOS F and a v/c greater than 1.0. The NB thru and right shared lane shows a LOS F.

The signalized intersection of Derry Road and Menkes Drive operates with an acceptable LOS C. However, some movements are approaching capacity. The 95th queue is longer than the existing storage lengths for the NBL, which experienced a LOS F with v/c greater than the recommended values.

PM Peak Hour Analysis

The signalized intersection of Derry Road and Bramalea Road operates with a failed LOS and over capacity. The 95th queue is less than the existing storage lengths for all movements. The EBL, WBL, NBL, and NBTR experienced a LOS F with v/c greater than the recommended values.

The signalized intersection of Derry Road and Menkes Drive operates with an acceptable LOS D. However, some movements are approaching capacity. The 95th queue is longer than the existing storage lengths for the NBL, which experienced a LOS F with v/c greater than the recommended values.

Table 15 - 2031 Horizon Year No Alstep Extension and Split Phasing at Bramalea/Derry

Analysis Period	Control	Intersection	Overall		Critical Movement(s)					
			LOS	Delay (s)	Mvmt	v/c	Delay	LOS	95 th Queue (m)	Storage Capacity (m)
AM PEAK	Signalized	Bramalea Rd & Derry Rd E	D	55	EBLL	0.85	82	F	69	210
					WBLL	0.90	99	F	78	200
					NBL	0.30	79	E	12	89
					NBR	1.65	464	F	70	130
		SBL	0.66	61	E	111	210			
		Derry Rd E & Menkes Dr/Telford W	C	23	NBLL	0.79	99	F	31	125
SBL	0.18				62	E	20	39		
PM PEAK	Signalized	Bramalea Rd & Derry Rd E	F	116	EBLL	1.19	194	F	105	210
					WBLL	0.86	123	F	35	200
					NBL	1.04	131	F	171	89
					NBR	2.03	546	F	414	130
		Derry Rd E & Menkes Dr/Telford W	D	53	EBL	0.91	89	F	99	210
					NBLL	0.96	99	F	127	125

Analysis Period	Control	Intersection	Overall		Critical Movement(s)					
			LOS	Delay (s)	Mvmt	v/c	Delay	LOS	95 th Queue (m)	Storage Capacity (m)
					SBL	0.37	61	E	48	39

9.2. Improve Intersection Operations

With this option, in addition to the auxiliary lanes and the optimized signal timing, the signal phasing at Bramalea Road is modified to allow for simultaneous entry of the NB-SB left turn lanes; split phasing is eliminated. A NB right turn lane is added at Bramalea Road. **Table 16** shows the analysis results and the detailed Synchro reports can be found in **Appendix I-2**.

AM Peak Hour Analysis

During the morning study peak hour, the signalized intersections along Derry Road operates within acceptable LOS range and under capacity, with overall LOS D and C. The 95th queue is less than the existing storage lengths for all lanes. At Bramalea, Road, the EB and WB left turn lanes operate with a failed LOS. Movements in the NB and SB approaches experienced longer delays with LOS E and F.

The intersection of Derry Road and Menkes Drive operates with an acceptable LOS C. However, NB and SB movements are approaching capacity.

PM Peak Hour Analysis

During the afternoon study peak hour, the signalized intersections of Derry Road and Bramalea Road operates within acceptable LOS range and under capacity, with an overall LOS C. The 95th queue is less than the existing storage lengths for the EB, WB, SB, and NB left turn lanes. The NB and SB left turn movements experienced longer delays with LOS F and v/c ratio above the threshold values.

The intersection of Derry Road and Menkes Drive operates with an acceptable LOS C. However, NB and EB left turn movements are at capacity.

Table 16 - 2031 Horizon Year No Alstep Extension and Unsplit Phasing at Bramalea/Derry

Analysis Period	Control	Intersection	Overall		Critical Movement(s)					
			LOS	Delay (s)	Mvmt	v/c	Delay	LOS	95 th Queue (m)	Storage Capacity (m)
AM PEAK	Signalized	Bramalea Rd & Derry Rd E	D	42	EBLL	0.85	82	F	69	210
					WBLL	0.85	88	F	74	200
					NBL	0.15	66	E	10	89
					NBR	0.86	131	F	48	130
					SBLL	0.86	78	E	96	210
		Derry Rd E & Menkes Dr/Telford W	C	23	NBLL	0.80	102	F	31	125
					NBTR	0.29	56	E	12	-
					SBL	0.18	62	E	20	39
PM PEAK	Signalized	Bramalea Rd & Derry Rd E	E	71	SBTR	0.21	62	E	24	-
					EBLL	0.93	104	F	84	210

Analysis Period	Control	Intersection	Overall		Critical Movement(s)					
			LOS	Delay (s)	Mvmt	v/c	Delay	LOS	95 th Queue (m)	Storage Capacity (m)
					WBLL	0.72	90	F	29	200
					NBL	0.65	49	D	60	89
					NBR	1.41	267	F	323	130
					SBLL	0.90	94	F	94	210
		Derry Rd E & Menkes Dr/Telford W	D	54	EBL	0.92	92	F	100	210
					NBLL	0.96	99	F	127	125
					SBL	0.37	61	E	48	39
					SBTR	0.77	77	E	89	-

9.3. Extend Alstep Drive

With this option, in addition to the auxiliary lanes and the optimized signal timing, the NB-SB phases at Bramalea remains split and Alstep Drive is extended to Bramalea Road. A NB right turn lane is added at Bramalea Road. **Table 17** shows the analysis results and the detailed Synchro reports can be found in **Appendix I-3**.

AM Peak Hour Analysis

During the morning study peak hour, the signalized intersections along Derry Road operates within acceptable LOS range and under capacity, with an overall LOS D and C. The 95th queue is less than the existing storage lengths for all left turning movements. Movements in the NB approaches experienced longer delays with LOS E and F. The v/c ratio is below the threshold values. The signalized intersection of Derry Road and Bramalea Road operates with an acceptable LOS D. The WB left turn lane shows a LOS D and is approaching capacity. The NB thru and right lanes show LOS E and F.

The signalized intersection of Derry Road and Menkes Drive operates with an acceptable LOS C. However, the NB left turn lane is approaching capacity.

PM Peak Hour Analysis

The signalized intersection of Derry Road and Bramalea Road operates with a failed LOS and over capacity. The 95th queue is less than the existing storage lengths for all movements. The EBL, WBL, NBL, and NBR experienced a LOS F with v/c greater than the recommended values.

The signalized intersection of Derry Road and Menkes Drive operates with an acceptable LOS D. However, some movements are approaching capacity. The 95th queue is longer than the existing storage lengths for the SBL, which experienced a LOS E with v/c less than the recommended values.

Table 17 - 2031 Horizon Year with Alstep and Split Phasing at Bramalea/Derry

Analysis Period	Control	Intersection	Overall		Critical Movement(s)					
			LOS	Delay (s)	Mvmt	v/c	Delay	LOS	95th Queue (m)	Storage Capacity (m)
AM PEAK	Signalized	Bramalea Rd & Derry Rd E	D	45	WBLL	0.87	55	D	54	200
					NBL	0.21	76	E	8	89
					NBT	0.34	79	E	14	-
					NBR	1.65	464	F	70	130
					SBL	0.66	61	E	111	210
	Derry Rd E & Menkes Dr/Telford W	C	21	EBL	0.53	15	B	24	210	
				WBL	0.38	24	C	13	115	
				NBL	0.76	65	E	22	125	
	Stop Control	Bramalea Rd & FedEx Truck Ent	B	12	EBL	0.22	29	C	0	-
PM PEAK	Signalized	Bramalea Rd & Derry Rd E	F	116	EBLL	1.19	194	F	105	210
					WBLL	0.92	137	F	39	200
					NBL	0.99	116	F	156	89
					NBR	2.03	546	F	414	130
					EBL	0.89	65	E	91	210
	Derry Rd E & Menkes Dr/Telford W	D	40	WBL	0.43	27	C	16	115	
				NBL	0.95	81	F	66	125	
				SBL	0.37	61	E	47	39	
	Stop Control	Bramalea Rd & FedEx Truck Ent	C	28	EBLTR	0.11	25	D	3	-

9.4. Combined Scenario

With this option, in addition to the auxiliary lanes and the optimized signal timing, the signal phasing at Bramalea Road is modified to allow for dual entry of the NB-SB left turn lanes. Alstep Drive is extended to Bramalea Road to form a signalized intersection. A NB right turn lane is added at Bramalea Road. **Table 18** shows the analysis results and the detailed Synchro reports can be found in **Appendix I-4**.

AM Peak Hour Analysis

During the morning study peak hour, the signalized intersections along Derry Road operates within acceptable LOS range and under capacity, with an overall LOS D and C. The 95th queue is less than the existing storage lengths for the EB and WB left turn lanes. Movements in the NB and SB approaches experienced longer delays with LOS E and F. The v/c ratio is below the threshold values.

PM Peak Hour Analysis

During the afternoon study peak hour, the signalized intersections of Derry Road and Bramalea Road is approaching capacity with an overall LOS E. The 95th queue is less than the existing storage lengths for the EB, WB, SB, and NB left turn lanes. The NB and SB left turn movements experienced longer delays with LOS F and v/c ratio above the threshold values.

The intersection of Derry Road and Menkes Drive operates with an acceptable LOS C. However, NB and EB left turn movements are at capacity.

Table 18 - 2031 Horizon Year with Alstep and Unsplit Phasing at Bramalea/Derry

Analysis Period	Control	Intersection	Overall		Critical Movement(s)					
			LOS	Delay (s)	Mvmt	v/c	Delay	LOS	95th Queue (m)	Storage Capacity (m)
AM PEAK	Signalized	Bramalea Rd & Derry Rd E	D	44	EBLL	0.85	82	F	69	210
					WBLL	0.88	90	F	84	200
					NBL	0.10	66	E	7	89
					NBR	0.84	114	F	44	130
					SBLL	0.89	84	F	100	210
		Derry Rd E & Menkes Dr/Telford W	C	22	EBL	0.53	15	B	28	210
					NBLL	0.80	93	F	31	125
					SBL	0.18	62	E	20	39
		Bramalea Rd & FedEx Truck Ent	B	12	EBLTR	0.22	29	C	1	-
PM PEAK	Signalized	Bramalea Rd & Derry Rd E	E	71	EBLL	1.19	194	F	84	210
					WBLL	0.92	137	F	31	200
					NBL	0.99	116	F	21	89
					NBR	2.03	546	F	314	130
					SBLL	0.49	55	D	94	210
		Derry Rd E & Menkes Dr/Telford W	D	40	EBL	0.93	104	F	98	210
					WBL	0.73	90	F	19	115
					NBLL	0.56	43	D	0	125
					SBL	0.90	94	F	48	39
		Bramalea Rd & Fed-Ex Truck Ent	D	25	EBLTR	0.11	49	D	3	-

9.5. Additional Measures

From the results shown in **Tables 17 and 18**, providing an unsplit operation of the traffic signals for the north and south approaches, will provide better traffic operations with acceptable LOS and less overall delay, at the Derry Road and Bramalea Road intersection. Additional measures to the unsplit phase of the north and south legs, such the followings, are needed to be implemented.

- Roadway improvements in the north leg and keeping the southbound channelized right at the intersection.
- Roadway improvements in the south leg and providing a northbound right lane at the intersection.
- Extending Alstep Drive to Bramalea Road to provide a balance in the roadway network operations. The Extension of Alstep Drive may be beneficial for the network, although not providing the best results.

The analysis outlined above indicates that congestion occurring at signalized intersections is anticipated to continue in the future. Congestion is anticipated to occur in 2031 along Derry Road at Bramalea Road and Menkes Drive. This section considers the need for improvements to the existing roadway network,

in the form of traffic control provisions, auxiliary turn lane, roadway widening, and traffic signal modifications to the phases.

Traffic Signal Warrants

Two unsignalized intersections have been assessed for traffic signal warrants using the Ontario Traffic Manual⁴ guidelines: Alstep Drive at Menway and Bramalea Road at Alstep Drive. To warrant the installation of a traffic control signal for an existing intersection with forecast traffic volumes, the minimum vehicular warrant and the delay to cross traffic warrant must be fulfilled. The signal warrant analysis is provided in **Exhibit 6** and summarized in **Table 19**.

The Alstep Drive and Menway Court intersection is expected to have an overall LOS A with queue less than 10 m as a stop-controlled intersection (only Menway Court traffic stopping).

⁴ Ontario Traffic Manual Book 12. Justification 7 – Projected Volumes (Section 4.10 of Book 12) was not used since this section states that “If eight-hour projections are available, Justifications 1,2 or 3 should be used.”

Table 19 - Traffic Signal Warrant Analysis

Horizon Year	OTM Warrants - Justification					Warranted
	1A	1B	2A	2B	3	
Bramalea Road & Alstep Drive	65%	77%	45%	52%	No	No
Alstep Drive & Menway Court	51%	19%	47%	32%	No	No

The intersection of Bramalea Road and Alstep Drive is anticipated to operate with high levels of delay on the side street approaches to Bramalea during the PM peak hour, if stop-controlled. Delays are estimated to be in the LOS F range with the EB movement experiencing v/c ratios greater than 2.16 and queue of 296 m. To alleviate the high levels of delay anticipated to occur for the side street approaches the need for improved traffic control has been considered. As a conservative measure, EXP ran the intersection capacity analysis for this intersection with and without the traffic signals. The results of the analysis found that with traffic signal at the intersection, during the PM peak hour, the overall LOS is B and the EB queue is only 78 m.

Auxiliary Turn Lane Requirements

The need for auxiliary turn lanes was reviewed for several intersections near the site. The warrants for left-turn lanes were based on the requirements in the Ministry of Transportation's (MTO) Geometric Design Standards. A design speed of 60 km/h has been utilized along Alstep Drive using a design speed taken 10 km/h over the posted speed limit. The percentages of left-turning vehicles in the approaching volume were rounded to the nearest 5 percent. The following is noted for an analysis conducted for the 2031 future total traffic volumes. The left turn lane warrant nomographs are attached in **Exhibit 7** and summarized in **Table 20**.

Table 20 - Left Turn Warrant Analysis

Movement / Intersection	Traffic Control	Horizon Year		Storage Recommended
		Background	Total	
WB / Alstep Drive at the Access	Stop	No	Yes	30 m
WB / Alstep Drive & Menway Court	Stop	No	No	No
EB / Bramalea Road & Alstep Drive	Stop	No	No	80 m
NB / Bramalea Road & Alstep Drive	Stop	No	No	20 m

Although no left turn is warranted at the Alstep Drive and Bramalea Road intersection, it is necessary to provide a left turn lane as a mitigative measure at the intersection. As a conservative measure, EXP ran the intersection capacity analysis for this intersection with and without the auxiliary left-turn lane. The results of the analysis found that without the auxiliary left-turn lane during the PM peak hour, the EB approach is expected to have a long queue. The EB left-turn movement specifically is expected to operate with v/c ratios greater than 1. The NB left will suffer undue delay because of the long resulting queue from Derry Road. It is important to note that the NBL queue at the Bramalea Road and Derry Road intersection will impact traffic operations at the Alstep Drive intersection.

Furthermore, as stated in the referenced MTO's design standards, "Left turn lanes are required when conflicts between through and turning traffic cause congestion or create collision hazards. Those

requirements are generally substantiated by applying the left turn lane warrant graphs.” Based on the results of the capacity analysis, it is our opinion that the EB and NB left-turn movements are expected to result in congestion if no left turn lanes are provided.

Sight Distance Evaluation

The Transportation Association of Canada (TAC) recommends that safe stopping sight distance be measured from an approaching driver eye height of 1.05 m to an object height (e.g. taillights) of 0.38 m at the proposed new municipal road intersections. The profile along Bramalea and Alstep Road is level and does not present any major vertical curve that may reduce the stopping sight distance. Likewise, with the design of the access along Alstep, the horizontal curve will not impact the stopping sight distance.

As for departure sight distance, the measurement should be taken from the height of the turning vehicle driver’s eye of 1.05 m to the top of the approaching vehicle, 1.30 m above the pavement. See **Exhibit 8** for the minimum sight distance requirements for a 60 km/h design speed.

The sight distances at two driveways (on Alstep Drive and on Bramalea Road) were measured with the lines of sight contained within the proposed sight line allowance. Sight distance⁵ measurements indicate that at both accesses, the sight distance requirements are met for left and right turning vehicles. There were no obstructed sight lines at both accesses.

TDM Measures

The study will to accommodate pedestrian activity satisfactorily, and the proposed TDM measures are considered sufficient in meeting the City’s TDM objectives. The proposed TDM measures are as follows:

- Sidewalk connectivity;
- Bicycle racks;
- Flexible hours; and
- Carpooling.
- Transit Improvements
- No known planned improvements on the cycling network.

Within the study area, the site within walking distance to the major intersection of Bramalea Rd and Derry Rd which provides transit service via Miway Route 42 and the Brampton Transit Route 15. The Miway Route 42 provides transit service along Derry Rd and has major stops at key locations such as the Westwood mall and the Meadowvale Town Centre. The Brampton Transit Route 15 provides transit service along Bramalea Rd and has major stops near the Brampton GO station, the William Osler Health System Hospital and a variety of commercial plazas.

Within the site’s zone of influence are the following communities:

- Marvin Heights;

⁵ Minimum Departure (Left Turning) Sight Distance 158.5m. Minimum Departure (Right Turning) Sight Distance 141.8m
Sight distance for passenger vehicle to turn left onto two-lane roadway and attain 85% of design speed without being overtaken by a vehicle approaching from the right and reducing speed from design. Based on TAC and MTO manuals.

- Ridgewood;
- Malton;
- Frasers Corners; and
- Mt Charles.

Summary of Proposed Improvements

The future network is determined based on the Regional and Municipal plans to widen roads and improve local networks prior to opening day of the development and 2031 horizon year.

A summary of the proposed improvements to mitigate the impacts of increased background traffic, background developments and site-generated traffic is summarized in **Table 21**, with the type of improvements (geometric, new signals, signal timing revision and/or signal timing phasing) indicated. It is noted that the combined scenario improvements are considered in the preferred design alternative as shown in **Exhibit 9**.

Table 21 - Summary of Improvements at Intersections

Intersections	Geo ⁶	Sig	Time	Phase	Notes
Derry Rd E & Menkes Dr / Telford Way	✓		✓	✓	- Provide protected left for NB and SB - Provide protected-Permissive left for WB - Provide dual left turn lanes for NB
Derry Rd E & Bramalea Rd	✓		✓	✓	- Standard dual ring phasing for NB and SB - Provide protected left for WB, EB, and SB - Provide protected-permissive on NB left - Provide dual left turn lanes for WB, EB, and SB - Realigned SB thru-Right
Alstep Dr & Bramalea Rd	✓	✓			- Traffic signals - Add EBL, NBL, and SBR turn lanes
Roadway Segments	Geo	Sig	Time	Phase	- Notes
Bramalea Rd, south of Derry Rd	✓				- Add NB lane - Add SB lane
Menkes Dr, south of Derry	✓				- Add NB lane

10. Conclusion

The assumptions, findings and conclusions of our analysis are summarized below:

- Under existing traffic conditions, the study area intersections operate with an overall acceptable LOS and v/c ratios during the AM and PM network peak hours (7:30 to 8:30 AM and 4:30 to 5:30 PM).
- Under existing traffic conditions, all study area intersections operate with an overall acceptable LOS and v/c ratios during the AM and PM study peak hours (6:45 to 7:45 AM and 3:00 to 4:00 PM).
- Background traffic includes 2% growth rate per annum applied to all movements.

⁶ **Geo** = Geometric Improvements; **Sig** = New Signals; **Time** = Signal Timings; **Phase** = Left Turn Phase

- All intersections will operate at an overall acceptable LOS during both study peak periods in the *year 2022* future background traffic analysis. However, some movements at the signalized intersections show v/c ratios greater than the recommended 1.00.
- Most intersections will operate at an overall acceptable LOS during both study peak periods in the *year 2031* future background traffic analysis. However, the major signalized intersections show several movements with LOS F and v/c ratios greater than the recommended 1.00.
- The intersections along Derry Road, at Bramalea Road and at Menkes Drive, will start showing high levels of congestion with some movements failing during the study peak periods, in the *year 2022* future total traffic analysis. The unsignalized intersection at Alstep Drive and Bramalea Road is also becoming highly congested with a LOS F.
- In the *year 2031* future total traffic analysis the signalized intersections on Derry Road at Menkes and Bramalea continue to fail with a LOS F. Additional movements exceed capacity and additional turning lanes queue lengths exceed existing storage lengths. The unsignalized intersection at Alstep Drive and Bramalea Road is also highly congested with a LOS F. Th
- Left turn lane warrants were conducted at each of the unsignalized study area intersections and indicate that left turn lanes are not required.
- Access on Bramalea Road meets the sight distance requirements to the north and south.
- Access on Alstep Drive meets the sight distance requirements to the east and west.
- The extension of Alstep Drive will allow better connectivity within the roadway network although not required by the Bombardier development.

Recommendations

Based on the foregoing discussions, it is recommended the following improvements be implemented.

- At the intersection of Derry Road and Menkes Dr /Telford Way, maintain the permitted/protective phase during the weekday peak hours for the WBL and EBL, a protected left for NB and SB, and provide dual left turn lanes for NB traffic. Modify signal timings to accommodate the dual left turn lanes. Modify the pavement markings and road geometry as necessary to meet the required storage lengths for SBL and EBL.
- At the intersection of Derry Road and Bramalea Road, implement a protective phase during the weekday peak hours for all turning movements. Provide dual left turn lanes for EB, WB, and SB. Modify signal timings to accommodate the dual left turn lanes. Provide protected left for WB, EB, and SB. Provide protected-permissive on NB left and realigned SB thru-Right lane. Add NB and SB right turn lanes. Modify the pavement markings and road geometry as necessary to meet the required storage lengths for SBLL and EBLL.
- At the site's north access, extend Alstep Drive from its current end to Bramalea Road.
- At the intersection of the Alstep Drive extension and Bramalea Road, install a traffic signal to mitigate the impact of the long queue. Provide single left turn lane for EB and NB movements. Provide protected-permissive on NBL and EBL.

- Along Alstep Drive, provide a left turn lane at the Bombardier site to facilitate left turns to and from the drive access.
- Maintain the existing lane configuration along Alstep Drive, west of the proposed site.
- Implement the TDM measures as discussed in the report.

Exhibits

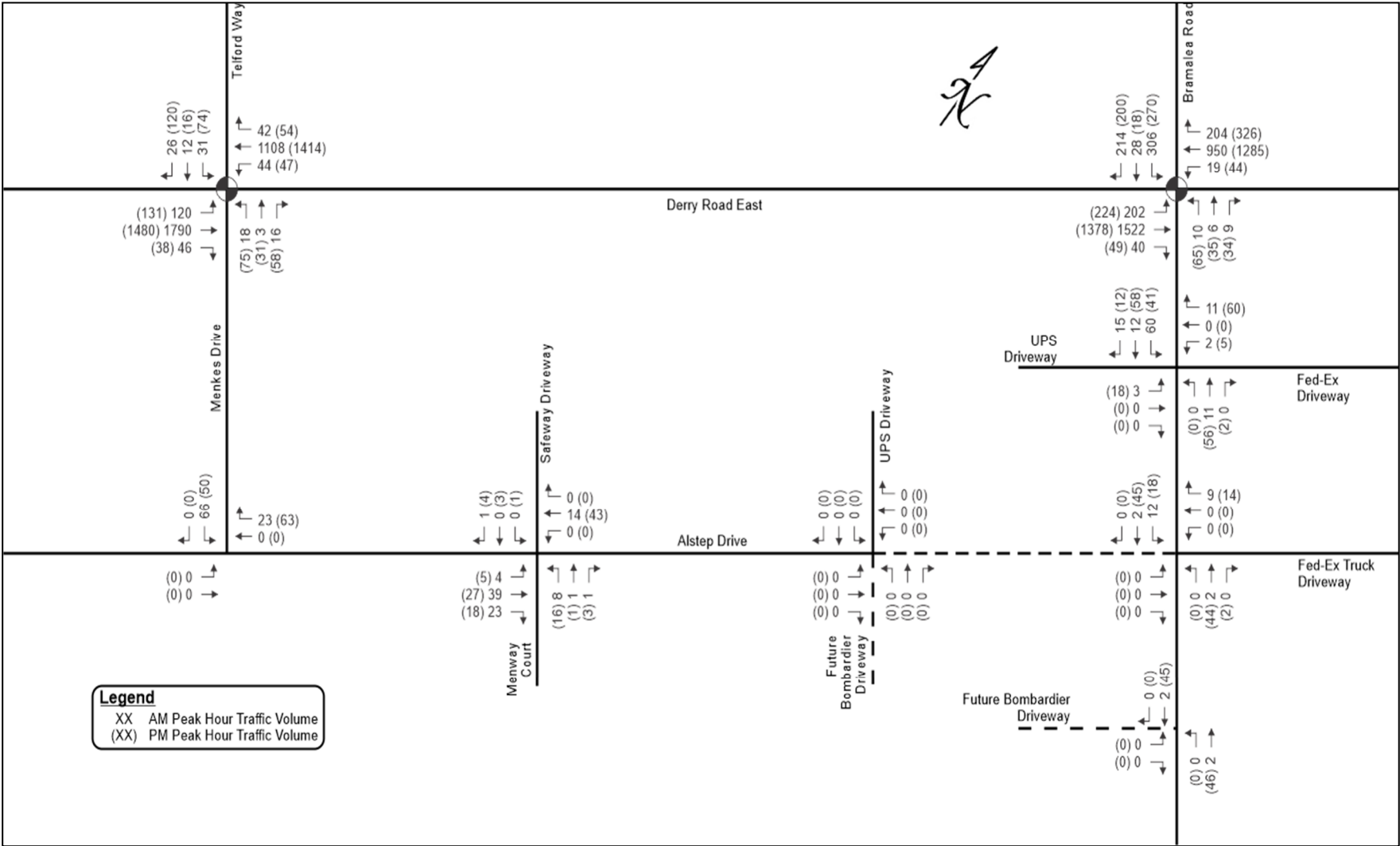


Exhibit 1 - Existing (2019) Network AM and PM Peak Hour Traffic Volume

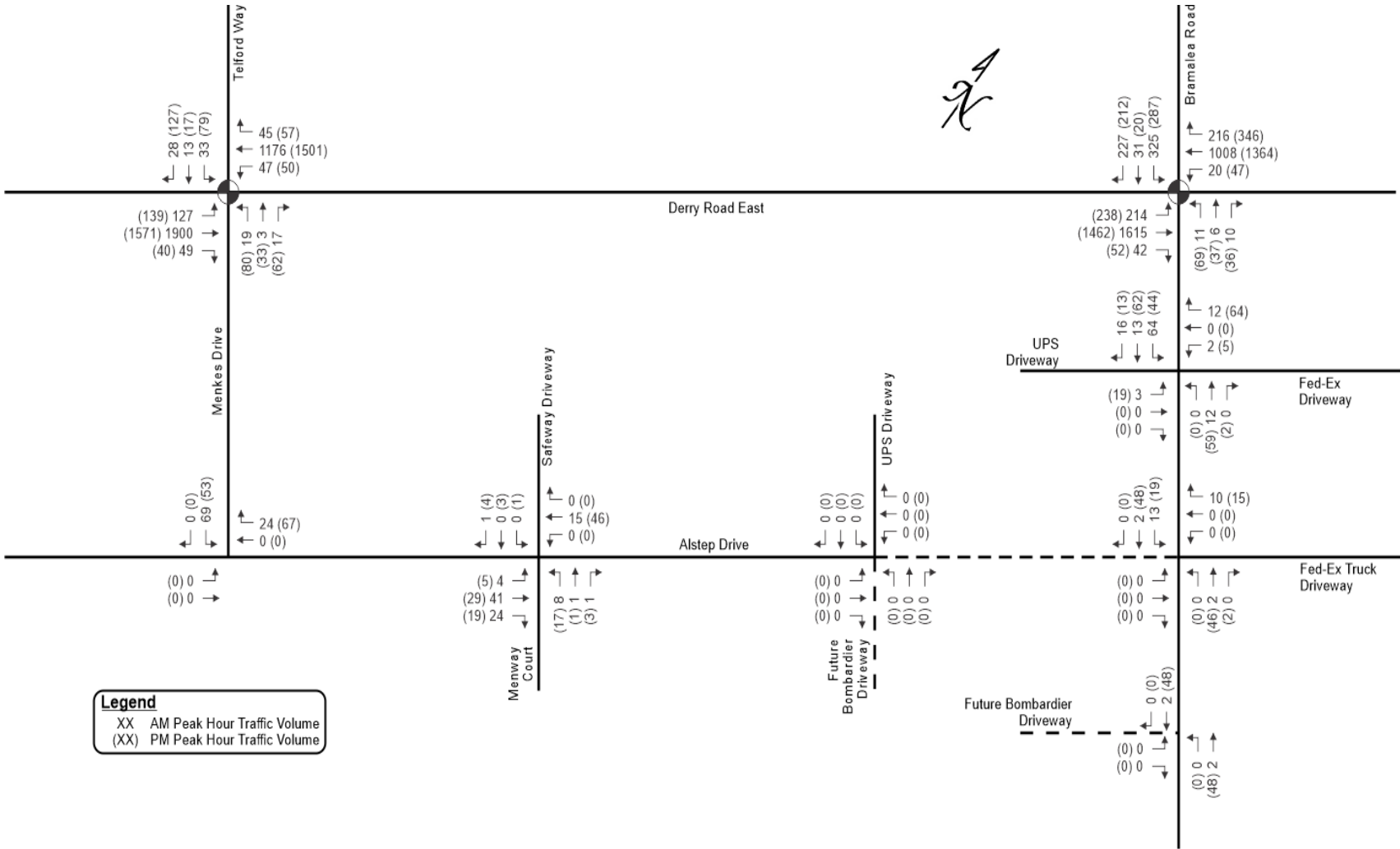


Exhibit 4 – Future 2031 Background Estimated AM and PM Peak Hour Traffic Volume

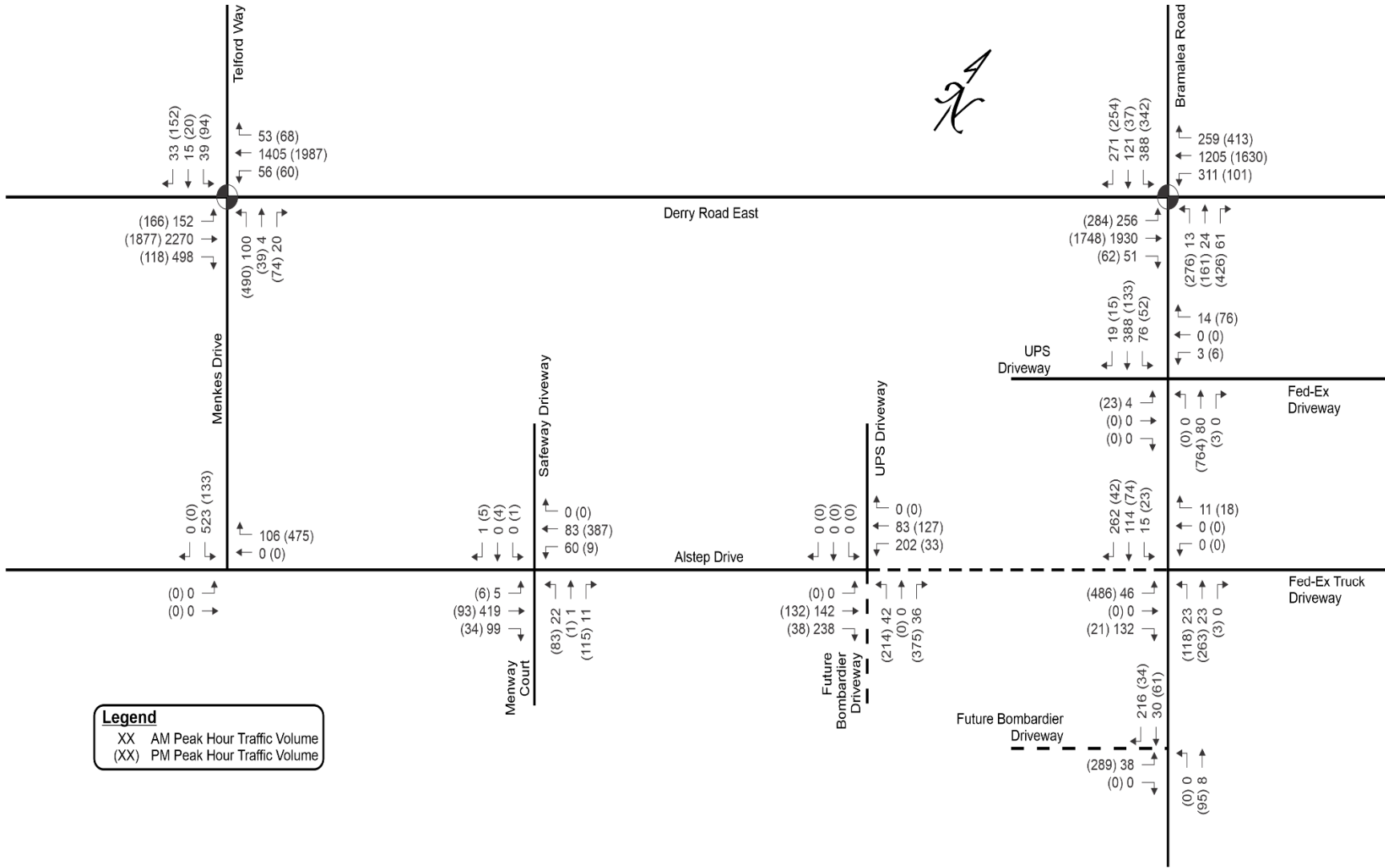


Exhibit 5 - Future 2031 Full (Background + Site Trips) Estimated AM and PM Peak Hour Traffic Volume

Input Data Sheet

Analysis Sheet

Results Sheet

Proposed Collision

GO TO Justification:

What are the intersecting roadways?

Alstep Dr. / Bramalea Rd.

What is the direction of the Main Road street?

North-South

When was the data collected?

Future Total 2027

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road?

1

b.- Number of lanes on the Minor Road?

1

c.- How many approaches?

4

d.- What is the operating environment?

Urban

Population >= 10,000

AND

Speed < 70 km/hr

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Northbound Approach			Minor Eastbound Approach			Main Southbound Approach			Minor Westbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
7:00	0	22	1	7	0	176	16	172	355	2	0	25	0
8:00	23	65	1	60	0	69	34	106	147	4	0	49	0
9:00	0	61	2	20	0	0	46	63	13	5	0	66	0
10:00	0	61	2	20	0	0	46	64	13	5	0	66	0
13:00	0	50	1	16	0	2	37	56	17	5	0	55	0
15:00	0	41	1	13	0	46	30	81	100	4	0	43	0
16:00	176	195	1	365	0	21	34	66	52	4	0	50	0
17:00	69	128	2	160	0	0	52	73	15	6	0	75	0
Total	268	623	11	661	0	314	295	681	712	35	0	429	0

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	0
13-24	0
25-36	0

* Include only collisions that are susceptible to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume									
Factored 8 hour pedestrian volume	0		0		0		0		
% Assigned to crossing rate	23%		34%		30%		100%		
Net 8 Hour Pedestrian Volume at Crossing									0
Net 8 Hour Vehicular Volume on Street Being Crossed									2,000

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	0	0	0	0	0	0	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds									
Factored volume of total pedestrians	0		0		0		0		
Factored volume of delayed pedestrians	0		0		0		0		
% Assigned to Crossing Rate	23%		34%		30%		100%		
Net 8 Hour Volume of Total Pedestrians									0
Net 8 Hour Volume of Delayed Pedestrians									0

Exhibit 6 - Traffic Signal Warrant

Justification 1: Minimum Vehicle Volumes

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW	RESTR. FLOW	FREE FLOW	RESTR. FLOW	7:00	8:00	9:00	10:00	13:00	15:00	16:00	17:00		
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>										
1A	480	720	600	900	776	558	276	277	239	359	964	580		
	COMPLIANCE %				100	78	38	38	33	50	100	81	518	65
1B	120	170	120	170	210	182	91	91	78	106	440	241		
	COMPLIANCE %				100	100	54	54	46	62	100	100	615	77
Restricted Flow					Both 1A and 1B 100% Fulfilled each of 8 hours								Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Signal Justification 1:					Lesser of 1A or 1B at least 80% fulfilled each of 8 hours								Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>

Justification 2: Delay to Cross Traffic

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW	RESTR. FLOW	FREE FLOW	RESTR. FLOW	7:00	8:00	9:00	10:00	13:00	15:00	16:00	17:00		
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>										
2A	480	720	600	900	566	376	185	186	161	253	524	339		
	COMPLIANCE %				79	52	26	26	22	35	73	47	360	45
2B	50	75	50	75	9	64	25	25	21	17	369	166		
	COMPLIANCE %				12	85	33	33	28	23	100	100	415	52
Restricted Flow					Both 2A and 2B 100% Fulfilled each of 8 hours								Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Signal Justification 2:					Lesser of 2A or 2B at least 80% fulfilled each of 8 hours								Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>

Justification 3: Combination

Combination Justification 1 and 2

Justification Satisfied 80% or More				Two Justifications Satisfied 80% or More	
Justification 1	Minimum Vehicular Volume	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>
Justification 2	Delay Cross Traffic	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>	NOT JUSTIFIED	

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main)	Heaviest Minor Approach	Required Value	Average % Compliance	Overall % Compliance
		X	Y (actual)	Y (warrant threshold)		
Justification 4	7:00	566	183	234	78 %	66 %
	8:00	376	129	320	40 %	
	16:00	524	386	252	100 %	
	17:00	339	160	339	47 %	

Exhibit 6 - Traffic Signal Warrant

Justification 5: Collision Experience

Justification	Preceding Months	% Fulfillment	Overall % Compliance
Justification 5	1-12	0 %	0 %
	13-24	0 %	
	25-36	0 %	

Justification 6: Pedestrian Volume

Pedestrian Volume Analysis

	8 Hour Vehicular Volume V_8	Net 8 Hour Pedestrian Volume				
		< 200	200 - 275	276 - 475	476 - 1000	>1000
Justification 6A	< 1440					
	1440 - 2600	Not Justified				
	2601 - 7000					
	> 7000					

Pedestrian Delay Analysis

	Net Total 8 Hour Volume of Total Pedestrians	Net Total 8 Hour Volume of Delayed Pedestrians		
		< 75	75 - 130	> 130
Justification 6B	< 200	Not Justified		
	200 - 300			
	> 300			

Results Sheet

[Input Sheet](#)

[Analysis Sheet](#)

[Proposed Collision](#)

GO TO Justification:

Intersection: Alstep Dr. / Bramalea Rd.

Count Date: Future Total 2027

Summary Results

	Justification	Compliance	Signal Justified?	
			YES	NO
1. Minimum Vehicular Volume	A Total Volume	65 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Crossing Volume	77 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2. Delay to Cross Traffic	A Main Road	45 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Crossing Road	52 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3. Combination	A Justificaton 1	65 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Justification 2	45 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4. 4-Hr Volume		66 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>

5. Collision Experience		0 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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6. Pedestrians	A Volume	Justification not met	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Delay	Justification not met	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Exhibit 6 - Traffic Signal Warrant

Input Data Sheet

Analysis Sheet

Results Sheet

Proposed Collision

GO TO Justification:

What are the intersecting roadways?

Alstep Dr. / Menway Crt.

What is the direction of the Main Road street?

East-West

When was the data collected?

Future Total 2027

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road?

1

b.- Number of lanes on the Minor Road?

1

c.- How many approaches?

3

d.- What is the operating environment?

Urban

Population >= 10,000

AND

Speed < 70 km/hr

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Eastbound Approach			Minor Northbound Approach			Main Westbound Approach			Minor Southbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
7:00	4	515	105	0	1	1	0	6	0	0	0	0	0
8:00	7	224	80	12	2	12	1	79	0	0	0	0	0
9:00	11	24	39	1	7	20	5	36	1	0	0	0	4
10:00	14	31	42	0	8	5	6	34	0	0	0	0	2
13:00	12	146	51	0	9	5	9	40	1	0	0	0	0
15:00	15	78	32	95	13	85	9	545	0	0	0	0	0
16:00	21	24	20	37	14	36	10	297	0	0	0	0	0
17:00	24	14	13	1	13	4	11	68	0	0	0	0	4
Total	108	1,056	382	146	67	168	51	1,105	2	0	0	0	10

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	0
13-24	0
25-36	0

* Include only collisions that are susceptible to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume									
Factored 8 hour pedestrian volume	0		0		0		0		
% Assigned to crossing rate	23%		34%		30%		100%		
Net 8 Hour Pedestrian Volume at Crossing									0
Net 8 Hour Vehicular Volume on Street Being Crossed									2,000

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	0	0	0	0	0	0	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds									
Factored volume of total pedestrians	0		0		0		0		
Factored volume of delayed pedestrians	0		0		0		0		
% Assigned to Crossing Rate	23%		34%		30%		100%		
Net 8 Hour Volume of Total Pedestrians									0
Net 8 Hour Volume of Delayed Pedestrians									0

Justification 1: Minimum Vehicle Volumes

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW	RESTR. FLOW	FREE FLOW	RESTR. FLOW	7:00	8:00	9:00	10:00	13:00	15:00	16:00	17:00		
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>										
1A	480	720	600	900	632	417	144	140	273	872	459	148		
	COMPLIANCE %				88	58	20	19	38	100	64	21	407	51
1B	180	255	180	255	2	26	28	13	14	193	87	18		
	COMPLIANCE %				1	10	11	5	5	76	34	7	149	19
Restricted Flow					Both 1A and 1B 100% Fulfilled each of 8 hours								Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Signal Justification 1:					Lesser of 1A or 1B at least 80% fulfilled each of 8 hours								Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>

Justification 2: Delay to Cross Traffic

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW	RESTR. FLOW	FREE FLOW	RESTR. FLOW	7:00	8:00	9:00	10:00	13:00	15:00	16:00	17:00		
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>										
2A	480	720	600	900	630	391	116	127	259	679	372	130		
	COMPLIANCE %				88	54	16	18	36	94	52	18	376	47
2B	50	75	50	75	1	14	12	10	9	108	51	18		
	COMPLIANCE %				1	19	16	13	12	100	68	24	253	32
Restricted Flow					Both 2A and 2B 100% Fulfilled each of 8 hours								Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Signal Justification 2:					Lesser of 2A or 2B at least 80% fulfilled each of 8 hours								Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>

Justification 3: Combination

Combination Justification 1 and 2

Justification Satisfied 80% or More				Two Justifications Satisfied 80% or More	
Justification 1	Minimum Vehicular Volume	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>
Justification 2	Delay Cross Traffic	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>	NOT JUSTIFIED	

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main)	Heaviest Minor Approach	Required Value	Average % Compliance	Overall % Compliance
		X	Y (actual)	Y (warrant threshold)		
Justification 4	7:00	630	2	209	1 %	34 %
	8:00	391	26	313	8 %	
	15:00	679	193	191	100 %	
	16:00	372	87	322	27 %	

Justification 5: Collision Experience

Justification	Preceding Months	% Fulfillment	Overall % Compliance
Justification 5	1-12	0 %	0 %
	13-24	0 %	
	25-36	0 %	

Justification 6: Pedestrian Volume

Pedestrian Volume Analysis

	8 Hour Vehicular Volume V_8	Net 8 Hour Pedestrian Volume				
		< 200	200 - 275	276 - 475	476 - 1000	>1000
Justification 6A	< 1440					
	1440 - 2600	Not Justified				
	2601 - 7000					
	> 7000					

Pedestrian Delay Analysis

	Net Total 8 Hour Volume of Total Pedestrians	Net Total 8 Hour Volume of Delayed Pedestrians		
		< 75	75 - 130	> 130
Justification 6B	< 200	Not Justified		
	200 - 300			
	> 300			

Results Sheet

[Input Sheet](#)

[Analysis Sheet](#)

[Proposed Collision](#)

[GO TO Justification:](#)

Intersection: Alstep Dr. / Menway Cr.

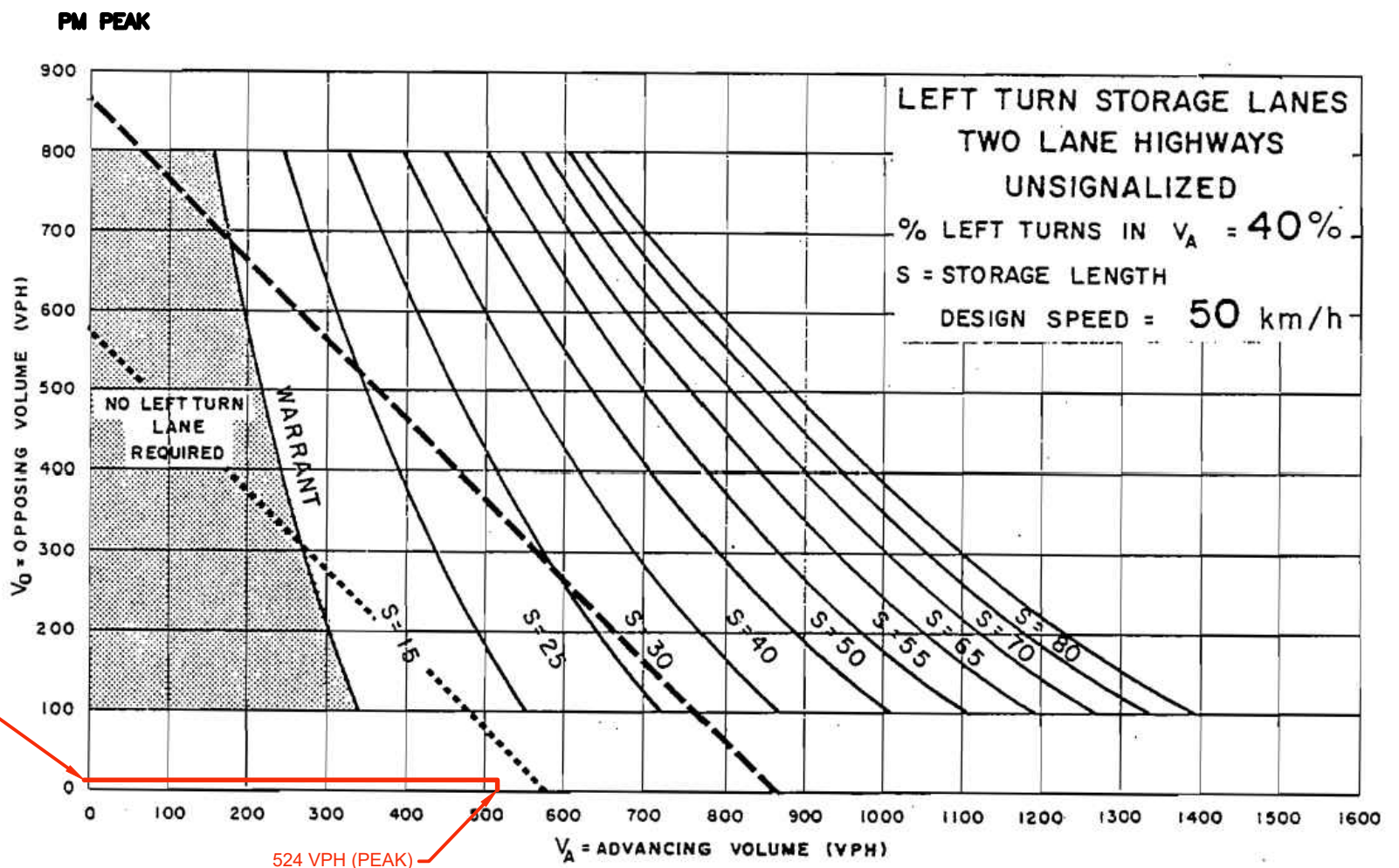
Count Date: Future Total 2027

Summary Results

	Justification	Compliance	Signal Justified?	
			YES	NO
1. Minimum Vehicular Volume	A Total Volume	51 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Crossing Volume	19 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2. Delay to Cross Traffic	A Main Road	47 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Crossing Road	32 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3. Combination	A Justificaton 1	19 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Justification 2	32 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4. 4-Hr Volume		34 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>

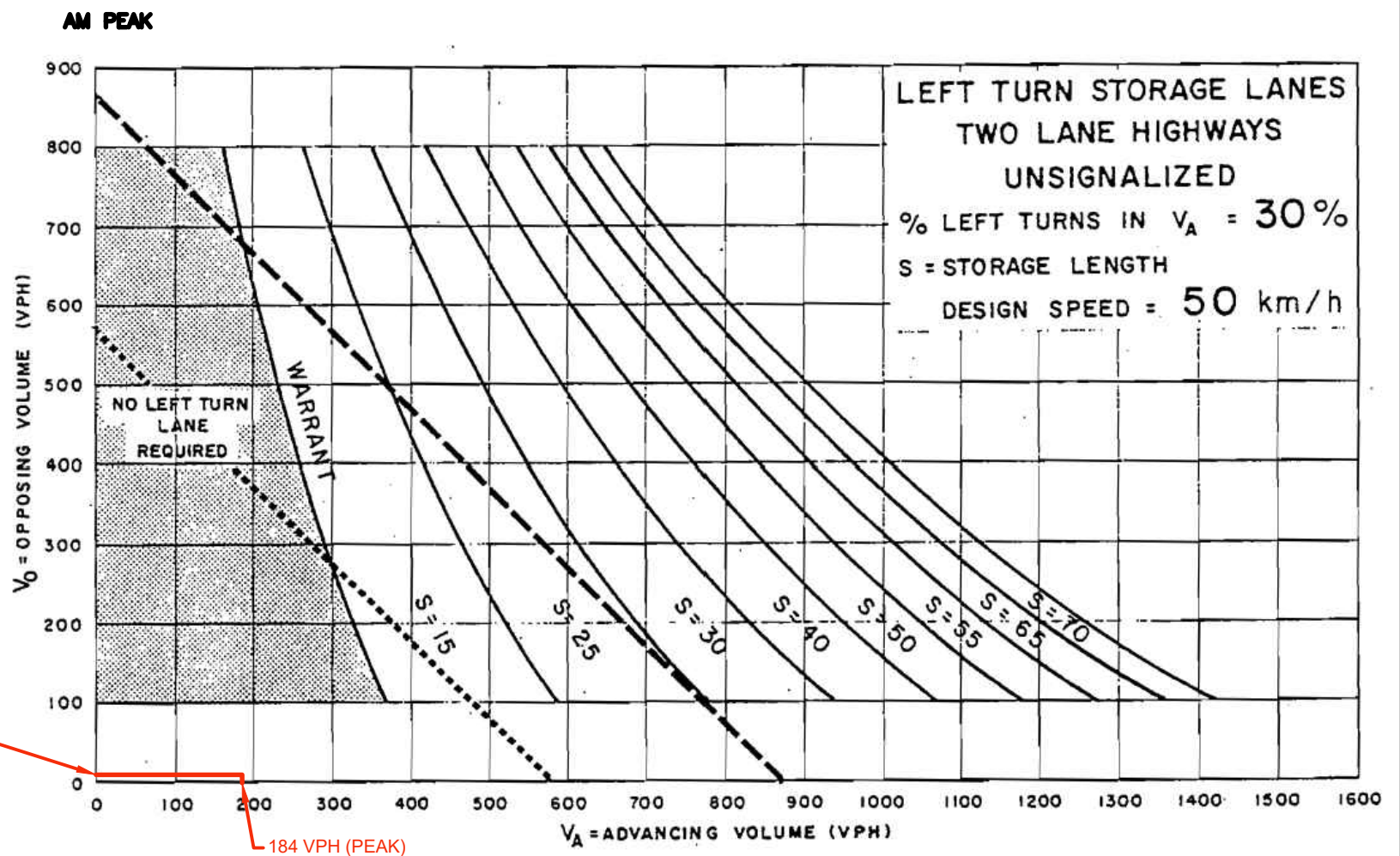
5. Collision Experience		0 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
-------------------------	--	-----	--------------------------	-------------------------------------

6. Pedestrians	A Volume	Justification not met	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Delay	Justification not met	<input type="checkbox"/>	<input checked="" type="checkbox"/>



NOTE:

1. % LEFT TURNS ARE 95% (NO GRAPHS FOR ABOVE 40%)



BOMBARDIER INC.

Project:

BOMBARDIER AEROSPACE - PEARSON

Title:

ALSTEP DRIVE AND BRAMALEA ROAD - EB APPROACH LEFT TURN WARRANT ANALYSIS

Date:

APRIL, 2019

Project No.:

STR-02018572-0

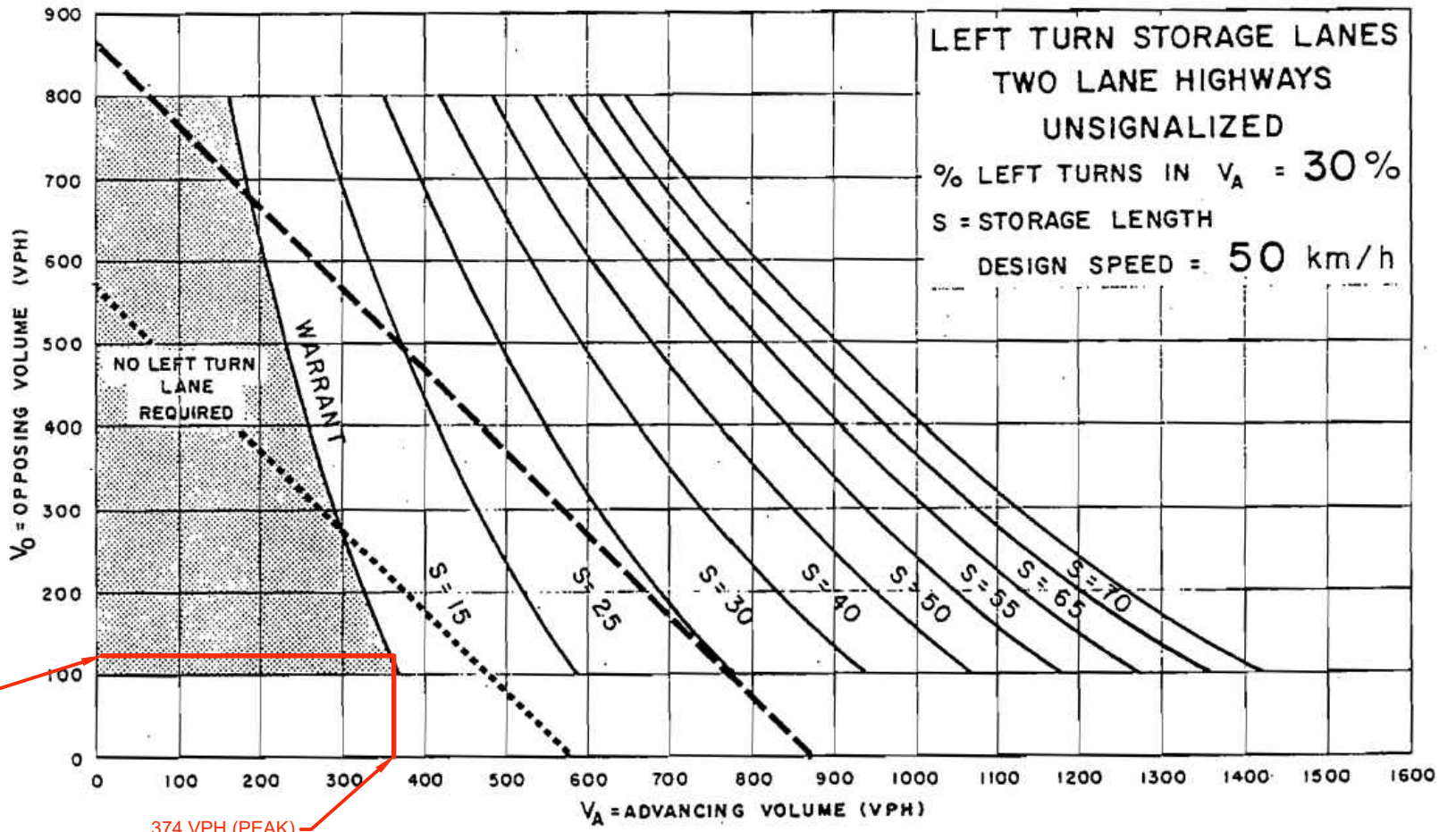
Scale:

N.T.S.

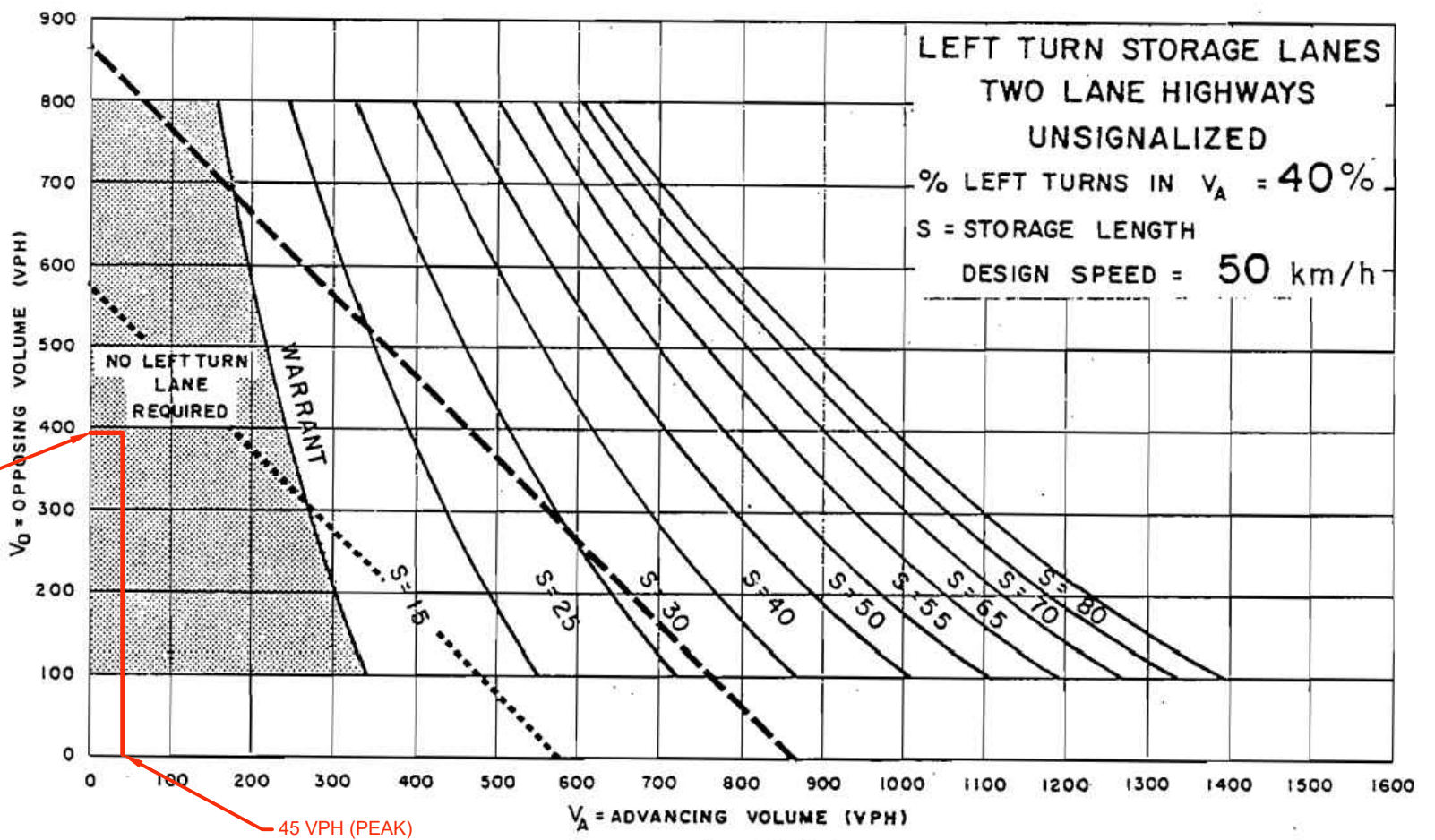
Exhibit:

7

PM PEAK



AM PEAK



NOTE:

1. % LEFT TURNS ARE 50% (NO GRAPHS FOR ABOVE 40%)



BOMBARDIER INC.

Project:

BOMBARDIER AEROSPACE - PEARSON

Title:

ALSTEP DRIVE AND BRAMALEA ROAD - NB APPROACH
LEFT TURN WARRANT ANALYSIS

Date:

APRIL, 2019

Project No.:

STR-02018572-0

Scale:

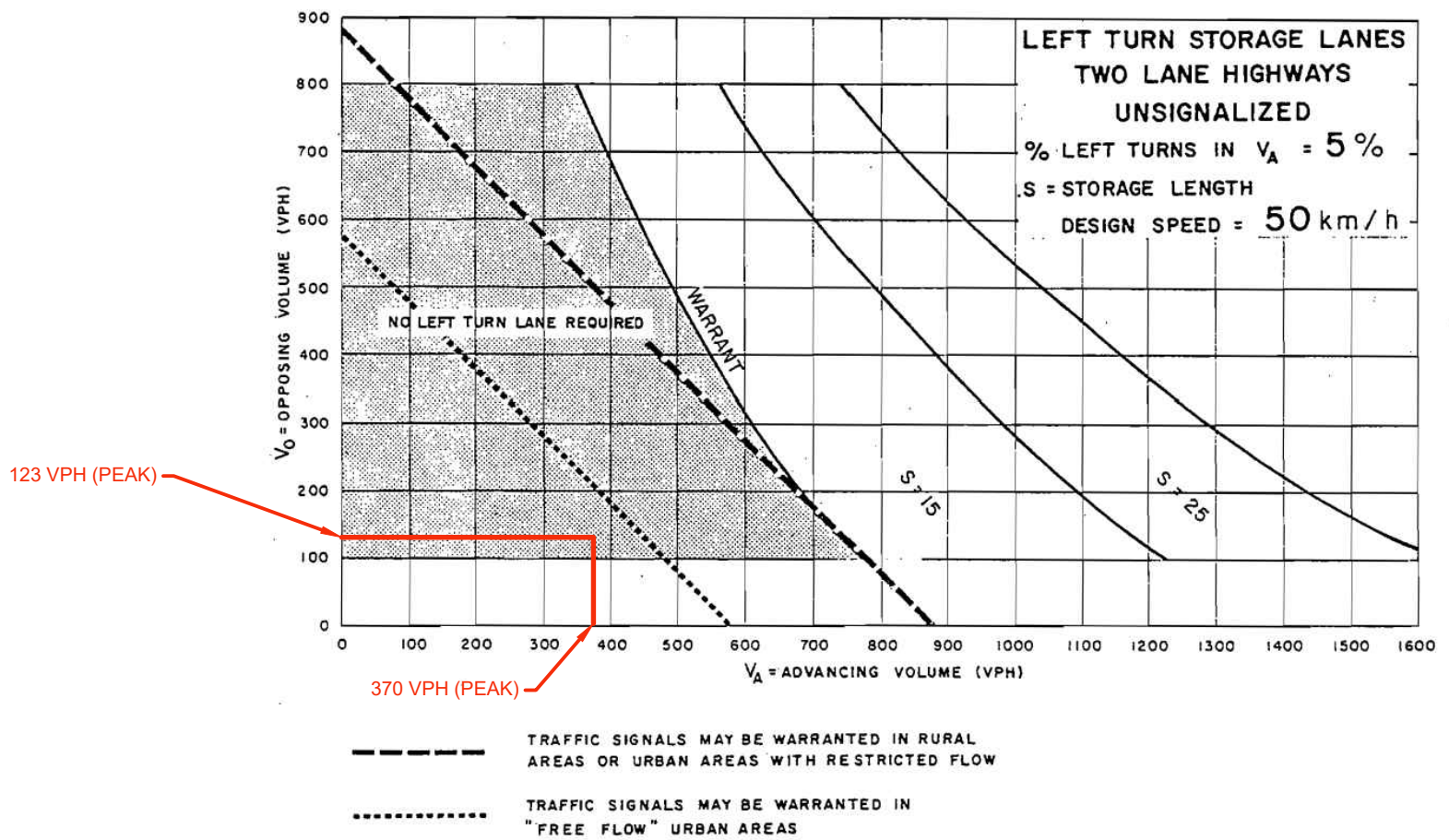
N.T.S.

Exhibit:

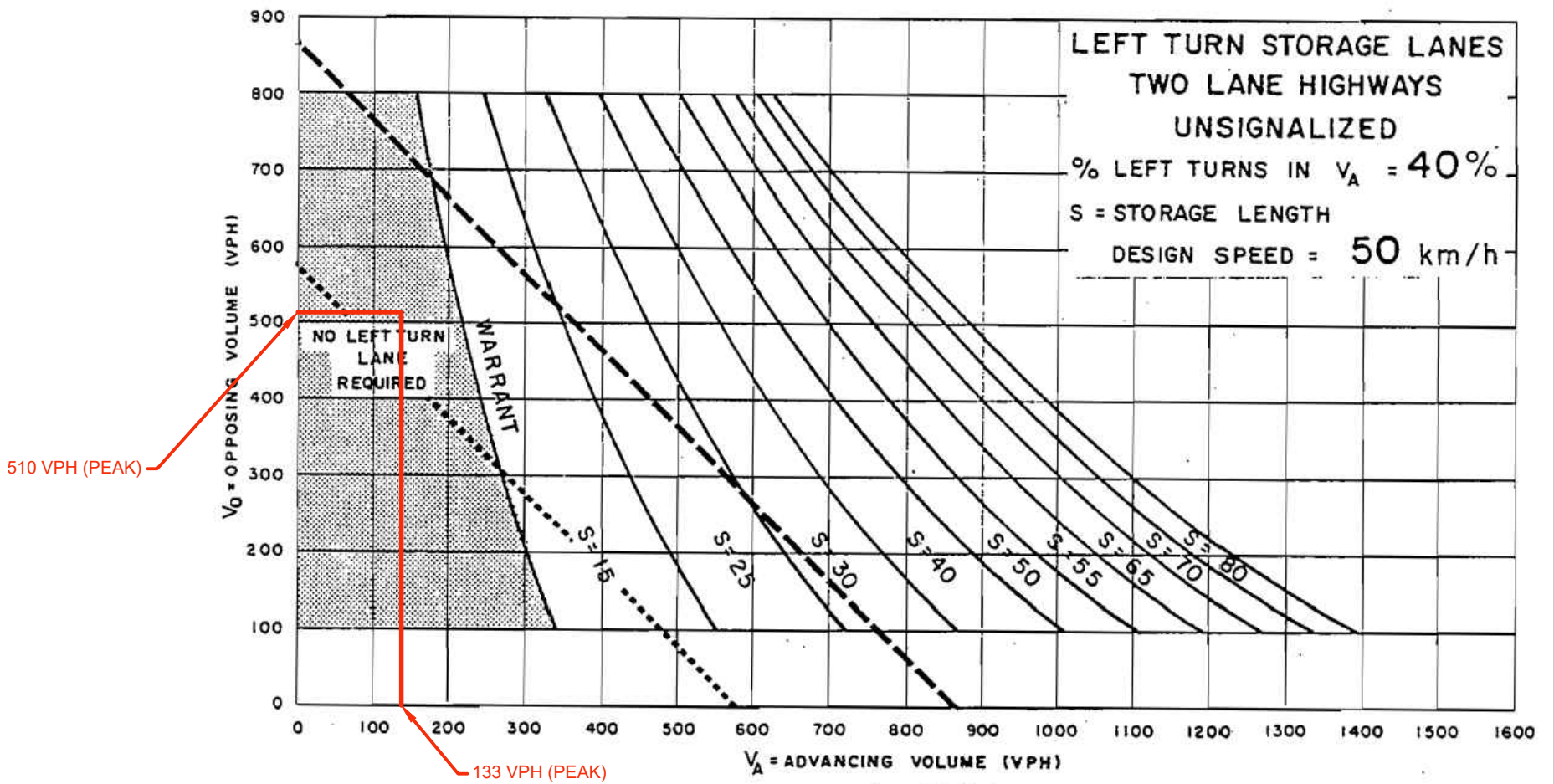
7

PM PEAK
AT-GRADE INTERSECTIONS

APPENDIX A



AM PEAK



NOTE:

1. % LEFT TURNS ARE 45% (NO GRAPHS FOR ABOVE 40%)



BOMBARDIER INC.

Project:

BOMBARDIER AEROSPACE - PEARSON

Title:

ALSTEP DRIVE AND MENWAY COURT - WB APPROACH LEFT TURN WARRANT ANALYSIS

Date:

APRIL, 2019

Project No.:

STR-02018572-0

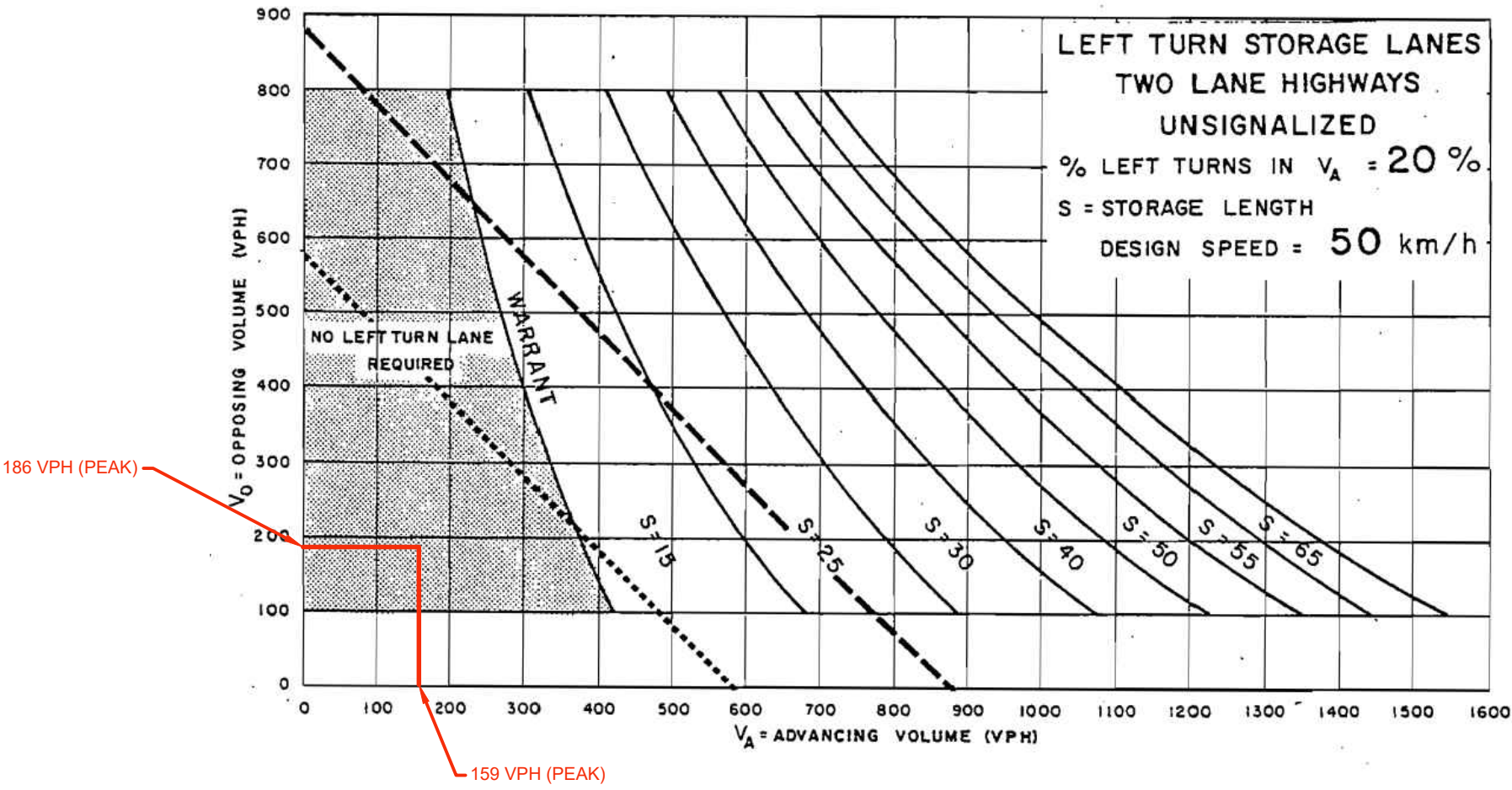
Scale:

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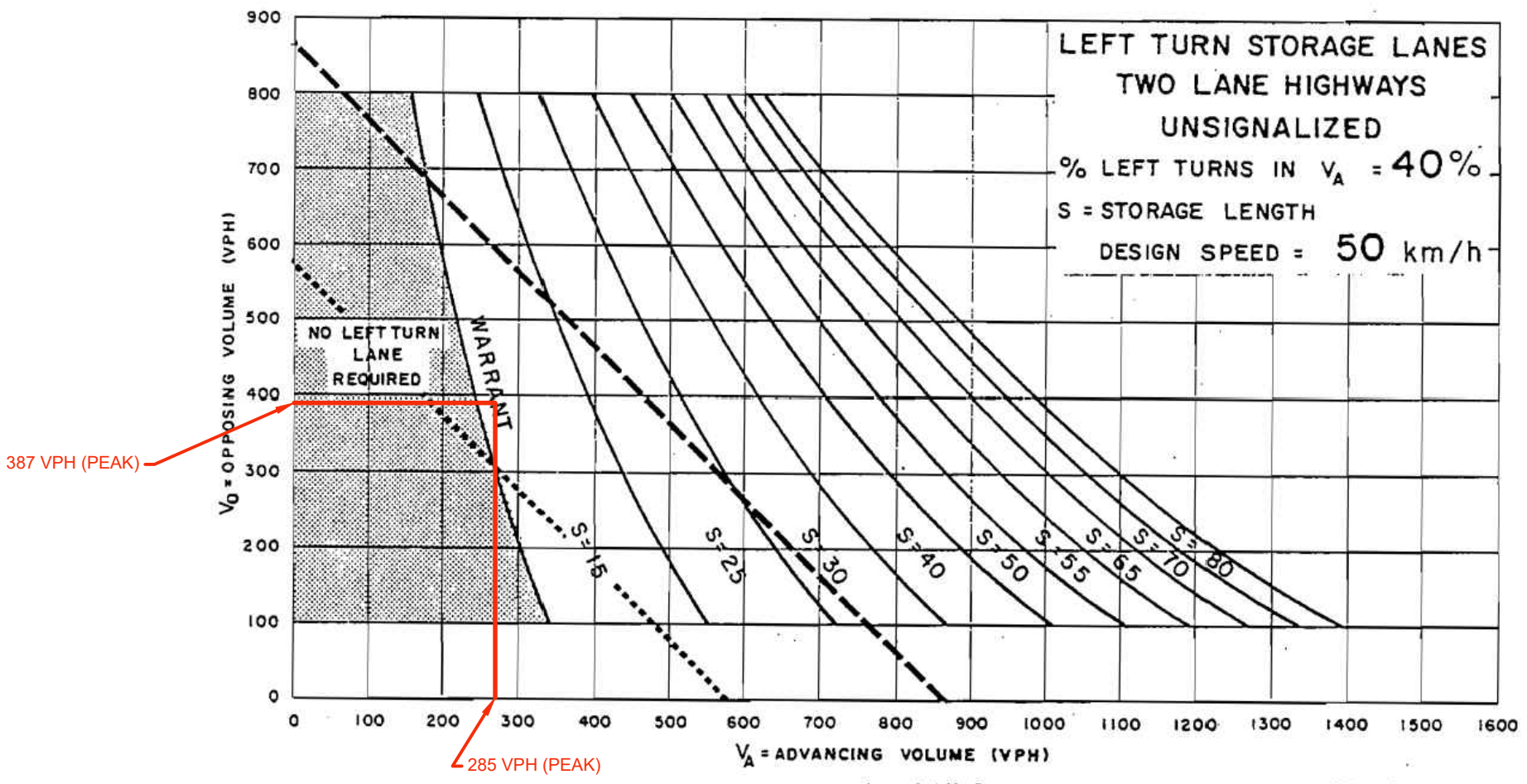
Exhibit:

7

PM PEAK



AM PEAK



NOTE:

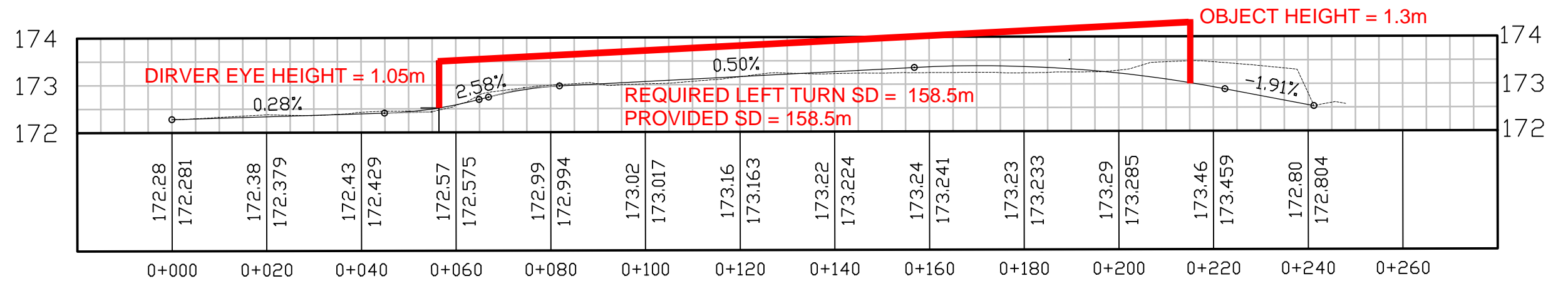
- 1. % LEFT TURNS ARE 70% (NO GRAPHS FOR ABOVE 40%)



BOMBARDIER INC.

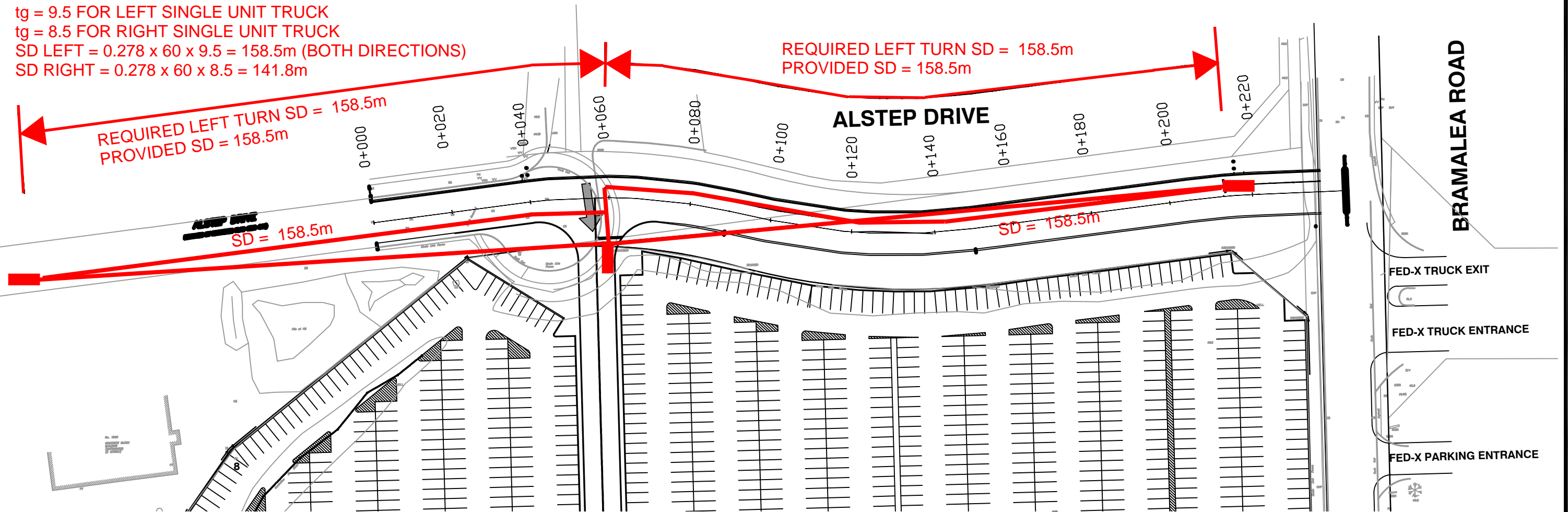
Project:		BOMBARDIER AEROSPACE - PEARSON	
Title:		ALSTEP DRIVE AND SITE ACCESS - WB APPROACH LEFT TURN WARRANT ANALYSIS	
Date:	APRIL, 2019	Project No.:	STR-02018572-0
Scale:	N.T.S.	Exhibit:	7

ALSTEP DRIVE EXTENSION PROFILE



$SD = 0.278 \times DS \times tg$
 $DS = 60 \text{ km/H}$
 $tg = 9.5 \text{ FOR LEFT SINGLE UNIT TRUCK}$
 $tg = 8.5 \text{ FOR RIGHT SINGLE UNIT TRUCK}$
 $SD \text{ LEFT} = 0.278 \times 60 \times 9.5 = 158.5\text{m (BOTH DIRECTIONS)}$
 $SD \text{ RIGHT} = 0.278 \times 60 \times 8.5 = 141.8\text{m}$

REQUIRED LEFT TURN SD = 158.5m
PROVIDED SD = 158.5m



BOMBARDIER INC.

Project: BOMBARDIER AEROSPACE - PEARSON

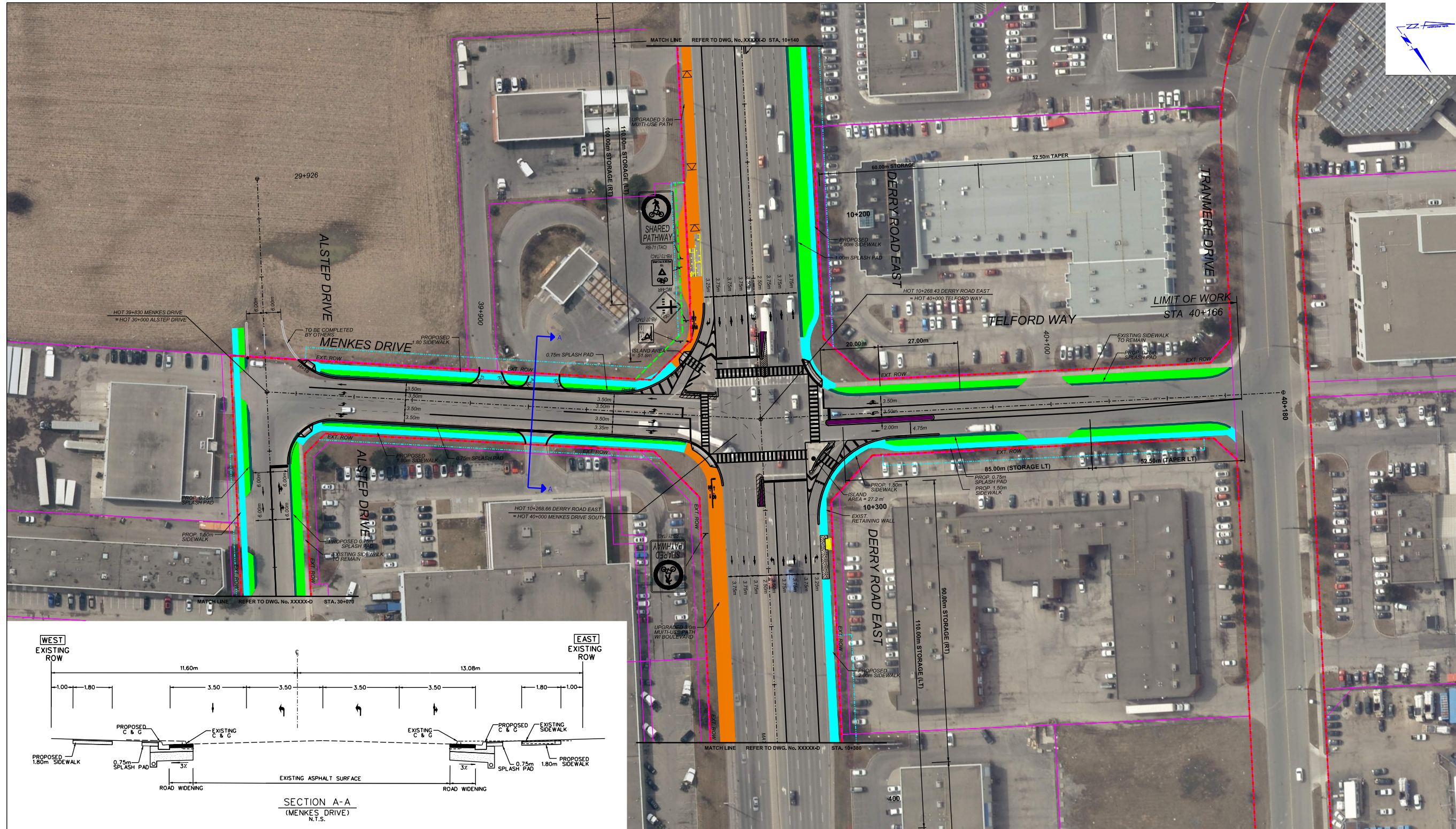
Title: SIGHT DISTANCE ANALYSIS - ALSTEP DRIVE

Date: APRIL, 2019

Project No.: STR-02018572-0

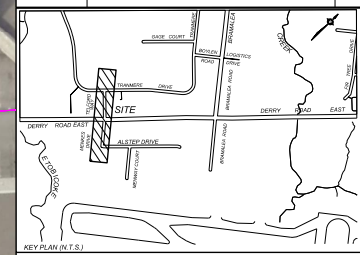
Scale: N.T.S.

Exhibit: 8



SERVICE DATA					
SERVICE	DATE	INIT	SERVICE	DATE	INIT

REVISIONS		
DATE	DETAILS	INIT
APRIL 2021		K.F.
NOVEMBER 2021		C.G.



LEGEND

- MEDIAN REMOVAL
- ROAD WIDENING
- PROPOSED SIDEWALK
- PROPOSED MULTI-USE TRAIL
- SPLASH PAD
- PROPOSED MEDIAN
- GRASS AREA
- PARCEL FABRIC
- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- TEMPORARY EASEMENT

BOMBARDIER *exp.*

General Notes

All Driveways Are ASPHALT Unless Otherwise Noted
 All Water And Sanitary Service Locations Are Approximate
 And Must Be Located Accordingly In The Field
 All Horizontal And Vertical Berms Are In Degrees
 All Slopes Size In mm
 300 Existing Water Service, Size In mm
 WSDS Proposed Water Service, Size In mm
 S & B No. Description Location
 The Contractor Is Responsible For Locating And Protecting All
 Existing Utilities Prior To And During Construction. Location Of
 Existing Utilities Approximate Only. To Be Verified In Field By Contractor.

Designed by: *CHL* Approved by: _____

100' 0' 20' 30' HORIZONTAL SCALE

Region of Peel
working with you

MENKES DRIVE/TELFORD WAY
DERRY ROAD & MENKES DRIVE / TELFORD WAY
ALTERNATIVE 2
WIDEN MENKES DRIVE / TELFORD WAY TO BOTH SIDES

CAD Area	X-XX	Area	X-XX	Project No.	XX-XXXX
Checked by	C.G.	Drawn by	K.S.	Sheet	X of X
Date	NOVEMBER 2021	Sheet	X of X	Plan No.	XXXXX-D

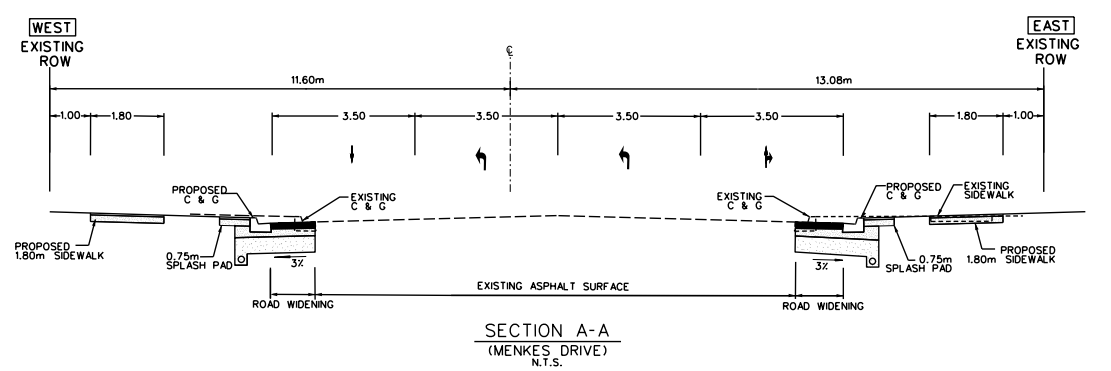
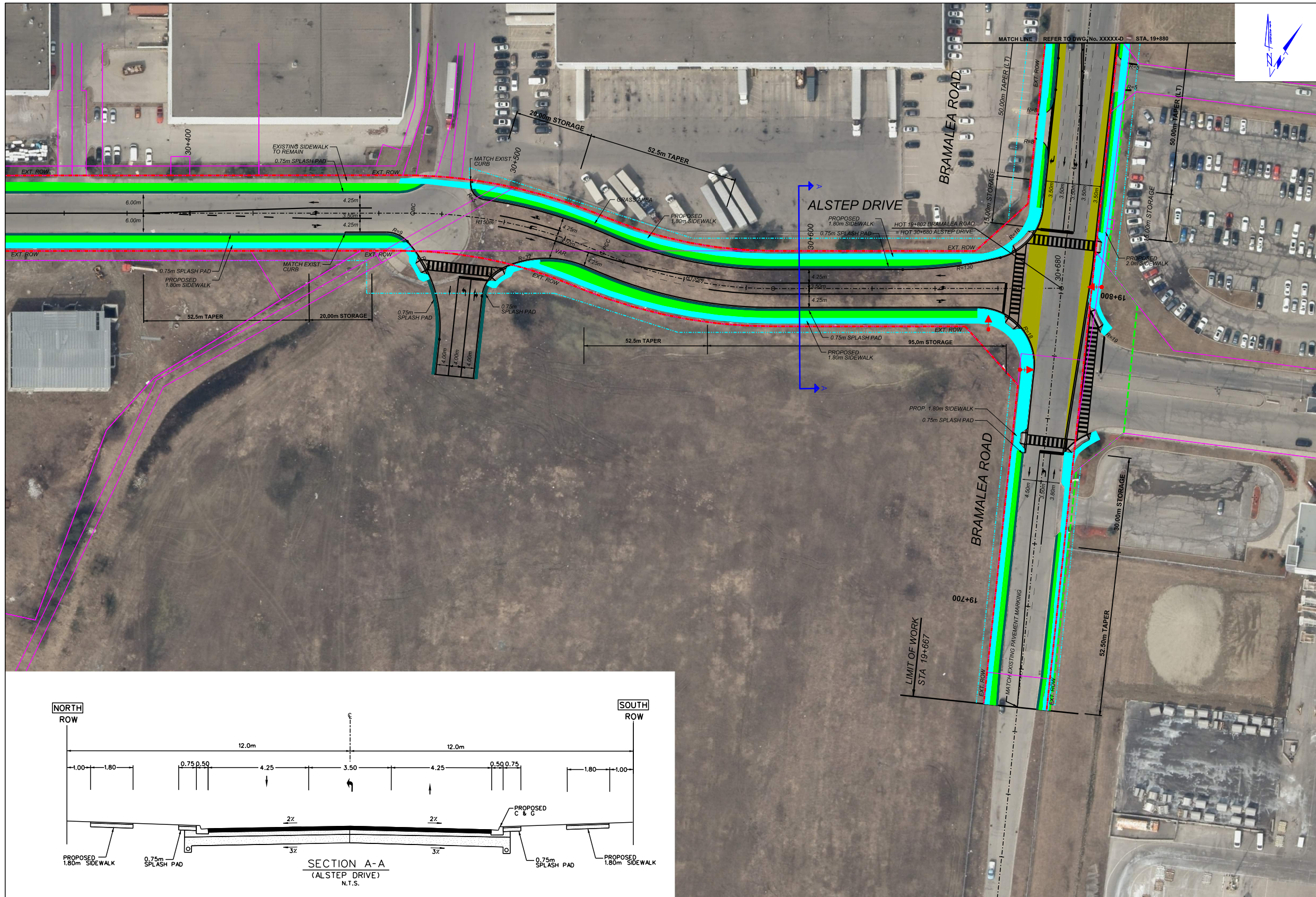
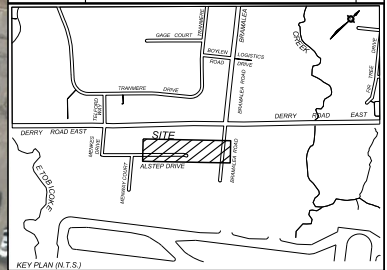


Exhibit 9 - Preferred Alternative



SERVICE DATA					
SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
REVISIONS					
DATE	DETAILS	INIT.	DATE	DETAILS	INIT.
APRIL 2021		M.F.			
NOVEMBER 2021		C.G.			

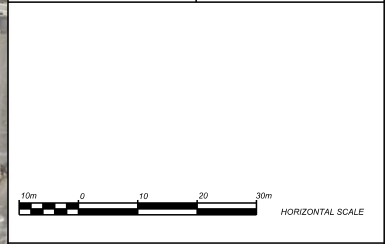


LEGEND	
	MEDIAN REMOVAL
	ROAD WIDENING
	PROPOSED SIDEWALK
	PROPOSED MULTI-USE TRAIL
	SPLASH PAD
	PROPOSED MEDIAN
	GRASS AREA
	PARCEL FABRIC
	EXISTING RIGHT OF WAY
	PROPOSED RIGHT OF WAY
	TEMPORARY EASEMENT



General Notes
 All Driveways Are ASPHALT Unless Otherwise Noted
 All Water And Sanitary Service Locations Are Approximate And Must Be Located Accordingly In The Field
 All Horizontal And Vertical Bends Are In Degrees
 All Pipes Size In mm
 300 Existing Water Service, Size In mm
 WS25 Proposed Water Service, Size In mm
 B.M. No. Description
 Location
 The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction. Location Of Existing Utilities Approximate Only. To Be Verified In Field By Contractor.

Designed by:
 Approved by:



ALSTEP DRIVE
 ALSTEP DRIVE & BRAMALEA ROAD
 ALTERNATIVE 3

EXTEND ALSTEP WITH 3-LANE SIGNALIZED INTERSECTION AT BRAMALEA ROAD

CAD Area	X-XX	Area	X-XX	Project No.	XX-XXXX
Checked by	C.G.	Drawn by	K.S.		
Date	NOVEMBER 2021	Sheet	X of X	Plan No.	XXXXX-D

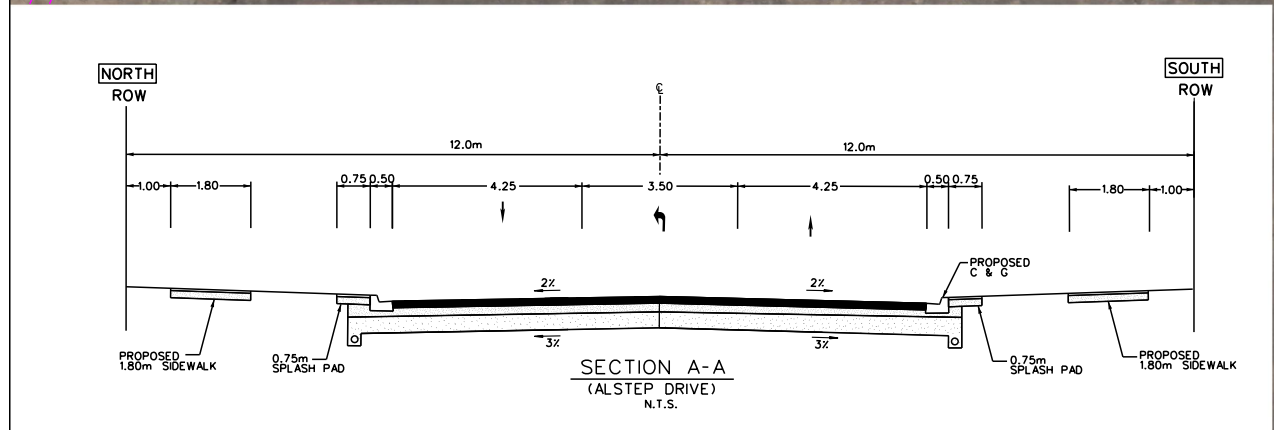


Exhibit 9 - Preferred Alternative

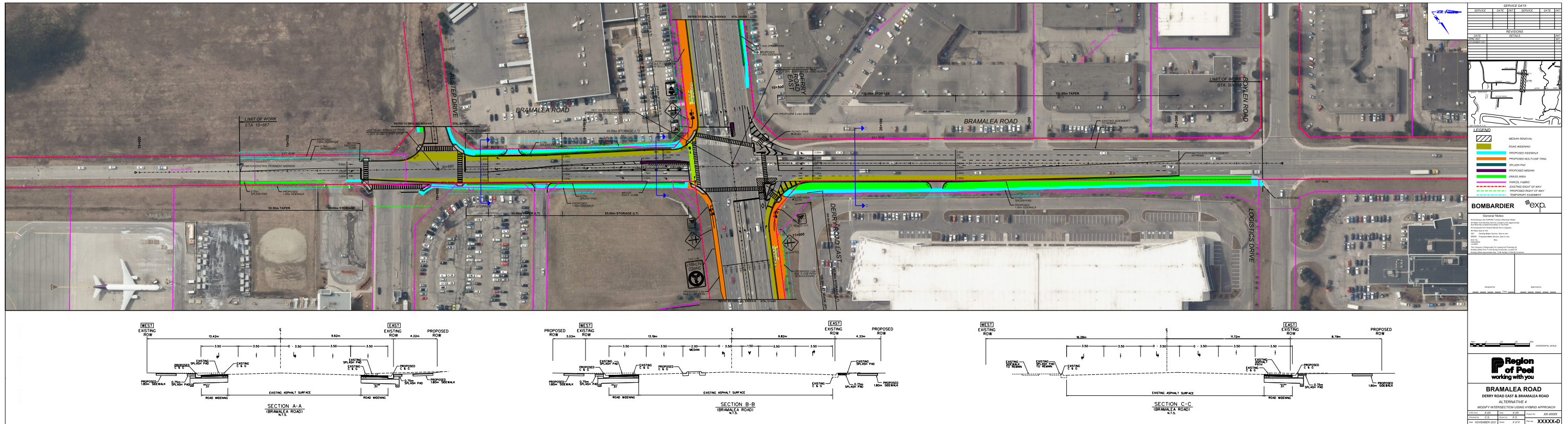


Exhibit 9 - Preferred Alternative

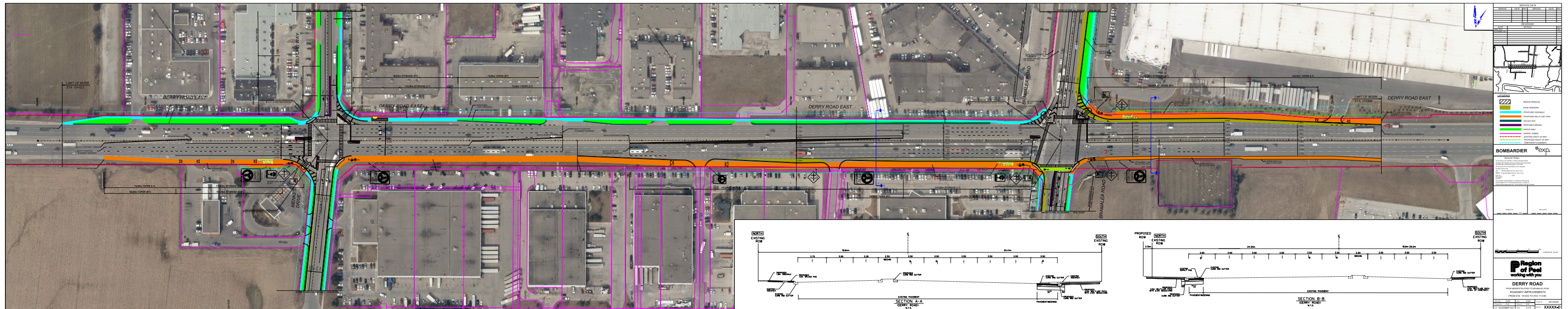


Exhibit 9 - Preferred Alternative

APPENDIX A

Existing Traffic Data

REGIONAL MUNICIPALITY OF PEEL

Traffic Signal Timing Parameters

Database Date		February 27, 2019		Prepared Date:		February 28, 2019				
Database Rev		iNET		Completed By:		J AP				
Timing Card / Field rev		iNET		Checked By:		RC				
Derry Road at Bramalea Road										
Phase #	Direction	Vehicle Minimum (sec.)	Pedestrian Minimum (sec.)		Amber (sec.)	All Red (sec.)	TIME PERIOD (sec.)			
			WALK	FDWALK			AM MAX	OFF MAX	PM MAX	
1	Derry Road - EB P.P. LT Arrow	5.0	0.0	0.0	3.0	0.0	16.0	22.0	29.0	
2	Derry Road - EB/WB Green	12.0	11.0	18.0	4.2	2.5	77.0	58.0	58.0	
3	Private Road - NB Green	8.0	0.0	0.0	4.0	3.9	29.0	22.0	22.0	
4	Bramalea Road - SB Green	10.0	15.0	24.0	4.0	3.9	38.0	58.0	51.0	
5										
6										
7										
8										
System Control		Yes								
Local Control		No								
Semi-Actuated Mode		Yes								
				TIME (M-F)		PEAK		CYCLE LENGTH (sec.)		OFFSET (sec.)
				06:00 - 09:30		AM		160		56
				09:30 - 15:00		OFF		160		37
				19:30 - 00:00		PM		160		93

REGIONAL MUNICIPALITY OF PEEL

Traffic Signal Timing Parameters

Database Date		February 27, 2019		Prepared Date:		February 28, 2019				
Database Rev		INET		Completed By:		J AP				
Timing Card / Field rev		INET		Checked By:		RC				
Derry Road at Telford Way/Menkes Drive										
Phase #	Direction	Vehicle Minimum (sec.)	Pedestrian Minimum (sec.)		Amber (sec.)	All Red (sec.)	TIME PERIOD (sec.)			
			WALK	FDWALK			AM MAX	OFF MAX	PM MAX	
1	Derry Road - WB P.P. LT Arrow	5.0			3.0		14.0	14.0	21.0	
2	Derry Road - EB Green	12.0	9.0	14.0	4.2	2.0	95.0	119.0	94.0	
3	Not In Use									
4	Menkes Drive - NB Green	8.0	13.0	20.0	4.0	3.1	51.0	27.0	45.0	
5	Derry Road - EB P.P. LT Arrow	5.0			3.0		18.0			
6	Derry Road - WB Green	12.0	9.0	14.0	4.2	2.0	91.0	133.0	115.0	
7	Not In Use									
8	Telford Way - SB Green	8.0	13.0	20.0	4.0	3.1	51.0	27.0	45.0	
System Control								Yes		
Local Control								No		
Semi-Actuated Mode								Yes		
				TIME (M-F)		PEAK		CYCLE LENGTH (sec.)		OFFSET (sec.)
				06:00 - 09:30		AM		160		139
				09:30 - 15:00		OFF		160		86
				19:30 - 00:00		PM		160		142

APPENDIX A

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period

From: 6:00:00
To: 12:00:00

One Hour Peak

From: 7:30:00
To: 8:30:00

Municipality: Mississauga
Site #: 1904100001
Intersection: Derry Rd E & Bramalea Rd
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Signalized Intersection ****

Major Road: Derry Rd E runs W/E

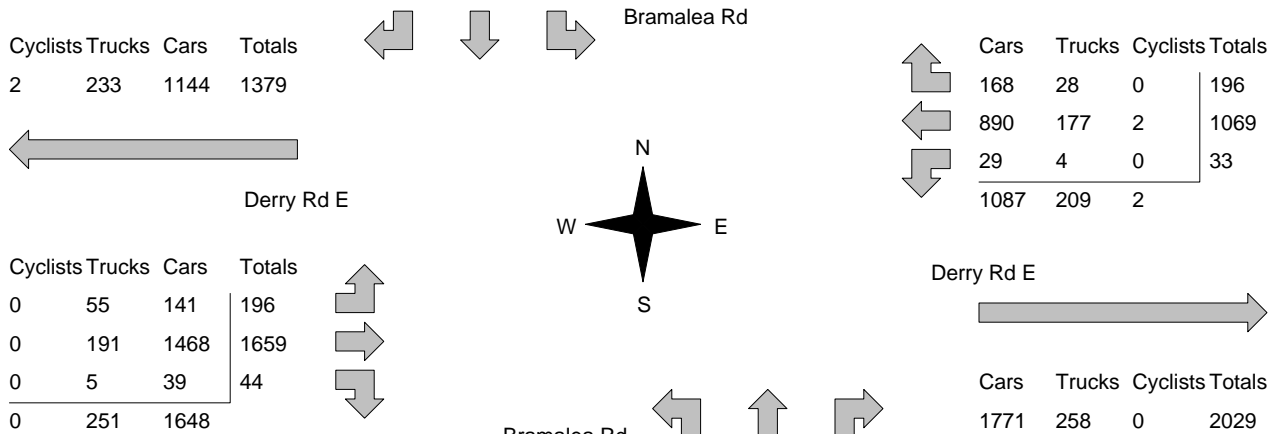
North Leg Total: 1072
North Entering: 667
North Peds: 8
Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	41	16	59	116
Cars	218	39	294	551
Totals	259	55	353	



Cyclists	0
Trucks	89
Cars	316
Totals	405

East Leg Total: 3327
East Entering: 1298
East Peds: 1
Peds Cross: \bowtie



Peds Cross: \bowtie
West Peds: 13
West Entering: 1899
West Leg Total: 3278

Cars	107	Cars	36	7	9	52
Trucks	25	Trucks	15	6	8	29
Cyclists	0	Cyclists	0	0	0	0
Totals	132	Totals	51	13	17	

Peds Cross: \bowtie
South Peds: 2
South Entering: 81
South Leg Total: 213

Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period

From: 12:00:00

To: 19:00:00

One Hour Peak

From: 15:30:00

To: 16:30:00

Municipality: Mississauga
Site #: 1904100001
Intersection: Derry Rd E & Bramalea Rd
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Signalized Intersection ****

Major Road: Derry Rd E runs W/E

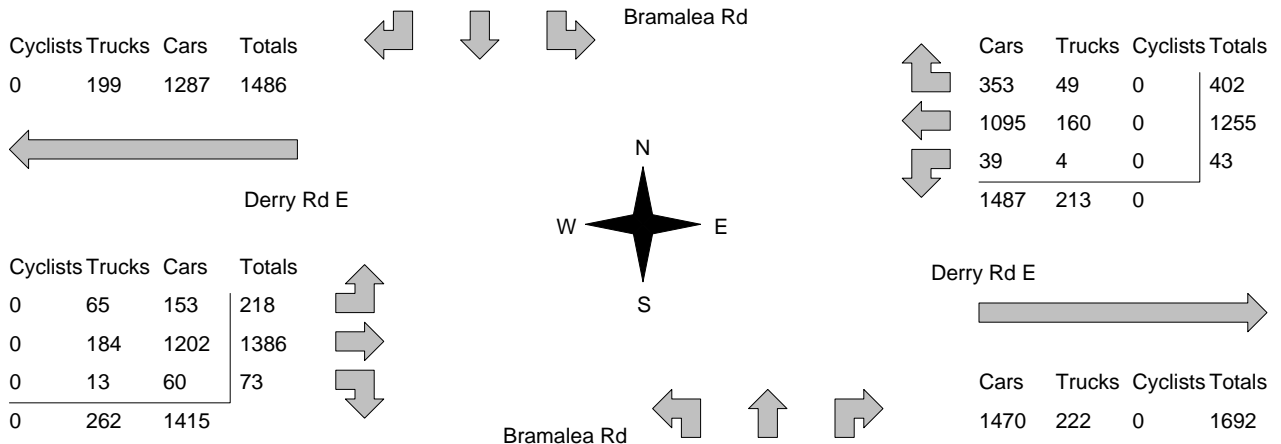
North Leg Total: 1141
 North Entering: 467
 North Peds: 3
 Peds Cross: \times

Cyclists	0	0	0	0
Trucks	35	5	33	73
Cars	142	16	236	394
Totals	177	21	269	



Cyclists	0
Trucks	116
Cars	558
Totals	674

East Leg Total: 3392
 East Entering: 1700
 East Peds: 0
 Peds Cross: \times



Peds Cross: \times
 West Peds: 9
 West Entering: 1677
 West Leg Total: 3163

Cars	115
Trucks	22
Cyclists	0
Totals	137

Cars	50	52	32	134
Trucks	4	2	5	11
Cyclists	0	0	0	0
Totals	54	54	37	

Peds Cross: \times
 South Peds: 1
 South Entering: 145
 South Leg Total: 282

Comments

Ontario Traffic Inc.

Eight Hour Peak Diagram

Eight Hour Peak

From: 10:45:00

To: 18:45:00

Municipality: Mississauga
Site #: 1904100001
Intersection: Derry Rd E & Bramalea Rd
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Signalized Intersection ****

Major Road: Derry Rd E runs W/E

North Leg Total: 7902
 North Entering: 3423
 North Peds: 44
 Peds Cross: \times

Cyclists	0	0	0	0
Trucks	326	42	284	652
Cars	1140	138	1493	2771
Totals	1466	180	1777	



Cyclists	0
Trucks	979
Cars	3500
Totals	4479

East Leg Total: 23207
 East Entering: 11334
 East Peds: 0
 Peds Cross: \times

Cyclists	Trucks	Cars	Totals
0	1821	8845	10666

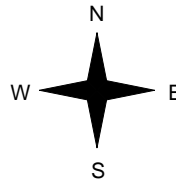


Bramalea Rd

Cars	Trucks	Cyclists	Totals
1957	378	0	2335
7290	1434	0	8724
233	42	0	275
9480	1854	0	



Derry Rd E



Cyclists	Trucks	Cars	Totals
0	569	1226	1795
2	1471	8384	9857
0	80	360	440
2	2120	9970	



Derry Rd E



Peds Cross: \times
 West Peds: 78
 West Entering: 12092
 West Leg Total: 22758

Cars	731	Cars	415	317	205	937
Trucks	164	Trucks	61	32	34	127
Cyclists	0	Cyclists	0	0	0	0
Totals	895	Totals	476	349	239	



Bramalea Rd



Peds Cross: \times
 South Peds: 19
 South Entering: 1064
 South Leg Total: 1959

Comments

Ontario Traffic Inc.

Total Count Diagram

Municipality: Mississauga
Site #: 1904100001
Intersection: Derry Rd E & Bramalea Rd
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Signalized Intersection ****

Major Road: Derry Rd E runs W/E

North Leg Total: 12511
 North Entering: 5986
 North Peds: 76
 Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	528	72	454	1054
Cars	1944	275	2713	4932
Totals	2472	347	3167	



Cyclists 0
 Trucks 1488
 Cars 5037
 Totals 6525

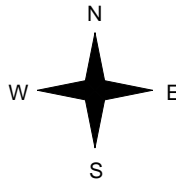
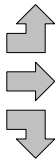
East Leg Total: 36932
 East Entering: 16932
 East Peds: 1
 Peds Cross: \bowtie

Cyclists	Trucks	Cars	Totals
3	2898	13490	16391



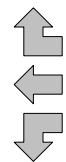
Derry Rd E

Cyclists	Trucks	Cars	Totals
0	854	1978	2832
3	2434	14084	16521
0	104	562	666
3	3392	16624	



Bramalea Rd

Cars	Trucks	Cyclists	Totals
2680	550	0	3230
10985	2254	3	13242
404	56	0	460
14069	2860	3	



Derry Rd E



Cars	Trucks	Cyclists	Totals
17060	2937	3	20000

Peds Cross: \bowtie
 West Peds: 135
 West Entering: 20019
 West Leg Total: 36410

Cars	1241
Trucks	232
Cyclists	0
Totals	1473



Cars	561	379	263	1203
Trucks	116	84	49	249
Cyclists	0	0	0	0
Totals	677	463	312	

Peds Cross: \bowtie
 South Peds: 24
 South Entering: 1452
 South Leg Total: 2925

Comments

Ontario Traffic Inc. Traffic Count Summary

Intersection: Derry Rd E & Bramalea Rd					Count Date: 19-Feb-19		Municipality: Mississauga					
North Approach Totals						South Approach Totals						
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds	North/South Total Approaches	Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0
7:00:00	295	34	162	491	2	519	7:00:00	14	7	7	28	0
8:00:00	334	46	224	604	8	642	8:00:00	20	8	10	38	2
9:00:00	372	37	250	659	5	740	9:00:00	46	22	13	81	2
10:00:00	209	23	205	437	10	558	10:00:00	60	44	17	121	1
11:00:00	188	22	193	403	6	542	11:00:00	76	38	25	139	0
12:00:00	155	21	186	362	1	470	12:00:00	46	38	24	108	4
13:00:00	218	20	201	439	0	548	13:00:00	53	26	30	109	1
14:00:00	213	18	196	427	7	544	14:00:00	56	28	33	117	0
15:00:00	279	22	236	537	4	654	15:00:00	57	32	28	117	2
16:00:00	270	18	200	488	7	622	16:00:00	65	35	34	134	1
17:00:00	254	16	153	423	3	580	17:00:00	51	80	26	157	0
18:00:00	207	32	130	369	17	552	18:00:00	75	71	37	183	9
19:00:00	173	38	136	347	6	467	19:00:00	58	34	28	120	2
Totals:	3167	347	2472	5986	76	7438		677	463	312	1452	24
East Approach Totals						West Approach Totals						
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds	East/West Total Approaches	Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0
7:00:00	40	742	176	958	0	2600	7:00:00	219	1365	58	1642	8
8:00:00	21	1022	209	1252	0	3002	8:00:00	191	1520	39	1750	14
9:00:00	43	1004	183	1230	1	3061	9:00:00	217	1567	47	1831	11
10:00:00	42	857	168	1067	0	2481	10:00:00	201	1169	44	1414	18
11:00:00	32	825	161	1018	0	2337	11:00:00	202	1088	29	1319	4
12:00:00	28	891	192	1111	0	2437	12:00:00	203	1095	28	1326	5
13:00:00	22	979	194	1195	0	2583	13:00:00	217	1143	28	1388	7
14:00:00	50	1035	231	1316	0	2749	14:00:00	235	1145	53	1433	9
15:00:00	32	1246	222	1500	0	3052	15:00:00	195	1311	46	1552	12
16:00:00	44	1285	326	1655	0	3306	16:00:00	224	1378	49	1651	10
17:00:00	29	1164	477	1670	0	3383	17:00:00	230	1374	109	1713	9
18:00:00	37	1050	456	1543	0	3222	18:00:00	264	1335	80	1679	20
19:00:00	40	1142	235	1417	0	2738	19:00:00	234	1031	56	1321	8
Totals:	460	13242	3230	16932	1	36951		2832	16521	666	20019	135
Calculated Values for Traffic Crossing Major Street												
Hours Ending:	8:00	9:00	14:00	15:00			16:00	17:00	18:00	19:00		
Crossing Values:	414	467	306	380			380	394	373	277		

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period

From: 6:00:00
To: 12:00:00

One Hour Peak

From: 7:30:00
To: 8:30:00

Municipality: Mississauga
Site #: 1904100003
Intersection: Derry Rd E & Menkes Dr-Telford W
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Signalized Intersection ****

Major Road: Derry Rd E runs W/E

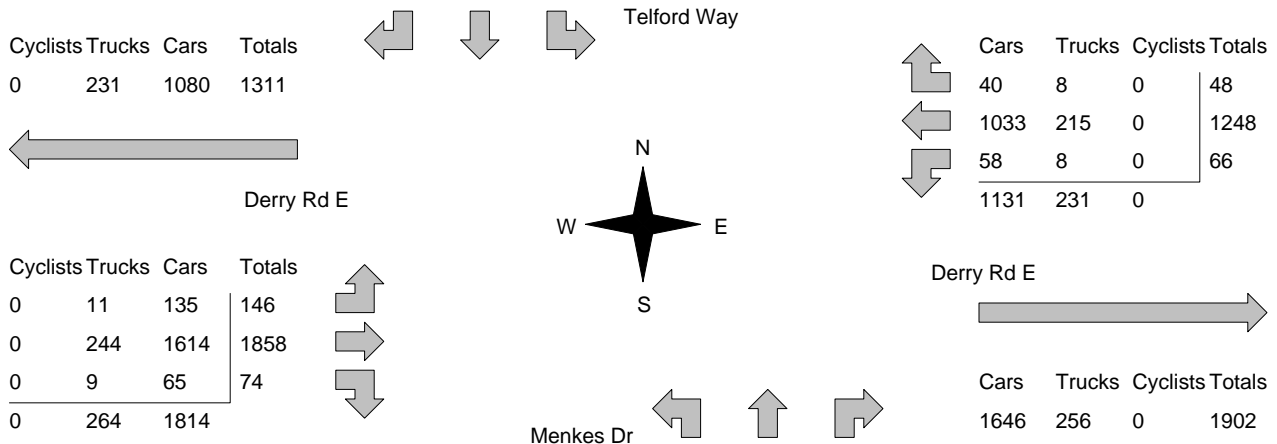
North Leg Total: 275
North Entering: 76
North Peds: 6
Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	5	1	8	14
Cars	27	13	22	62
Totals	32	14	30	



Cyclists 0
Trucks 20
Cars 179
Totals 199

East Leg Total: 3264
East Entering: 1362
East Peds: 3
Peds Cross: \bowtie



Peds Cross: \bowtie
West Peds: 10
West Entering: 2078
West Leg Total: 3389

Cars	136	Cars	20	4	10	34
Trucks	18	Trucks	11	1	4	16
Cyclists	0	Cyclists	0	0	0	0
Totals	154	Totals	31	5	14	

Peds Cross: \bowtie
South Peds: 1
South Entering: 50
South Leg Total: 204

Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period

From: 12:00:00

To: 19:00:00

One Hour Peak

From: 14:15:00

To: 15:15:00

Municipality: Mississauga
Site #: 1904100003
Intersection: Derry Rd E & Menkes Dr-Telford W
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Signalized Intersection ****

Major Road: Derry Rd E runs W/E

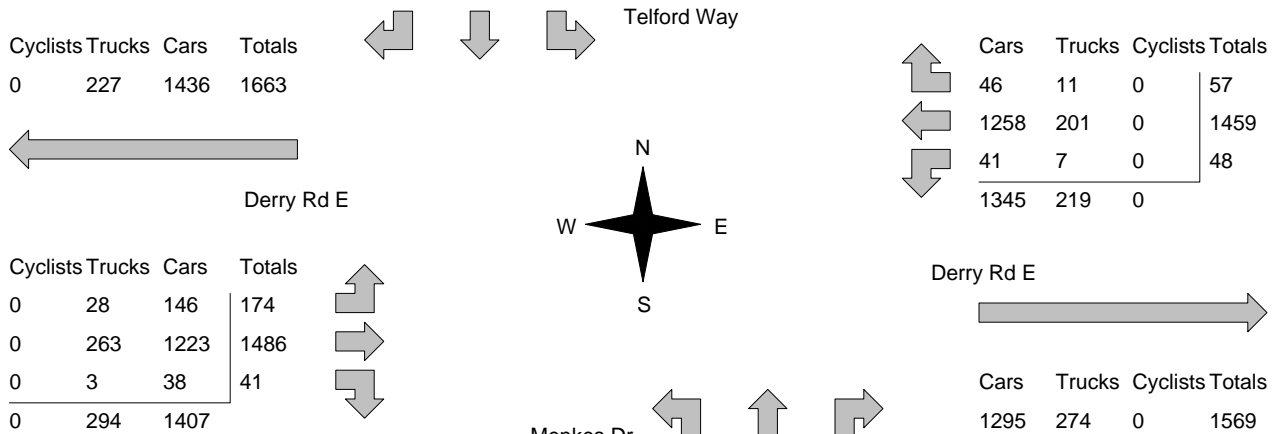
North Leg Total: 428
 North Entering: 183
 North Peds: 8
 Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	15	3	5	23
Cars	112	7	41	160
Totals	127	10	46	



Cyclists	0
Trucks	43
Cars	202
Totals	245

East Leg Total: 3133
 East Entering: 1564
 East Peds: 4
 Peds Cross: \bowtie



Peds Cross: \bowtie
 West Peds: 4
 West Entering: 1701
 West Leg Total: 3364

Cars	86	66	10	31	107
Trucks	13	11	4	6	21
Cyclists	0	0	0	0	0
Totals	99	77	14	37	

Peds Cross: \bowtie
 South Peds: 2
 South Entering: 128
 South Leg Total: 227

Comments

Ontario Traffic Inc.

Eight Hour Peak Diagram

Eight Hour Peak

From: 10:45:00

To: 18:45:00

Municipality: Mississauga
Site #: 1904100003
Intersection: Derry Rd E & Menkes Dr-Telford W
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Signalized Intersection ****

Major Road: Derry Rd E runs W/E

North Leg Total: 3166
 North Entering: 1489
 North Peds: 54
 Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	139	28	45	212
Cars	797	84	396	1277
Totals	936	112	441	



Cyclists	0
Trucks	309
Cars	1368
Totals	1677

East Leg Total: 22546
 East Entering: 10509
 East Peds: 36
 Peds Cross: \bowtie

Cyclists	Trucks	Cars	Totals
0	1844	9359	11203

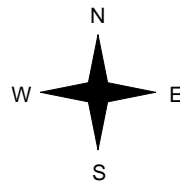


Telford Way

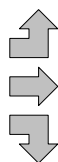
Cars	Trucks	Cyclists	Totals
311	94	0	405
8105	1630	0	9735
294	75	0	369
8710	1799	0	



Derry Rd E



Cyclists	Trucks	Cars	Totals
0	176	906	1082
1	2002	9267	11270
0	64	235	299
1	2242	10408	



Derry Rd E



Peds Cross: \bowtie
 West Peds: 35
 West Entering: 12651
 West Leg Total: 23854

Cars	613
Trucks	167
Cyclists	0
Totals	780



Cars	457	151	265	873
Trucks	75	39	61	175
Cyclists	0	0	0	0
Totals	532	190	326	

Peds Cross: \bowtie
 South Peds: 25
 South Entering: 1048
 South Leg Total: 1828

Menkes Dr



Comments

Ontario Traffic Inc.

Total Count Diagram

Municipality: Mississauga
Site #: 1904100003
Intersection: Derry Rd E & Menkes Dr-Telford W
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Signalized Intersection ****

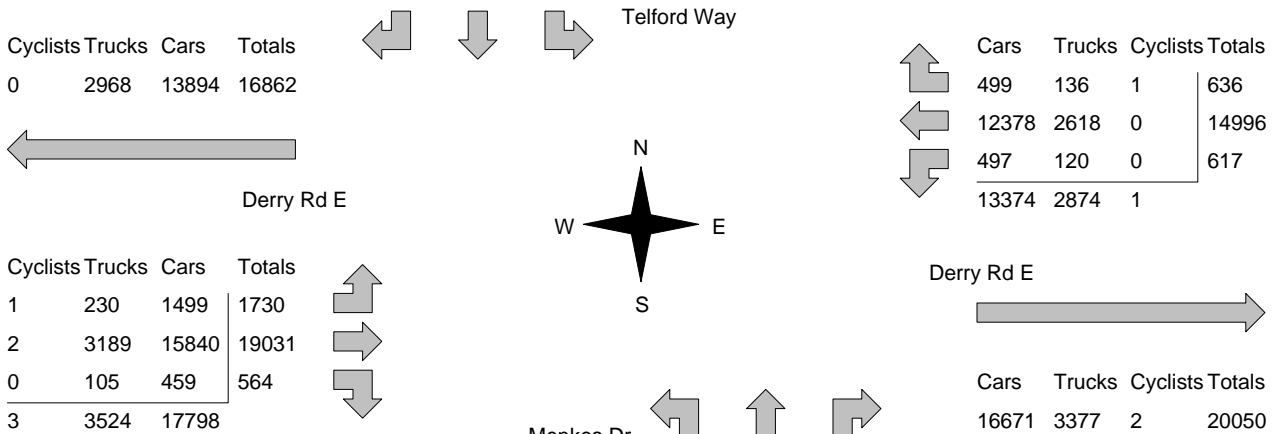
Major Road: Derry Rd E runs W/E

North Leg Total: 4481
 North Entering: 1891
 North Peds: 86
 Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	197	37	78	312
Cars	963	121	495	1579
Totals	1160	158	573	

Cyclists 2
 Trucks 422
 Cars 2166
 Totals 2590

East Leg Total: 36299
 East Entering: 16249
 East Peds: 49
 Peds Cross: \bowtie



Peds Cross: \bowtie
 West Peds: 77
 West Entering: 21325
 West Leg Total: 38187

Cars	1077	Cars	553	168	336	1057
Trucks	262	Trucks	153	56	110	319
Cyclists	0	Cyclists	0	0	0	0
Totals	1339	Totals	706	224	446	

Peds Cross: \bowtie
 South Peds: 33
 South Entering: 1376
 South Leg Total: 2715

Comments

Ontario Traffic Inc. Traffic Count Summary

Intersection: Derry Rd E & Menkes Dr-Telford V													Count Date: 19-Feb-19		Municipality: Mississauga	
North Approach Totals						South Approach Totals										
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds	North/South Total Approaches	Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds				
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total					
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0				
7:00:00	10	3	17	30	3	54	7:00:00	12	0	12	24	3				
8:00:00	31	14	26	71	11	114	8:00:00	24	4	15	43	0				
9:00:00	28	11	47	86	8	154	9:00:00	39	9	20	68	2				
10:00:00	26	15	59	100	8	189	10:00:00	50	7	32	89	1				
11:00:00	46	6	71	123	5	217	11:00:00	46	15	33	94	2				
12:00:00	42	11	98	151	3	244	12:00:00	51	14	28	93	1				
13:00:00	51	18	141	210	9	321	13:00:00	54	23	34	111	1				
14:00:00	46	9	132	187	6	316	14:00:00	74	14	41	129	3				
15:00:00	42	10	131	183	9	280	15:00:00	56	9	32	97	4				
16:00:00	74	16	120	210	9	374	16:00:00	75	31	58	164	2				
17:00:00	78	19	130	227	6	432	17:00:00	102	44	59	205	9				
18:00:00	66	21	96	183	6	342	18:00:00	76	41	42	159	4				
19:00:00	33	5	92	130	3	230	19:00:00	47	13	40	100	1				
Totals:	573	158	1160	1891	86	3267		706	224	446	1376	33				
East Approach Totals						West Approach Totals										
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds	East/West Total Approaches	Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds				
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total					
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0				
7:00:00	31	890	29	950	1	2772	7:00:00	111	1677	34	1822	0				
8:00:00	53	1142	50	1245	2	3174	8:00:00	123	1738	68	1929	17				
9:00:00	61	1192	43	1296	4	3312	9:00:00	156	1780	80	2016	11				
10:00:00	57	1000	52	1109	3	2683	10:00:00	145	1384	45	1574	13				
11:00:00	40	1017	52	1109	3	2527	11:00:00	140	1234	44	1418	5				
12:00:00	35	1049	27	1111	2	2522	12:00:00	145	1223	43	1411	1				
13:00:00	44	1092	62	1198	3	2712	13:00:00	154	1314	46	1514	5				
14:00:00	62	1194	44	1300	3	2888	14:00:00	162	1388	38	1588	6				
15:00:00	48	1409	53	1510	3	3204	15:00:00	183	1473	38	1694	1				
16:00:00	47	1414	54	1515	5	3164	16:00:00	131	1480	38	1649	8				
17:00:00	54	1238	66	1358	9	3066	17:00:00	116	1557	35	1708	2				
18:00:00	39	1128	67	1234	7	2919	18:00:00	106	1550	29	1685	6				
19:00:00	46	1231	37	1314	4	2631	19:00:00	58	1233	26	1317	2				
Totals:	617	14996	636	16249	49	37574		1730	19031	564	21325	77				
Calculated Values for Traffic Crossing Major Street																
Hours Ending:	8:00	9:00	13:00	14:00			15:00	16:00	17:00	18:00						
Crossing Values:	88	93	136	143			112	193	235	196						

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period

From: 6:00:00
To: 12:00:00

One Hour Peak

From: 8:45:00
To: 9:45:00

Municipality: Mississauga
Site #: 1904100006
Intersection: Alstep Dr & Menway Court
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Signalized Intersection ****

Major Road: Alstep Dr runs W/E

North Leg Total: 27
North Entering: 15
North Peds: 0
Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	11	2	0	13
Cars	1	0	1	2
Totals	12	2	1	



Cyclists	0
Trucks	8
Cars	4
Totals	12

East Leg Total: 80
East Entering: 37
East Peds: 0
Peds Cross: \bowtie

Cyclists	0
Trucks	36
Cars	25
Totals	61

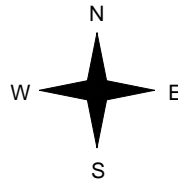


Private Access

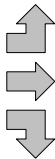
Cars	0	0	0	0
Trucks	16	19	0	35
Cyclists	2	0	0	2
Totals	18	19	0	



Alstep Dr



Cyclists	0
Trucks	6
Cars	4
Totals	10
Cyclists	0
Trucks	13
Cars	29
Totals	42
Cyclists	0
Trucks	10
Cars	30
Totals	40
Cyclists	0
Trucks	29
Cars	63
Totals	



Alstep Dr



Cars	30
Trucks	13
Cyclists	0
Totals	43

Peds Cross: \bowtie
West Peds: 4
West Entering: 92
West Leg Total: 153

Cars	32
Trucks	12
Cyclists	0
Totals	44



Cars	8	0	0	8
Trucks	6	2	0	8
Cyclists	0	0	0	0
Totals	14	2	0	

Peds Cross: \bowtie
South Peds: 0
South Entering: 16
South Leg Total: 60

Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period

From: 12:00:00

To: 19:00:00

One Hour Peak

From: 16:15:00

To: 17:15:00

Municipality: Mississauga
Site #: 1904100006
Intersection: Alstep Dr & Menway Court
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Signalized Intersection ****

Major Road: Alstep Dr runs W/E

North Leg Total: 21
 North Entering: 8
 North Peds: 0
 Peds Cross: \times

Cyclists	0	0	0	0
Trucks	3	3	0	6
Cars	1	0	1	2
Totals	4	3	1	



Cyclists	0
Trucks	10
Cars	3
Totals	13

East Leg Total: 138
 East Entering: 95
 East Peds: 0
 Peds Cross: \times

Cyclists	0
Trucks	20
Cars	115
Totals	135

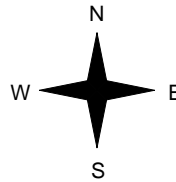


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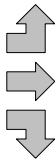
Cars	0	0	0	0
Trucks	84	11	0	95
Cyclists	0	0	0	0
Totals	84	11	0	



Alstep Dr



Cyclists	0
Trucks	7
Cars	3
Totals	10
Cyclists	0
Trucks	11
Cars	21
Totals	32
Cyclists	0
Trucks	4
Cars	11
Totals	15
Cyclists	0
Trucks	22
Cars	35
Totals	57



Alstep Dr



Cars	31	12	0	43
Trucks				
Cyclists				
Totals	31	12	0	43

Menway Court



Peds Cross: \times
 West Peds: 0
 West Entering: 57
 West Leg Total: 192

Cars	11
Trucks	7
Cyclists	0
Totals	18



Cars	30	0	9	39
Trucks	6	3	1	10
Cyclists	0	0	0	0
Totals	36	3	10	

Peds Cross: \times
 South Peds: 1
 South Entering: 49
 South Leg Total: 67

Comments

Ontario Traffic Inc.

Eight Hour Peak Diagram

Eight Hour Peak

From: 9:15:00

To: 17:15:00

Municipality: Mississauga
Site #: 1904100006
Intersection: Alstep Dr & Menway Court
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Signalized Intersection ****

Major Road: Alstep Dr runs W/E

North Leg Total: 144
 North Entering: 80
 North Peds: 4
 Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	50	22	0	72
Cars	5	0	3	8
Totals	55	22	3	



Cyclists	0
Trucks	53
Cars	11
Totals	64

East Leg Total: 594
 East Entering: 333
 East Peds: 2
 Peds Cross: \bowtie

Cyclists	0
Trucks	173
Cars	379
Totals	552

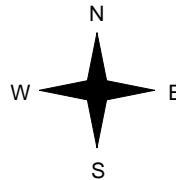


Private Access

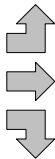
Cars	1	1	0	2
Trucks	248	76	0	324
Cyclists	6	1	0	7
Totals	255	78	0	



Alstep Dr



Cyclists	0
Trucks	37
Cars	10
Totals	47
Cyclists	0
Trucks	68
Cars	166
Totals	234
Cyclists	0
Trucks	45
Cars	135
Totals	180
Cyclists	0
Trucks	150
Cars	311
Totals	461



Alstep Dr



Cars	188	73	0	261
Trucks				
Cyclists				
Totals	188	73	0	261

Peds Cross: \bowtie
 West Peds: 5
 West Entering: 461
 West Leg Total: 1013

Cars	141	126	0	19	145
Trucks	68	47	15	5	67
Cyclists	0	0	0	0	0
Totals	209	173	15	24	



Menway Court



Peds Cross: \bowtie
 South Peds: 2
 South Entering: 212
 South Leg Total: 421

Comments

Ontario Traffic Inc.

Total Count Diagram

Municipality: Mississauga
Site #: 1904100006
Intersection: Alstep Dr & Menway Court
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Signalized Intersection ****

Major Road: Alstep Dr runs W/E

North Leg Total: 216
 North Entering: 109
 North Peds: 8
 Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	68	28	0	96
Cars	10	0	3	13
Totals	78	28	3	



Cyclists 0
 Trucks 86
 Cars 21
 Totals 107

East Leg Total: 889
 East Entering: 450
 East Peds: 3
 Peds Cross: \bowtie

Cyclists	Trucks	Cars	Totals
0	253	472	725

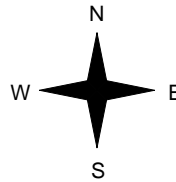


Private Access

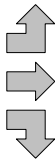
Cars	Trucks	Cyclists	Totals
1	1	0	2
316	121	0	437
8	3	0	11
325	125	0	



Alstep Dr



Cyclists	Trucks	Cars	Totals
0	64	20	84
0	97	306	403
0	60	220	280
0	221	546	



Alstep Dr



Peds Cross: \bowtie
 West Peds: 10
 West Entering: 767
 West Leg Total: 1492

Cars	228
Trucks	91
Cyclists	0
Totals	319



Cars	146	0	26	172
Trucks	64	21	7	92
Cyclists	0	0	0	0
Totals	210	21	33	

Peds Cross: \bowtie
 South Peds: 2
 South Entering: 264
 South Leg Total: 583

Menway Court



Comments

Ontario Traffic Inc. Traffic Count Summary

Intersection: Alstep Dr & Menway Court

Count Date: 19-Feb-19

Municipality: Mississauga

North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0
7:00:00	0	1	1	2	0	4	7:00:00	2	0	0	2	0
8:00:00	0	1	1	2	1	16	8:00:00	12	1	1	14	0
9:00:00	0	1	6	7	2	15	9:00:00	5	2	1	8	0
10:00:00	1	3	17	21	1	38	10:00:00	16	1	0	17	0
11:00:00	0	6	14	20	1	41	11:00:00	15	6	0	21	0
12:00:00	0	2	10	12	0	30	12:00:00	15	1	2	18	0
13:00:00	0	2	4	6	2	41	13:00:00	29	2	4	35	0
14:00:00	0	2	1	3	0	31	14:00:00	26	0	2	28	1
15:00:00	0	1	4	5	0	27	15:00:00	18	1	3	22	0
16:00:00	1	3	4	8	0	28	16:00:00	16	1	3	20	0
17:00:00	0	3	4	7	0	48	17:00:00	30	3	8	41	1
18:00:00	1	2	3	6	1	28	18:00:00	17	2	3	22	0
19:00:00	0	1	9	10	0	26	19:00:00	9	1	6	16	0
Totals:	3	28	78	109	8	373		210	21	33	264	2
East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0
7:00:00	0	5	0	5	0	47	7:00:00	3	30	9	42	0
8:00:00	0	12	0	12	0	97	8:00:00	5	43	37	85	0
9:00:00	3	28	0	31	0	123	9:00:00	8	60	24	92	3
10:00:00	2	31	1	34	0	110	10:00:00	7	36	33	76	3
11:00:00	1	22	0	23	2	75	11:00:00	5	28	19	52	0
12:00:00	1	26	0	27	0	81	12:00:00	8	19	27	54	0
13:00:00	0	29	0	29	0	104	13:00:00	7	33	35	75	2
14:00:00	3	37	0	40	0	103	14:00:00	2	39	22	63	0
15:00:00	1	34	1	36	0	84	15:00:00	3	23	22	48	0
16:00:00	0	43	0	43	0	93	16:00:00	5	27	18	50	0
17:00:00	0	87	0	87	0	145	17:00:00	9	32	17	58	0
18:00:00	0	58	0	58	1	99	18:00:00	11	19	11	41	2
19:00:00	0	25	0	25	0	56	19:00:00	11	14	6	31	0
Totals:	11	437	2	450	3	1217		84	403	280	767	10
Calculated Values for Traffic Crossing Major Street												
Hours Ending:	9:00	10:00	11:00	13:00		14:00	16:00	17:00	18:00			
Crossing Values:	10	23	23	33		28	20	33	23			

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period

From: 6:00:00
To: 12:00:00

One Hour Peak

From: 9:30:00
To: 10:30:00

Municipality: Mississauga
Site #: 1904100008
Intersection: Bramalea Rd & Fed-Ex Employee Entrance
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Bramalea Rd runs N/S

North Leg Total: 259
North Entering: 103
North Peds: 9
Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	0	12	2	14
Cars	17	26	46	89
Totals	17	38	48	



Cyclists 0
Trucks 62
Cars 94
Totals 156

East Leg Total: 179
East Entering: 126
East Peds: 0
Peds Cross: \bowtie

Cyclists	0	0	17	17
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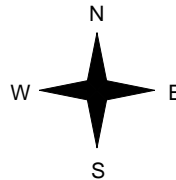


Bramalea Rd

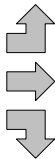
Cars	66	56	0	122
Trucks	0	0	0	0
Cyclists	4	0	0	4
Totals	70	56	0	



UPS Access



Cyclists	0	0	4	4
Trucks	0	0	0	0
Cars	0	0	0	0
Totals	0	0	4	



Fed-Ex Employee Entrance



Cars	50	3	0	53
------	----	---	---	----

Peds Cross: \bowtie
West Peds: 0
West Entering: 4
West Leg Total: 21

Cars	30	0	0	30
Trucks	12	0	0	12
Cyclists	0	0	0	0
Totals	42	0	0	



Cars	0	24	4	28
Trucks	0	6	1	7
Cyclists	0	0	0	0
Totals	0	30	5	

Peds Cross: \bowtie
South Peds: 0
South Entering: 35
South Leg Total: 77

Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period

From: 12:00:00

To: 19:00:00

One Hour Peak

From: 16:15:00

To: 17:15:00

Municipality: Mississauga
Site #: 1904100008
Intersection: Bramalea Rd & Fed-Ex Employee Entrance
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Bramalea Rd runs N/S

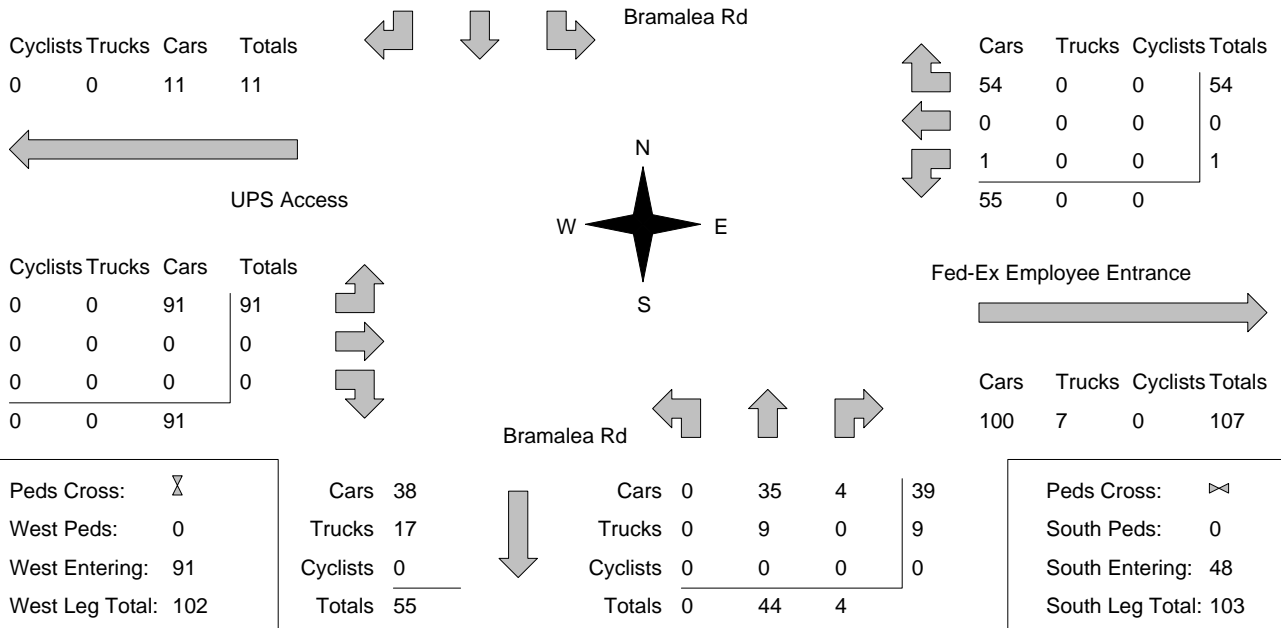
North Leg Total: 357
 North Entering: 168
 North Peds: 0
 Peds Cross: \times

Cyclists	0	0	0	0
Trucks	0	17	7	24
Cars	11	37	96	144
Totals	11	54	103	



Cyclists	0
Trucks	9
Cars	180
Totals	189

East Leg Total: 162
 East Entering: 55
 East Peds: 0
 Peds Cross: \times



Peds Cross: \times
 West Peds: 0
 West Entering: 91
 West Leg Total: 102

Peds Cross: \times
 South Peds: 0
 South Entering: 48
 South Leg Total: 103

Comments

Ontario Traffic Inc.

Eight Hour Peak Diagram

Eight Hour Peak

From: 11:00:00

To: 19:00:00

Municipality: Mississauga
Site #: 1904100008
Intersection: Bramalea Rd & Fed-Ex Employee Entrance
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Bramalea Rd runs N/S

North Leg Total: 1961
 North Entering: 916
 North Peds: 16
 Peds Cross: 2

Cyclists	0	0	0	0
Trucks	0	104	66	170
Cars	77	302	367	746
Totals	77	406	433	



Cyclists 0
 Trucks 121
 Cars 924
 Totals 1045

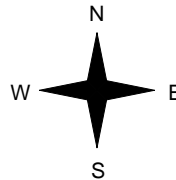
East Leg Total: 899
 East Entering: 440
 East Peds: 3
 Peds Cross: 8

Cyclists	Trucks	Cars	Totals
0	0	77	77



UPS Access

Cyclists	Trucks	Cars	Totals
0	2	225	227
0	0	1	1
0	0	0	0
0	2	226	



Bramalea Rd

Cars	Trucks	Cyclists	Totals
397	14	0	411
0	0	0	0
26	3	0	29
423	17	0	

Fed-Ex Employee Entrance



Cars	Trucks	Cyclists	Totals
386	73	0	459

Peds Cross: 8
 West Peds: 3
 West Entering: 228
 West Leg Total: 305

Cars	328
Trucks	107
Cyclists	0
Totals	435



Cars	0	302	18	320
Trucks	0	105	7	112
Cyclists	0	0	0	0
Totals	0	407	25	

Peds Cross: 2
 South Peds: 0
 South Entering: 432
 South Leg Total: 867

Comments

Ontario Traffic Inc.

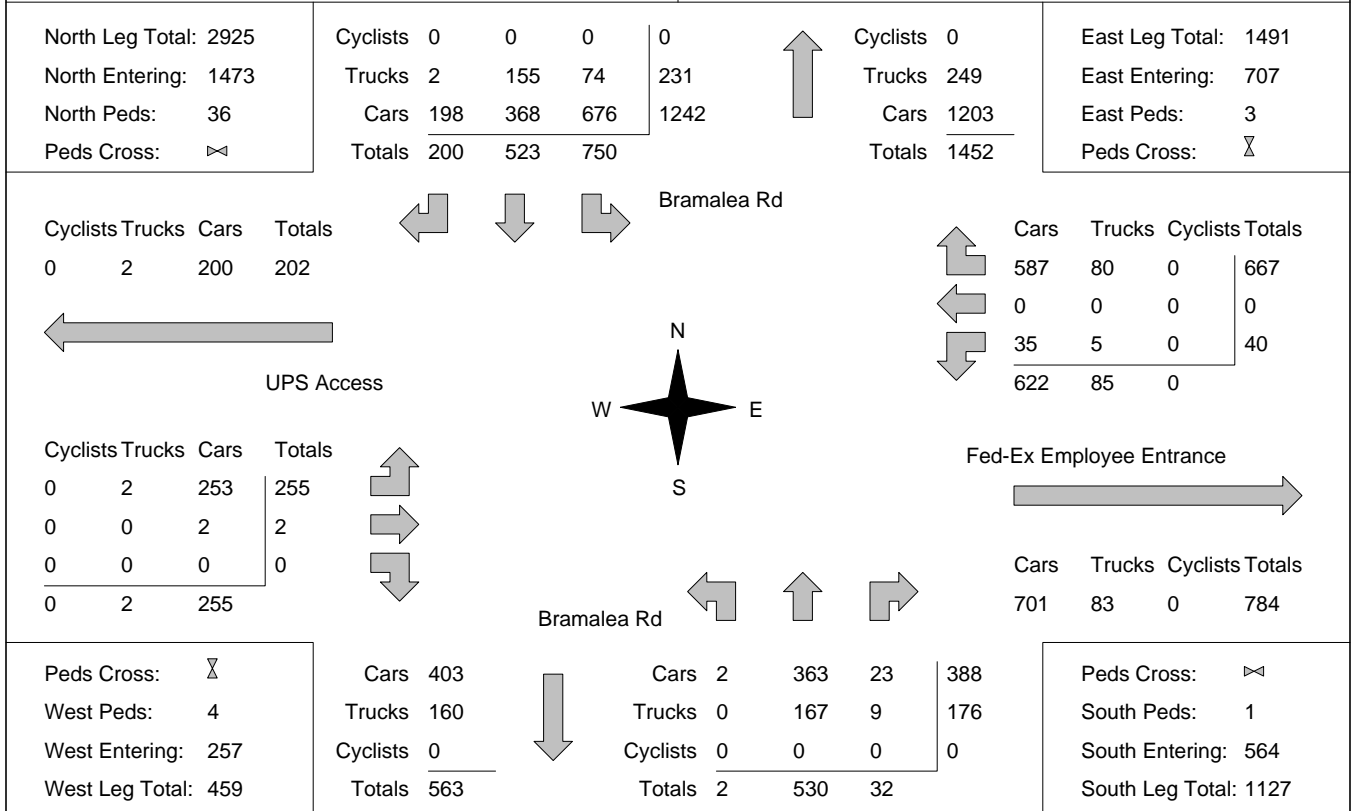
Total Count Diagram

Municipality: Mississauga
Site #: 1904100008
Intersection: Bramalea Rd & Fed-Ex Employee Entrance
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Bramalea Rd runs N/S



Comments

Ontario Traffic Inc. Traffic Count Summary

Intersection: Bramalea Rd & Fed-Ex Employee													Count Date: 19-Feb-19		Municipality: Mississauga	
North Approach Totals						North/South Total Approaches	South Approach Totals									
Includes Cars, Trucks, & Cyclists					Total Peds		Includes Cars, Trucks, & Cyclists					Total Peds				
Hour Ending	Left	Thru	Right	Grand Total			Hour Ending	Left	Thru	Right	Grand Total					
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0				
7:00:00	110	9	14	133	3	145	7:00:00	1	10	1	12	0				
8:00:00	57	20	28	105	3	119	8:00:00	0	14	0	14	0				
9:00:00	62	19	46	127	3	158	9:00:00	0	31	0	31	1				
10:00:00	50	37	22	109	4	141	10:00:00	0	28	4	32	0				
11:00:00	38	32	13	83	7	126	11:00:00	1	40	2	43	0				
12:00:00	25	44	8	77	1	136	12:00:00	0	55	4	59	0				
13:00:00	14	44	12	70	0	133	13:00:00	0	60	3	63	0				
14:00:00	48	53	20	121	4	173	14:00:00	0	51	1	52	0				
15:00:00	40	54	6	100	5	155	15:00:00	0	50	5	55	0				
16:00:00	41	58	12	111	2	169	16:00:00	0	56	2	58	0				
17:00:00	83	58	13	154	2	195	17:00:00	0	37	4	41	0				
18:00:00	95	50	4	149	1	209	18:00:00	0	57	3	60	0				
19:00:00	87	45	2	134	1	178	19:00:00	0	41	3	44	0				
Totals:	750	523	200	1473	36	2037		2	530	32	564	1				
East Approach Totals						East/West Total Approaches	West Approach Totals									
Includes Cars, Trucks, & Cyclists					Total Peds		Includes Cars, Trucks, & Cyclists					Total Peds				
Hour Ending	Left	Thru	Right	Grand Total			Hour Ending	Left	Thru	Right	Grand Total					
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0				
7:00:00	2	0	16	18	0	20	7:00:00	2	0	0	2	0				
8:00:00	1	0	19	20	0	25	8:00:00	5	0	0	5	0				
9:00:00	2	0	38	40	0	52	9:00:00	12	0	0	12	0				
10:00:00	3	0	89	92	0	96	10:00:00	4	0	0	4	1				
11:00:00	3	0	94	97	0	103	11:00:00	5	1	0	6	0				
12:00:00	4	0	45	49	0	57	12:00:00	8	0	0	8	1				
13:00:00	0	0	36	36	0	49	13:00:00	13	0	0	13	0				
14:00:00	3	0	54	57	0	69	14:00:00	12	0	0	12	0				
15:00:00	7	0	51	58	0	74	15:00:00	16	0	0	16	0				
16:00:00	5	0	60	65	0	83	16:00:00	18	0	0	18	0				
17:00:00	0	0	57	57	0	120	17:00:00	63	0	0	63	0				
18:00:00	2	0	54	56	3	129	18:00:00	72	1	0	73	2				
19:00:00	8	0	54	62	0	87	19:00:00	25	0	0	25	0				
Totals:	40	0	667	707	3	964		255	2	0	257	4				
Calculated Values for Traffic Crossing Major Street																
Hours Ending:	10:00	11:00	14:00	15:00		16:00	17:00	18:00	19:00							
Crossing Values:	11	16	19	28		25	65	76	34							

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period

From: 6:00:00
To: 12:00:00

One Hour Peak

From: 7:30:00
To: 8:30:00

Municipality: Mississauga
Site #: 1904100009
Intersection: Derry Rd E & Fed-Ex Employee En
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Derry Rd E runs W/E

East Leg Total: 3378
East Entering: 1341
East Peds: 0
Peds Cross: ∞

Cyclists	Trucks	Cars	Totals
2	209	1130	1341



Derry Rd E

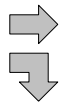
Cars	Trucks	Cyclists	Totals
1130	209	2	1341
0	0	0	0
1130	209	2	



Derry Rd E



Cyclists	Trucks	Cars	Totals
0	261	1768	2029
0	0	8	8
0	261	1776	



Fed-Ex Employee Entrance

Cars	Trucks	Cyclists	Totals
1776	261	0	2037

Peds Cross: ∞
West Peds: 0
West Entering: 2037
West Leg Total: 3378

Cars	8	Cars	0	8	8
Trucks	0	Trucks	0	0	0
Cyclists	0	Cyclists	0	0	0
Totals	8	Totals	0	8	

Peds Cross: ∞
South Peds: 0
South Entering: 8
South Leg Total: 16

Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period

From: 12:00:00

To: 19:00:00

One Hour Peak

From: 15:15:00

To: 16:15:00

Municipality: Mississauga
Site #: 1904100009
Intersection: Derry Rd E & Fed-Ex Employee En
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Derry Rd E runs W/E

East Leg Total: 3373
 East Entering: 1724
 East Peds: 0
 Peds Cross: ∞

Cyclists	Trucks	Cars	Totals
0	217	1507	1724



Derry Rd E

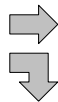
Cars	Trucks	Cyclists	Totals
1507	217	0	1724
0	0	0	0
<hr/>			
1507	217	0	



Derry Rd E



Cyclists	Trucks	Cars	Totals
0	216	1418	1634
0	3	4	7
<hr/>			
0	219	1422	



Fed-Ex Employee Entrance

Cars	Trucks	Cyclists	Totals
1432	217	0	1649

Peds Cross: ∞
 West Peds: 0
 West Entering: 1641
 West Leg Total: 3365

Cars	4
Trucks	3
Cyclists	0
Totals	7



Cars	0	14	14
Trucks	0	1	1
Cyclists	0	0	0
Totals	0	15	

Peds Cross: ∞
 South Peds: 1
 South Entering: 15
 South Leg Total: 22

Comments

Ontario Traffic Inc.

Eight Hour Peak Diagram

Eight Hour Peak

From: 11:00:00

To: 19:00:00

Municipality: Mississauga
Site #: 1904100009
Intersection: Derry Rd E & Fed-Ex Employee En
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Derry Rd E runs W/E

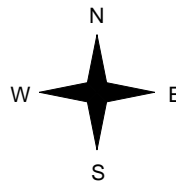
East Leg Total: 23345
 East Entering: 11492
 East Peds: 0
 Peds Cross: ∞

Cyclists	Trucks	Cars	Totals
0	1837	9655	11492

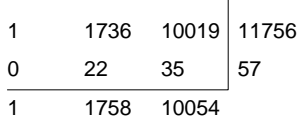


Derry Rd E

Cars	Trucks	Cyclists	Totals
9655	1837	0	11492
0	0	0	0
9655	1837	0	



Cyclists	Trucks	Cars	Totals
1	1736	10019	11756
0	22	35	57
1	1758	10054	



Fed-Ex Employee Entrance

Derry Rd E

Cars	Trucks	Cyclists	Totals
10111	1741	1	11853

Peds Cross: ∞
 West Peds: 0
 West Entering: 11813
 West Leg Total: 23305

Cars	35	Cars	0	92	92
Trucks	22	Trucks	0	5	5
Cyclists	0	Cyclists	0	0	0
Totals	57	Totals	0	97	

Peds Cross: ∞
 South Peds: 4
 South Entering: 97
 South Leg Total: 154

Comments

Ontario Traffic Inc.

Total Count Diagram

Municipality: Mississauga
Site #: 1904100009
Intersection: Derry Rd E & Fed-Ex Employee En
TFR File #: 1
Count date: 19-Feb-19

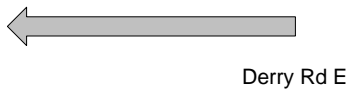
Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

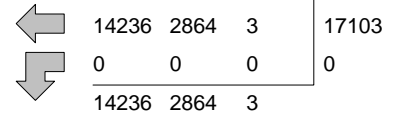
Major Road: Derry Rd E runs W/E

East Leg Total: 37231
 East Entering: 17103
 East Peds: 0
 Peds Cross: X

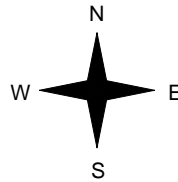
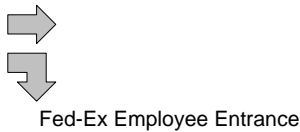
Cyclists	Trucks	Cars	Totals
3	2864	14236	17103



Cars	Trucks	Cyclists	Totals
14236	2864	3	17103
0	0	0	0
14236	2864	3	



Cyclists	Trucks	Cars	Totals
2	2914	17037	19953
0	30	85	115
2	2944	17122	



Cars	Trucks	Cyclists	Totals
17182	2944	2	20128

Peds Cross: X
 West Peds: 0
 West Entering: 20068
 West Leg Total: 37171

Cars	85	Cars	0	145	145
Trucks	30	Trucks	0	30	30
Cyclists	0	Cyclists	0	0	0
Totals	115	Totals	0	175	

Peds Cross: X
 South Peds: 5
 South Entering: 175
 South Leg Total: 290

Comments

Ontario Traffic Inc. Traffic Count Summary

Intersection: Derry Rd E & Fed-Ex Employee E													Count Date: 19-Feb-19		Municipality: Mississauga	
North Approach Totals						South Approach Totals										
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds	North/South Total Approaches	Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds				
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total					
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0				
7:00:00	0	0	0	0	0	3	7:00:00	0	0	3	3	0				
8:00:00	0	0	0	0	0	4	8:00:00	0	0	4	4	0				
9:00:00	0	0	0	0	0	13	9:00:00	0	0	13	13	0				
10:00:00	0	0	0	0	0	36	10:00:00	0	0	36	36	1				
11:00:00	0	0	0	0	0	22	11:00:00	0	0	22	22	0				
12:00:00	0	0	0	0	0	16	12:00:00	0	0	16	16	1				
13:00:00	0	0	0	0	0	9	13:00:00	0	0	9	9	0				
14:00:00	0	0	0	0	0	13	14:00:00	0	0	13	13	0				
15:00:00	0	0	0	0	0	12	15:00:00	0	0	12	12	0				
16:00:00	0	0	0	0	0	14	16:00:00	0	0	14	14	1				
17:00:00	0	0	0	0	0	15	17:00:00	0	0	15	15	0				
18:00:00	0	0	0	0	0	5	18:00:00	0	0	5	5	1				
19:00:00	0	0	0	0	0	13	19:00:00	0	0	13	13	1				
Totals:	0	0	0	0	0	175		0	0	175	175	5				
East Approach Totals						West Approach Totals										
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds	East/West Total Approaches	Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds				
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total					
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0				
7:00:00	0	973	0	973	0	2673	7:00:00	0	1687	13	1700	0				
8:00:00	0	1277	0	1277	0	3156	8:00:00	0	1873	6	1879	0				
9:00:00	0	1252	0	1252	0	3223	9:00:00	0	1956	15	1971	0				
10:00:00	0	1065	0	1065	0	2471	10:00:00	0	1387	19	1406	0				
11:00:00	0	1044	0	1044	0	2343	11:00:00	0	1294	5	1299	0				
12:00:00	0	1155	0	1155	0	2430	12:00:00	0	1273	2	1275	0				
13:00:00	0	1204	0	1204	0	2610	13:00:00	0	1399	7	1406	0				
14:00:00	0	1318	0	1318	0	2709	14:00:00	0	1385	6	1391	0				
15:00:00	0	1513	0	1513	0	3131	15:00:00	0	1609	9	1618	0				
16:00:00	0	1667	0	1667	0	3320	16:00:00	0	1645	8	1653	0				
17:00:00	0	1663	0	1663	0	3295	17:00:00	0	1625	7	1632	0				
18:00:00	0	1552	0	1552	0	3155	18:00:00	0	1593	10	1603	0				
19:00:00	0	1420	0	1420	0	2655	19:00:00	0	1227	8	1235	0				
Totals:	0	17103	0	17103	0	37171		0	19953	115	20068	0				
Calculated Values for Traffic Crossing Major Street																
Hours Ending:	7:00	8:00	9:00	14:00		15:00	16:00	17:00	18:00							
Crossing Values:	0	0	0	0		0	0	0	0							

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period

From: 6:00:00
To: 12:00:00

One Hour Peak

From: 11:00:00
To: 12:00:00

Municipality: Mississauga
Site #: 1904100010
Intersection: Bramalea Rd & Fed-Ex Truck Entrance
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Bramalea Rd runs N/S

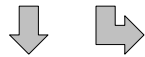
North Leg Total: 108
North Entering: 48
North Peds: 0
Peds Cross: \times

Cyclists	0	0	0
Trucks	2	9	11
Cars	31	6	37
Totals	33	15	

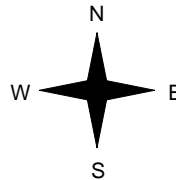


Cyclists	0
Trucks	26
Cars	34
Totals	60

East Leg Total: 49
East Entering: 32
East Peds: 0
Peds Cross: \times



Bramalea Rd



	Cars	Trucks	Cyclists	Totals
Northbound	5	25	0	30
Southbound	2	0	0	2
Totals	7	25	0	

Fed-Ex Truck Entrance



	Cars	Trucks	Cyclists	Totals
Eastbound	8	9	0	17

Cars	33
Trucks	2
Cyclists	0
Totals	35



Bramalea Rd

Cars	27	2	29
Trucks	1	0	1
Cyclists	0	0	0
Totals	28	2	

Peds Cross: \times
South Peds: 0
South Entering: 30
South Leg Total: 65

Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period

From: 12:00:00

To: 19:00:00

One Hour Peak

From: 13:30:00

To: 14:30:00

Municipality: Mississauga
Site #: 1904100010
Intersection: Bramalea Rd & Fed-Ex Truck Entrance
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Bramalea Rd runs N/S

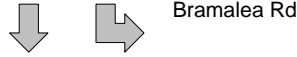
North Leg Total: 127
 North Entering: 63
 North Peds: 0
 Peds Cross: \times

Cyclists	0	0	0
Trucks	0	11	11
Cars	42	10	52
Totals	42	21	

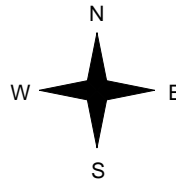


Cyclists	0
Trucks	10
Cars	54
Totals	64

East Leg Total: 44
 East Entering: 20
 East Peds: 0
 Peds Cross: \times



Bramalea Rd



	Cars	Trucks	Cyclists	Totals
Upward arrow	10	10	0	20
Downward arrow	0	0	0	0
Rightward arrow	10	10	0	

Fed-Ex Truck Entrance



Cars	Trucks	Cyclists	Totals
13	11	0	24

Cars	42
Trucks	0
Cyclists	0
Totals	42



Cars	42	3	45
Trucks	0	0	0
Cyclists	0	0	0
Totals	42	3	

Peds Cross: \times
 South Peds: 0
 South Entering: 45
 South Leg Total: 87

Comments

Ontario Traffic Inc.

Eight Hour Peak Diagram

Eight Hour Peak

From: 10:45:00

To: 18:45:00

Municipality: Mississauga
Site #: 1904100010
Intersection: Bramalea Rd & Fed-Ex Truck Entrance
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Bramalea Rd runs N/S

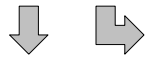
North Leg Total: 858
 North Entering: 426
 North Peds: 2
 Peds Cross: \times

Cyclists	0	0	0
Trucks	4	98	102
Cars	287	37	324
Totals	291	135	

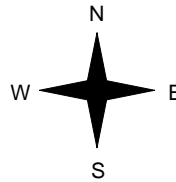


Cyclists	0
Trucks	114
Cars	318
Totals	432

East Leg Total: 306
 East Entering: 160
 East Peds: 3
 Peds Cross: \times



Bramalea Rd



	Cars	Trucks	Cyclists	Totals
Northbound	44	108	0	152
Southbound	7	1	0	8
Totals	51	109	0	

Fed-Ex Truck Entrance



	Cars	Trucks	Cyclists	Totals
Eastbound	48	98	0	146

Cars	294
Trucks	5
Cyclists	0
Totals	299



Bramalea Rd

Cars	268	11	279
Trucks	6	0	6
Cyclists	0	0	0
Totals	274	11	

Peds Cross: \times
 South Peds: 0
 South Entering: 285
 South Leg Total: 584

Comments

Ontario Traffic Inc.

Total Count Diagram

Municipality: Mississauga
Site #: 1904100010
Intersection: Bramalea Rd & Fed-Ex Truck Entrance
TFR File #: 1
Count date: 19-Feb-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Bramalea Rd runs N/S

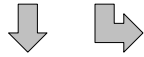
North Leg Total: 1117
 North Entering: 560
 North Peds: 2
 Peds Cross: \times

Cyclists	0	0	0
Trucks	5	152	157
Cars	353	50	403
Totals	358	202	

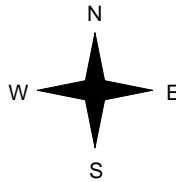


Cyclists	0
Trucks	171
Cars	386
Totals	557

East Leg Total: 438
 East Entering: 224
 East Peds: 3
 Peds Cross: \times



Bramalea Rd



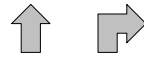
	Cars	Trucks	Cyclists	Totals
	53	161	0	214
	9	1	0	10
	62	162	0	

Fed-Ex Truck Entrance



	Cars	Trucks	Cyclists	Totals
	62	152	0	214

Bramalea Rd



Cars	362	Cars	327	12	339
Trucks	6	Trucks	10	0	10
Cyclists	0	Cyclists	0	0	0
Totals	368	Totals	337	12	



Peds Cross: \times
 South Peds: 1
 South Entering: 349
 South Leg Total: 717

Comments

Ontario Traffic Inc. Traffic Count Summary

Intersection: Bramalea Rd & Fed-Ex Truck Entrance													Count Date: 19-Feb-19		Municipality: Mississauga	
North Approach Totals						South Approach Totals										
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds	North/South Total Approaches	Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds				
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total					
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0				
7:00:00	10	1	0	11	0	13	7:00:00	0	2	0	2	0				
8:00:00	20	3	0	23	0	25	8:00:00	0	2	0	2	0				
9:00:00	8	13	0	21	0	29	9:00:00	0	8	0	8	0				
10:00:00	16	25	0	41	0	65	10:00:00	0	23	1	24	1				
11:00:00	12	22	0	34	0	61	11:00:00	0	27	0	27	0				
12:00:00	15	33	0	48	0	78	12:00:00	0	28	2	30	0				
13:00:00	10	33	0	43	0	75	13:00:00	0	31	1	32	0				
14:00:00	19	37	0	56	0	92	14:00:00	0	35	1	36	0				
15:00:00	21	39	0	60	0	97	15:00:00	0	34	3	37	0				
16:00:00	18	43	0	61	0	105	16:00:00	0	42	2	44	0				
17:00:00	17	41	0	58	0	91	17:00:00	0	32	1	33	0				
18:00:00	18	33	0	51	2	96	18:00:00	0	44	1	45	0				
19:00:00	18	35	0	53	0	82	19:00:00	0	29	0	29	0				
Totals:	202	358	0	560	2	909		0	337	12	349	1				
East Approach Totals						West Approach Totals										
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds	East/West Total Approaches	Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds				
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total					
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0				
7:00:00	0	0	8	8	0	8	7:00:00	0	0	0	0	0				
8:00:00	0	0	12	12	0	12	8:00:00	0	0	0	0	0				
9:00:00	0	0	23	23	0	23	9:00:00	0	0	0	0	0				
10:00:00	0	0	8	8	0	8	10:00:00	0	0	0	0	0				
11:00:00	2	0	16	18	0	18	11:00:00	0	0	0	0	0				
12:00:00	2	0	30	32	0	34	12:00:00	2	0	0	2	0				
13:00:00	2	0	27	29	0	30	13:00:00	1	0	0	1	0				
14:00:00	0	0	16	16	0	17	14:00:00	1	0	0	1	0				
15:00:00	2	0	19	21	0	22	15:00:00	1	0	0	1	0				
16:00:00	0	0	14	14	0	15	16:00:00	1	0	0	1	0				
17:00:00	0	0	9	9	0	9	17:00:00	0	0	0	0	0				
18:00:00	0	0	16	16	3	16	18:00:00	0	0	0	0	0				
19:00:00	2	0	16	18	0	18	19:00:00	0	0	0	0	0				
Totals:	10	0	214	224	3	230		6	0	0	6	0				
Calculated Values for Traffic Crossing Major Street																
Hours Ending:	12:00	13:00	14:00	15:00		16:00	17:00	18:00	19:00							
Crossing Values:	4	3	1	3		1	0	2	2							

APPENDIX B

Intersection Operation Synchro Reports
2019 Existing Conditions

HCM 6th Signalized Intersection Summary
7: Bramalea Road & Derry Road E (RR 5)

Existing 2019 - AM Study Peak
6:45 AM - 7:45 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↗		↘	↗	↘
Traffic Volume (veh/h)	202	1522	40	19	950	204	10	6	9	306	28	214
Future Volume (veh/h)	202	1522	40	19	950	204	10	6	9	306	28	214
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.95	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.98
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1604	1737	1781	1826	1693	1625	1307	1411	1411	1722	1870	1870
Adj Flow Rate, veh/h	202	1522	40	19	950	0	10	6	9	326	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	20	11	8	5	14	14	40	33	33	12	2	2
Cap, veh/h	394	3269	1001	218	2809		42	16	25	448	0	
Arrive On Green	0.06	0.69	0.69	0.61	0.61	0.00	0.03	0.03	0.03	0.14	0.00	0.00
Sat Flow, veh/h	1527	4742	1453	322	4621	1322	1245	491	737	3280	0	1560
Grp Volume(v), veh/h	202	1522	40	19	950	0	10	0	15	326	0	0
Grp Sat Flow(s),veh/h/ln	1527	1581	1453	322	1540	1322	1245	0	1229	1640	0	1560
Q Serve(g_s), s	7.7	23.5	1.4	4.7	16.2	0.0	1.3	0.0	1.9	15.2	0.0	0.0
Cycle Q Clear(g_c), s	7.7	23.5	1.4	16.1	16.2	0.0	1.3	0.0	1.9	15.2	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.60	1.00		1.00
Lane Grp Cap(c), veh/h	394	3269	1001	218	2809		42	0	41	448	0	
V/C Ratio(X)	0.51	0.47	0.04	0.09	0.34		0.24	0.00	0.36	0.73	0.00	
Avail Cap(c_a), veh/h	422	3269	1001	218	2809		164	0	162	617	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	11.2	11.4	7.9	18.3	15.5	0.0	75.3	0.0	75.6	66.2	0.0	0.0
Incr Delay (d2), s/veh	1.0	0.5	0.1	0.4	0.2	0.0	6.2	0.0	11.1	5.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	5.4	14.3	0.9	0.7	10.5	0.0	0.9	0.0	1.4	11.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.2	11.9	8.0	18.7	15.6	0.0	81.5	0.0	86.8	71.3	0.0	0.0
LnGrp LOS	B	B	A	B	B		F	A	F	E	A	
Approach Vol, veh/h		1764			969	A		25			326	A
Approach Delay, s/veh		11.8			15.7			84.7			71.3	
Approach LOS		B			B			F			E	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		117.0		13.3	13.0	104.0		29.7				
Change Period (Y+Rc), s		6.7		7.9	3.0	6.7		7.9				
Max Green Setting (Gmax), s		86.3		21.1	13.0	70.3		30.1				
Max Q Clear Time (g_c+I1), s		26.5		3.9	9.7	19.2		17.2				
Green Ext Time (p_c), s		53.3		0.2	0.3	33.4		2.8				

Intersection Summary

HCM 6th Ctrl Delay	19.9
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.
Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
 11: Menkes Drive/Telford Way & Derry Road E (RR 5)

Existing 2019 - AM Study Peak
 6:45 AM - 7:45 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑↑↑	↗	↖	↑↑↑	↗	↖	↗		↖	↗	
Traffic Volume (veh/h)	120	1790	46	44	1108	42	18	3	16	31	12	26
Future Volume (veh/h)	120	1790	46	44	1108	42	18	3	16	31	12	26
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.97		0.97	0.98		0.97
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1730	1737	1640	1628	1678	1519	1159	435	418	1707	1976	1900
Adj Flow Rate, veh/h	120	1790	0	44	1108	0	18	3	16	31	12	26
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	4	11	0	16	15	14	50	100	100	13	0	0
Cap, veh/h	395	3451		215	3303		148	8	44	165	78	169
Arrive On Green	0.03	0.73	0.00	0.03	0.72	0.00	0.14	0.14	0.14	0.14	0.14	0.14
Sat Flow, veh/h	1648	4742	1362	1550	4580	1262	827	58	310	1242	544	1178
Grp Volume(v), veh/h	120	1790	0	44	1108	0	18	0	19	31	0	38
Grp Sat Flow(s),veh/h/ln	1648	1581	1362	1550	1527	1262	827	0	368	1242	0	1722
Q Serve(g_s), s	3.1	26.4	0.0	1.2	14.2	0.0	3.1	0.0	7.5	3.7	0.0	3.1
Cycle Q Clear(g_c), s	3.1	26.4	0.0	1.2	14.2	0.0	6.2	0.0	7.5	11.2	0.0	3.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.84	1.00		0.68
Lane Grp Cap(c), veh/h	395	3451		215	3303		148	0	53	165	0	247
V/C Ratio(X)	0.30	0.52		0.21	0.34		0.12	0.00	0.36	0.19	0.00	0.15
Avail Cap(c_a), veh/h	494	3451		280	3303		256	0	101	328	0	472
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	6.2	9.5	0.0	7.9	8.2	0.0	62.7	0.0	61.9	66.9	0.0	60.0
Incr Delay (d2), s/veh	0.4	0.6	0.0	0.5	0.3	0.0	0.8	0.0	8.6	1.2	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.3	15.5	0.0	0.8	9.2	0.0	1.3	0.0	1.6	2.3	0.0	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	6.6	10.1	0.0	8.4	8.5	0.0	63.5	0.0	70.5	68.1	0.0	60.6
LnGrp LOS	A	B		A	A		E	A	E	E	A	E
Approach Vol, veh/h		1910	A		1152	A		37			69	
Approach Delay, s/veh		9.9			8.5			67.1			64.0	
Approach LOS		A			A			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.3	122.7		30.1	8.4	121.6		30.1				
Change Period (Y+Rc), s	3.0	6.2		7.1	3.0	6.2		7.1				
Max Green Setting (Gmax), s	1.0	88.8		43.9	15.0	84.8		43.9				
Max Q Clear Time (g_c+13), s	1.0	29.4		9.5	5.1	17.2		13.2				
Green Ext Time (p_c), s	0.1	56.2		0.6	0.3	45.8		1.0				

Intersection Summary

HCM 6th Ctrl Delay	11.2
HCM 6th LOS	B

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	39	23	0	14	0	8	1	1	0	0	1
Future Vol, veh/h	4	39	23	0	14	0	8	1	1	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	75	5	0	0	79	0	75	100	0	0	0	100
Mvmt Flow	4	39	23	0	14	0	8	1	1	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	14	0	0	62	0	0	74	73	51	74	84	14
Stage 1	-	-	-	-	-	-	59	59	-	14	14	-
Stage 2	-	-	-	-	-	-	15	14	-	60	70	-
Critical Hdwy	4.85	-	-	4.1	-	-	7.85	7.5	6.2	7.1	6.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Follow-up Hdwy	2.875	-	-	2.2	-	-	4.175	4.9	3.3	3.5	4	4.2
Pot Cap-1 Maneuver	1236	-	-	1554	-	-	766	663	1023	921	810	840
Stage 1	-	-	-	-	-	-	797	687	-	1011	888	-
Stage 2	-	-	-	-	-	-	845	723	-	957	841	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1236	-	-	1554	-	-	764	661	1023	917	808	840
Mov Cap-2 Maneuver	-	-	-	-	-	-	764	661	-	917	808	-
Stage 1	-	-	-	-	-	-	795	685	-	1008	888	-
Stage 2	-	-	-	-	-	-	844	723	-	952	838	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			0			9.7			9.3		
HCM LOS							A			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	772	1236	-	-	1554	-	-	840
HCM Lane V/C Ratio	0.013	0.003	-	-	-	-	-	0.001
HCM Control Delay (s)	9.7	7.9	0	-	0	-	-	9.3
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection												
Int Delay, s/veh	5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	0	0	2	0	11	0	11	0	60	12	15
Future Vol, veh/h	3	0	0	2	0	11	0	11	0	60	12	15
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	91	0	0	75	0
Mvmt Flow	3	0	0	2	0	11	0	11	0	60	12	15

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	158	151	20	151	158	12	27	0	0	11	0	0
Stage 1	140	140	-	11	11	-	-	-	-	-	-	-
Stage 2	18	11	-	140	147	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	813	744	1064	821	738	1074	1600	-	-	1621	-	-
Stage 1	868	785	-	1015	890	-	-	-	-	-	-	-
Stage 2	1006	890	-	868	779	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	780	716	1064	797	710	1073	1600	-	-	1621	-	-
Mov Cap-2 Maneuver	780	716	-	797	710	-	-	-	-	-	-	-
Stage 1	868	755	-	1015	890	-	-	-	-	-	-	-
Stage 2	995	890	-	835	749	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	9.6		8.6		0		5	
HCM LOS	A		A					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1600	-	-	780	1019	1621	-	-
HCM Lane V/C Ratio	-	-	-	0.004	0.013	0.037	-	-
HCM Control Delay (s)	0	-	-	9.6	8.6	7.3	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0.1	-	-

Intersection						
Int Delay, s/veh	7.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	9	2	0	12	2
Future Vol, veh/h	0	9	2	0	12	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	100	50	0	75	0
Mvmt Flow	0	9	2	0	12	2

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	28	2	0	0	2	0
Stage 1	2	-	-	-	-	-
Stage 2	26	-	-	-	-	-
Critical Hdwy	6.4	7.2	-	-	4.85	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	4.2	-	-	2.875	-
Pot Cap-1 Maneuver	992	855	-	-	1250	-
Stage 1	1026	-	-	-	-	-
Stage 2	1002	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	982	855	-	-	1250	-
Mov Cap-2 Maneuver	982	-	-	-	-	-
Stage 1	1016	-	-	-	-	-
Stage 2	1002	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	6.8
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	855	1250
HCM Lane V/C Ratio	-	-	-	0.011	0.01
HCM Control Delay (s)	-	-	0	9.3	7.9
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	-	0	0

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑		↑↑↑		↑
Traffic Vol, veh/h	1830	7	0	1173	0	4
Future Vol, veh/h	1830	7	0	1173	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	370	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	11	0	0	14	0	0
Mvmt Flow	1830	7	0	1173	0	4

Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	-	-	-	915
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.1
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.9
Pot Cap-1 Maneuver	-	-	0	-	0	239
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	239
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	20.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	239	-	-	-
HCM Lane V/C Ratio	0.017	-	-	-
HCM Control Delay (s)	20.3	-	-	-
HCM Lane LOS	C	-	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-

HCM 6th Signalized Intersection Summary
7: Bramalea Road & Derry Road E (RR 5)

Existing 2019 - PM Study Peak
3:00 PM - 4:00 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑↑↑	↗	↖	↑↑↑	↗	↖	↖		↖	↗	↗
Traffic Volume (veh/h)	224	1378	49	44	1285	326	65	35	34	270	18	200
Future Volume (veh/h)	224	1378	49	44	1285	326	65	35	34	270	18	200
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.95	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.99
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1470	1678	1574	1737	1722	1625	1737	1811	1811	1737	1811	1604
Adj Flow Rate, veh/h	224	1378	49	44	1285	0	65	35	34	283	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	29	15	22	11	12	14	11	6	6	11	6	20
Cap, veh/h	295	3025	847	224	2620		96	48	46	465	0	
Arrive On Green	0.08	0.66	0.66	0.56	0.56	0.00	0.06	0.06	0.06	0.14	0.00	0.00
Sat Flow, veh/h	1400	4580	1282	348	4701	1327	1654	820	797	3309	0	1343
Grp Volume(v), veh/h	224	1378	49	44	1285	0	65	0	69	283	0	0
Grp Sat Flow(s),veh/h/ln	1400	1527	1282	348	1567	1327	1654	0	1617	1654	0	1343
Q Serve(g_s), s	10.5	23.4	2.2	11.2	26.6	0.0	6.2	0.0	6.7	12.9	0.0	0.0
Cycle Q Clear(g_c), s	10.5	23.4	2.2	18.1	26.6	0.0	6.2	0.0	6.7	12.9	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.49	1.00		1.00
Lane Grp Cap(c), veh/h	295	3025	847	224	2620		96	0	94	465	0	
V/C Ratio(X)	0.76	0.46	0.06	0.20	0.49		0.67	0.00	0.73	0.61	0.00	
Avail Cap(c_a), veh/h	405	3025	847	224	2620		146	0	142	891	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	19.0	13.2	9.6	21.6	21.6	0.0	73.8	0.0	74.1	64.6	0.0	0.0
Incr Delay (d2), s/veh	5.5	0.5	0.1	0.9	0.3	0.0	16.1	0.0	20.6	2.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	8.3	14.0	1.3	1.9	16.1	0.0	5.7	0.0	6.2	9.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.5	13.7	9.7	22.5	21.9	0.0	89.9	0.0	94.7	67.4	0.0	0.0
LnGrp LOS	C	B	A	C	C		F	A	F	E	A	
Approach Vol, veh/h		1651			1329	A		134			283	A
Approach Delay, s/veh		15.0			21.9			92.4			67.4	
Approach LOS		B			C			F			E	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		112.4		17.2	16.5	95.9		30.4				
Change Period (Y+Rc), s		6.7		7.9	3.0	6.7		7.9				
Max Green Setting (Gmax), s		80.3		14.1	26.0	51.3		43.1				
Max Q Clear Time (g_c+I1), s		25.4		8.7	12.5	28.6		14.9				
Green Ext Time (p_c), s		46.9		0.6	1.0	20.7		3.4				

Intersection Summary

HCM 6th Ctrl Delay	25.1
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.
Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
 11: Menkes Drive/Telford Way & Derry Road E (RR 5)

Existing 2019 - PM Study Peak
 3:00 PM - 4:00 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑↑↑	↗	↖	↑↑↑	↗	↖	↑	↗	↖	↗	↖
Traffic Volume (veh/h)	131	1480	38	47	1414	54	75	31	58	74	16	120
Future Volume (veh/h)	131	1480	38	47	1414	54	75	31	58	74	16	120
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	0.99		0.99
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No		No		No		No		No		No
Adj Sat Flow, veh/h/ln	1549	1633	1410	1526	1722	1413	1737	1483	1426	1767	1498	1441
Adj Flow Rate, veh/h	131	1480	0	47	1414	0	75	31	58	74	16	120
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	17	18	18	23	12	22	11	32	32	9	31	31
Cap, veh/h	237	3039		237	3421		152	87	162	204	28	213
Arrive On Green	0.68	0.68	0.00	0.03	0.73	0.00	0.19	0.19	0.19	0.19	0.19	0.19
Sat Flow, veh/h	315	4459	1171	1454	4701	1173	1155	458	857	1224	150	1128
Grp Volume(v), veh/h	131	1480	0	47	1414	0	75	0	89	74	0	136
Grp Sat Flow(s),veh/h/ln	315	1486	1171	1454	1567	1173	1155	0	1315	1224	0	1278
Q Serve(g_s), s	44.5	25.3	0.0	1.5	18.7	0.0	10.1	0.0	9.4	9.0	0.0	15.4
Cycle Q Clear(g_c), s	55.8	25.3	0.0	1.5	18.7	0.0	25.5	0.0	9.4	18.4	0.0	15.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.65	1.00		0.88
Lane Grp Cap(c), veh/h	237	3039		237	3421		152	0	249	204	0	242
V/C Ratio(X)	0.55	0.49		0.20	0.41		0.49	0.00	0.36	0.36	0.00	0.56
Avail Cap(c_a), veh/h	237	3039		361	3421		207	0	312	263	0	303
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.8	12.1	0.0	9.2	8.5	0.0	70.4	0.0	56.4	64.4	0.0	58.9
Incr Delay (d2), s/veh	9.0	0.6	0.0	0.4	0.4	0.0	5.2	0.0	1.9	2.3	0.0	4.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	7.4	14.5	0.0	1.0	11.6	0.0	6.0	0.0	6.2	5.5	0.0	9.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.8	12.7	0.0	9.6	8.9	0.0	75.7	0.0	58.3	66.7	0.0	63.2
LnGrp LOS	C	B		A	A		E	A	E	E	A	E
Approach Vol, veh/h		1611	A		1461	A		164			210	
Approach Delay, s/veh		14.1			8.9			66.2			64.4	
Approach LOS		B			A			E			E	
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	7.4	115.3		37.4		122.6		37.4				
Change Period (Y+Rc), s	3.0	6.2		7.1		6.2		7.1				
Max Green Setting (Gmax), s	88.0	87.8		37.9		108.8		37.9				
Max Q Clear Time (g_c+1), s	13.5	57.8		27.5		20.7		20.4				
Green Ext Time (p_c), s	0.1	28.6		1.5		69.9		3.2				

Intersection Summary

HCM 6th Ctrl Delay	17.4
HCM 6th LOS	B

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	2.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	27	18	0	43	0	16	1	3	1	3	4
Future Vol, veh/h	5	27	18	0	43	0	16	1	3	1	3	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	100	41	28	0	23	0	25	100	0	0	100	100
Mvmt Flow	5	27	18	0	43	0	16	1	3	1	3	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	43	0	0	45	0	0	93	89	36	91	98	43
Stage 1	-	-	-	-	-	-	46	46	-	43	43	-
Stage 2	-	-	-	-	-	-	47	43	-	48	55	-
Critical Hdwy	5.1	-	-	4.1	-	-	7.35	7.5	6.2	7.1	7.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Follow-up Hdwy	3.1	-	-	2.2	-	-	3.725	4.9	3.3	3.5	4.9	4.2
Pot Cap-1 Maneuver	1113	-	-	1576	-	-	838	648	1042	898	640	806
Stage 1	-	-	-	-	-	-	912	698	-	976	700	-
Stage 2	-	-	-	-	-	-	911	700	-	971	690	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1113	-	-	1576	-	-	828	645	1042	891	637	806
Mov Cap-2 Maneuver	-	-	-	-	-	-	828	645	-	891	637	-
Stage 1	-	-	-	-	-	-	907	695	-	971	700	-
Stage 2	-	-	-	-	-	-	903	700	-	962	687	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	0	9.4	9.9
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	842	1113	-	-	1576	-	-	741
HCM Lane V/C Ratio	0.024	0.004	-	-	-	-	-	0.011
HCM Control Delay (s)	9.4	8.2	0	-	0	-	-	9.9
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection												
Int Delay, s/veh	4.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	18	0	0	5	0	60	0	56	2	41	58	12
Future Vol, veh/h	18	0	0	5	0	60	0	56	2	41	58	12
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	6	0	0	20	0	5	0	16	50	0	24	25
Mvmt Flow	18	0	0	5	0	60	0	56	2	41	58	12

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	235	204	64	203	209	59	70	0	0	58	0	0
Stage 1	146	146	-	57	57	-	-	-	-	-	-	-
Stage 2	89	58	-	146	152	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.5	6.2	7.3	6.5	6.25	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.16	5.5	-	6.3	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.5	-	6.3	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4	3.3	3.68	4	3.345	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	711	696	1006	718	692	998	1544	-	-	1559	-	-
Stage 1	847	780	-	911	851	-	-	-	-	-	-	-
Stage 2	909	851	-	816	775	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	653	677	1006	703	673	996	1544	-	-	1559	-	-
Mov Cap-2 Maneuver	653	677	-	703	673	-	-	-	-	-	-	-
Stage 1	847	759	-	911	851	-	-	-	-	-	-	-
Stage 2	852	851	-	794	754	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.7	9	0	2.7
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1544	-	-	653	965	1559	-
HCM Lane V/C Ratio	-	-	-	0.028	0.067	0.026	-
HCM Control Delay (s)	0	-	-	10.7	9	7.4	0
HCM Lane LOS	A	-	-	B	A	A	A
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0.1	-

Intersection						
Int Delay, s/veh	2.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	14	44	2	18	45
Future Vol, veh/h	0	14	44	2	18	45
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	50	5	0	67	2
Mvmt Flow	0	14	44	2	18	45

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	126	45	0	0	46
Stage 1	45	-	-	-	-
Stage 2	81	-	-	-	-
Critical Hdwy	6.4	6.7	-	-	4.77
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.75	-	-	2.803
Pot Cap-1 Maneuver	874	904	-	-	1230
Stage 1	983	-	-	-	-
Stage 2	947	-	-	-	-
Platoon blocked, %					
Mov Cap-1 Maneuver	861	904	-	-	1230
Mov Cap-2 Maneuver	861	-	-	-	-
Stage 1	968	-	-	-	-
Stage 2	947	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	2.3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	-	904	1230
HCM Lane V/C Ratio	-	-	0.015	0.015
HCM Control Delay (s)	-	-	0	9
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑		↑↑↑		↑
Traffic Vol, veh/h	1674	8	0	1655	0	14
Future Vol, veh/h	1674	8	0	1655	0	14
Conflicting Peds, #/hr	0	1	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	370	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	14	50	0	12	0	7
Mvmt Flow	1674	8	0	1655	0	14

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	-	-	838
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	-	-	-	7.24
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	3.97
Pot Cap-1 Maneuver	-	-	0	-	258
Stage 1	-	-	0	-	-
Stage 2	-	-	0	-	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	258
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	19.8
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	258	-	-	-
HCM Lane V/C Ratio	0.054	-	-	-
HCM Control Delay (s)	19.8	-	-	-
HCM Lane LOS	C	-	-	-
HCM 95th %tile Q(veh)	0.2	-	-	-

APPENDIX C

Intersection Operation Synchro Reports
2022 Future Background Conditions

HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

Future Background 2022 - AM Peak Hour
 6:45 AM - 7:45 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑↑↑	↗	↖	↑↑↑	↗	↖	↑		↖	↗	
Traffic Volume (veh/h)	127	1900	49	47	1176	45	19	3	17	33	13	28
Future Volume (veh/h)	127	1900	49	47	1176	45	19	3	17	33	13	28
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.97		0.97	0.98		0.97
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1730	1737	1640	1628	1678	1519	1159	435	418	1707	1976	1900
Adj Flow Rate, veh/h	127	1900	0	47	1176	0	19	3	17	33	13	28
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	4	11	0	16	15	14	50	100	100	13	0	0
Cap, veh/h	372	3424		197	3271		150	8	46	168	81	175
Arrive On Green	0.04	0.72	0.00	0.03	0.71	0.00	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1648	4742	1362	1550	4580	1262	824	55	312	1240	546	1175
Grp Volume(v), veh/h	127	1900	0	47	1176	0	19	0	20	33	0	41
Grp Sat Flow(s),veh/h/ln	1648	1581	1362	1550	1527	1262	824	0	367	1240	0	1721
Q Serve(g_s), s	3.3	29.7	0.0	1.3	15.8	0.0	3.3	0.0	7.9	3.9	0.0	3.3
Cycle Q Clear(g_c), s	3.3	29.7	0.0	1.3	15.8	0.0	6.6	0.0	7.9	11.8	0.0	3.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.85	1.00		0.68
Lane Grp Cap(c), veh/h	372	3424		197	3271		150	0	55	168	0	256
V/C Ratio(X)	0.34	0.55		0.24	0.36		0.13	0.00	0.37	0.20	0.00	0.16
Avail Cap(c_a), veh/h	468	3424		261	3271		254	0	101	324	0	472
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	6.6	10.3	0.0	9.0	8.8	0.0	62.3	0.0	61.3	66.6	0.0	59.4
Incr Delay (d2), s/veh	0.5	0.7	0.0	0.6	0.3	0.0	0.8	0.0	8.6	1.2	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.4	17.2	0.0	0.9	10.0	0.0	1.4	0.0	1.6	2.5	0.0	2.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.2	11.0	0.0	9.6	9.1	0.0	63.1	0.0	69.9	67.8	0.0	60.0
LnGrp LOS	A	B		A	A		E	A	E	E	A	E
Approach Vol, veh/h		2027	A		1223	A		39			74	
Approach Delay, s/veh		10.7			9.1			66.6			63.5	
Approach LOS		B			A			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.4	121.7		30.9	8.7	120.5		30.9				
Change Period (Y+Rc), s	3.0	6.2		7.1	3.0	6.2		7.1				
Max Green Setting (Gmax), s	11.0	88.8		43.9	15.0	84.8		43.9				
Max Q Clear Time (g_c+I1), s	3.3	32.7		9.9	5.3	18.8		13.8				
Green Ext Time (p_c), s	0.1	54.0		0.6	0.3	47.7		1.1				

Intersection Summary

HCM 6th Ctrl Delay	11.9
HCM 6th LOS	B

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
2: Bramalea Road & Derry Road E (RR 5)

Future Background 2022 - AM Peak Hour
6:45 AM - 7:45 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↑	↗	↘	↖	↗
Traffic Volume (veh/h)	214	1615	42	20	1008	216	11	6	10	325	31	227
Future Volume (veh/h)	214	1615	42	20	1008	216	11	6	10	325	31	227
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.94	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.98
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1604	1737	1781	1826	1693	1625	1307	1411	1411	1722	1870	1870
Adj Flow Rate, veh/h	214	1615	42	20	1008	0	11	6	10	347	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	20	11	8	5	14	14	40	33	33	12	2	2
Cap, veh/h	376	3232	990	195	2753		43	16	27	469	0	
Arrive On Green	0.07	0.68	0.68	0.60	0.60	0.00	0.03	0.03	0.03	0.14	0.00	0.00
Sat Flow, veh/h	1527	4742	1453	294	4621	1322	1245	456	760	3280	0	1560
Grp Volume(v), veh/h	214	1615	42	20	1008	0	11	0	16	347	0	0
Grp Sat Flow(s),veh/h/ln	1527	1581	1453	294	1540	1322	1245	0	1217	1640	0	1560
Q Serve(g_s), s	8.5	26.3	1.5	5.7	18.0	0.0	1.4	0.0	2.1	16.2	0.0	0.0
Cycle Q Clear(g_c), s	8.5	26.3	1.5	19.3	18.0	0.0	1.4	0.0	2.1	16.2	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.63	1.00		1.00
Lane Grp Cap(c), veh/h	376	3232	990	195	2753		43	0	43	469	0	
V/C Ratio(X)	0.57	0.50	0.04	0.10	0.37		0.25	0.00	0.38	0.74	0.00	
Avail Cap(c_a), veh/h	398	3232	990	195	2753		164	0	160	617	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	12.3	12.3	8.4	20.5	16.7	0.0	75.2	0.0	75.5	65.7	0.0	0.0
Incr Delay (d2), s/veh	1.7	0.6	0.1	0.5	0.2	0.0	6.4	0.0	11.4	5.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	6.1	15.8	1.0	0.8	11.5	0.0	1.0	0.0	1.5	12.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.0	12.9	8.4	21.0	16.9	0.0	81.5	0.0	86.9	71.2	0.0	0.0
LnGrp LOS	B	B	A	C	B		F	A	F	E	A	
Approach Vol, veh/h		1871			1028	A		27			347	A
Approach Delay, s/veh		12.9			17.0			84.7			71.2	
Approach LOS		B			B			F			E	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		115.7		13.5	13.7	102.0		30.8				
Change Period (Y+Rc), s		6.7		7.9	3.0	6.7		7.9				
Max Green Setting (Gmax), s		86.3		21.1	13.0	70.3		30.1				
Max Q Clear Time (g_c+I1), s		29.3		4.1	10.5	21.3		18.2				
Green Ext Time (p_c), s		52.3		0.2	0.3	34.3		2.8				

Intersection Summary

HCM 6th Ctrl Delay	21.0
HCM 6th LOS	C

Notes

- User approved pedestrian interval to be less than phase max green.
- User approved volume balancing among the lanes for turning movement.
- Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	5.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	0	0	2	0	12	0	12	0	64	13	16
Future Vol, veh/h	3	0	0	2	0	12	0	12	0	64	13	16
Conflicting Peds, #/hr	0	0	0	0	0	0	145	0	0	0	0	145
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	50	0	1	0	67	2	0
Mvmt Flow	3	0	0	2	0	12	0	12	0	64	13	16

Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	312	306	166	161	314	12	174	0	0	12	0	0
Stage 1	294	294	-	12	12	-	-	-	-	-	-	-
Stage 2	18	12	-	149	302	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.7	4.1	-	-	4.77	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.75	2.2	-	-	2.803	-	-
Pot Cap-1 Maneuver	644	611	884	809	605	945	1415	-	-	1270	-	-
Stage 1	719	673	-	1014	890	-	-	-	-	-	-	-
Stage 2	1006	890	-	858	668	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	536	508	775	777	503	945	1241	-	-	1270	-	-
Mov Cap-2 Maneuver	536	508	-	777	503	-	-	-	-	-	-	-
Stage 1	631	560	-	1014	890	-	-	-	-	-	-	-
Stage 2	993	890	-	814	556	-	-	-	-	-	-	-

Approach	EB		WB			NB			SB		
HCM Control Delay, s	11.8		9			0			5.5		
HCM LOS	B		A								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1241	-	-	536	917	1270	-	-
HCM Lane V/C Ratio	-	-	-	0.006	0.015	0.05	-	-
HCM Control Delay (s)	0	-	-	11.8	9	8	0	-
HCM Lane LOS	A	-	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0.2	-	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	0	0	24	69	0
Future Vol, veh/h	0	0	0	24	69	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	78	11	0
Mvmt Flow	0	0	0	24	69	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	12	12	-	0
Stage 1	12	12	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	1013	887	-	-
Stage 1	1016	890	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	1013	0	-	-
Mov Cap-2 Maneuver	1013	0	-	-
Stage 1	1016	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	41	24	0	15	0	8	1	1	0	0	1
Future Vol, veh/h	4	41	24	0	15	0	8	1	1	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	75	5	0	0	79	0	75	100	0	0	0	100
Mvmt Flow	4	41	24	0	15	0	8	1	1	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	15	0	0	65	0	0	77	76	53	77	88	15
Stage 1	-	-	-	-	-	-	61	61	-	15	15	-
Stage 2	-	-	-	-	-	-	16	15	-	62	73	-
Critical Hdwy	4.85	-	-	4.1	-	-	7.85	7.5	6.2	7.1	6.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Follow-up Hdwy	2.875	-	-	2.2	-	-	4.175	4.9	3.3	3.5	4	4.2
Pot Cap-1 Maneuver	1234	-	-	1550	-	-	762	660	1020	917	806	839
Stage 1	-	-	-	-	-	-	795	686	-	1010	887	-
Stage 2	-	-	-	-	-	-	844	722	-	954	838	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1234	-	-	1550	-	-	760	658	1020	913	804	839
Mov Cap-2 Maneuver	-	-	-	-	-	-	760	658	-	913	804	-
Stage 1	-	-	-	-	-	-	793	684	-	1007	887	-
Stage 2	-	-	-	-	-	-	843	722	-	949	835	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			0			9.7			9.3		
HCM LOS							A			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	768	1234	-	-	1550	-	-	839
HCM Lane V/C Ratio	0.013	0.003	-	-	-	-	-	0.001
HCM Control Delay (s)	9.7	7.9	0	-	0	-	-	9.3
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection						
Int Delay, s/veh	7.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	10	2	0	13	2
Future Vol, veh/h	0	10	2	0	13	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	100	50	0	75	0
Mvmt Flow	0	10	2	0	13	2

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	30	2	0	0	2	0
Stage 1	2	-	-	-	-	-
Stage 2	28	-	-	-	-	-
Critical Hdwy	6.4	7.2	-	-	4.85	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	4.2	-	-	2.875	-
Pot Cap-1 Maneuver	989	855	-	-	1250	-
Stage 1	1026	-	-	-	-	-
Stage 2	1000	-	-	-	-	-
Platoon blocked, %						
Mov Cap-1 Maneuver	979	855	-	-	1250	-
Mov Cap-2 Maneuver	979	-	-	-	-	-
Stage 1	1026	-	-	-	-	-
Stage 2	990	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	6.9
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	855	1250
HCM Lane V/C Ratio	-	-	-	0.012	0.01
HCM Control Delay (s)	-	-	0	9.3	7.9
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	-	0	0

HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

Future Background 2022 - PM Peak Hour
 3:00 PM - 4:00 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↑↑↑	↖	↖	↑↑↑	↖	↖	↑		↖	↖	
Traffic Volume (veh/h)	139	1571	40	50	1501	57	80	33	62	79	17	127
Future Volume (veh/h)	139	1571	40	50	1501	57	80	33	62	79	17	127
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	0.99		0.99
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1549	1633	1410	1526	1722	1413	1737	1483	1426	1767	1498	1441
Adj Flow Rate, veh/h	139	1571	0	50	1501	0	80	33	62	79	17	127
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	17	18	18	23	12	22	11	32	32	9	31	31
Cap, veh/h	216	3006		218	3389		153	90	168	208	30	221
Arrive On Green	0.67	0.67	0.00	0.03	0.72	0.00	0.20	0.20	0.20	0.20	0.20	0.20
Sat Flow, veh/h	289	4459	1171	1454	4701	1173	1147	457	859	1218	151	1128
Grp Volume(v), veh/h	139	1571	0	50	1501	0	80	0	95	79	0	144
Grp Sat Flow(s),veh/h/ln	289	1486	1171	1454	1567	1173	1147	0	1316	1218	0	1279
Q Serve(g_s), s	60.6	28.4	0.0	1.6	20.9	0.0	10.9	0.0	10.0	9.6	0.0	16.3
Cycle Q Clear(g_c), s	74.1	28.4	0.0	1.6	20.9	0.0	27.2	0.0	10.0	19.6	0.0	16.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.65	1.00		0.88
Lane Grp Cap(c), veh/h	216	3006		218	3389		153	0	258	208	0	251
V/C Ratio(X)	0.64	0.52		0.23	0.44		0.52	0.00	0.37	0.38	0.00	0.57
Avail Cap(c_a), veh/h	216	3006		341	3389		200	0	312	257	0	303
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.9	13.1	0.0	10.3	9.2	0.0	70.6	0.0	55.7	64.2	0.0	58.3
Incr Delay (d2), s/veh	13.9	0.7	0.0	0.5	0.4	0.0	5.8	0.0	1.9	2.4	0.0	4.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	9.1	16.0	0.0	1.1	12.8	0.0	6.5	0.0	6.6	5.9	0.0	9.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.8	13.8	0.0	10.8	9.6	0.0	76.4	0.0	57.6	66.7	0.0	62.7
LnGrp LOS	D	B		B	A		E	A	E	E	A	E
Approach Vol, veh/h		1710	A		1551	A		175			223	
Approach Delay, s/veh		15.9			9.6			66.2			64.1	
Approach LOS		B			A			E			E	
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	7.5	114.1		38.5		121.5		38.5				
Change Period (Y+Rc), s	3.0	6.2		7.1		6.2		7.1				
Max Green Setting (Gmax), s	18.0	87.8		37.9		108.8		37.9				
Max Q Clear Time (g_c+I1), s	3.6	76.1		29.2		22.9		21.6				
Green Ext Time (p_c), s	0.1	11.5		1.5		71.8		3.3				

Intersection Summary

HCM 6th Ctrl Delay	18.6
HCM 6th LOS	B

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
2: Bramalea Road & Derry Road E (RR 5)

Future Background 2022 - PM Peak Hour
3:00 PM - 4:00 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↗		↘	↗	↗
Traffic Volume (veh/h)	238	1462	52	47	1364	346	69	37	36	287	20	212
Future Volume (veh/h)	238	1462	52	47	1364	346	69	37	36	287	20	212
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.95	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.99
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1470	1678	1574	1737	1722	1625	1737	1811	1811	1737	1811	1604
Adj Flow Rate, veh/h	238	1462	52	47	1364	0	69	37	36	301	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	29	15	22	11	12	14	11	6	6	11	6	20
Cap, veh/h	284	2981	834	201	2541		101	50	48	489	0	
Arrive On Green	0.09	0.65	0.65	0.54	0.54	0.00	0.06	0.06	0.06	0.15	0.00	0.00
Sat Flow, veh/h	1400	4580	1282	321	4701	1327	1654	818	796	3309	0	1343
Grp Volume(v), veh/h	238	1462	52	47	1364	0	69	0	73	301	0	0
Grp Sat Flow(s),veh/h/ln	1400	1527	1282	321	1567	1327	1654	0	1614	1654	0	1343
Q Serve(g_s), s	11.6	26.2	2.4	14.1	30.0	0.0	6.5	0.0	7.1	13.6	0.0	0.0
Cycle Q Clear(g_c), s	11.6	26.2	2.4	22.6	30.0	0.0	6.5	0.0	7.1	13.6	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.49	1.00		1.00
Lane Grp Cap(c), veh/h	284	2981	834	201	2541		101	0	98	489	0	
V/C Ratio(X)	0.84	0.49	0.06	0.23	0.54		0.68	0.00	0.74	0.62	0.00	
Avail Cap(c_a), veh/h	383	2981	834	201	2541		146	0	142	891	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	23.5	14.3	10.2	24.7	23.8	0.0	73.6	0.0	73.9	63.9	0.0	0.0
Incr Delay (d2), s/veh	11.6	0.6	0.1	1.3	0.4	0.0	16.1	0.0	21.3	2.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ft	0.5	15.4	1.4	2.2	17.9	0.0	6.1	0.0	6.6	10.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.1	14.9	10.3	25.9	24.2	0.0	89.7	0.0	95.2	66.6	0.0	0.0
LnGrp LOS	D	B	B	C	C		F	A	F	E	A	
Approach Vol, veh/h		1752			1411	A		142			301	A
Approach Delay, s/veh		17.5			24.3			92.5			66.6	
Approach LOS		B			C			F			E	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		110.8		17.6	17.7	93.2		31.5				
Change Period (Y+Rc), s		6.7		7.9	3.0	6.7		7.9				
Max Green Setting (Gmax), s		80.3		14.1	26.0	51.3		43.1				
Max Q Clear Time (g_c+I1), s		28.2		9.1	13.6	32.0		15.6				
Green Ext Time (p_c), s		46.3		0.6	1.0	18.0		3.6				

Intersection Summary

HCM 6th Ctrl Delay	27.2
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.
Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	4.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	19	0	0	5	0	64	0	59	2	44	62	13
Future Vol, veh/h	19	0	0	5	0	64	0	59	2	44	62	13
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	6	0	0	20	0	5	0	16	50	0	24	25
Mvmt Flow	19	0	0	5	0	64	0	59	2	44	62	13

Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	251	218	69	217	223	62	75	0	0	61	0	0
Stage 1	157	157	-	60	60	-	-	-	-	-	-	-
Stage 2	94	61	-	157	163	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.5	6.2	7.3	6.5	6.25	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.16	5.5	-	6.3	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.5	-	6.3	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4	3.3	3.68	4	3.345	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	694	684	1000	702	679	995	1537	-	-	1555	-	-
Stage 1	836	772	-	908	849	-	-	-	-	-	-	-
Stage 2	903	848	-	804	767	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	633	663	1000	686	659	993	1537	-	-	1555	-	-
Mov Cap-2 Maneuver	633	663	-	686	659	-	-	-	-	-	-	-
Stage 1	836	749	-	908	849	-	-	-	-	-	-	-
Stage 2	843	848	-	780	744	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.9	9	0	2.7
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1537	-	-	633	962	1555	-	-
HCM Lane V/C Ratio	-	-	-	0.03	0.072	0.028	-	-
HCM Control Delay (s)	0	-	-	10.9	9	7.4	0	-
HCM Lane LOS	A	-	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0.1	-	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	
Traffic Vol, veh/h	0	0	0	67	53	0
Future Vol, veh/h	0	0	0	67	53	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	29	44	0
Mvmt Flow	0	0	0	67	53	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	34	34	-	0
Stage 1	34	34	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	984	863	-	-
Stage 1	994	871	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	984	0	-	-
Mov Cap-2 Maneuver	984	0	-	-
Stage 1	994	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	2.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	29	19	0	46	0	17	1	3	1	3	4
Future Vol, veh/h	5	29	19	0	46	0	17	1	3	1	3	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	100	41	28	0	23	0	25	100	0	0	100	100
Mvmt Flow	5	29	19	0	46	0	17	1	3	1	3	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	46	0	0	48	0	0	99	95	39	97	104	46
Stage 1	-	-	-	-	-	-	49	49	-	46	46	-
Stage 2	-	-	-	-	-	-	50	46	-	51	58	-
Critical Hdwy	5.1	-	-	4.1	-	-	7.35	7.5	6.2	7.1	7.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Follow-up Hdwy	3.1	-	-	2.2	-	-	3.725	4.9	3.3	3.5	4.9	4.2
Pot Cap-1 Maneuver	1110	-	-	1572	-	-	831	643	1038	890	634	803
Stage 1	-	-	-	-	-	-	909	695	-	973	698	-
Stage 2	-	-	-	-	-	-	908	698	-	967	688	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1110	-	-	1572	-	-	821	640	1038	883	631	803
Mov Cap-2 Maneuver	-	-	-	-	-	-	821	640	-	883	631	-
Stage 1	-	-	-	-	-	-	904	692	-	968	698	-
Stage 2	-	-	-	-	-	-	900	698	-	958	685	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	0	9.4	9.9
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	835	1110	-	-	1572	-	-	736
HCM Lane V/C Ratio	0.025	0.005	-	-	-	-	-	0.011
HCM Control Delay (s)	9.4	8.3	0	-	0	-	-	9.9
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection						
Int Delay, s/veh	2.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	15	46	2	19	48
Future Vol, veh/h	0	15	46	2	19	48
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	50	5	0	67	2
Mvmt Flow	0	15	46	2	19	48

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	133	47	0	0	48
Stage 1	47	-	-	-	-
Stage 2	86	-	-	-	-
Critical Hdwy	6.4	6.7	-	-	4.77
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.75	-	-	2.803
Pot Cap-1 Maneuver	866	901	-	-	1228
Stage 1	981	-	-	-	-
Stage 2	942	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	852	901	-	-	1228
Mov Cap-2 Maneuver	852	-	-	-	-
Stage 1	981	-	-	-	-
Stage 2	927	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.1	0	2.3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	901	1228
HCM Lane V/C Ratio	-	-	-	0.017	0.015
HCM Control Delay (s)	-	-	0	9.1	8
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	-	0.1	0

APPENDIX D

**Intersection Operation Synchro Reports
2022 Future Total Conditions**

HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

Future Total 2022 - AM Peak Hour
 6:45 AM - 7:45 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑↑↑	↗	↖	↑↑↑	↗	↖	↗		↖	↗	
Traffic Volume (veh/h)	127	1900	489	47	1176	45	96	3	17	33	13	28
Future Volume (veh/h)	127	1900	489	47	1176	45	96	3	17	33	13	28
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.98		0.97	0.98		0.97
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1730	1737	1640	1628	1678	1519	1159	435	418	1707	1976	1900
Adj Flow Rate, veh/h	127	1900	0	47	1176	0	96	3	17	33	13	28
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	4	11	0	16	15	14	50	100	100	13	0	0
Cap, veh/h	356	3278		186	3120		177	10	56	210	98	212
Arrive On Green	0.04	0.69	0.00	0.03	0.68	0.00	0.18	0.18	0.18	0.18	0.18	0.18
Sat Flow, veh/h	1648	4742	1362	1550	4580	1262	828	55	313	1244	548	1180
Grp Volume(v), veh/h	127	1900	0	47	1176	0	96	0	20	33	0	41
Grp Sat Flow(s),veh/h/ln	1648	1581	1362	1550	1527	1262	828	0	369	1244	0	1728
Q Serve(g_s), s	3.7	33.0	0.0	1.5	17.6	0.0	17.7	0.0	7.5	3.8	0.0	3.2
Cycle Q Clear(g_c), s	3.7	33.0	0.0	1.5	17.6	0.0	20.8	0.0	7.5	11.3	0.0	3.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.85	1.00		0.68
Lane Grp Cap(c), veh/h	356	3278		186	3120		177	0	66	210	0	310
V/C Ratio(X)	0.36	0.58		0.25	0.38		0.54	0.00	0.30	0.16	0.00	0.13
Avail Cap(c_a), veh/h	449	3278		251	3120		256	0	101	328	0	474
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.3	12.7	0.0	11.2	10.9	0.0	63.9	0.0	57.0	61.9	0.0	55.2
Incr Delay (d2), s/veh	0.6	0.8	0.0	0.7	0.3	0.0	5.4	0.0	5.4	0.7	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.8	19.0	0.0	1.1	11.0	0.0	7.6	0.0	1.5	2.4	0.0	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.9	13.5	0.0	12.0	11.3	0.0	69.4	0.0	62.3	62.6	0.0	55.6
LnGrp LOS	A	B		B	B		E	A	E	E	A	E
Approach Vol, veh/h		2027	A		1223	A		116				74
Approach Delay, s/veh		13.2			11.3			68.2				58.7
Approach LOS		B			B			E				E
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.4	116.8		35.8	9.0	115.2		35.8				
Change Period (Y+Rc), s	3.0	6.2		7.1	3.0	6.2		7.1				
Max Green Setting (Gmax), s	11.0	88.8		43.9	15.0	84.8		43.9				
Max Q Clear Time (g_c+I1), s	3.5	36.0		22.8	5.7	20.6		13.3				
Green Ext Time (p_c), s	0.1	51.0		1.7	0.3	46.7		1.1				

Intersection Summary												
HCM 6th Ctrl Delay				15.4								
HCM 6th LOS				B								

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
 2: Bramalea Road & Derry Road E (RR 5)

Future Total 2022 - AM Peak Hour
 6:45 AM - 7:45 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↗		↘	↗	↗
Traffic Volume (veh/h)	214	1615	42	307	1008	216	11	22	60	325	117	227
Future Volume (veh/h)	214	1615	42	307	1008	216	11	22	60	325	117	227
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	1.00		0.81	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.98
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1604	1737	1781	1826	1693	1625	1307	1411	1411	1722	1870	1870
Adj Flow Rate, veh/h	214	1615	42	307	1008	0	11	22	60	221	263	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	20	11	8	5	14	14	40	33	33	12	2	2
Cap, veh/h	329	2774	833	152	2242		114	26	71	299	342	
Arrive On Green	0.08	0.59	0.59	0.49	0.49	0.00	0.09	0.09	0.09	0.18	0.18	0.00
Sat Flow, veh/h	1527	4742	1423	293	4621	1322	1245	283	772	1640	1870	1560
Grp Volume(v), veh/h	214	1615	42	307	1008	0	11	0	82	221	263	0
Grp Sat Flow(s),veh/h/ln	1527	1581	1423	293	1540	1322	1245	0	1054	1640	1870	1560
Q Serve(g_s), s	11.0	34.3	2.0	58.3	23.0	0.0	1.3	0.0	12.3	20.4	21.4	0.0
Cycle Q Clear(g_c), s	11.0	34.3	2.0	77.6	23.0	0.0	1.3	0.0	12.3	20.4	21.4	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.73	1.00		1.00
Lane Grp Cap(c), veh/h	329	2774	833	152	2242		114	0	97	299	342	
V/C Ratio(X)	0.65	0.58	0.05	2.02	0.45		0.10	0.00	0.85	0.74	0.77	
Avail Cap(c_a), veh/h	330	2774	833	152	2242		164	0	139	309	352	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	20.3	20.9	14.2	59.5	27.1	0.0	66.6	0.0	71.6	61.8	62.2	0.0
Incr Delay (d2), s/veh	4.4	0.9	0.1	481.7	0.3	0.0	0.8	0.0	37.4	10.8	11.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/lr	8.2	20.2	1.4	47.8	14.2	0.0	0.8	0.0	8.0	15.0	17.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.8	21.8	14.3	541.2	27.4	0.0	67.4	0.0	109.0	72.6	73.8	0.0
LnGrp LOS	C	C	B	F	C		E	A	F	E	E	
Approach Vol, veh/h		1871			1315	A		93			484	A
Approach Delay, s/veh		22.0			147.4			104.1			73.2	
Approach LOS		C			F			F			E	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		100.3		22.6	16.0	84.3		37.1				
Change Period (Y+Rc), s		6.7		7.9	3.0	6.7		7.9				
Max Green Setting (Gmax), s		86.3		21.1	13.0	70.3		30.1				
Max Q Clear Time (g_c+I1), s		37.3		14.3	13.0	79.6		23.4				
Green Ext Time (p_c), s		45.5		0.7	0.0	0.0		3.3				

Intersection Summary

HCM 6th Ctrl Delay	74.4
HCM 6th LOS	E

Notes

- User approved pedestrian interval to be less than phase max green.
- User approved volume balancing among the lanes for turning movement.
- Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	1.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	0	0	2	0	12	0	78	0	64	386	16
Future Vol, veh/h	3	0	0	2	0	12	0	78	0	64	386	16
Conflicting Peds, #/hr	1	0	0	0	0	1	91	0	0	0	0	91
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	50	0	1	0	67	2	0
Mvmt Flow	3	0	0	2	0	12	0	78	0	64	386	16

Major/Minor	Minor2		Minor1			Major1		Major2				
Conflicting Flow All	698	691	485	600	699	79	493	0	0	78	0	0
Stage 1	613	613	-	78	78	-	-	-	-	-	-	-
Stage 2	85	78	-	522	621	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.7	4.1	-	-	4.77	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.75	2.2	-	-	2.803	-	-
Pot Cap-1 Maneuver	358	370	586	416	366	863	1081	-	-	1194	-	-
Stage 1	483	486	-	936	834	-	-	-	-	-	-	-
Stage 2	928	834	-	542	482	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	308	318	541	394	314	862	998	-	-	1194	-	-
Mov Cap-2 Maneuver	308	318	-	394	314	-	-	-	-	-	-	-
Stage 1	446	417	-	936	834	-	-	-	-	-	-	-
Stage 2	914	834	-	505	414	-	-	-	-	-	-	-

Approach	EB		WB			NB		SB		
HCM Control Delay, s	16.8		10			0		1.1		
HCM LOS	C		B							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	998	-	-	308	737	1194	-	-
HCM Lane V/C Ratio	-	-	-	0.01	0.019	0.054	-	-
HCM Control Delay (s)	0	-	-	16.8	10	8.2	0	-
HCM Lane LOS	A	-	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0.2	-	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	0	0	101	509	0
Future Vol, veh/h	0	0	0	101	509	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	78	11	0
Mvmt Flow	0	0	0	101	509	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	51	51	-	0
Stage 1	51	51	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	963	844	-	-
Stage 1	977	856	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	963	0	-	-
Mov Cap-2 Maneuver	963	0	-	-
Stage 1	977	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	411	94	60	80	0	20	1	11	0	0	1
Future Vol, veh/h	4	411	94	60	80	0	20	1	11	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	75	5	0	0	79	0	75	100	0	0	0	100
Mvmt Flow	4	411	94	60	80	0	20	1	11	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	80	0	0	505	0	0	667	666	458	672	713	80
Stage 1	-	-	-	-	-	-	466	466	-	200	200	-
Stage 2	-	-	-	-	-	-	201	200	-	472	513	-
Critical Hdwy	4.85	-	-	4.1	-	-	7.85	7.5	6.2	7.1	6.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Follow-up Hdwy	2.875	-	-	2.2	-	-	4.175	4.9	3.3	3.5	4	4.2
Pot Cap-1 Maneuver	1161	-	-	1070	-	-	289	279	607	372	360	765
Stage 1	-	-	-	-	-	-	460	428	-	806	739	-
Stage 2	-	-	-	-	-	-	659	585	-	576	539	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1161	-	-	1070	-	-	275	261	607	346	337	765
Mov Cap-2 Maneuver	-	-	-	-	-	-	275	261	-	346	337	-
Stage 1	-	-	-	-	-	-	458	426	-	802	695	-
Stage 2	-	-	-	-	-	-	619	550	-	561	536	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			3.7			16.8			9.7		
HCM LOS							C			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	338	1161	-	-	1070	-	-	765
HCM Lane V/C Ratio	0.095	0.003	-	-	0.056	-	-	0.001
HCM Control Delay (s)	16.8	8.1	0	-	8.6	0	-	9.7
HCM Lane LOS	C	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.3	0	-	-	0.2	-	-	0

Intersection						
Int Delay, s/veh	3.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	142	238	202	83	42	36
Future Vol, veh/h	142	238	202	83	42	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	142	238	202	83	42	36

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	380	0	748 261
Stage 1	-	-	-	-	261 -
Stage 2	-	-	-	-	487 -
Critical Hdwy	-	-	4.12	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	-	-	2.218	-	3.518 3.318
Pot Cap-1 Maneuver	-	-	1178	-	380 778
Stage 1	-	-	-	-	783 -
Stage 2	-	-	-	-	618 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1178	-	312 778
Mov Cap-2 Maneuver	-	-	-	-	312 -
Stage 1	-	-	-	-	783 -
Stage 2	-	-	-	-	507 -

Approach	EB	WB	NB
HCM Control Delay, s	0	6.2	14.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	312	778	-	-	1178	-
HCM Lane V/C Ratio	0.135	0.046	-	-	0.171	-
HCM Control Delay (s)	18.3	9.9	-	-	8.7	0
HCM Lane LOS	C	A	-	-	A	A
HCM 95th %tile Q(veh)	0.5	0.1	-	-	0.6	-

HCM 6th TWSC
 7: Bramalea Road & Alstep Drive/Fed-Ex Truck Entrance

Future Total 2022 - AM Peak Hour
 6:45 AM - 7:45 AM

Intersection												
Int Delay, s/veh	4.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕		↕		↕			↕	
Traffic Vol, veh/h	46	0	132	0	0	10	23	22	0	13	113	262
Future Vol, veh/h	46	0	132	0	0	10	23	22	0	13	113	262
Conflicting Peds, #/hr	0	0	0	0	0	0	91	0	0	0	0	91
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	0	2	100	2	50	0	75	0	2
Mvmt Flow	46	0	132	0	0	10	23	22	0	13	113	262

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	434	429	335	404	-	22	466	0	0	22	0	0
Stage 1	361	361	-	68	-	-	-	-	-	-	-	-
Stage 2	73	68	-	336	-	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	-	7.2	4.12	-	-	4.85	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	-	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	-	4.2	2.218	-	-	2.875	-	-
Pot Cap-1 Maneuver	532	518	707	561	0	831	1095	-	-	1226	-	-
Stage 1	657	626	-	947	0	-	-	-	-	-	-	-
Stage 2	937	838	-	682	0	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	471	461	653	435	-	831	1011	-	-	1226	-	-
Mov Cap-2 Maneuver	471	461	-	435	-	-	-	-	-	-	-	-
Stage 1	593	570	-	925	-	-	-	-	-	-	-	-
Stage 2	904	819	-	537	-	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	13.6		9.4		4.4		0.3	
HCM LOS	B		A					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1011	-	-	594	-	831	1226	-	-
HCM Lane V/C Ratio	0.023	-	-	0.3	-	0.012	0.011	-	-
HCM Control Delay (s)	8.6	-	-	13.6	0	9.4	8	0	-
HCM Lane LOS	A	-	-	B	A	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.3	-	0	0	-	-

Intersection						
Int Delay, s/veh	1.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	38	0	0	7	29	216
Future Vol, veh/h	38	0	0	7	29	216
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	0	0	7	29	216

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	144	137	245	0	-	0
Stage 1	137	-	-	-	-	-
Stage 2	7	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	849	911	1321	-	-	-
Stage 1	890	-	-	-	-	-
Stage 2	1016	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	849	911	1321	-	-	-
Mov Cap-2 Maneuver	849	-	-	-	-	-
Stage 1	890	-	-	-	-	-
Stage 2	1016	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1321	-	849	-	-	-
HCM Lane V/C Ratio	-	-	0.045	-	-	-
HCM Control Delay (s)	0	-	9.4	0	-	-
HCM Lane LOS	A	-	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-	-

Intersection						
Int Delay, s/veh	1.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		T
Traffic Vol, veh/h	5	0	0	2	2	27
Future Vol, veh/h	5	0	0	2	2	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	0	0	2	2	27

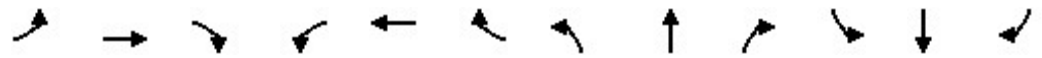
Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	18	16	29	0	0
Stage 1	16	-	-	-	-
Stage 2	2	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	1000	1063	1584	-	-
Stage 1	1007	-	-	-	-
Stage 2	1021	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	1000	1063	1584	-	-
Mov Cap-2 Maneuver	1000	-	-	-	-
Stage 1	1007	-	-	-	-
Stage 2	1021	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.6	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1584	-	1000	-	-
HCM Lane V/C Ratio	-	-	0.005	-	-
HCM Control Delay (s)	0	-	8.6	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

Future Total 2022 - PM Peak Hour
 3:00 PM - 4:00 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↑↑↑	↷	↶	↑↑↑	↷	↶	↷		↶	↷	
Traffic Volume (veh/h)	139	1571	110	50	1695	57	475	33	62	79	17	127
Future Volume (veh/h)	139	1571	110	50	1695	57	475	33	62	79	17	127
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	0.99		0.99
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1549	1633	1410	1526	1722	1413	1737	1483	1426	1767	1498	1441
Adj Flow Rate, veh/h	139	1571	0	50	1695	0	475	33	62	79	17	127
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	17	18	18	23	12	22	11	32	32	9	31	31
Cap, veh/h	165	2824		201	3197		206	108	204	262	36	268
Arrive On Green	0.63	0.63	0.00	0.03	0.68	0.00	0.24	0.24	0.24	0.24	0.24	0.24
Sat Flow, veh/h	240	4459	1171	1454	4701	1173	1149	458	860	1220	151	1130
Grp Volume(v), veh/h	139	1571	0	50	1695	0	475	0	95	79	0	144
Grp Sat Flow(s),veh/h/ln	240	1486	1171	1454	1567	1173	1149	0	1318	1220	0	1281
Q Serve(g_s), s	79.9	31.9	0.0	1.9	28.9	0.0	22.4	0.0	9.5	9.1	0.0	15.5
Cycle Q Clear(g_c), s	101.3	31.9	0.0	1.9	28.9	0.0	37.9	0.0	9.5	18.6	0.0	15.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.65	1.00		0.88
Lane Grp Cap(c), veh/h	165	2824		201	3197		206	0	312	262	0	303
V/C Ratio(X)	0.84	0.56		0.25	0.53		2.30	0.00	0.30	0.30	0.00	0.47
Avail Cap(c_a), veh/h	165	2824		324	3197		206	0	312	262	0	303
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	45.5	16.6	0.0	13.2	12.8	0.0	71.2	0.0	50.2	57.9	0.0	52.5
Incr Delay (d2), s/veh	38.1	0.8	0.0	0.6	0.6	0.0	602.1	0.0	1.2	1.4	0.0	2.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	12.3	17.8	0.0	1.3	16.9	0.0	71.1	0.0	6.2	5.6	0.0	9.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	83.6	17.4	0.0	13.9	13.4	0.0	673.3	0.0	51.4	59.2	0.0	54.9
LnGrp LOS	F	B		B	B		F	A	D	E	A	D
Approach Vol, veh/h		1710	A		1745	A		570				223
Approach Delay, s/veh		22.8			13.5			569.6				56.5
Approach LOS		C			B			F				E
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	7.5	107.5		45.0		115.0		45.0				
Change Period (Y+Rc), s	3.0	6.2		7.1		6.2		7.1				
Max Green Setting (Gmax), s	18.0	87.8		37.9		108.8		37.9				
Max Q Clear Time (g_c+I1), s	3.9	103.3		39.9		30.9		20.6				
Green Ext Time (p_c), s	0.1	0.0		0.0		70.9		3.4				

Intersection Summary

HCM 6th Ctrl Delay	94.1
HCM 6th LOS	F

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
 2: Bramalea Road & Derry Road E (RR 5)

Future Total 2022 - PM Peak Hour
 3:00 PM - 4:00 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↗		↘	↗	↗
Traffic Volume (veh/h)	238	1462	52	92	1364	346	263	153	419	287	34	212
Future Volume (veh/h)	238	1462	52	92	1364	346	263	153	419	287	34	212
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		0.72	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.99
Work Zone On Approach		No		No		No		No		No		No
Adj Sat Flow, veh/h/ln	1470	1678	1574	1737	1722	1625	1737	1811	1811	1737	1811	1604
Adj Flow Rate, veh/h	238	1462	52	92	1364	0	263	153	419	311	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	29	15	22	11	12	14	11	6	6	11	6	20
Cap, veh/h	258	2505	674	152	1952		146	29	79	742	0	
Arrive On Green	0.11	0.55	0.55	0.42	0.42	0.00	0.09	0.09	0.09	0.22	0.00	0.00
Sat Flow, veh/h	1400	4580	1232	319	4701	1327	1654	329	901	3309	0	1343
Grp Volume(v), veh/h	238	1462	52	92	1364	0	263	0	572	311	0	0
Grp Sat Flow(s),veh/h/ln	1400	1527	1232	319	1567	1327	1654	0	1230	1654	0	1343
Q Serve(g_s), s	15.3	34.0	3.2	43.1	38.2	0.0	14.1	0.0	14.1	12.9	0.0	0.0
Cycle Q Clear(g_c), s	15.3	34.0	3.2	56.0	38.2	0.0	14.1	0.0	14.1	12.9	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.73	1.00		1.00
Lane Grp Cap(c), veh/h	258	2505	674	152	1952		146	0	108	742	0	
V/C Ratio(X)	0.92	0.58	0.08	0.61	0.70		1.80	0.00	5.28	0.42	0.00	
Avail Cap(c_a), veh/h	328	2505	674	152	1952		146	0	108	891	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	32.3	24.1	17.2	49.8	38.6	0.0	72.9	0.0	73.0	53.1	0.0	0.0
Incr Delay (d2), s/veh	26.5	1.0	0.2	10.0	1.4	0.0	387.7	0.0	1944.7	0.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.9	19.6	1.9	7.3	22.4	0.0	35.0	0.0	95.4	9.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	58.8	25.1	17.4	59.7	40.0	0.0	460.6	0.0	2017.6	53.9	0.0	0.0
LnGrp LOS	E	C	B	E	D		F	A	F	D	A	
Approach Vol, veh/h		1752			1456	A		835			311	A
Approach Delay, s/veh		29.5			41.2			1527.2			53.9	
Approach LOS		C			D			F			D	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		94.2		22.0	21.1	73.1		43.8				
Change Period (Y+Rc), s		6.7		7.9	3.0	6.7		7.9				
Max Green Setting (Gmax), s		80.3		14.1	26.0	51.3		43.1				
Max Q Clear Time (g_c+I1), s		36.0		16.1	17.3	58.0		14.9				
Green Ext Time (p_c), s		40.0		0.0	0.8	0.0		3.8				

Intersection Summary

HCM 6th Ctrl Delay	322.4
HCM 6th LOS	F

Notes

User approved volume balancing among the lanes for turning movement.
 Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC
3: Bramalea Road & Fed-Ex Employee Entrance

Future Total 2022 - PM Peak Hour
3:00 PM - 4:00 PM

Intersection												
Int Delay, s/veh	2.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	19	0	0	5	0	64	0	752	2	44	121	13
Future Vol, veh/h	19	0	0	5	0	64	0	752	2	44	121	13
Conflicting Peds, #/hr	2	0	0	0	0	2	145	0	0	0	0	145
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	6	0	0	20	0	5	0	16	50	0	24	25
Mvmt Flow	19	0	0	5	0	64	0	752	2	44	121	13

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1148	1115	273	969	1120	755	279	0	0	754	0	0
Stage 1	361	361	-	753	753	-	-	-	-	-	-	-
Stage 2	787	754	-	216	367	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.5	6.2	7.3	6.5	6.25	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.16	5.5	-	6.3	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.5	-	6.3	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4	3.3	3.68	4	3.345	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	173	210	771	216	208	404	1295	-	-	865	-	-
Stage 1	649	629	-	376	420	-	-	-	-	-	-	-
Stage 2	379	420	-	747	626	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	120	172	668	207	170	403	1122	-	-	865	-	-
Mov Cap-2 Maneuver	120	172	-	207	170	-	-	-	-	-	-	-
Stage 1	562	515	-	376	420	-	-	-	-	-	-	-
Stage 2	318	420	-	706	512	-	-	-	-	-	-	-

Approach	EB		WB		NB			SB		
HCM Control Delay, s	40.6		16.7		0			2.3		
HCM LOS	E		C							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1122	-	-	120	377	865	-	-
HCM Lane V/C Ratio	-	-	-	0.158	0.183	0.051	-	-
HCM Control Delay (s)	0	-	-	40.6	16.7	9.4	0	-
HCM Lane LOS	A	-	-	E	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0.7	0.2	-	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	0	0	462	123	0
Future Vol, veh/h	0	0	0	462	123	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	29	44	0
Mvmt Flow	0	0	0	462	123	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	231	231	-	0
Stage 1	231	231	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	762	672	-	-
Stage 1	812	717	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	762	0	-	-
Mov Cap-2 Maneuver	762	0	-	-
Stage 1	812	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	88	30	9	378	0	80	1	114	1	3	4
Future Vol, veh/h	5	88	30	9	378	0	80	1	114	1	3	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	100	41	28	0	23	0	25	100	0	0	100	100
Mvmt Flow	5	88	30	9	378	0	80	1	114	1	3	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	378	0	0	118	0	0	513	509	103	567	524	378
Stage 1	-	-	-	-	-	-	113	113	-	396	396	-
Stage 2	-	-	-	-	-	-	400	396	-	171	128	-
Critical Hdwy	5.1	-	-	4.1	-	-	7.35	7.5	6.2	7.1	7.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Follow-up Hdwy	3.1	-	-	2.2	-	-	3.725	4.9	3.3	3.5	4.9	4.2
Pot Cap-1 Maneuver	796	-	-	1483	-	-	437	353	957	437	345	498
Stage 1	-	-	-	-	-	-	839	646	-	633	465	-
Stage 2	-	-	-	-	-	-	583	465	-	836	635	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	796	-	-	1483	-	-	426	348	957	380	340	498
Mov Cap-2 Maneuver	-	-	-	-	-	-	426	348	-	380	340	-
Stage 1	-	-	-	-	-	-	833	641	-	629	461	-
Stage 2	-	-	-	-	-	-	570	461	-	730	631	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.2			13.3			13.9		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	629	796	-	-	1483	-	-	411
HCM Lane V/C Ratio	0.31	0.006	-	-	0.006	-	-	0.019
HCM Control Delay (s)	13.3	9.6	0	-	7.4	0	-	13.9
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	1.3	0	-	-	0	-	-	0.1

Intersection						
Int Delay, s/veh	8.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	132	38	33	127	214	375
Future Vol, veh/h	132	38	33	127	214	375
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	132	38	33	127	214	375

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	170	0	344
Stage 1	-	-	-	-	151
Stage 2	-	-	-	-	193
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1407	-	652
Stage 1	-	-	-	-	877
Stage 2	-	-	-	-	840
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1407	-	636
Mov Cap-2 Maneuver	-	-	-	-	636
Stage 1	-	-	-	-	877
Stage 2	-	-	-	-	819

Approach	EB	WB	NB
HCM Control Delay, s	0	1.6	12.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	636	895	-	-	1407	-
HCM Lane V/C Ratio	0.336	0.419	-	-	0.023	-
HCM Control Delay (s)	13.5	11.9	-	-	7.6	0
HCM Lane LOS	B	B	-	-	A	A
HCM 95th %tile Q(veh)	1.5	2.1	-	-	0.1	-

Intersection												
Int Delay, s/veh	257.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕		↕		↕			↕	
Traffic Vol, veh/h	486	0	21	0	0	15	118	253	2	19	65	42
Future Vol, veh/h	486	0	21	0	0	15	118	253	2	19	65	42
Conflicting Peds, #/hr	0	0	0	0	0	0	145	0	0	0	0	145
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	0	2	50	2	5	0	67	2	2
Mvmt Flow	486	0	21	0	0	15	118	253	2	19	65	42

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	767	760	231	625	-	254	252	0	0	255	0	0
Stage 1	269	269	-	490	-	-	-	-	-	-	-	-
Stage 2	498	491	-	135	-	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	-	6.7	4.12	-	-	4.77	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	-	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	-	3.75	2.218	-	-	2.803	-	-
Pot Cap-1 Maneuver	~ 319	336	808	400	0	681	1313	-	-	1010	-	-
Stage 1	737	687	-	564	0	-	-	-	-	-	-	-
Stage 2	554	548	-	873	0	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 241	251	700	347	-	681	1137	-	-	1010	-	-
Mov Cap-2 Maneuver	~ 241	251	-	347	-	-	-	-	-	-	-	-
Stage 1	561	583	-	496	-	-	-	-	-	-	-	-
Stage 2	~ 476	482	-	830	-	-	-	-	-	-	-	-

Approach	EB		WB		NB			SB		
HCM Control Delay, s	\$ 516.4		10.4		2.7			1.3		
HCM LOS	F		B							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1137	-	-	248	-	681	1010	-	-
HCM Lane V/C Ratio	0.104	-	-	2.044	-	0.022	0.019	-	-
HCM Control Delay (s)	8.5	-	-	\$ 516.4	0	10.4	8.6	0	-
HCM Lane LOS	A	-	-	F	A	B	A	A	-
HCM 95th %tile Q(veh)	0.3	-	-	37.5	-	0.1	0.1	-	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
8: Bramalea Road & East Access

Future Total 2022 - PM Peak Hour
3:00 PM - 4:00 PM

Intersection						
Int Delay, s/veh	7.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	289	0	0	84	52	34
Future Vol, veh/h	289	0	0	84	52	34
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	289	0	0	84	52	34

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	153	69	86	0	0
Stage 1	69	-	-	-	-
Stage 2	84	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	839	994	1510	-	-
Stage 1	954	-	-	-	-
Stage 2	939	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	839	994	1510	-	-
Mov Cap-2 Maneuver	839	-	-	-	-
Stage 1	954	-	-	-	-
Stage 2	939	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1510	-	839	-	-	-
HCM Lane V/C Ratio	-	-	0.344	-	-	-
HCM Control Delay (s)	0	-	11.5	0	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	1.5	-	-	-

Intersection						
Int Delay, s/veh	2.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	36	0	0	48	48	4
Future Vol, veh/h	36	0	0	48	48	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	0	0	48	48	4

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	98	50	52	0	0
Stage 1	50	-	-	-	-
Stage 2	48	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	901	1018	1554	-	-
Stage 1	972	-	-	-	-
Stage 2	974	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	901	1018	1554	-	-
Mov Cap-2 Maneuver	901	-	-	-	-
Stage 1	972	-	-	-	-
Stage 2	974	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.2	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1554	-	901	-	-
HCM Lane V/C Ratio	-	-	0.04	-	-
HCM Control Delay (s)	0	-	9.2	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

APPENDIX E

**Intersection Operation Synchro Reports
2022 Future Total Conditions
with Improvements**

Timing Report, Sorted By Phase
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

No Alstep, Unsplit Phasing (2022 Horizon)

AM Peak Hour

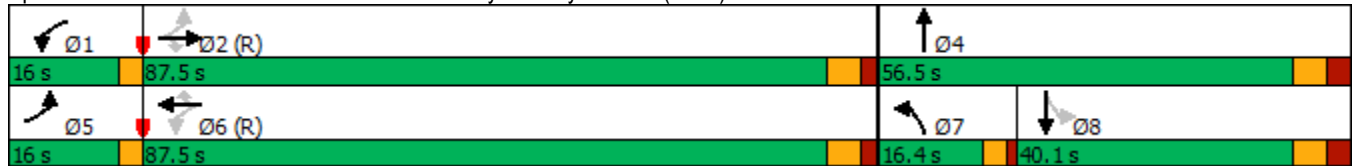


Phase Number	1	2	4	5	6	7	8
Movement	WBL	EBTL	NBT	EBL	WBTL	NBL	SBTL
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize						Yes	Yes
Recall Mode	None	C-Max	None	None	C-Max	None	None
Maximum Split (s)	16	87.5	56.5	16	87.5	16.4	40.1
Maximum Split (%)	10.0%	54.7%	35.3%	10.0%	54.7%	10.3%	25.1%
Minimum Split (s)	8	29.2	40.1	8	29.2	9.5	40.1
Yellow Time (s)	3	4.2	4	3	4.2	3	4
All-Red Time (s)	0	2	3.1	0	2	1	3.1
Minimum Initial (s)	5	12	8	5	12	5	8
Vehicle Extension (s)	3	5	5	3	5	3	5
Minimum Gap (s)	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0
Walk Time (s)		9	13		9		13
Flash Dont Walk (s)		14	20		14		20
Dual Entry	No	Yes	Yes	No	Yes	No	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	144	0	87.5	144	0	87.5	103.9
End Time (s)	0	87.5	144	0	87.5	103.9	144
Yield/Force Off (s)	157	81.3	136.9	157	81.3	99.9	136.9
Yield/Force Off 170(s)	157	67.3	116.9	157	67.3	99.9	116.9
Local Start Time (s)	144	0	87.5	144	0	87.5	103.9
Local Yield (s)	157	81.3	136.9	157	81.3	99.9	136.9
Local Yield 170(s)	157	67.3	116.9	157	67.3	99.9	116.9

Intersection Summary

Cycle Length	160
Control Type	Actuated-Coordinated
Natural Cycle	100
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 1: Menkes Drive/Telford Way & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

No Alstep, Unsplit Phasing (2022 Horizon)

AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	127	1942	447	90	1182	45	90	3	17	33	13	28
Future Volume (veh/h)	127	1942	447	90	1182	45	90	3	17	33	13	28
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	0.97		0.96
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1730	1737	1640	1628	1678	1519	1159	435	1159	1707	1976	1618
Adj Flow Rate, veh/h	127	1942	0	90	1182	0	90	3	17	33	13	28
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	4	11	0	16	15	14	50	100	50	13	0	19
Cap, veh/h	341	3130		178	2991		115	11	65	200	69	148
Arrive On Green	0.04	0.66	0.00	0.03	0.65	0.00	0.05	0.21	0.21	0.13	0.13	0.13
Sat Flow, veh/h	1648	4742	1362	1550	4580	1262	2141	55	314	1227	544	1171
Grp Volume(v), veh/h	127	1942	0	90	1182	0	90	0	20	33	0	41
Grp Sat Flow(s),veh/h/ln	1648	1581	1362	1550	1527	1262	1071	0	370	1227	0	1714
Q Serve(g_s), s	4.1	37.7	0.0	3.1	19.3	0.0	6.6	0.0	7.3	3.9	0.0	3.4
Cycle Q Clear(g_c), s	4.1	37.7	0.0	3.1	19.3	0.0	6.6	0.0	7.3	3.9	0.0	3.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.85	1.00		0.68
Lane Grp Cap(c), veh/h	341	3130		178	2991		115	0	76	200	0	217
V/C Ratio(X)	0.37	0.62		0.50	0.40		0.78	0.00	0.26	0.16	0.00	0.19
Avail Cap(c_a), veh/h	410	3130		254	2991		166	0	114	298	0	354
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.0	15.6	0.0	16.5	13.0	0.0	74.8	0.0	53.4	62.7	0.0	62.5
Incr Delay (d2), s/veh	0.7	0.9	0.0	2.2	0.4	0.0	13.8	0.0	3.9	0.8	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.1	21.5	0.0	2.8	12.0	0.0	3.9	0.0	1.4	2.4	0.0	2.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.7	16.6	0.0	18.7	13.4	0.0	88.6	0.0	57.3	63.5	0.0	63.4
LnGrp LOS	B	B		B	B		F	A	E	E	A	E
Approach Vol, veh/h		2069	A		1272	A		110				74
Approach Delay, s/veh		16.2			13.8			82.9				63.4
Approach LOS		B			B			F				E
Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.2	111.8		40.0	9.3	110.7	12.6	27.4				
Change Period (Y+Rc), s	3.0	6.2		7.1	3.0	6.2	4.0	7.1				
Max Green Setting (Gmax), s	13.0	81.3		49.4	13.0	81.3	12.4	33.0				
Max Q Clear Time (g_c+I1), s	5.1	40.7		9.3	6.1	22.3	8.6	5.9				
Green Ext Time (p_c), s	0.2	39.6		0.3	0.3	44.1	0.1	1.0				

Intersection Summary

HCM 6th Ctrl Delay	18.4
HCM 6th LOS	B

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Timing Report, Sorted By Phase
2: Bramalea Road & Derry Road E (RR 5)

No Alstep, Unsplit Phasing (2022 Horizon)

AM Peak Hour

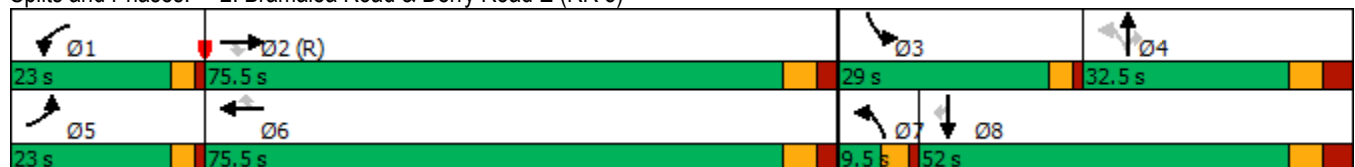


Phase Number	1	2	3	4	5	6	7	8
Movement	WBL	EBT	SBL	NBTL	EBL	WBT	NBL	SBT
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize	Yes	Yes	Yes	Yes			Yes	Yes
Recall Mode	None	C-Max	None	None	None	None	None	None
Maximum Split (s)	23	75.5	29	32.5	23	75.5	9.5	52
Maximum Split (%)	14.4%	47.2%	18.1%	20.3%	14.4%	47.2%	5.9%	32.5%
Minimum Split (s)	9.5	35.7	9.5	15.9	9	35.7	9.5	46.9
Yellow Time (s)	3	4.2	3	4	3	4.2	3.5	4
All-Red Time (s)	1	2.5	1	3.9	1	2.5	1	3.9
Minimum Initial (s)	5	12	5	8	5	12	5	10
Vehicle Extension (s)	3	5	3	5	3	5	3	5
Minimum Gap (s)	3	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0	0
Walk Time (s)		11				11		15
Flash Dont Walk (s)		18				18		24
Dual Entry	No	Yes	No	Yes	No	Yes	No	No
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	137	0	75.5	104.5	137	0	75.5	85
End Time (s)	0	75.5	104.5	137	0	75.5	85	137
Yield/Force Off (s)	156	68.8	100.5	129.1	156	68.8	80.5	129.1
Yield/Force Off 170(s)	156	50.8	100.5	129.1	156	50.8	80.5	105.1
Local Start Time (s)	137	0	75.5	104.5	137	0	75.5	85
Local Yield (s)	156	68.8	100.5	129.1	156	68.8	80.5	129.1
Local Yield 170(s)	156	50.8	100.5	129.1	156	50.8	80.5	105.1

Intersection Summary

































Cycle Length 160
Control Type Actuated-Coordinated
Natural Cycle 115
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green

Splits and Phases: 2: Bramalea Road & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
2: Bramalea Road & Derry Road E (RR 5)

No Alstep, Unsplit Phasing (2022 Horizon)
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	  		  	  					 		
Traffic Volume (veh/h)	214	1615	84	264	1051	216	17	20	60	325	117	227
Future Volume (veh/h)	214	1615	84	264	1051	216	17	20	60	325	117	227
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	0.85		0.83	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.98
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1604	1737	1781	1826	1693	1625	1307	1411	1248	1722	1870	1870
Adj Flow Rate, veh/h	214	1615	84	264	1051	0	17	20	60	325	117	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	20	11	8	5	14	14	40	33	44	12	2	2
Cap, veh/h	258	2582	774	315	2545		143	143	88	380	376	
Arrive On Green	0.09	0.54	0.54	0.09	0.55	0.00	0.02	0.10	0.10	0.12	0.20	0.00
Sat Flow, veh/h	2963	4742	1421	3374	4621	1322	1245	1411	873	3182	1870	1560
Grp Volume(v), veh/h	214	1615	84	264	1051	0	17	20	60	325	117	0
Grp Sat Flow(s),veh/h/ln	1481	1581	1421	1687	1540	1322	1245	1411	873	1591	1870	1560
Q Serve(g_s), s	11.4	37.6	4.6	12.3	21.2	0.0	2.0	2.1	10.6	16.0	8.5	0.0
Cycle Q Clear(g_c), s	11.4	37.6	4.6	12.3	21.2	0.0	2.0	2.1	10.6	16.0	8.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	258	2582	774	315	2545		143	143	88	380	376	
V/C Ratio(X)	0.83	0.63	0.11	0.84	0.41		0.12	0.14	0.68	0.85	0.31	
Avail Cap(c_a), veh/h	352	2582	774	401	2545		161	217	134	497	516	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	71.9	25.2	17.6	71.4	20.9	0.0	63.1	65.5	69.4	69.1	54.4	0.0
Incr Delay (d2), s/veh	11.5	1.2	0.3	11.9	0.2	0.0	0.4	0.9	17.7	10.9	1.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	8.5	22.0	3.2	10.1	13.2	0.0	1.2	1.5	5.3	11.9	7.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	83.3	26.3	17.9	83.3	21.1	0.0	63.5	66.5	87.0	79.9	55.4	0.0
LnGrp LOS	F	C	B	F	C		E	E	F	E	E	
Approach Vol, veh/h		1913			1315	A		97			442	A
Approach Delay, s/veh		32.3			33.6			78.7			73.5	
Approach LOS		C			C			E			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	18.9	93.8	23.1	24.1	17.9	94.8	7.2	40.1				
Change Period (Y+Rc), s	4.0	6.7	4.0	7.9	4.0	6.7	4.5	7.9				
Max Green Setting (Gmax), s	19.0	68.8	25.0	24.6	19.0	68.8	5.0	44.1				
Max Q Clear Time (g_c+I1), s	14.3	40.6	18.0	12.6	13.4	24.2	4.0	10.5				
Green Ext Time (p_c), s	0.6	27.0	1.1	0.6	0.5	32.3	0.0	2.6				

Intersection Summary

HCM 6th Ctrl Delay	38.8
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.
Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC
3: Bramalea Road & Fed-Ex Employee Entrance

No Alstep, Unsplit Phasing (2022 Horizon)
AM Peak Hour

Intersection												
Int Delay, s/veh	1.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	0	0	2	0	12	0	82	0	64	385	16
Future Vol, veh/h	3	0	0	2	0	12	0	82	0	64	385	16
Conflicting Peds, #/hr	1	0	0	0	0	1	91	0	0	0	0	91
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	50	0	1	0	67	2	0
Mvmt Flow	3	0	0	2	0	12	0	82	0	64	385	16

Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	654	694	292	403	702	42	492	0	0	82	0	0
Stage 1	612	612	-	82	82	-	-	-	-	-	-	-
Stage 2	42	82	-	321	620	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	7.9	4.1	-	-	5.44	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.8	2.2	-	-	2.87	-	-
Pot Cap-1 Maneuver	356	369	710	537	365	883	1082	-	-	1145	-	-
Stage 1	452	487	-	923	831	-	-	-	-	-	-	-
Stage 2	973	831	-	671	483	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	306	316	655	507	313	882	999	-	-	1145	-	-
Mov Cap-2 Maneuver	306	316	-	507	313	-	-	-	-	-	-	-
Stage 1	417	417	-	923	831	-	-	-	-	-	-	-
Stage 2	959	831	-	623	414	-	-	-	-	-	-	-

Approach	EB		WB			NB			SB		
HCM Control Delay, s	16.9		9.6			0			1.3		
HCM LOS	C		A								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	999	-	-	306	798	1145	-	-
HCM Lane V/C Ratio	-	-	-	0.01	0.018	0.056	-	-
HCM Control Delay (s)	0	-	-	16.9	9.6	8.3	0.2	-
HCM Lane LOS	A	-	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0.2	-	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	0	0	95	511	0
Future Vol, veh/h	0	0	0	95	511	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	78	11	0
Mvmt Flow	0	0	0	95	511	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	48	48	-	0
Stage 1	48	48	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	967	847	-	-
Stage 1	980	859	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	967	0	-	-
Mov Cap-2 Maneuver	967	0	-	-
Stage 1	980	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	0.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	448	59	0	83	0	11	1	1	0	0	1
Future Vol, veh/h	4	448	59	0	83	0	11	1	1	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	75	5	0	0	79	0	75	100	0	0	0	100
Mvmt Flow	4	448	59	0	83	0	11	1	1	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	83	0	0	507	0	0	570	569	478	570	598	83
Stage 1	-	-	-	-	-	-	486	486	-	83	83	-
Stage 2	-	-	-	-	-	-	84	83	-	487	515	-
Critical Hdwy	4.85	-	-	4.1	-	-	7.85	7.5	6.2	7.1	6.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Follow-up Hdwy	2.875	-	-	2.2	-	-	4.175	4.9	3.3	3.5	4	4.2
Pot Cap-1 Maneuver	1157	-	-	1068	-	-	340	323	591	435	418	762
Stage 1	-	-	-	-	-	-	447	418	-	930	830	-
Stage 2	-	-	-	-	-	-	771	669	-	566	538	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1157	-	-	1068	-	-	338	321	591	432	416	762
Mov Cap-2 Maneuver	-	-	-	-	-	-	338	321	-	432	416	-
Stage 1	-	-	-	-	-	-	445	416	-	925	830	-
Stage 2	-	-	-	-	-	-	770	669	-	561	535	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	15.7	9.7
HCM LOS			C	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	348	1157	-	-	1068	-	-	762
HCM Lane V/C Ratio	0.037	0.003	-	-	-	-	-	0.001
HCM Control Delay (s)	15.7	8.1	0	-	0	-	-	9.7
HCM Lane LOS	C	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection						
Int Delay, s/veh	0.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	10	72	0	13	374
Future Vol, veh/h	0	10	72	0	13	374
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	100	50	0	75	0
Mvmt Flow	0	10	72	0	13	374

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	285	36	0	0	72	0
Stage 1	72	-	-	-	-	-
Stage 2	213	-	-	-	-	-
Critical Hdwy	6.8	8.9	-	-	5.6	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	4.3	-	-	2.95	-
Pot Cap-1 Maneuver	687	783	-	-	1124	-
Stage 1	948	-	-	-	-	-
Stage 2	808	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	677	783	-	-	1124	-
Mov Cap-2 Maneuver	677	-	-	-	-	-
Stage 1	948	-	-	-	-	-
Stage 2	796	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.7	0	0.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	-	783	1124
HCM Lane V/C Ratio	-	-	0.013	0.012
HCM Control Delay (s)	-	-	0	9.7
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

Intersection						
Int Delay, s/veh	1.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	63	0	0	9	43	331
Future Vol, veh/h	63	0	0	9	43	331
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	63	0	0	9	43	331

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	218	187	374	0	-	0
Stage 1	209	-	-	-	-	-
Stage 2	9	-	-	-	-	-
Critical Hdwy	6.63	6.93	4.13	-	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	760	824	1183	-	-	-
Stage 1	806	-	-	-	-	-
Stage 2	1014	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	760	824	1183	-	-	-
Mov Cap-2 Maneuver	760	-	-	-	-	-
Stage 1	806	-	-	-	-	-
Stage 2	1014	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1183	-	760	-	-	-
HCM Lane V/C Ratio	-	-	0.083	-	-	-
HCM Control Delay (s)	0	-	10.2	0	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-	-

Intersection						
Int Delay, s/veh	1.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	7	0	0	2	2	41
Future Vol, veh/h	7	0	0	2	2	41
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	0	0	2	2	41

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	25	23	43	0	-	0
Stage 1	23	-	-	-	-	-
Stage 2	2	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	991	1054	1566	-	-	-
Stage 1	1000	-	-	-	-	-
Stage 2	1021	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	991	1054	1566	-	-	-
Mov Cap-2 Maneuver	991	-	-	-	-	-
Stage 1	1000	-	-	-	-	-
Stage 2	1021	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.7	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1566	-	991	-	-
HCM Lane V/C Ratio	-	-	0.007	-	-
HCM Control Delay (s)	0	-	8.7	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Timing Report, Sorted By Phase

No Alstep, Unsplit Phasing (2022 Horizon Year)

1: Menkes Drive/Telford Way & Derry Road E (RR 5)

PM Peak Hour

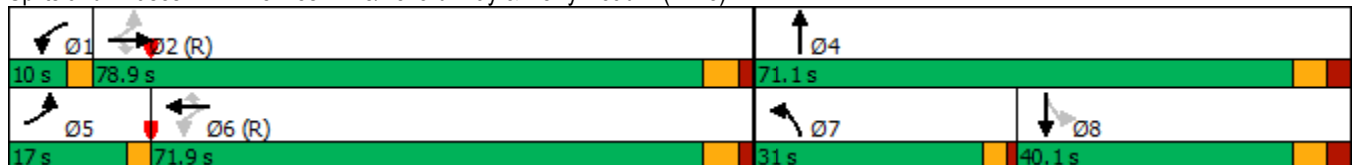


Phase Number	1	2	4	5	6	7	8
Movement	WBL	EBTL	NBT	EBL	WBTL	NBL	SBTL
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize				Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	None	C-Max	None	None
Maximum Split (s)	10	78.9	71.1	17	71.9	31	40.1
Maximum Split (%)	6.3%	49.3%	44.4%	10.6%	44.9%	19.4%	25.1%
Minimum Split (s)	8	29.2	40.1	9.5	29.2	9.5	40.1
Yellow Time (s)	3	4.2	4	3	4.2	3	4
All-Red Time (s)	0	2	3.1	0	2	1	3.1
Minimum Initial (s)	5	12	8	5	12	5	8
Vehicle Extension (s)	3	5	5	3	5	3	5
Minimum Gap (s)	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0
Walk Time (s)		9	13		9		13
Flash Dont Walk (s)		14	20		14		20
Dual Entry	No	Yes	Yes	No	Yes	No	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	143	153	71.9	143	0	71.9	102.9
End Time (s)	153	71.9	143	0	71.9	102.9	143
Yield/Force Off (s)	150	65.7	135.9	157	65.7	98.9	135.9
Yield/Force Off 170(s)	150	51.7	115.9	157	51.7	98.9	115.9
Local Start Time (s)	143	153	71.9	143	0	71.9	102.9
Local Yield (s)	150	65.7	135.9	157	65.7	98.9	135.9
Local Yield 170(s)	150	51.7	115.9	157	51.7	98.9	115.9





























Intersection Summary

Cycle Length	160
Control Type	Actuated-Coordinated
Natural Cycle	130
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 1: Menkes Drive/Telford Way & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary No Alstep, Unsplit Phasing (2022 Horizon Year)
 1: Menkes Drive/Telford Way & Derry Road E (RR 5) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  		 					
Traffic Volume (veh/h)	139	1577	103	56	1710	57	461	33	62	79	17	127
Future Volume (veh/h)	139	1577	103	56	1710	57	461	33	62	79	17	127
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	0.99		0.98
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1549	1633	1410	1526	1722	1413	1737	1483	1752	1767	1498	1693
Adj Flow Rate, veh/h	139	1577	0	56	1710	0	461	33	62	79	17	127
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	17	18	18	23	12	22	11	32	10	9	31	14
Cap, veh/h	181	2351		158	2340		507	157	295	237	24	178
Arrive On Green	0.06	0.53	0.00	0.03	0.50	0.00	0.16	0.34	0.34	0.16	0.16	0.16
Sat Flow, veh/h	1475	4459	1171	1454	4701	1173	3209	459	862	1212	151	1125
Grp Volume(v), veh/h	139	1577	0	56	1710	0	461	0	95	79	0	144
Grp Sat Flow(s),veh/h/ln	1475	1486	1171	1454	1567	1173	1605	0	1320	1212	0	1275
Q Serve(g_s), s	7.2	41.4	0.0	3.0	45.9	0.0	22.6	0.0	8.2	9.4	0.0	17.1
Cycle Q Clear(g_c), s	7.2	41.4	0.0	3.0	45.9	0.0	22.6	0.0	8.2	9.4	0.0	17.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.65	1.00		0.88
Lane Grp Cap(c), veh/h	181	2351		158	2340		507	0	451	237	0	202
V/C Ratio(X)	0.77	0.67		0.35	0.73		0.91	0.00	0.21	0.33	0.00	0.71
Avail Cap(c_a), veh/h	224	2351		180	2340		542	0	528	295	0	263
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	31.2	27.6	0.0	24.0	31.7	0.0	66.2	0.0	37.4	60.6	0.0	63.8
Incr Delay (d2), s/veh	11.9	1.5	0.0	1.3	2.1	0.0	18.6	0.0	0.5	1.7	0.0	10.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	6.4	22.8	0.0	2.1	26.2	0.0	16.5	0.0	5.3	5.7	0.0	10.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	43.1	29.2	0.0	25.3	33.8	0.0	84.8	0.0	37.8	62.3	0.0	74.3
LnGrp LOS	D	C		C	C		F	A	D	E	A	E
Approach Vol, veh/h		1716	A		1766	A		556			223	
Approach Delay, s/veh		30.3			33.5			76.8			70.0	
Approach LOS		C			C			E			E	
Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.6	90.6		61.8	12.4	85.8	29.3	32.5				
Change Period (Y+Rc), s	3.0	6.2		7.1	3.0	6.2	4.0	7.1				
Max Green Setting (Gmax), s	7.0	72.7		64.0	14.0	65.7	27.0	33.0				
Max Q Clear Time (g_c+I1), s	5.0	43.4		10.2	9.2	47.9	24.6	19.1				
Green Ext Time (p_c), s	0.0	27.7		2.7	0.2	17.3	0.7	2.9				

Intersection Summary												
HCM 6th Ctrl Delay				39.8								
HCM 6th LOS				D								

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Timing Report, Sorted By Phase
2: Bramalea Road & Derry Road E (RR 5)

No Alstep, Unsplit Phasing (2022 Horizon Year)

PM Peak Hour

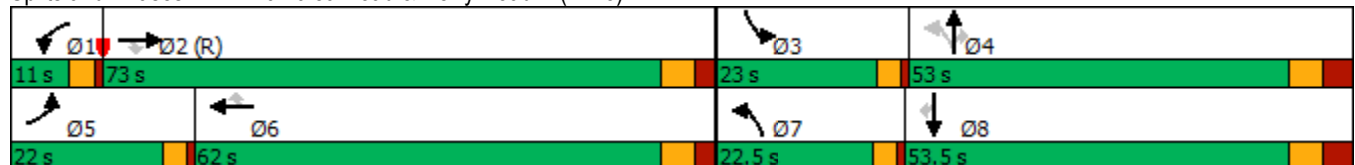


Phase Number	1	2	3	4	5	6	7	8
Movement	WBL	EBT	SBL	NBTL	EBL	WBT	NBL	SBT
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize	Yes	Yes	Yes	Yes			Yes	Yes
Recall Mode	None	C-Max	None	None	None	None	None	None
Maximum Split (s)	11	73	23	53	22	62	22.5	53.5
Maximum Split (%)	6.9%	45.6%	14.4%	33.1%	13.8%	38.8%	14.1%	33.4%
Minimum Split (s)	9.5	35.7	9.5	15.9	9	35.7	9.5	46.9
Yellow Time (s)	3	4.2	3	4	3	4.2	3	4
All-Red Time (s)	1	2.5	1	3.9	1	2.5	1	3.9
Minimum Initial (s)	5	12	5	8	5	12	5	10
Vehicle Extension (s)	3	5	3	5	3	5	3	5
Minimum Gap (s)	3	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0	0
Walk Time (s)		11				11		15
Flash Dont Walk (s)		18				18		24
Dual Entry	No	Yes	No	Yes	No	Yes	No	No
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	149	0	73	96	149	11	73	95.5
End Time (s)	0	73	96	149	11	73	95.5	149
Yield/Force Off (s)	156	66.3	92	141.1	7	66.3	91.5	141.1
Yield/Force Off 170(s)	156	48.3	92	141.1	7	48.3	91.5	117.1
Local Start Time (s)	149	0	73	96	149	11	73	95.5
Local Yield (s)	156	66.3	92	141.1	7	66.3	91.5	141.1
Local Yield 170(s)	156	48.3	92	141.1	7	48.3	91.5	117.1

Intersection Summary

Cycle Length 160
Control Type Actuated-Coordinated
Natural Cycle 105
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green
































Splits and Phases: 2: Bramalea Road & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
2: Bramalea Road & Derry Road E (RR 5)

No Alstep, Unsplit Phasing (2022 Horizon Year)

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	  		 	  					 		
Traffic Volume (veh/h)	238	1462	58	86	1370	346	278	153	419	287	34	212
Future Volume (veh/h)	238	1462	58	86	1370	346	278	153	419	287	34	212
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		1.00	0.91		0.91	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.99
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1470	1678	1574	1737	1722	1625	1737	1811	1722	1737	1811	1604
Adj Flow Rate, veh/h	238	1462	58	86	1370	0	278	153	419	287	34	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	29	15	22	11	12	14	11	6	12	11	6	20
Cap, veh/h	273	1993	530	123	1753		535	510	375	332	488	
Arrive On Green	0.10	0.44	0.44	0.04	0.37	0.00	0.12	0.28	0.28	0.10	0.27	0.00
Sat Flow, veh/h	2716	4580	1218	3209	4701	1327	1654	1811	1331	3209	1811	1343
Grp Volume(v), veh/h	238	1462	58	86	1370	0	278	153	419	287	34	0
Grp Sat Flow(s),veh/h/ln	1358	1527	1218	1605	1567	1327	1654	1811	1331	1605	1811	1343
Q Serve(g_s), s	13.8	42.4	4.5	4.2	41.3	0.0	18.5	10.6	45.1	14.1	2.2	0.0
Cycle Q Clear(g_c), s	13.8	42.4	4.5	4.2	41.3	0.0	18.5	10.6	45.1	14.1	2.2	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	273	1993	530	123	1753		535	510	375	332	488	
V/C Ratio(X)	0.87	0.73	0.11	0.70	0.78		0.52	0.30	1.12	0.86	0.07	
Avail Cap(c_a), veh/h	306	1993	530	140	1753		535	510	375	381	516	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	70.9	37.5	26.8	76.0	44.4	0.0	36.5	45.1	57.4	70.6	43.5	0.0
Incr Delay (d2), s/veh	21.2	2.4	0.4	12.3	2.7	0.0	0.9	0.7	82.1	16.7	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	9.8	24.1	2.7	3.7	24.2	0.0	1.1	9.0	35.0	11.2	2.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	92.1	39.9	27.2	88.3	47.1	0.0	37.4	45.8	139.6	87.3	43.6	0.0
LnGrp LOS	F	D	C	F	D		D	D	F	F	D	
Approach Vol, veh/h		1758			1456	A		850			321	A
Approach Delay, s/veh		46.6			49.6			89.3			82.7	
Approach LOS		D			D			F			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.1	76.3	20.6	53.0	20.1	66.3	22.5	51.1				
Change Period (Y+Rc), s	4.0	6.7	4.0	7.9	4.0	6.7	4.0	7.9				
Max Green Setting (Gmax), s	7.0	66.3	19.0	45.1	18.0	55.3	18.5	45.6				
Max Q Clear Time (g_c+I1), s	6.2	44.4	16.1	47.1	15.8	43.3	20.5	4.2				
Green Ext Time (p_c), s	0.0	20.7	0.5	0.0	0.3	11.4	0.0	0.6				

Intersection Summary

HCM 6th Ctrl Delay	58.5
HCM 6th LOS	E

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC
3: Bramalea Road & Fed-Ex Employee Entrance

No Alstep, Unsplit Phasing (2022 Horizon Year)
PM Peak Hour

Intersection												
Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	19	0	0	5	0	64	0	767	2	44	121	13
Future Vol, veh/h	19	0	0	5	0	64	0	767	2	44	121	13
Conflicting Peds, #/hr	2	0	0	0	0	2	145	0	0	0	0	145
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	6	0	0	20	0	5	0	16	50	0	24	25
Mvmt Flow	19	0	0	5	0	64	0	767	2	44	121	13

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	747	1130	212	917	1135	387	279	0	0	769	0	0
Stage 1	361	361	-	768	768	-	-	-	-	-	-	-
Stage 2	386	769	-	149	367	-	-	-	-	-	-	-
Critical Hdwy	7.62	6.5	6.9	7.9	6.5	7	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.62	5.5	-	6.9	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.62	5.5	-	6.9	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.56	4	3.3	3.7	4	3.35	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	294	205	800	201	204	603	1295	-	-	854	-	-
Stage 1	619	629	-	323	414	-	-	-	-	-	-	-
Stage 2	598	413	-	789	626	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	217	168	693	192	167	602	1122	-	-	854	-	-
Mov Cap-2 Maneuver	217	168	-	192	167	-	-	-	-	-	-	-
Stage 1	536	515	-	323	414	-	-	-	-	-	-	-
Stage 2	533	413	-	745	512	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	23.2		13		0		2.5	
HCM LOS	C		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1122	-	-	217	521	854	-	-
HCM Lane V/C Ratio	-	-	-	0.088	0.132	0.052	-	-
HCM Control Delay (s)	0	-	-	23.2	13	9.4	0.2	-
HCM Lane LOS	A	-	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.5	0.2	-	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	0	0	448	122	0
Future Vol, veh/h	0	0	0	448	122	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	29	44	0
Mvmt Flow	0	0	0	448	122	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	224	224	-	0
Stage 1	224	224	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	769	678	-	-
Stage 1	818	722	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	769	0	-	-
Mov Cap-2 Maneuver	769	0	-	-
Stage 1	818	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	1.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	93	24	0	405	0	39	1	3	1	3	4
Future Vol, veh/h	5	93	24	0	405	0	39	1	3	1	3	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	100	41	28	0	23	0	25	100	0	0	100	100
Mvmt Flow	5	93	24	0	405	0	39	1	3	1	3	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	405	0	0	117	0	0	524	520	105	522	532	405
Stage 1	-	-	-	-	-	-	115	115	-	405	405	-
Stage 2	-	-	-	-	-	-	409	405	-	117	127	-
Critical Hdwy	5.1	-	-	4.1	-	-	7.35	7.5	6.2	7.1	7.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Follow-up Hdwy	3.1	-	-	2.2	-	-	3.725	4.9	3.3	3.5	4.9	4.2
Pot Cap-1 Maneuver	775	-	-	1484	-	-	430	347	955	468	341	478
Stage 1	-	-	-	-	-	-	837	645	-	626	460	-
Stage 2	-	-	-	-	-	-	576	460	-	892	636	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	775	-	-	1484	-	-	421	345	955	463	339	478
Mov Cap-2 Maneuver	-	-	-	-	-	-	421	345	-	463	339	-
Stage 1	-	-	-	-	-	-	831	640	-	622	460	-
Stage 2	-	-	-	-	-	-	567	460	-	882	632	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0			14.2			13.9		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	436	775	-	-	1484	-	-	413
HCM Lane V/C Ratio	0.099	0.006	-	-	-	-	-	0.019
HCM Control Delay (s)	14.2	9.7	0	-	0	-	-	13.9
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.1

Intersection						
Int Delay, s/veh	0.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	15	754	2	19	107
Future Vol, veh/h	0	15	754	2	19	107
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	50	5	0	67	2
Mvmt Flow	0	15	754	2	19	107

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	847	378	0	0	756	0
Stage 1	755	-	-	-	-	-
Stage 2	92	-	-	-	-	-
Critical Hdwy	6.8	7.9	-	-	5.44	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.8	-	-	2.87	-
Pot Cap-1 Maneuver	305	501	-	-	533	-
Stage 1	430	-	-	-	-	-
Stage 2	927	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	293	501	-	-	533	-
Mov Cap-2 Maneuver	293	-	-	-	-	-
Stage 1	430	-	-	-	-	-
Stage 2	892	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.4	0	2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	-	501	533
HCM Lane V/C Ratio	-	-	0.03	0.036
HCM Control Delay (s)	-	-	0	12.4
HCM Lane LOS	-	-	A	B
HCM 95th %tile Q(veh)	-	-	0.1	0.1

Intersection						
Int Delay, s/veh	20.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	654	0	0	102	54	53
Future Vol, veh/h	654	0	0	102	54	53
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	654	0	0	102	54	53

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	183	54	107	0	0
Stage 1	81	-	-	-	-
Stage 2	102	-	-	-	-
Critical Hdwy	6.63	6.93	4.13	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-
Pot Cap-1 Maneuver	798	1002	1483	-	-
Stage 1	933	-	-	-	-
Stage 2	922	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	798	1002	1483	-	-
Mov Cap-2 Maneuver	798	-	-	-	-
Stage 1	933	-	-	-	-
Stage 2	922	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	26.5	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1483	-	798	-	-	-
HCM Lane V/C Ratio	-	-	0.82	-	-	-
HCM Control Delay (s)	0	-	26.5	0	-	-
HCM Lane LOS	A	-	D	A	-	-
HCM 95th %tile Q(veh)	0	-	9.1	-	-	-

Intersection						
Int Delay, s/veh	3.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	54	0	0	48	48	6
Future Vol, veh/h	54	0	0	48	48	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	54	0	0	48	48	6

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	99	51	54	0	0
Stage 1	51	-	-	-	-
Stage 2	48	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	900	1017	1551	-	-
Stage 1	971	-	-	-	-
Stage 2	974	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	900	1017	1551	-	-
Mov Cap-2 Maneuver	900	-	-	-	-
Stage 1	971	-	-	-	-
Stage 2	974	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.3	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1551	-	900	-	-
HCM Lane V/C Ratio	-	-	0.06	-	-
HCM Control Delay (s)	0	-	9.3	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

APPENDIX F

**Intersection Operation Synchro Reports
2022 Future Total Conditions**



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Memorandum

Date: May 8th, 2020 **Client:** Bombardier
Project Name: BAP-OSW - EA Safety Analysis **Project No.:** STR-02018572-00
To: Yves Monereau, P.Eng., PE,
PTOE, RSP **From:** Josée Dumont, P.Eng., M.A.Sc.,
RSP1
Written By: Josée Dumont, Parth Bhatt **Memo No.** 1 (Revision 1)
Subject: Partial Internal Memorandum, Safety Analysis, Existing Conditions
Distribution: N/A

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the intersection and has one lane per direction and a dedicated southbound left-turn lane at the intersection.

Between 2014 and 2018, there have been 58 collisions reported to the police at the intersection of Derry Road and Menkes Drive/Telford Way:

- 83% of collisions resulted in PDO, and 17% resulted in non-fatal injuries;
- Most collisions occurred in clear environmental conditions (78%), during the daylight (83%) and/or on dry roadways (72%);
- Collisions resulted from the driver of the first vehicle:
 - Making an improper turn in 33% of collisions;
 - Following too close in 12% of collisions;
 - Disobeying the traffic controls in 12% of collisions; and
 - Being inattentive in 24% of collisions;
- The following collision patterns were observed:
 - Turning movement collisions between eastbound and westbound vehicles (19 collisions – 33%);
 - Rear-end collisions between eastbound vehicles (10 collisions – 17%);
 - Rear-end collisions between westbound vehicles (7 collisions – 12%);
 - Sideswipe collisions between eastbound vehicles (4 collisions – 7%);
 - Angle collisions between southbound and eastbound vehicles (3 collisions – 5%); and
 - Single motor vehicle collisions for westbound vehicles (3 collisions – 5%).

The detailed collision analysis of intersections and road segments is presented in **Appendix A**.

2.1.2. Derry Road & Bramalea Road

The intersection of Derry Road and Bramalea Road is a four-legged signalized intersection. Derry Road is the east/west roadway, and has three through lanes per direction, a channelized right-turn lane and a dedicated left-turn lane in each direction. The eastbound and westbound lanes are separated by a raised median at the intersection. Bramalea Road is the north/south roadway, where the south leg is a dead-end servicing private businesses. The south leg has one lane per direction and a dedicated northbound left-turn lane. The north leg has two receiving northbound lanes and two southbound lanes. At the intersection, there is one dedicated right-turn lane, one dedicated left-turn lane and one shared through and left-turn lane. The northbound and southbound lanes of the southbound leg are separated by a raised median.

Between 2014 and 2018, there have been 78 collisions reported to the police at the intersection of Derry Road and Bramalea Road:

- 87% of collisions resulted in PDO, 10% resulted in non-fatal injuries, and 3% were non-reportable;
- Most collisions occurred in clear environmental conditions (83%), during the daylight (63%) and/or on dry roadways (74%);
- Collisions resulted from the driver of the first vehicle:
 - Making an improper turn in 22% of collisions;
 - Driving properly in 18% of collisions;
 - Following too close in 17% of collisions;
 - Failed to yield the right-of-way in 12% of collisions; and
 - Being inattentive in 33% of collisions;
- The following collision patterns were observed:
 - Turning movement collisions between eastbound and westbound vehicles (17 collisions – 22%);
 - Rear-end collisions between westbound vehicles (12 collisions – 15%);
 - Rear-end collisions between southbound vehicles (9 collisions – 12%);
 - Rear-end collisions between eastbound vehicles (8 collisions – 10%);

Sideswipe collisions between westbound vehicles (7 collisions – 9%); and
Turning movement collisions between westbound and eastbound vehicles (6 collisions – 8%).

The detailed collision analysis of intersections and road segments is presented in **Appendix B**.

2.1.3. Bramalea Road & Boylen Road/Logistics Drive

The intersection of Bramalea Road and Boylen Road/Logistics Drive is a four-legged signalized intersection. Bramalea Road is the north/south roadway and currently has two lanes per direction and a dedicated left-turn lane in each direction. Boylen Road is the west leg of the intersection and currently has one lane per direction, with a dedicated left-turn lane at the intersection. It provides access to a few businesses and to Tranmere Drive. Logistics Drive is the east leg of the intersection and currently has one lane per direction with a dedicated left-turn lane at the intersection. It is a dead-end servicing private business.

The exact date of signalization is unknown, but it appears to be in 2019, more recently than the collision history provided for review. According to Google satellite images, it appears that prior to signalization (and at the time of the collision history), Bramalea Road had two lanes per directions, while Boylen Road and Logistics Drive had one lane per direction and were stop-controlled.

Between 2014 and 2018, there have been 11 collisions reported to the police at the intersection of Bramalea Road and Boylen Road/Logistics Drive:

- 82% of collisions resulted in PDO, and 18% resulted in non-fatal injuries;
- Most collisions occurred in clear environmental conditions (73%) and/or on dry roadways (73%);
- Collisions resulted from the driver of the first vehicle:
 - Failing to yield the right-of-way (27%); and
 - Making an improper turn (27%);
- The following collision patterns were observed:
 - Angle collisions between eastbound and northbound vehicles (2 collisions – 18%);
 - Turning movement collisions between southbound and northbound vehicles (2 collisions – 18%);
 - and
 - Turning movement collisions between eastbound and southbound vehicles (2 collisions – 18%).

The detailed collision analysis of intersections and road segments is presented in **Appendix C**.

2.1.4. Telford Way & Tranmere Drive

The intersection of Telford Way and Tranmere Drive is a three-legged unsignalized intersection. Tranmere Drive is the east/west roadway and currently has one lane per direction. Telford Way is the south leg of the intersection and currently has one lane per direction. There is a driveway on the north side of the intersection, which provides access to a commercial property.

Between 2014 and 2018, there was one collision reported to the police at the intersection of Telford Way and Tranmere Drive. The collision caused property damage only. It was a turning movement collision between northbound and westbound vehicles, that occurred in clear environmental conditions and dry road surface condition.

2.2. Road Segments

2.2.1. Derry Road between Western Study Area Limit & Menkes Drive/Telford Way

The road segment of Derry Road between the western study area limit and Menkes Drive/Telford Way is approximately 200 metres long. It includes three lanes per direction, separated by a raised median. There are two commercial accesses on the south side of the roadway and one on the north side.

Between 2014 and 2018, there have been 3 collisions reported to the police in the road segment of Derry Road between the western study area limit and Menkes Drive/Telford Way:

- 67% of collisions resulted in PDO, and 33% resulted in non-fatal injuries;
- All collisions occurred in clear environmental conditions under dark with artificial lighting conditions and on a dry road surface condition;
- Collisions resulted from the driver of the first vehicle:
 - Making an improper lane change (67%);
 - Following too close (33%); and
 - Being inattentive (33%);
- The following collisions were observed:
 - Sideswipe collisions between westbound vehicles (2 collisions – 67%); and
 - Rear-end collision between eastbound vehicles (1 collision – 33%).

The detailed collision analysis of intersections and road segments is presented in **Appendix D**.

2.2.2. Derry Road between Menkes Drive/Telford Way & Bramalea Road

The road segment of Derry Road between Menkes Drive/Telford Way and Bramalea Road is approximately 650 metres long. It includes three lanes per direction, separated by a raised median. The section of approximately 350 metres closer to Bramalea Road has an eastbound continuous right-turn lane in addition to the through lanes. There are two commercial accesses on the south side of the roadway and three on the north side.

Between 2014 and 2018, there have been 23 collisions reported to the police in the road segment of Derry Road between Menkes Drive/Telford Way and Bramalea Road:

- 74% of collisions resulted in PDO, and 26% resulted in non-fatal injuries;
- Most collisions occurred in clear environmental conditions (87%), during daylight (52%) and/or on dry roadways (83%). Several collisions also occurred in dark conditions (13%) or dark with artificial lighting conditions (22%);
- Collisions resulted from the driver of the first vehicle:
 - Following too close in 26% of collisions;
 - Driving properly in 17% of collisions;
 - Making an improper lane change in 17% of collisions; and
 - Being inattentive in 30% of collisions;
- The following collision patterns were observed:
 - Rear-end collisions between eastbound vehicles (7 collisions – 30%);
 - Rear-end collisions between westbound vehicles (7 collisions – 30%);
 - Sideswipe collisions between eastbound vehicles (3 collisions – 13%); and
 - Sideswipe collisions between westbound vehicles (2 collisions – 9%).

The detailed collision analysis of intersections and road segments is presented in **Appendix E**.

2.2.3. Derry Road between Bramalea Road & Eastern Study Area Limit

The road segment of Derry Road between Bramalea Road and the eastern study area limit is approximately 440 metres long. It includes three lanes per direction, separated by a raised median. There is one commercial access on the south side of the roadway and one commercial right-out access on the north side.

Between 2014 and 2018, there have been 8 collisions reported to the police in the road segment of Derry Road between Bramalea Road and the eastern study area limit:

- 75% of collisions resulted in PDO, and 25% resulted in non-fatal injuries;
- Most collisions occurred in clear environmental conditions (63%), during daylight (88%), and/or on dry roadways (75%). Several collisions also occurred in snow conditions (25%) on a slush or packed snow road surface (25%);
- Collisions resulted from the driver of the first vehicle:
 - Driving properly in 50% of collisions;
 - Following too close in 25% of collisions;
 - Losing control in 13% of collisions;
 - Making an improper lane change in 13% of collisions; and
 - Being inattentive in 13% of collisions;
- The following collision patterns were observed:
 - Rear-end collisions between westbound vehicles (3 collisions – 38%);
 - Single motor vehicle collisions for westbound vehicles (3 collisions – 38%); and
 - Single motor vehicle collisions for eastbound vehicles (2 collisions – 25%).

The detailed collision analysis of intersections and road segments is presented in **Appendix F**.

2.2.4. Bramalea Road between North Service Road & Derry Road

The road segment of Bramalea Road between North Service Road and Derry Road is approximately 540 metres long. It includes one lane per direction. There are three commercial accesses to the same property on the east side of the roadway and one commercial access on the west side. Bramalea Road does not provide access to North Service Road, as there are barriers blocking access to the airport property.

Between 2014 and 2018, there have been 3 collisions reported to the police in the road segment of Bramalea Road between North Service Road and Derry Road:

- 67% of collisions resulted in PDO, and 33% resulted in non-fatal injuries;
- 67% of collisions occurred in clear environmental conditions and on a dry roadway. 33% of the collisions occurred in rain conditions, on a wet roadway;
- Collisions resulted from the driver of the first vehicle:
 - Failing to yield the right-of-way in 33% of collisions; and
 - Losing control in 33% of collisions;
- The following collisions were observed:
 - Approaching collision between southbound and northbound vehicles (1 collision – 33%);
 - Rear-end collision between southbound vehicles (1 collision – 33%); and
 - Single motor vehicle collisions for southbound vehicle (1 collision – 33%).

2.2.5. Bramalea Road between Derry Road & Boylen Road/Logistics Drive

The road segment of Bramalea Road between Derry Road and Boylen Road/Logistics Drive is approximately 330 metres long. It includes two lanes per direction. There is one commercial access to the east side of the roadway and two commercial accesses on the west side.

Between 2014 and 2018, there have been 3 collisions reported to the police in the road segment of Bramalea Road between Derry Road and Boylen Road/Logistics Drive:

- All collisions resulted in PDO;
- All collisions occurred in clear environmental conditions, and 67% occurred on a dry roadway;
- Collisions resulted from the driver of the first vehicle:
 - Losing control in 33% of collisions; and
 - Driving properly in 33% of collisions;
- The following collisions were observed:

Turning movement collision between two northbound vehicles (1 collision – 33%);
Turning movement collision between a southbound and a westbound vehicle (1 collision – 33%);
and
Single motor vehicle collision for southbound vehicle (1 collision – 33%).

2.2.6. Telford Way between Derry Road & Tranmere Drive

The road segment of Telford Way between Derry Road and Tranmere Drive is approximately 140 metres long. It includes one lane per direction. There is one commercial access to the east side of the roadway and one commercial access on the west side.

Between 2014 and 2018, there was one collision reported to the police on the road segment of Telford Way between Derry Road and Tranmere Drive. The collision caused property damage only. It was rear end collision between two southbound transport trucks that occurred in clear environmental conditions and on a dry road surface condition.

2.2.7. Menkes Drive between Alstep Drive & Derry Road

The road segment of Menkes Drive between Alstep Drive and Derry Road is approximately 140 metres long. It includes one lane per direction. There is one commercial access on the east side of the roadway and two commercial accesses on the west side.

Between 2014 and 2020, there was one collision reported to the police on the road segment of Menkes Drive between Alstep Drive and Derry Road. The collision caused property damages only. It was a sideswipe collision between southbound vehicles, which occurred when a driver made an improper passing manoeuvre. The collision occurred in clear environmental conditions and dry road surface condition.

2.2.8. Alstep Drive between Menkes Drive & Menway Court

The road segment of Alstep Drive between Menkes Drive and Menway Court is approximately 159 metres long. It includes two lanes per direction. There is one commercial access to the east side of the roadway and two commercial accesses on the west side.

Between 2014 and 2018, there have been no collision reported to the police in the road segment of Alstep Drive between Menkes Drive and Menway Court.

3. Safety Performance Review

Table 1 presents the network screening results provided by the Region for the main regional intersections and road segments within the study area. Network screening first determines the observed number of collisions and the number of collisions predicted by the SPFs developed or calibrated for the Region, for the same time period. The expected number of collisions for the location is then calculated using the Empirical Bayes method, and taking into account the number of observed collisions and the number of predicted collisions at the location. Finally, the potential for safety improvement (PSI) is calculated as the difference between the expected number of collisions and the predicted number of collisions. If the expected number of collisions is lower than the predicted number of collisions, the PSI takes the value 0.

As shown below, for the Region, the collisions were divided into *Severe*, which is a combination of all collisions causing injuries or fatalities, and *PDO*, which accounts for all collisions causing property damages only. The *All* category includes all collisions.

The PSI values were also divided into *Severe*, *PDO*, and *All*. In this case, the value of the PSI_{Severe} also takes into account the proportion of fatal and injury collisions on the network, at similar locations, as well as the social cost of fatal and injury collisions.

Table 1 shows that, for the period used for the network screening:

- The intersection of Derry Road and Menkes Drive/Telford Way performed better than predicted for severe collisions, but worse than predicted for PDO collisions. It obtained a PSI_{Severe} of 0, but a positive PSI_{PDO} . The intersection ranked 187th within the Region.
- The intersection of Derry Road and Bramalea Road performed better than predicted for all types of collisions and obtained a PSI of 0.
- The intersection of Derry Road and Vanguard Road performed better than predicted for all types of collisions and obtained a PSI of 0.
- The road segment of Derry Road between Menkes Drive/Telford Way and Bramalea Road performed worse than predicted for severe collisions and worse than predicted for PDO collisions. It obtained positive PSI values. The road segment ranked 82nd within the Region.

Table 1: Network Screening Results

Observed Collisions			Predicted Collisions		Expected Collisions			PSI			Rank
Severe	PDO	All	Severe	PDO	Severe	PDO	All	Severe	PDO	All	
Derry Road and Menkes Drive/Telford Way											
7	42	49	7.94	37	7.22	41.57	48.79	0	4.56	4.56	187
Derry Road and Bramalea Road											
10	60	70	11.85	60.42	10.31	60.02	70.34	0	0	0	396
Derry Road and Vanguard Road											
1	5	6	1.93	8.64	1.37	5.55	6.92	0	0	0	396
Derry Road between Menkes Drive/Telford Way and Bramalea Road											
5	17	22	2.55	13.7	3.51	16.7	20.2	0.96	2.92	7.55	82

The observed number of collisions for the period of 2014 to 2018 was not compared to the predicted or expected number of collisions for the same period, as the information required for this analysis was not provided by the Region.

4. Safety-Related Findings

The findings presented in this section are based solely on the collision analysis. These findings may be adjusted based on the results of the safety performance review and the site visit. Based on the collision analysis completed:

- The intersection of Derry Road and Menkes Drive/Telford Way appears to have a higher proportion of the following collisions:
 - Turning movement collisions between eastbound and westbound vehicles;
 - Rear-end collisions between eastbound vehicles;
 - Rear-end collisions between westbound vehicles; and
 - The collisions do not seem to be attributable to poor driving conditions;
- The intersection of Derry Road and Bramalea Road appears to have a higher proportion of the following conditions:

- Turning movement collisions between eastbound and westbound vehicles;
- Rear-end collisions between westbound vehicles;
- Rear-end collisions between southbound vehicles;
- Rear-end collisions between eastbound vehicles; and
- The collisions do not seem to be attributable to poor driving conditions;
- The intersection of Bramalea Road and Boylen Road/Logistics Drive appears to have a higher proportion of the following conditions:
 - Angle collisions between eastbound and northbound vehicles;
 - Turning movement collisions between southbound and northbound vehicles;
 - Turning movement collisions between eastbound and southbound vehicles;
 - The collisions do not seem to be attributable to poor driving conditions; and
 - The intersection appears to have been signalized after the 5-year period reviewed, potentially mitigating the collisions observed during our review.
- The intersection of Telford Way and Tranmere Drive had no identified collision pattern, with only one collision in the five-year period;
- The road segment of Derry Road between the western study area limit and Menkes Drive/Telford Way had no identified collision patterns. The collisions observed included:
 - Sideswipe collisions between westbound vehicles; and
 - Rear-end collision between eastbound vehicles;
- The road segment of Derry Road between Menkes Drive/Telford Way and Bramalea Road appears to have a higher proportion of the following conditions:
 - Rear-end collisions between eastbound vehicles;
 - Rear-end collisions between westbound vehicles;
 - Sideswipe collisions between eastbound vehicles; and
 - Sideswipe collisions between westbound vehicles;
- The road segment of Derry Road between Bramalea Road and the eastern study area limit appears to have a higher proportion of the following conditions:
 - Rear-end collisions between westbound vehicles;
 - Single motor vehicle collisions for westbound vehicles; and
 - Single motor vehicle collisions for eastbound vehicles;
- The road segment of Bramalea Road between North Service Road and Derry Road had no identified collision patterns. The collisions observed included:
 - Approaching collision between southbound and northbound vehicles;
 - Rear-end collision between southbound vehicles; and
 - Single motor vehicle collisions for southbound vehicle;
- The road segment of Bramalea Road between Derry Road and Boylen Road/Logistics Drive had no identified collision patterns. The collisions observed included:
 - Turning movement collision between two northbound vehicles;
 - Turning movement collision between a southbound and a westbound vehicle; and
 - Single motor vehicle collision for southbound vehicle;
- The road segment of Telford Way between Derry Road and Tranmere Drive had no identified collision pattern, with only one collision in the five-year period;
- The road segment of Menkes Drive between Alstep Drive and Derry Road had no identified collision pattern, with only one collision in the five-year period;
- The road segment of Alstep Drive between Menkes Drive and Menway Court had no reported collision in the five-year period.

Appendix A: Detailed Collision Analysis, Intersection of Derry Road & Menkes Drive/Telford Way

Between 2014 and 2018, there have been 58 collisions reported to the police at the intersection of Derry Road and Menkes Drive/Telford Way. **Figure 2** presents the collisions by classification and impact type. It shows that a large majority of collisions (83%) only caused property damages, with the remaining collisions (17%) causing non-fatal injuries. The type of collisions varied, with the most prevalent being turning movement collisions (41%) and rear-end collisions (29%).

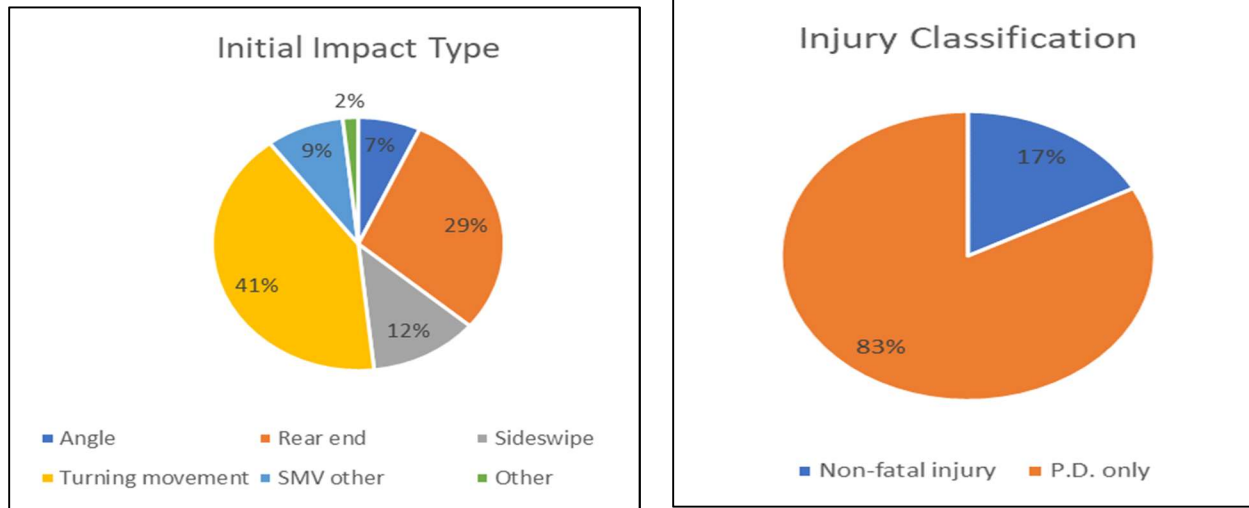


Figure 2: Collisions by Injury and Impact Type (Derry @ Menkes/Telford)

Figure 3 presents the distribution of collisions by year and month. It shows that collisions are distributed over all years and all months of the year. However, collisions resulting in injuries occurred during the summer months (May to August) and the fall months (October and November). No injury collision occurred in the winter months.

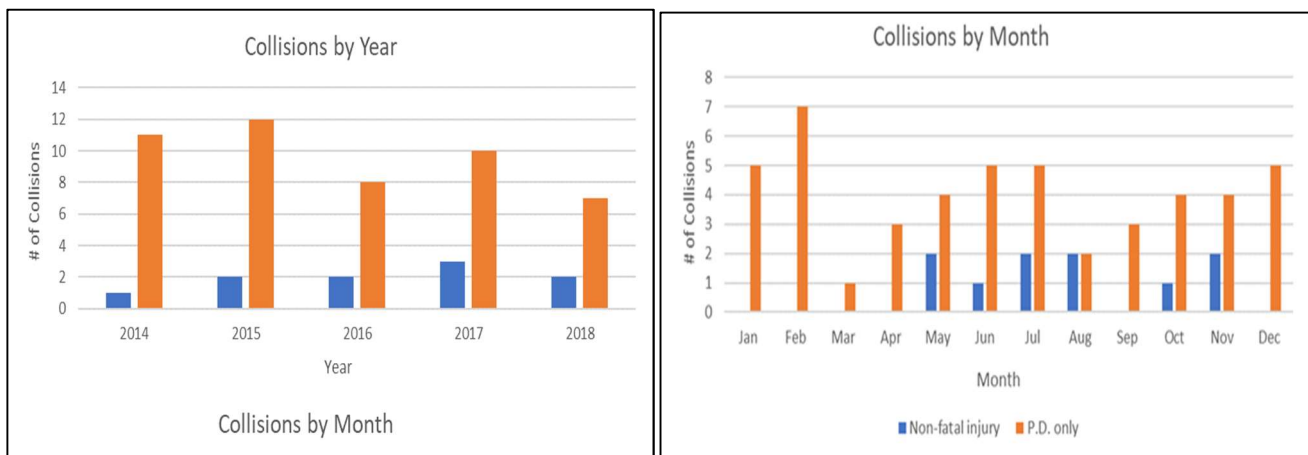


Figure 3: Collisions by Year and Month (Derry @ Menkes/Telford)

Figure 4 presents the conditions when collisions occurred. It shows that most collisions occurred in clear environmental conditions (78%), during the daylight (83%) and/or on dry roadways (72%).

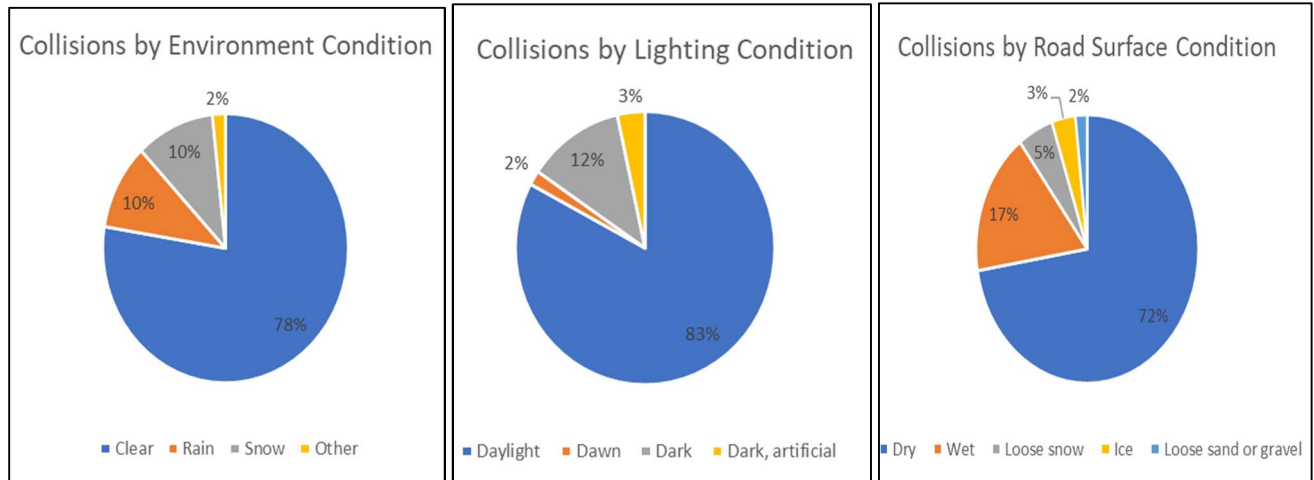


Figure 4: Collisions by Conditions (Derry @ Menkes/Telford)

Figure 5 presents the proportion of collisions by driver action and condition. It shows that collisions resulted from the driver of the first vehicle:

- Making an improper turn in 33% of collisions;
- Following too close in 12% of collisions;
- Disobeying the traffic controls in 12% of collisions; and
- Being inattentive in 24% of collisions.

Most (83%) of the drivers of the second vehicle were found to have been driving properly.

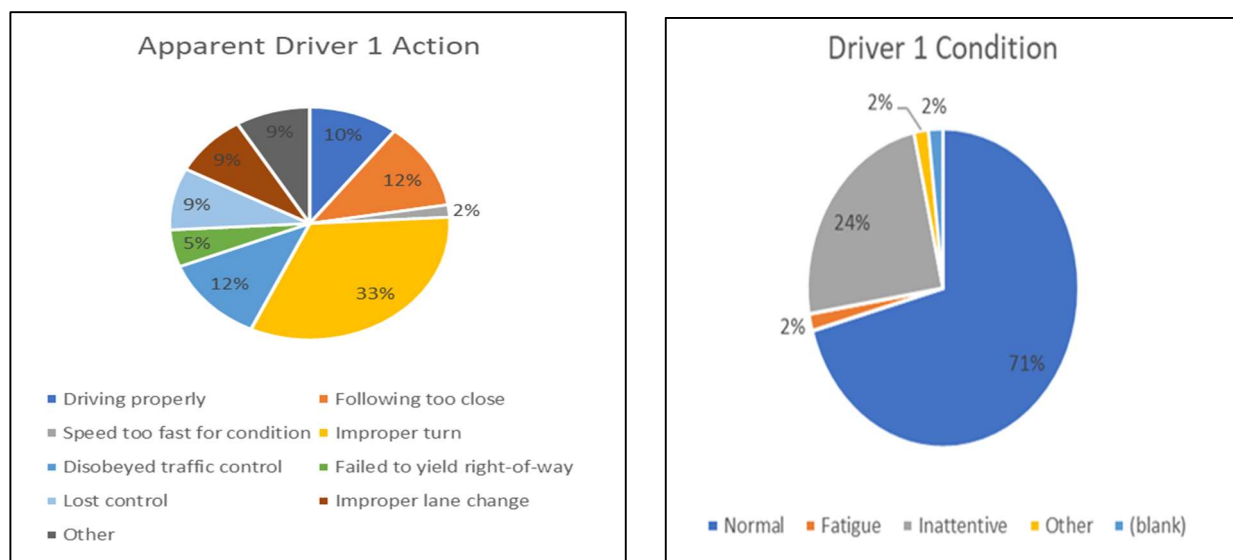


Figure 5: Collisions by Drivers' Actions and Conditions (Derry @ Menkes/Telford)

Table 2 presents the directions of both vehicles, by collision type. It shows the following patterns:

- Turning movement collisions between eastbound and westbound vehicles (19 collisions);
- Rear-end collisions between eastbound vehicles (10 collisions);
- Rear-end collisions between westbound vehicles (7 collisions);
- Sideswipe collisions between eastbound vehicles (4 collisions);
- Angle collisions between southbound and eastbound vehicles (3 collisions); and
- Single motor vehicle collisions for westbound vehicles (3 collisions).

Table 2: Collision Types and Directions (Derry @ Menkes/Telford)

Direction of Vehicle 1	Direction of Vehicle 2			
	North	South	East	West
Angle Collisions				
North	-	-	-	-
South	-	-	3	-
East	-	-	-	-
West	-	1	-	-
Rear End Collisions				
North	-	-	-	-
South	-	-	-	-
East	-	-	10	-
West	-	-	-	7
Sideswipe Collisions				
North	1	-	-	-
South	-	-	-	-
East	-	-	4	-
West	-	-	-	2
Turning Movement Collisions				
North	1	1	-	-
South	1	-	-	-
East	-	-	1	10
West	-	-	9	1
Other Collisions				
North	-	-	-	-
South	-	-	-	-
East	-	-	-	-
West	-	-	-	1
Single Motor Vehicle (Other) Collisions				
North	1			
South	-			
East	1			
West	3			

Appendix B: Detailed Collision Analysis, Intersection of Derry Road & Bramalea Road

Between 2014 and 2018, there have been 78 collisions reported to the police at the intersection of Derry Road and Bramalea Road. **Figure 6** presents the collisions by classification and impact type. It shows that a large majority of collisions (87%) only caused property damages, 10% of collisions caused non-fatal injuries, and 3% of collisions were classified as non-reportable. The type of collisions varied, with the most prevalent being rear-end collisions (40%) and turning movement collisions (36%).

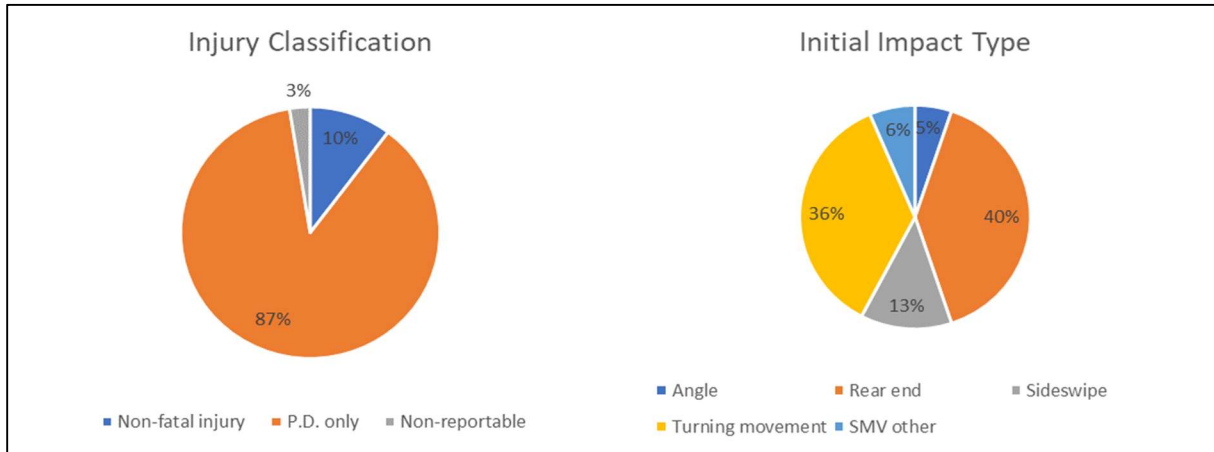


Figure 6: Collisions by Injury and Impact Type (Derry @ Bramalea)

Figure 7 presents the distribution of collisions by year and month. It shows that collisions are distributed over all years and all months of the year. It shows that more collisions occur in the winter and spring (December to April) than the summer and fall (May to November).

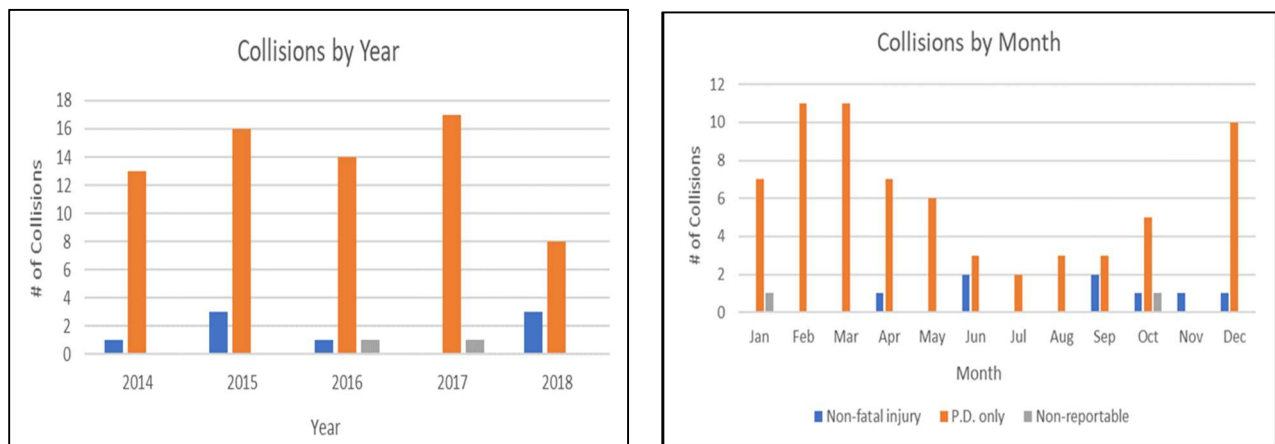


Figure 7: Collisions by Year and Month (Derry @ Bramalea)

Figure 8 presents the conditions when collisions occurred. It shows that most collisions occurred in clear environmental conditions (83%), during the daylight (63%) and/or on dry roadways (74%).

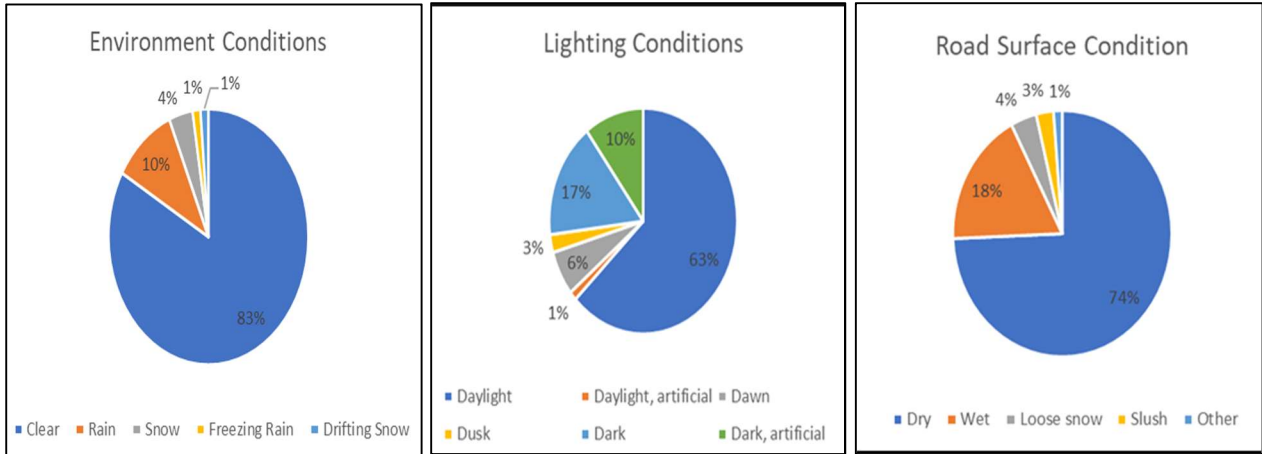


Figure 8: Collisions by Conditions (Derry @ Bramalea)

Figure 9 presents the proportion of collisions by driver action and condition. It shows that collisions resulted from the driver of the first vehicle:

- Making an improper turn in 22% of collisions;
- Driving properly in 18% of collisions;
- Following too close in 17% of collisions;
- Failed to yield the right-of-way in 12% of collisions; and
- Being inattentive in 33% of collisions.

Most (85%) of the drivers of the second vehicle were found to have been driving properly.

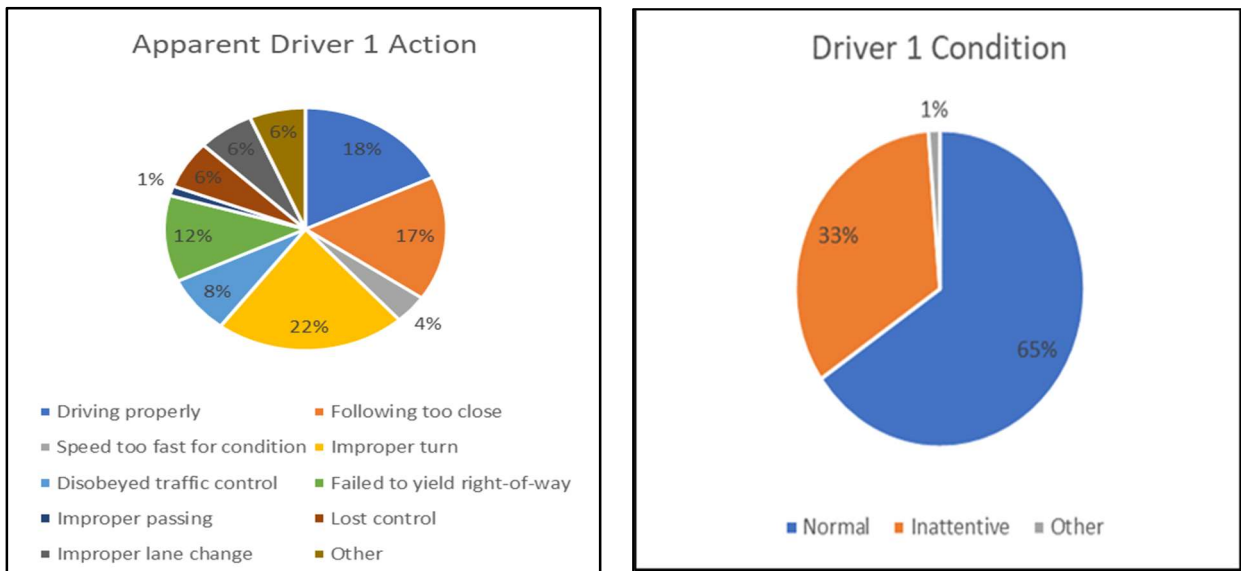


Figure 9: Collisions by Drivers' Actions and Conditions (Derry @ Bramalea)

Table 3 presents the directions of both vehicles, by collision type. It shows the following patterns:

- Turning movement collisions between eastbound and westbound vehicles (17 collisions);
- Rear-end collisions between westbound vehicles (12 collisions);
- Rear-end collisions between southbound vehicles (9 collisions);
- Rear-end collisions between eastbound vehicles (8 collisions);
- Sideswipe collisions between westbound vehicles (7 collisions); and
- Turning movement collisions between westbound and eastbound vehicles (6 collisions).

Table 3: Collision Types and Directions (Derry @ Bramalea)

Direction of Vehicle 1	Direction of Vehicle 2			
	North	South	East	West
Angle Collisions				
North	-	-	-	-
South	-	-	-	-
East	-	1	-	-
West	1	1	1	-
Rear End Collisions				
North	2	-	-	-
South	-	9	-	-
East	-	-	8	-
West	-	-	-	12
Sideswipe Collisions				
North	1	-	-	-
South	-	1	-	-
East	-	-	1	-
West	-	-	-	7
Turning Movement Collisions				
North	1	-	-	-
South	-	2	-	-
East	-	-	-	17
West	-	-	6	2
Single Motor Vehicle (Other) Collisions				
North	-			
South	2			
East	2			
West	1			

Appendix C: Detailed Collision Analysis, Intersection of Bramalea Road and Boylen Road/Logistics Drive

Between 2014 and 2018, there have been 11 collisions reported to the police at the intersection of Bramalea Road and Boylen Road/Logistics Drive. **Figure 10** presents the collisions by classification and impact type. It shows that a large majority of collisions (82%) only caused property damages, with the remaining collisions causing non-fatal injuries (18%). The type of collisions included a majority of turning movement collisions (64%), as well as angle collisions (27%) and rear-end collisions (9%).

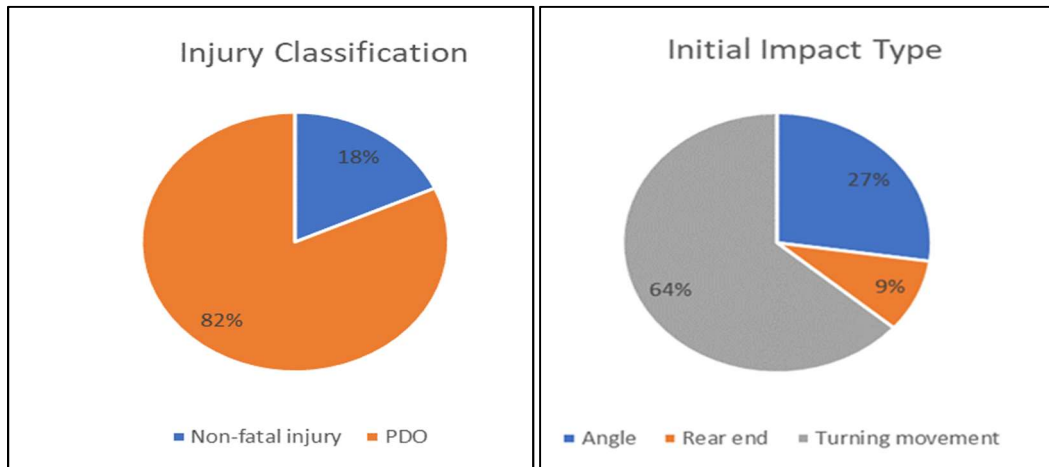


Figure 10: Collisions by Injury and Impact Type (Bramalea @ Boylen/Logistics)

Figure 11 presents the distribution of collisions by year and month. It shows that collisions are distributed over all years and all months of the year.

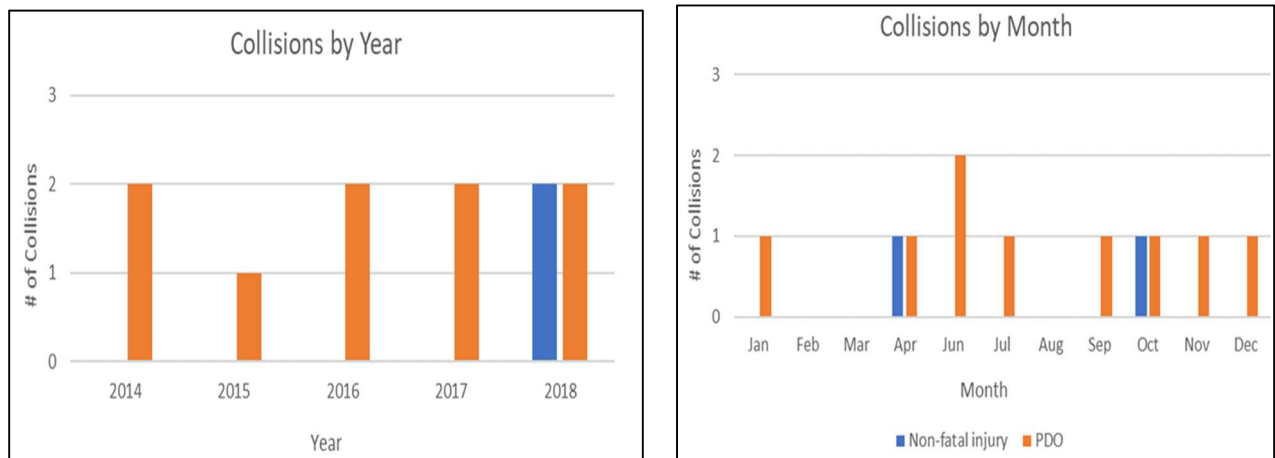


Figure 11: Collisions by Year and Month (Bramalea @ Boylen/Logistics)

Figure 12 presents the conditions when collisions occurred. It shows that most collisions occurred in clear environmental conditions (73%) and/or on dry roadways (73%). Lighting conditions information was not available.

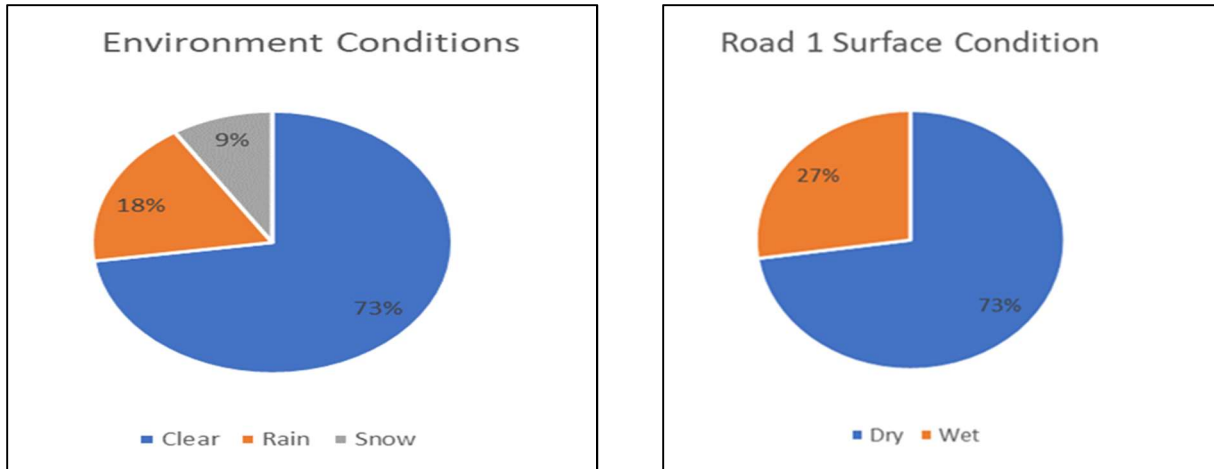


Figure 12: Collisions by Conditions (Bramalea @ Boylen/Logistics)

Figure 13 presents the proportion of collisions by driver action. Driver condition information was not available. It shows that collisions resulted from the driver in the first vehicle:

- Failing to yield the right-of-way in 27% of collisions; and
- Making an improper turn in 27% of collisions.

Most (91%) of the drivers of the second vehicle were found to have been driving properly.

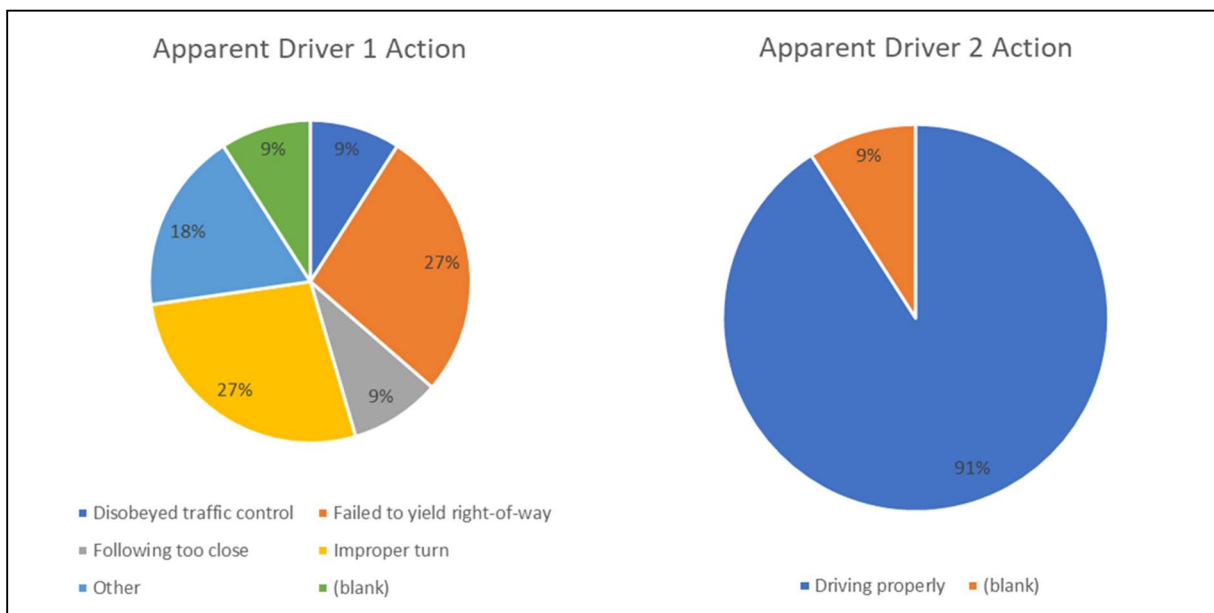


Figure 13: Collisions by Drivers' Actions (Bramalea @ Boylen/Logistics)

Table 4 presents the directions of both vehicles, by collision type. It shows the following patterns:

- Angle collisions between eastbound and northbound vehicles (2 collisions);
- Turning movement collisions between southbound and northbound vehicles (2 collisions); and
- Turning movement collisions between eastbound and southbound vehicles (2 collisions).

Table 4: Collision Types and Directions (Bramalea @ Boylen/Logistics)

Direction of Vehicle 1	Direction of Vehicle 2			
	North	South	East	West
Angle Collisions				
North	-	-	-	-
South	-	-	-	1
East	2	-	-	-
West	-	-	-	-
Rear End Collisions				
North	1	-	-	-
South	-	-	-	-
East	-	-	-	-
West	-	-	-	-
Turning Movement Collisions				
North	-	-	-	1
South	2	-	-	1
East	-	2	-	-
West	1	-	-	-

Appendix D: Detailed Collision Analysis, Derry Road
between Western Study Area Limit and Menkes
Drive/Telford Way

Between 2014 and 2018, there have been 3 collisions reported to the police in the road segment of Derry Road between the western study area limit and Menkes Drive/Telford Way. **Figure 14** presents the collisions by classification and impact type. It shows that two of the three collisions (67%) only caused property damages, with the remaining collision causing non-fatal injuries (33%). The type of collisions included two sideswipe collisions (67%) and one rear-end collision (33%).

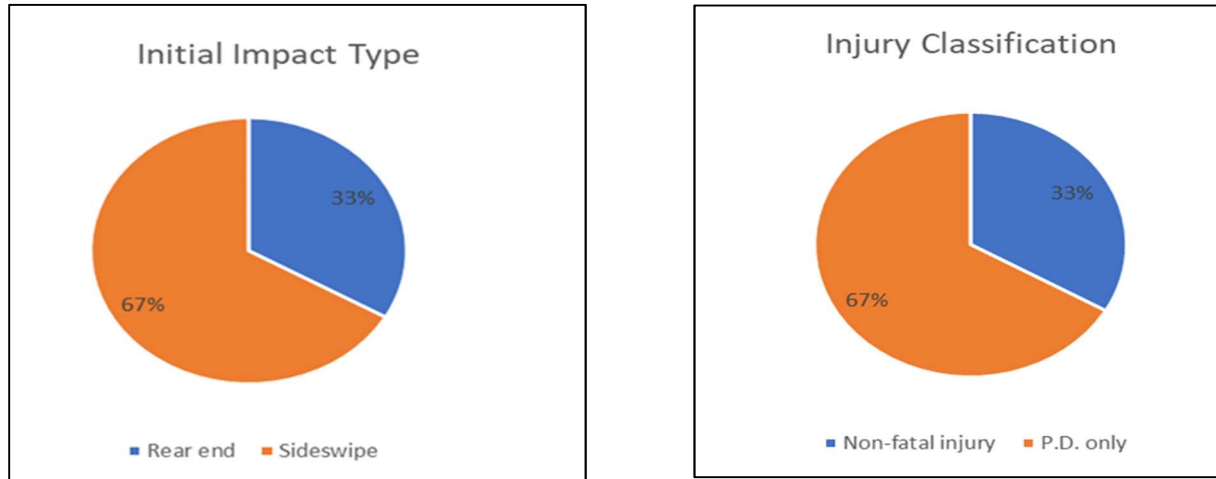


Figure 14: Collisions by Injury and Impact Type (Derry between west limit & Menkes/Telford)

Figure 15 presents the distribution of collisions by year and month. It shows that the three collisions occurred in different years and months.

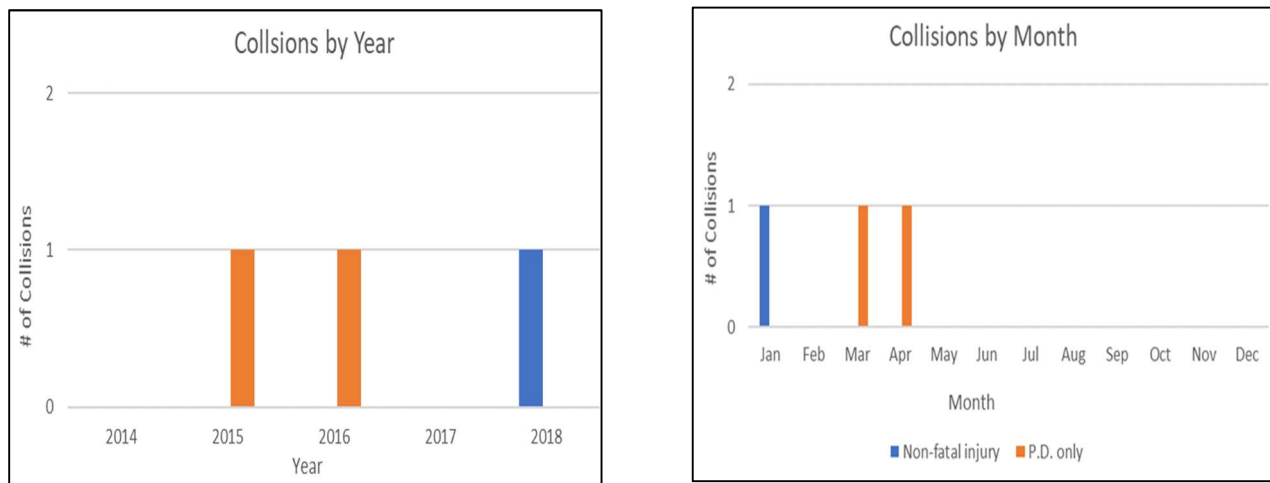


Figure 15: Collisions by Year and Month (Derry between west limit & Menkes/Telford)

All collisions occurred in clear environmental conditions, under dark with artificial lighting conditions and on a dry road surface condition.

Figure 16 presents the proportion of collisions by the actions and conditions of the drivers of the first vehicle. It shows that collisions resulted from the driver in the first vehicle:

- Making an improper lane change in 67% of collisions;
- Following too close in 33% of collisions; and
- Being inattentive in 33% of collisions.

All drivers of the second vehicle were found to have been driving properly and in normal conditions.

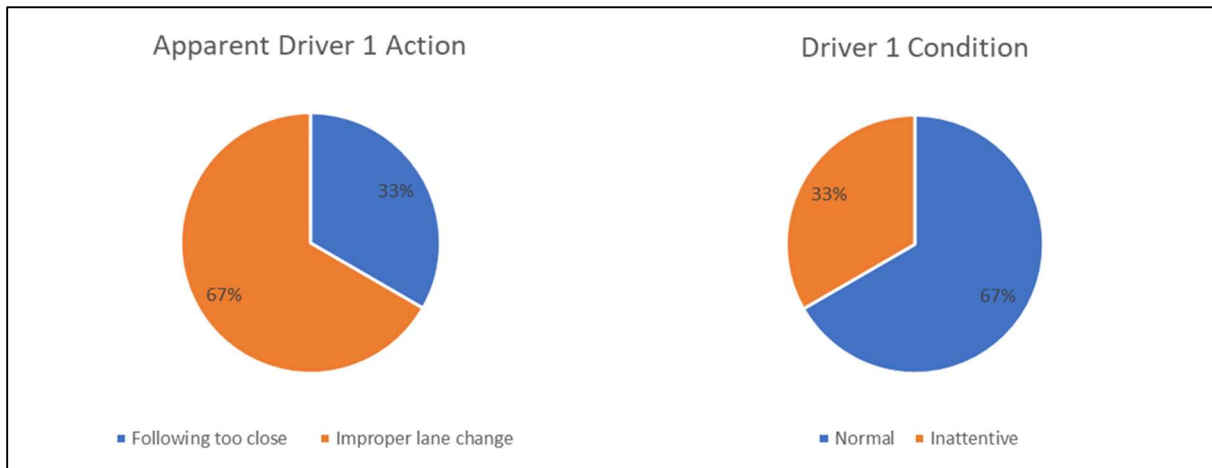


Figure 16: Collisions by Driver 1's Action and Condition (Derry between west limit & Menkes/Telford)

Table 5 presents the directions of both vehicles, by collision type. It shows the following collisions:

- Sideswipe collisions between westbound vehicles (2 collisions); and
- Rear-end collision between eastbound vehicles (1 collision).

Table 5: Collision Types and Directions (Derry between west limit & Menkes/Telford)

Direction of Vehicle 1	Direction of Vehicle 2			
	North	South	East	West
Rear End Collisions				
North	-	-	-	-
South	-	-	-	-
East	-	-	1	-
West	-	-	-	-
Sideswipe Collisions				
North	-	-	-	-
South	-	-	-	-
East	-	-	-	-
West	-	-	-	2

Appendix E: Detailed Collision Analysis, Derry Road between Menkes Drive/Telford Way and Bramalea Road

Between 2014 and 2018, there have been 23 collisions reported to the police in the road segment of Derry Road between Menkes Drive/Telford Way and Bramalea Road. **Figure 17** presents the collisions by classification and impact type. It shows that a majority of collisions (74%) only caused property damages, with the remaining collisions causing non-fatal injuries (26%). The type of collisions included a majority of rear-end collisions (61%), as well as sideswipe collisions (27%).

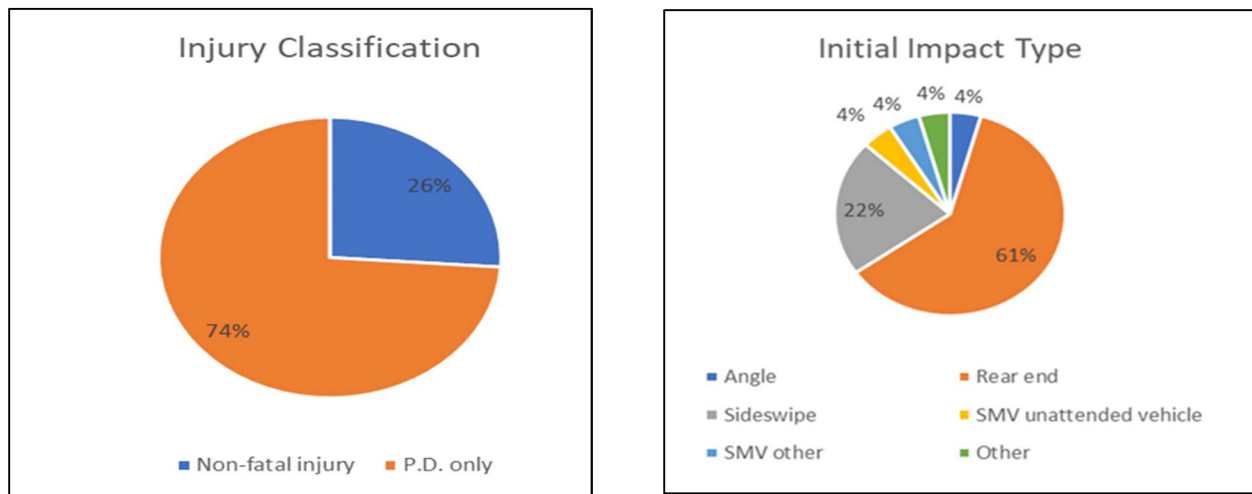


Figure 17: Collisions by Injury and Impact Type (Derry between Menkes/Telford & Bramalea)

Figure 18 presents the distribution of collisions by year and month. It shows that collisions peaked in 2016 (9 collisions) and that collisions seem to occur more frequently between late fall and early spring (November to April).

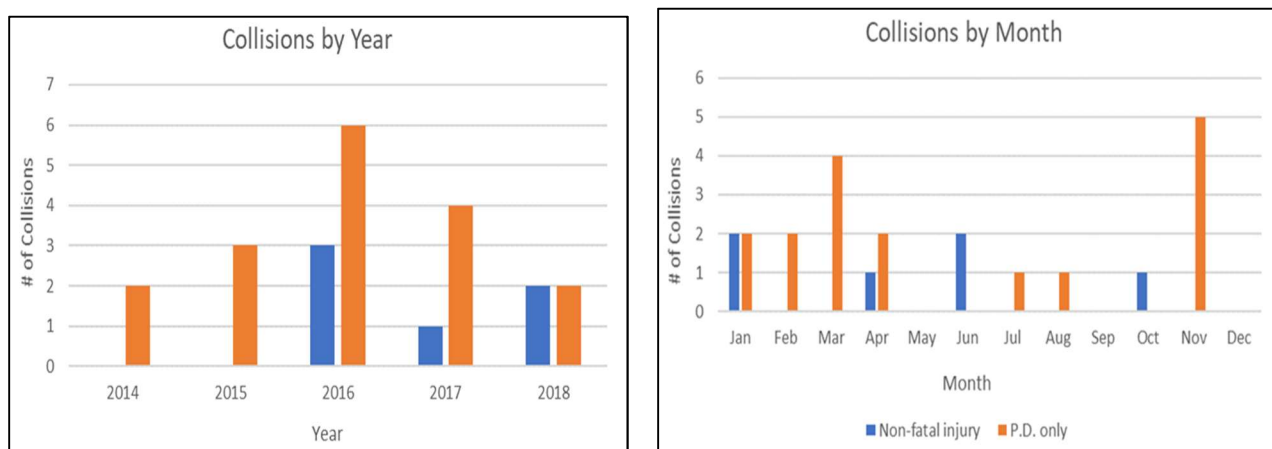


Figure 18: Collisions by Year and Month (Derry between Menkes/Telford & Bramalea)

Figure 19 presents the conditions when collisions occurred. It shows that most collisions occurred in clear environmental conditions (87%), during daylight (52%), and/or on dry roadways (83%). Several collisions also occurred in dark conditions (13%) or dark with artificial lighting conditions (22%).

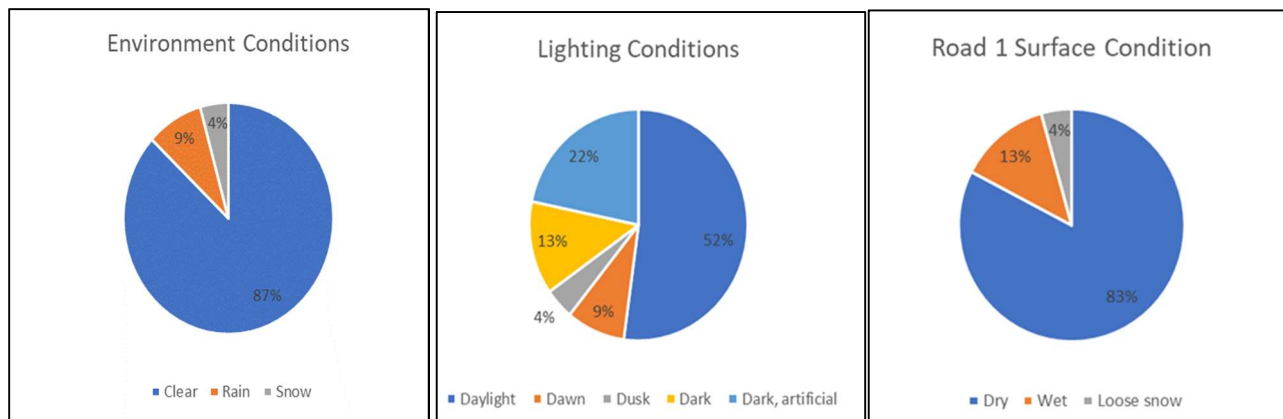


Figure 19: Collisions by Conditions (Derry between Menkes/Telford & Bramalea)

Figure 20 presents the proportion of collisions by driver action and condition. It shows that collisions resulted from the driver of the first vehicle:

- Following too close in 26% of collisions;
- Driving properly in 17% of collisions;
- Making an improper lane change in 17% of collisions; and
- Being inattentive in 30% of collisions.

Most of the drivers of the second vehicle were found to have been driving properly (74%) and/or in normal condition (74%).

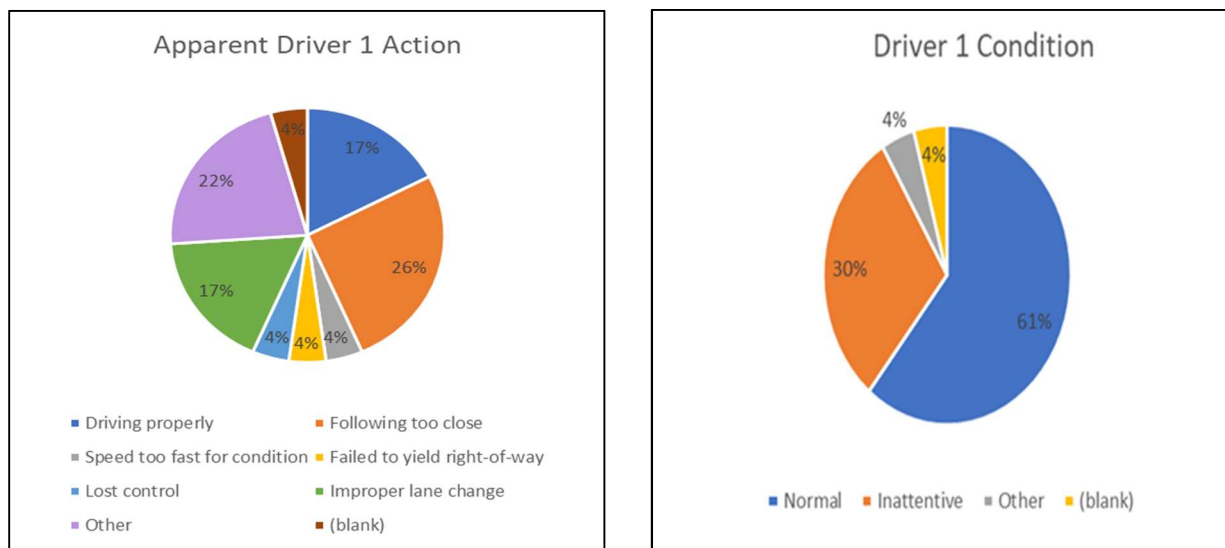


Figure 20: Collisions by Drivers' Actions and Conditions (Derry between Menkes/Telford & Bramalea)

Table 6 presents the directions of both vehicles, by collision type. It shows the following patterns:

- Rear-end collisions between eastbound vehicles (7 collisions);
- Rear-end collisions between westbound vehicles (7 collisions);
- Sideswipe collisions between eastbound vehicles (3 collisions); and
- Sideswipe collisions between westbound vehicles (2 collisions).

Table 6: Collision Types and Directions (Derry between Menkes/Telford & Bramalea)

Direction of Vehicle 1	Direction of Vehicle 2			
	North	South	East	West
Angle Collisions				
North	-	-	1	-
South	-	-	-	-
East	-	-	-	-
West	-	-	-	-
Rear End Collisions				
North	-	-	-	-
South	-	-	-	-
East	-	-	7	-
West	-	-	-	7
Sideswipe Collisions				
North	-	-	-	-
South	-	-	-	-
East	-	-	3	-
West	-	-	-	2
Other Collisions				
North	-	-	-	-
South	-	-	-	-
East	-	-	-	-
West	-	-	-	1
Single Motor Vehicle (Unattended Vehicle) Collisions				
North	-	-	-	-
South	-	-	-	1
East	-	-	-	-
West	-	-	-	-
Single Motor Vehicle (Other) Collisions				
North	-			
South	-			
East	1			
West	-			

Appendix F: Detailed Collision Analysis, Derry Road between Bramalea Road and Eastern Study Area Limit

Between 2014 and 2018, there have been 8 collisions reported to the police in the road segment of Derry Road between Bramalea Road and the eastern study area limit. **Figure 21** presents the collisions by classification and impact type. It shows that three-quarters of collisions (75%) only caused property damages, with the remaining collisions causing non-fatal injuries (25%). The type of collisions included rear-end collisions (50%), single motor vehicle collisions (38%) and sideswipe collisions (13%).

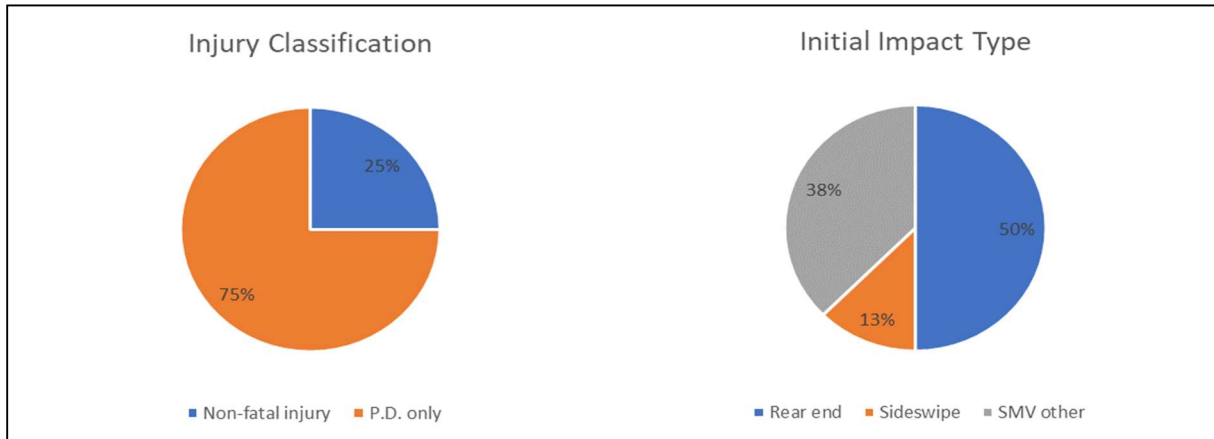


Figure 21: Collisions by Injury and Impact Type (Derry between Bramalea & east limit)

Figure 22 presents the distribution of collisions by year and month. It shows that collisions peaked in 2018 (3 collisions) and in March (3 collisions) and July (2 collisions).

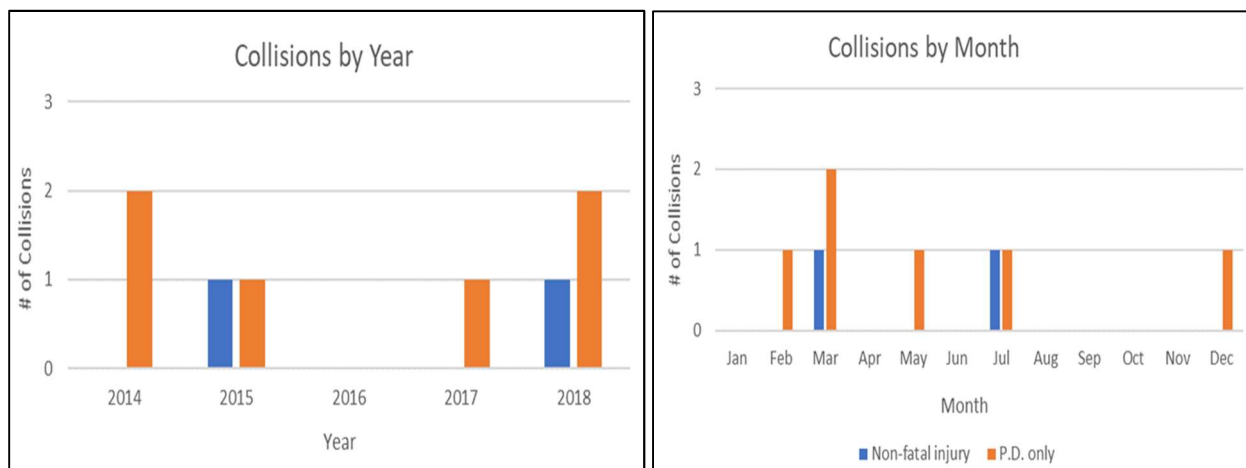


Figure 22: Collisions by Year and Month (Derry between Bramalea & east limit)

Figure 23 presents the conditions when collisions occurred. It shows that most collisions occurred in clear environmental conditions (63%), during daylight (88%), and/or on dry roadways (75%). Several collisions also occurred in snow conditions (25%) on a slush or packed snow road surface (25%).

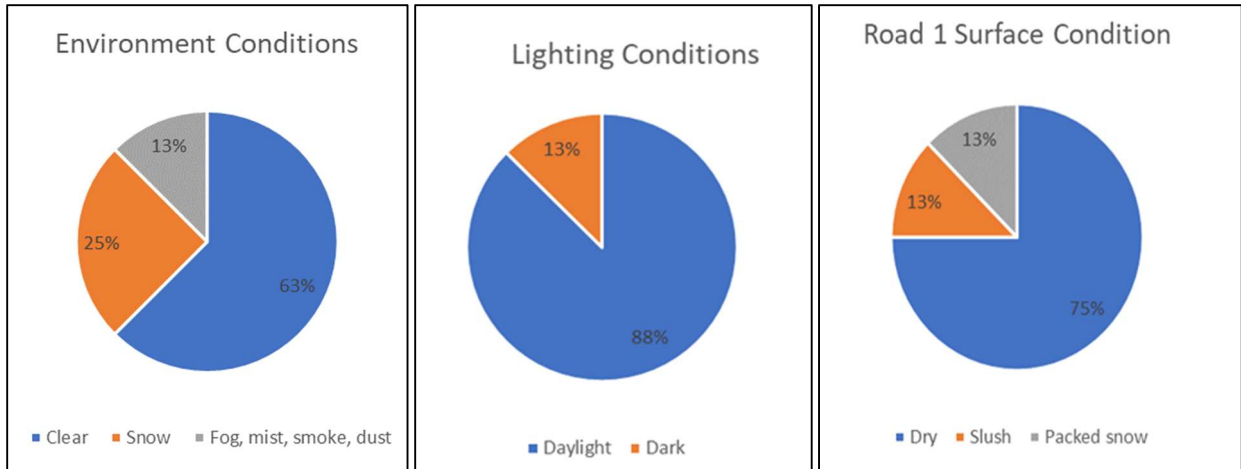


Figure 23: Collisions by Conditions (Derry between Bramalea & east limit)

Figure 24 presents the proportion of collisions by driver action and condition. It shows that collisions resulted from the driver of the first vehicle:

- Driving properly in 50% of collisions;
- Following too close in 25% of collisions;
- Losing control in 13% of collisions;
- Making an improper lane change in 13% of collisions; and
- Being inattentive in 13% of collisions.

Only 63% of collisions included a second vehicles, and for all of those, the drivers of the second vehicle were found to have been driving properly (63%) and/or in normal condition (63%).

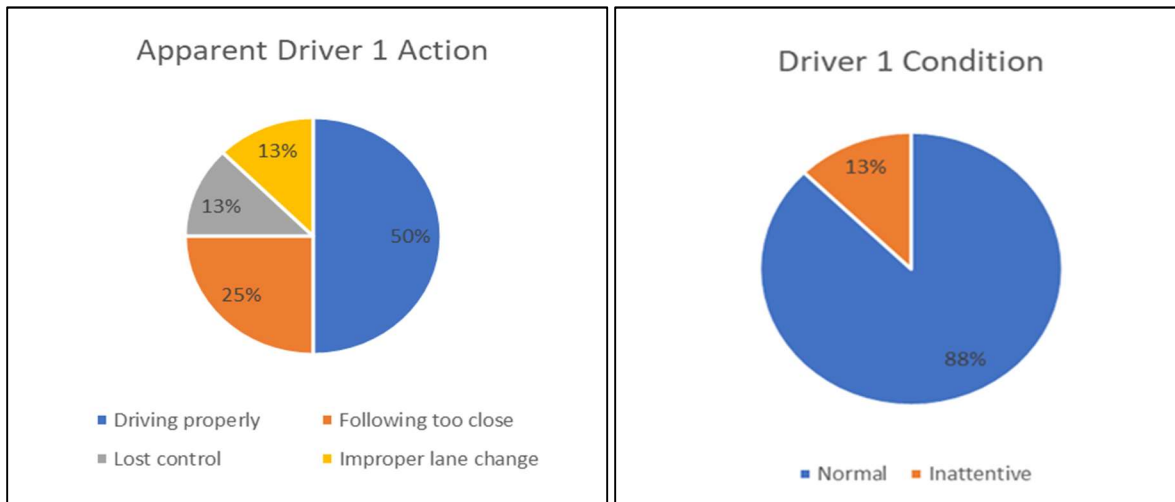


Figure 24: Collisions by Drivers' Actions and Conditions (Derry between Bramalea & east limit)

Table 7 presents the directions of both vehicles, by collision type. It shows the following patterns:

- Rear-end collisions between westbound vehicles (3 collisions);
- Single motor vehicle collisions for westbound vehicles (3 collisions); and
- Single motor vehicle collisions for eastbound vehicles (2 collisions).

Table 7: Collision Types and Directions (Derry between Bramalea and Eastern Study Limit)

Direction of Vehicle 1	Direction of Vehicle 2			
	North	South	East	West
Rear End Collisions				
North	-	-	-	-
South	-	-	-	-
East	-	-	1	-
West	-	-	-	3
Sideswipe Collisions				
North	-	-	-	-
South	-	-	-	-
East	-	-	-	-
West	-	-	-	1
Single Motor Vehicle (Other) Collisions				
North	-			
South	-			
East	2			
West	3			

APPENDIX G

**Intersection Operation Synchro Reports
2031 Future Background Conditions**

HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

Future Background 2031 - AM Peak Hour
 6:45 AM - 7:45 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↗		↘	↗	
Traffic Volume (veh/h)	152	2270	58	56	1405	53	23	4	20	39	15	33
Future Volume (veh/h)	152	2270	58	56	1405	53	23	4	20	39	15	33
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.97		0.97	0.97		0.97
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1730	1737	1640	1628	1678	1519	1159	435	418	1707	1976	1900
Adj Flow Rate, veh/h	152	2270	0	56	1405	0	23	4	20	39	15	33
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	4	11	0	16	15	14	50	100	100	13	0	0
Cap, veh/h	309	3351		151	3178		158	10	50	174	87	192
Arrive On Green	0.04	0.71	0.00	0.03	0.69	0.00	0.16	0.16	0.16	0.16	0.16	0.16
Sat Flow, veh/h	1648	4742	1362	1550	4580	1262	817	61	306	1233	536	1180
Grp Volume(v), veh/h	152	2270	0	56	1405	0	23	0	24	39	0	48
Grp Sat Flow(s),veh/h/ln	1648	1581	1362	1550	1527	1262	817	0	367	1233	0	1716
Q Serve(g_s), s	4.2	43.1	0.0	1.7	21.7	0.0	4.0	0.0	9.4	4.7	0.0	3.9
Cycle Q Clear(g_c), s	4.2	43.1	0.0	1.7	21.7	0.0	7.8	0.0	9.4	14.0	0.0	3.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.83	1.00		0.69
Lane Grp Cap(c), veh/h	309	3351		151	3178		158	0	60	174	0	279
V/C Ratio(X)	0.49	0.68		0.37	0.44		0.15	0.00	0.40	0.22	0.00	0.17
Avail Cap(c_a), veh/h	395	3351		213	3178		249	0	101	311	0	471
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.0	13.2	0.0	15.5	10.8	0.0	61.1	0.0	60.0	66.3	0.0	57.7
Incr Delay (d2), s/veh	1.2	1.1	0.0	1.5	0.4	0.0	0.9	0.0	9.0	1.4	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.2	23.8	0.0	1.8	13.0	0.0	1.7	0.0	1.9	2.9	0.0	3.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.2	14.3	0.0	17.0	11.3	0.0	61.9	0.0	69.0	67.7	0.0	58.3
LnGrp LOS	B	B		B	B		E	A	E	E	A	E
Approach Vol, veh/h		2422	A		1461	A		47				87
Approach Delay, s/veh		14.1			11.5			65.6				62.5
Approach LOS		B			B			E				E
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.6	119.3		33.2	9.6	117.2		33.2				
Change Period (Y+Rc), s	3.0	6.2		7.1	3.0	6.2		7.1				
Max Green Setting (Gmax), s	11.0	88.8		43.9	15.0	84.8		43.9				
Max Q Clear Time (g_c+I1), s	3.7	46.1		11.4	6.2	24.7		16.0				
Green Ext Time (p_c), s	0.1	42.3		0.8	0.4	50.9		1.3				

Intersection Summary

HCM 6th Ctrl Delay	14.8
HCM 6th LOS	B

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
2: Bramalea Road & Derry Road E (RR 5)

Future Background 2031 - AM Peak Hour
6:45 AM - 7:45 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↗		↘	↗	↗
Traffic Volume (veh/h)	256	1930	51	24	1205	259	13	8	11	388	35	271
Future Volume (veh/h)	256	1930	51	24	1205	259	13	8	11	388	35	271
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.93	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.98
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1604	1737	1781	1826	1693	1625	1307	1411	1411	1722	1870	1870
Adj Flow Rate, veh/h	256	1930	51	24	1205	0	13	8	11	413	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	20	11	8	5	14	14	40	33	33	12	2	2
Cap, veh/h	329	3141	962	136	2599		47	20	27	522	0	
Arrive On Green	0.08	0.66	0.66	0.56	0.56	0.00	0.04	0.04	0.04	0.16	0.00	0.00
Sat Flow, veh/h	1527	4742	1452	214	4621	1322	1245	515	709	3280	0	1560
Grp Volume(v), veh/h	256	1930	51	24	1205	0	13	0	19	413	0	0
Grp Sat Flow(s),veh/h/ln	1527	1581	1452	214	1540	1322	1245	0	1224	1640	0	1560
Q Serve(g_s), s	11.1	37.1	2.0	11.6	24.7	0.0	1.6	0.0	2.4	19.4	0.0	0.0
Cycle Q Clear(g_c), s	11.1	37.1	2.0	33.7	24.7	0.0	1.6	0.0	2.4	19.4	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.58	1.00		1.00
Lane Grp Cap(c), veh/h	329	3141	962	136	2599		47	0	46	522	0	
V/C Ratio(X)	0.78	0.61	0.05	0.18	0.46		0.28	0.00	0.41	0.79	0.00	
Avail Cap(c_a), veh/h	329	3141	962	136	2599		164	0	161	617	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	18.1	15.4	9.4	29.8	20.7	0.0	74.8	0.0	75.2	64.7	0.0	0.0
Incr Delay (d2), s/veh	11.3	0.9	0.1	1.3	0.3	0.0	6.6	0.0	11.9	7.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/lr	9.3	21.2	1.3	1.3	14.9	0.0	1.1	0.0	1.7	14.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.3	16.3	9.6	31.2	21.0	0.0	81.4	0.0	87.1	72.5	0.0	0.0
LnGrp LOS	C	B	A	C	C		F	A	F	E	A	
Approach Vol, veh/h		2237			1229	A		32			413	A
Approach Delay, s/veh		17.6			21.2			84.8			72.5	
Approach LOS		B			C			F			E	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		112.7		14.0	16.0	96.7		33.3				
Change Period (Y+Rc), s		6.7		7.9	3.0	6.7		7.9				
Max Green Setting (Gmax), s		86.3		21.1	13.0	70.3		30.1				
Max Q Clear Time (g_c+I1), s		40.1		4.4	13.1	35.7		21.4				
Green Ext Time (p_c), s		45.0		0.2	0.0	29.5		2.7				

Intersection Summary

HCM 6th Ctrl Delay	25.1
HCM 6th LOS	C

Notes

- User approved pedestrian interval to be less than phase max green.
- User approved volume balancing among the lanes for turning movement.
- Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	5.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	0	0	3	0	14	0	14	0	76	15	19
Future Vol, veh/h	4	0	0	3	0	14	0	14	0	76	15	19
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	91	0	0	75	0
Mvmt Flow	4	0	0	3	0	14	0	14	0	76	15	19

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	199	191	25	191	200	15	34	0	0	14	0	0
Stage 1	177	177	-	14	14	-	-	-	-	-	-	-
Stage 2	22	14	-	177	186	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	764	708	1057	773	699	1070	1591	-	-	1617	-	-
Stage 1	829	756	-	1011	888	-	-	-	-	-	-	-
Stage 2	1002	888	-	829	750	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	726	674	1057	744	665	1069	1591	-	-	1617	-	-
Mov Cap-2 Maneuver	726	674	-	744	665	-	-	-	-	-	-	-
Stage 1	829	720	-	1011	888	-	-	-	-	-	-	-
Stage 2	988	888	-	789	714	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10	8.7	0	5.1
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1591	-	-	726	992	1617	-	-
HCM Lane V/C Ratio	-	-	-	0.006	0.017	0.047	-	-
HCM Control Delay (s)	0	-	-	10	8.7	7.3	0	-
HCM Lane LOS	A	-	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0.1	-	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	0	0	29	83	0
Future Vol, veh/h	0	0	0	29	83	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	78	11	0
Mvmt Flow	0	0	0	29	83	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	15	15	-	0
Stage 1	15	15	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	1009	883	-	-
Stage 1	1013	887	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	1009	0	-	-
Mov Cap-2 Maneuver	1009	0	-	-
Stage 1	1013	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	49	29	0	18	0	10	1	1	0	0	1
Future Vol, veh/h	5	49	29	0	18	0	10	1	1	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	75	5	0	0	79	0	75	100	0	0	0	100
Mvmt Flow	5	49	29	0	18	0	10	1	1	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	18	0	0	78	0	0	93	92	64	93	106	18
Stage 1	-	-	-	-	-	-	74	74	-	18	18	-
Stage 2	-	-	-	-	-	-	19	18	-	75	88	-
Critical Hdwy	4.85	-	-	4.1	-	-	7.85	7.5	6.2	7.1	6.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Follow-up Hdwy	2.875	-	-	2.2	-	-	4.175	4.9	3.3	3.5	4	4.2
Pot Cap-1 Maneuver	1231	-	-	1533	-	-	743	645	1006	895	788	836
Stage 1	-	-	-	-	-	-	782	676	-	1006	884	-
Stage 2	-	-	-	-	-	-	841	720	-	939	826	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1231	-	-	1533	-	-	740	642	1006	891	785	836
Mov Cap-2 Maneuver	-	-	-	-	-	-	740	642	-	891	785	-
Stage 1	-	-	-	-	-	-	779	673	-	1002	884	-
Stage 2	-	-	-	-	-	-	840	720	-	933	823	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0	9.9	9.3
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	747	1231	-	-	1533	-	-	836
HCM Lane V/C Ratio	0.016	0.004	-	-	-	-	-	0.001
HCM Control Delay (s)	9.9	7.9	0	-	0	-	-	9.3
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection						
Int Delay, s/veh	6.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	11	3	0	15	3
Future Vol, veh/h	0	11	3	0	15	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	100	50	0	75	0
Mvmt Flow	0	11	3	0	15	3

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	36	3	0	0	3	0
Stage 1	3	-	-	-	-	-
Stage 2	33	-	-	-	-	-
Critical Hdwy	6.4	7.2	-	-	4.85	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	4.2	-	-	2.875	-
Pot Cap-1 Maneuver	982	854	-	-	1249	-
Stage 1	1025	-	-	-	-	-
Stage 2	995	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	970	854	-	-	1249	-
Mov Cap-2 Maneuver	970	-	-	-	-	-
Stage 1	1025	-	-	-	-	-
Stage 2	983	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	6.6
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	854	1249
HCM Lane V/C Ratio	-	-	-	0.013	0.012
HCM Control Delay (s)	-	-	0	9.3	7.9
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	-	0	0

HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

Future Background (2031) - PM Peak Hour

3:00 PM - 4:00 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↗		↘	↗	
Traffic Volume (veh/h)	166	1877	48	60	1793	68	95	39	74	94	20	152
Future Volume (veh/h)	166	1877	48	60	1793	68	95	39	74	94	20	152
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	0.99		0.99
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1549	1633	1410	1526	1722	1413	1737	1483	1426	1767	1498	1441
Adj Flow Rate, veh/h	166	1877	0	60	1793	0	95	39	74	94	20	152
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	17	18	18	23	12	22	11	32	32	9	31	31
Cap, veh/h	156	2887		165	3269		158	101	191	223	33	251
Arrive On Green	0.65	0.65	0.00	0.03	0.70	0.00	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	218	4459	1171	1454	4701	1173	1120	454	862	1200	149	1131
Grp Volume(v), veh/h	166	1877	0	60	1793	0	95	0	113	94	0	172
Grp Sat Flow(s),veh/h/ln	218	1486	1171	1454	1567	1173	1120	0	1316	1200	0	1280
Q Serve(g_s), s	81.2	41.0	0.0	2.1	30.0	0.0	13.3	0.0	11.7	11.6	0.0	19.3
Cycle Q Clear(g_c), s	103.6	41.0	0.0	2.1	30.0	0.0	32.7	0.0	11.7	23.3	0.0	19.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.65	1.00		0.88
Lane Grp Cap(c), veh/h	156	2887		165	3269		158	0	292	223	0	283
V/C Ratio(X)	1.07	0.65		0.36	0.55		0.60	0.00	0.39	0.42	0.00	0.61
Avail Cap(c_a), veh/h	156	2887		286	3269		175	0	312	242	0	303
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	51.1	17.2	0.0	16.3	12.0	0.0	70.7	0.0	53.0	63.0	0.0	56.0
Incr Delay (d2), s/veh	90.7	1.1	0.0	1.3	0.7	0.0	8.4	0.0	1.8	2.7	0.0	5.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	16.7	22.0	0.0	1.7	17.4	0.0	7.8	0.0	7.7	7.0	0.0	11.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	141.8	18.3	0.0	17.7	12.7	0.0	79.1	0.0	54.8	65.6	0.0	61.1
LnGrp LOS	F	B		B	B		E	A	D	E	A	E
Approach Vol, veh/h		2043	A		1853	A		208			266	
Approach Delay, s/veh		28.3			12.8			65.9			62.7	
Approach LOS		C			B			E			E	
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	7.7	109.8		42.5		117.5		42.5				
Change Period (Y+Rc), s	3.0	6.2		7.1		6.2		7.1				
Max Green Setting (Gmax), s	18.0	87.8		37.9		108.8		37.9				
Max Q Clear Time (g_c+I1), s	4.1	105.6		34.7		32.0		25.3				
Green Ext Time (p_c), s	0.2	0.0		0.8		71.6		3.3				

Intersection Summary

HCM 6th Ctrl Delay	25.6
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
 2: Bramalea Road & Derry Road E (RR 5)

Future Background (2031) - PM Peak Hour
 3:00 PM - 4:00 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↗		↘	↗	↗
Traffic Volume (veh/h)	284	1748	62	56	1630	413	82	45	43	342	23	254
Future Volume (veh/h)	284	1748	62	56	1630	413	82	45	43	342	23	254
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.94	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.99
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1470	1678	1574	1737	1722	1625	1737	1811	1811	1737	1811	1604
Adj Flow Rate, veh/h	284	1748	62	56	1630	0	82	45	43	358	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	29	15	22	11	12	14	11	6	6	11	6	20
Cap, veh/h	300	2853	797	139	2114		116	58	55	551	0	
Arrive On Green	0.15	0.62	0.62	0.45	0.45	0.00	0.07	0.07	0.07	0.17	0.00	0.00
Sat Flow, veh/h	1400	4580	1280	241	4701	1327	1654	825	789	3309	0	1343
Grp Volume(v), veh/h	284	1748	62	56	1630	0	82	0	88	358	0	0
Grp Sat Flow(s),veh/h/ln	1400	1527	1280	241	1567	1327	1654	0	1614	1654	0	1343
Q Serve(g_s), s	22.5	37.2	3.1	29.6	46.7	0.0	7.8	0.0	8.6	16.2	0.0	0.0
Cycle Q Clear(g_c), s	22.5	37.2	3.1	39.1	46.7	0.0	7.8	0.0	8.6	16.2	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.49	1.00		1.00
Lane Grp Cap(c), veh/h	300	2853	797	139	2114		116	0	113	551	0	
V/C Ratio(X)	0.95	0.61	0.08	0.40	0.77		0.71	0.00	0.78	0.65	0.00	
Avail Cap(c_a), veh/h	311	2853	797	139	2114		146	0	142	891	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	43.7	18.4	12.0	38.8	37.1	0.0	72.8	0.0	73.2	62.3	0.0	0.0
Incr Delay (d2), s/veh	36.8	1.0	0.2	4.0	2.1	0.0	17.8	0.0	26.4	2.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	21.3	20.9	1.9	3.6	26.7	0.0	7.3	0.0	8.1	11.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	80.5	19.4	12.1	42.8	39.2	0.0	90.6	0.0	99.7	65.0	0.0	0.0
LnGrp LOS	F	B	B	D	D		F	A	F	E	A	
Approach Vol, veh/h		2094			1686	A		170			358	A
Approach Delay, s/veh		27.5			39.3			95.3			65.0	
Approach LOS		C			D			F			E	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		106.4		19.1	27.7	78.6		34.6				
Change Period (Y+Rc), s		6.7		7.9	3.0	6.7		7.9				
Max Green Setting (Gmax), s		80.3		14.1	26.0	51.3		43.1				
Max Q Clear Time (g_c+I1), s		39.2		10.6	24.5	48.7		18.2				
Green Ext Time (p_c), s		39.4		0.6	0.2	2.5		4.3				

Intersection Summary

HCM 6th Ctrl Delay	37.9
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.
 Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	4.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	23	0	0	6	0	76	0	71	3	52	74	15
Future Vol, veh/h	23	0	0	6	0	76	0	71	3	52	74	15
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	6	0	0	20	0	5	0	16	50	0	24	25
Mvmt Flow	23	0	0	6	0	76	0	71	3	52	74	15

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	299	260	82	259	266	75	89	0	0	74	0	0
Stage 1	186	186	-	73	73	-	-	-	-	-	-	-
Stage 2	113	74	-	186	193	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.5	6.2	7.3	6.5	6.25	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.16	5.5	-	6.3	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.5	-	6.3	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4	3.3	3.68	4	3.345	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	645	648	983	659	643	978	1519	-	-	1538	-	-
Stage 1	807	750	-	893	838	-	-	-	-	-	-	-
Stage 2	882	837	-	776	745	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	577	625	983	641	620	976	1519	-	-	1538	-	-
Mov Cap-2 Maneuver	577	625	-	641	620	-	-	-	-	-	-	-
Stage 1	807	723	-	893	838	-	-	-	-	-	-	-
Stage 2	811	837	-	748	718	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	11.5		9.2		0		2.7	
HCM LOS	B		A					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1519	-	-	577	940	1538	-	-
HCM Lane V/C Ratio	-	-	-	0.04	0.087	0.034	-	-
HCM Control Delay (s)	0	-	-	11.5	9.2	7.4	0	-
HCM Lane LOS	A	-	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.3	0.1	-	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	0	0	80	63	0
Future Vol, veh/h	0	0	0	80	63	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	29	44	0
Mvmt Flow	0	0	0	80	63	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	40	40	-	0
Stage 1	40	40	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	977	856	-	-
Stage 1	988	866	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	977	0	-	-
Mov Cap-2 Maneuver	977	0	-	-
Stage 1	988	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	2.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	34	23	0	55	0	20	1	4	1	4	5
Future Vol, veh/h	6	34	23	0	55	0	20	1	4	1	4	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	100	41	28	0	23	0	25	100	0	0	100	100
Mvmt Flow	6	34	23	0	55	0	20	1	4	1	4	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	55	0	0	57	0	0	118	113	46	115	124	55
Stage 1	-	-	-	-	-	-	58	58	-	55	55	-
Stage 2	-	-	-	-	-	-	60	55	-	60	69	-
Critical Hdwy	5.1	-	-	4.1	-	-	7.35	7.5	6.2	7.1	7.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Follow-up Hdwy	3.1	-	-	2.2	-	-	3.725	4.9	3.3	3.5	4.9	4.2
Pot Cap-1 Maneuver	1100	-	-	1560	-	-	807	626	1029	867	617	793
Stage 1	-	-	-	-	-	-	899	688	-	962	690	-
Stage 2	-	-	-	-	-	-	897	690	-	957	680	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1100	-	-	1560	-	-	794	622	1029	858	613	793
Mov Cap-2 Maneuver	-	-	-	-	-	-	794	622	-	858	613	-
Stage 1	-	-	-	-	-	-	894	684	-	956	690	-
Stage 2	-	-	-	-	-	-	886	690	-	946	676	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	0	9.6	10.1
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	815	1100	-	-	1560	-	-	714
HCM Lane V/C Ratio	0.031	0.005	-	-	-	-	-	0.014
HCM Control Delay (s)	9.6	8.3	0	-	0	-	-	10.1
HCM Lane LOS	A	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection						
Int Delay, s/veh	2.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	18	56	3	23	57
Future Vol, veh/h	0	18	56	3	23	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	50	5	0	67	2
Mvmt Flow	0	18	56	3	23	57

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	161	58	0	0	59
Stage 1	58	-	-	-	-
Stage 2	103	-	-	-	-
Critical Hdwy	6.4	6.7	-	-	4.77
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.75	-	-	2.803
Pot Cap-1 Maneuver	835	888	-	-	1215
Stage 1	970	-	-	-	-
Stage 2	926	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	818	888	-	-	1215
Mov Cap-2 Maneuver	818	-	-	-	-
Stage 1	970	-	-	-	-
Stage 2	907	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.1	0	2.3
HCM LOS	A		

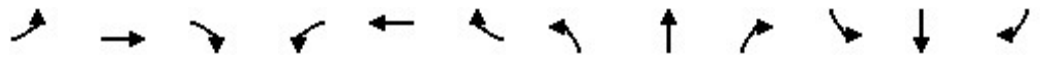
Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	888	1215
HCM Lane V/C Ratio	-	-	-	0.02	0.019
HCM Control Delay (s)	-	-	0	9.1	8
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	-	0.1	0.1

APPENDIX H

**Intersection Operation Synchro Reports
2031 Future Total Conditions**

HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

Future Total 2031 - AM Peak Hour
 6:45 AM - 7:45 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↗	↗	↘	↗	↗
Traffic Volume (veh/h)	152	2270	498	56	1405	53	100	4	20	39	15	33
Future Volume (veh/h)	152	2270	498	56	1405	53	100	4	20	39	15	33
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.97		0.97	0.98		0.97
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1730	1737	1640	1628	1678	1519	1159	435	418	1707	1976	1900
Adj Flow Rate, veh/h	152	2270	0	56	1405	0	100	4	20	39	15	33
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	4	11	0	16	15	14	50	100	100	13	0	0
Cap, veh/h	299	3236		145	3057		179	11	57	206	101	221
Arrive On Green	0.04	0.68	0.00	0.03	0.67	0.00	0.19	0.19	0.19	0.19	0.19	0.19
Sat Flow, veh/h	1648	4742	1362	1550	4580	1262	820	61	307	1236	538	1184
Grp Volume(v), veh/h	152	2270	0	56	1405	0	100	0	24	39	0	48
Grp Sat Flow(s),veh/h/ln	1648	1581	1362	1550	1527	1262	820	0	369	1236	0	1721
Q Serve(g_s), s	4.6	46.7	0.0	1.8	23.5	0.0	18.6	0.0	9.1	4.5	0.0	3.7
Cycle Q Clear(g_c), s	4.6	46.7	0.0	1.8	23.5	0.0	22.3	0.0	9.1	13.6	0.0	3.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.83	1.00		0.69
Lane Grp Cap(c), veh/h	299	3236		145	3057		179	0	69	206	0	322
V/C Ratio(X)	0.51	0.70		0.39	0.46		0.56	0.00	0.35	0.19	0.00	0.15
Avail Cap(c_a), veh/h	382	3236		207	3057		251	0	101	314	0	472
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.6	15.5	0.0	18.2	12.8	0.0	63.7	0.0	56.5	62.4	0.0	54.4
Incr Delay (d2), s/veh	1.3	1.3	0.0	1.7	0.5	0.0	5.7	0.0	6.3	0.9	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.5	25.7	0.0	1.9	14.0	0.0	7.8	0.0	1.8	2.8	0.0	3.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.9	16.8	0.0	19.9	13.3	0.0	69.4	0.0	62.8	63.4	0.0	54.8
LnGrp LOS	B	B		B	B		E	A	E	E	A	D
Approach Vol, veh/h		2422	A		1461	A		124				87
Approach Delay, s/veh		16.5			13.5			68.1				58.7
Approach LOS		B			B			E				E
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.6	115.4		37.0	10.0	113.0		37.0				
Change Period (Y+Rc), s	3.0	6.2		7.1	3.0	6.2		7.1				
Max Green Setting (Gmax), s	11.0	88.8		43.9	15.0	84.8		43.9				
Max Q Clear Time (g_c+I1), s	3.8	49.7		24.3	6.6	26.5		15.6				
Green Ext Time (p_c), s	0.1	38.8		1.8	0.4	49.5		1.3				

Intersection Summary

HCM 6th Ctrl Delay	17.9
HCM 6th LOS	B

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
 2: Bramalea Road & Derry Road E (RR 5)

Future Total 2031 - AM Peak Hour
 6:45 AM - 7:45 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↗		↘	↗	↘
Traffic Volume (veh/h)	256	1930	51	311	1205	259	13	24	61	388	121	271
Future Volume (veh/h)	256	1930	51	311	1205	259	13	24	61	388	121	271
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	1.00		0.81	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.98
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1604	1737	1781	1826	1693	1625	1307	1411	1411	1722	1870	1870
Adj Flow Rate, veh/h	256	1930	51	311	1205	0	13	24	61	254	308	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	20	11	8	5	14	14	40	33	33	12	2	2
Cap, veh/h	284	2743	823	106	2211		117	28	72	306	349	
Arrive On Green	0.08	0.58	0.58	0.48	0.48	0.00	0.09	0.09	0.09	0.19	0.19	0.00
Sat Flow, veh/h	1527	4742	1422	214	4621	1322	1245	300	762	1640	1870	1560
Grp Volume(v), veh/h	256	1930	51	311	1205	0	13	0	85	254	308	0
Grp Sat Flow(s),veh/h/ln	1527	1581	1422	214	1540	1322	1245	0	1062	1640	1870	1560
Q Serve(g_s), s	13.0	46.3	2.5	45.3	29.4	0.0	1.5	0.0	12.6	23.8	25.7	0.0
Cycle Q Clear(g_c), s	13.0	46.3	2.5	76.6	29.4	0.0	1.5	0.0	12.6	23.8	25.7	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.72	1.00		1.00
Lane Grp Cap(c), veh/h	284	2743	823	106	2211		117	0	100	306	349	
V/C Ratio(X)	0.90	0.70	0.06	2.95	0.55		0.11	0.00	0.85	0.83	0.88	
Avail Cap(c_a), veh/h	284	2743	823	106	2211		164	0	140	309	352	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	28.5	24.0	14.7	67.0	29.4	0.0	66.3	0.0	71.3	62.6	63.4	0.0
Incr Delay (d2), s/veh	29.6	1.5	0.1	900.8	0.5	0.0	0.9	0.0	37.6	18.7	23.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ft	2.4	26.2	1.7	55.7	17.5	0.0	1.0	0.0	8.2	17.8	21.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	58.1	25.5	14.9	967.8	29.9	0.0	67.2	0.0	108.9	81.3	86.6	0.0
LnGrp LOS	E	C	B	F	C		E	A	F	F	F	
Approach Vol, veh/h		2237			1516	A		98			562	A
Approach Delay, s/veh		29.0			222.3			103.4			84.2	
Approach LOS		C			F			F			F	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		99.3		23.0	16.0	83.3		37.8				
Change Period (Y+Rc), s		6.7		7.9	3.0	6.7		7.9				
Max Green Setting (Gmax), s		86.3		21.1	13.0	70.3		30.1				
Max Q Clear Time (g_c+I1), s		49.3		14.6	15.0	78.6		27.7				
Green Ext Time (p_c), s		36.2		0.7	0.0	0.0		1.5				

Intersection Summary

HCM 6th Ctrl Delay	104.1
HCM 6th LOS	F

Notes

- User approved pedestrian interval to be less than phase max green.
- User approved volume balancing among the lanes for turning movement.
- Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	0	0	3	0	14	0	80	0	76	388	19
Future Vol, veh/h	4	0	0	3	0	14	0	80	0	76	388	19
Conflicting Peds, #/hr	1	0	0	0	0	1	91	0	0	0	0	91
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	50	0	1	0	67	2	0
Mvmt Flow	4	0	0	3	0	14	0	80	0	76	388	19

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	729	721	489	630	730	81	498	0	0	80	0	0
Stage 1	641	641	-	80	80	-	-	-	-	-	-	-
Stage 2	88	80	-	550	650	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.7	4.1	-	-	4.77	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.75	2.2	-	-	2.803	-	-
Pot Cap-1 Maneuver	341	356	583	397	352	861	1076	-	-	1192	-	-
Stage 1	466	473	-	934	832	-	-	-	-	-	-	-
Stage 2	925	832	-	523	468	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	290	301	538	372	298	860	993	-	-	1192	-	-
Mov Cap-2 Maneuver	290	301	-	372	298	-	-	-	-	-	-	-
Stage 1	430	400	-	934	832	-	-	-	-	-	-	-
Stage 2	909	832	-	480	396	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.6	10.3	0	1.3
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	993	-	-	290	698	1192	-	-
HCM Lane V/C Ratio	-	-	-	0.014	0.024	0.064	-	-
HCM Control Delay (s)	0	-	-	17.6	10.3	8.2	0	-
HCM Lane LOS	A	-	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0.2	-	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	0	0	106	523	0
Future Vol, veh/h	0	0	0	106	523	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	78	11	0
Mvmt Flow	0	0	0	106	523	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	53	53	-	0
Stage 1	53	53	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	960	842	-	-
Stage 1	975	855	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	960	0	-	-
Mov Cap-2 Maneuver	960	0	-	-
Stage 1	975	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	419	99	60	83	0	22	1	11	0	0	1
Future Vol, veh/h	5	419	99	60	83	0	22	1	11	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	75	5	0	0	79	0	75	100	0	0	0	100
Mvmt Flow	5	419	99	60	83	0	22	1	11	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	83	0	0	518	0	0	683	682	469	688	731	83
Stage 1	-	-	-	-	-	-	479	479	-	203	203	-
Stage 2	-	-	-	-	-	-	204	203	-	485	528	-
Critical Hdwy	4.85	-	-	4.1	-	-	7.85	7.5	6.2	7.1	6.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Follow-up Hdwy	2.875	-	-	2.2	-	-	4.175	4.9	3.3	3.5	4	4.2
Pot Cap-1 Maneuver	1157	-	-	1058	-	-	282	272	598	363	351	762
Stage 1	-	-	-	-	-	-	452	421	-	804	737	-
Stage 2	-	-	-	-	-	-	657	583	-	567	531	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1157	-	-	1058	-	-	268	254	598	338	328	762
Mov Cap-2 Maneuver	-	-	-	-	-	-	268	254	-	338	328	-
Stage 1	-	-	-	-	-	-	449	418	-	799	694	-
Stage 2	-	-	-	-	-	-	617	549	-	552	528	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			3.6			17.3			9.7		
HCM LOS							C			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	326	1157	-	-	1058	-	-	762
HCM Lane V/C Ratio	0.104	0.004	-	-	0.057	-	-	0.001
HCM Control Delay (s)	17.3	8.1	0	-	8.6	0	-	9.7
HCM Lane LOS	C	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.3	0	-	-	0.2	-	-	0

Intersection						
Int Delay, s/veh	3.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	142	238	202	83	42	36
Future Vol, veh/h	142	238	202	83	42	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	142	238	202	83	42	36

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	380	0	748 261
Stage 1	-	-	-	-	261 -
Stage 2	-	-	-	-	487 -
Critical Hdwy	-	-	4.12	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	-	-	2.218	-	3.518 3.318
Pot Cap-1 Maneuver	-	-	1178	-	380 778
Stage 1	-	-	-	-	783 -
Stage 2	-	-	-	-	618 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1178	-	312 778
Mov Cap-2 Maneuver	-	-	-	-	312 -
Stage 1	-	-	-	-	783 -
Stage 2	-	-	-	-	507 -

Approach	EB	WB	NB
HCM Control Delay, s	0	6.2	14.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	312	778	-	-	1178	-
HCM Lane V/C Ratio	0.135	0.046	-	-	0.171	-
HCM Control Delay (s)	18.3	9.9	-	-	8.7	0
HCM Lane LOS	C	A	-	-	A	A
HCM 95th %tile Q(veh)	0.5	0.1	-	-	0.6	-

Intersection												
Int Delay, s/veh	4.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕		↕		↕			↕	
Traffic Vol, veh/h	46	0	132	0	0	11	23	23	0	15	114	262
Future Vol, veh/h	46	0	132	0	0	11	23	23	0	15	114	262
Conflicting Peds, #/hr	0	0	0	0	0	0	91	0	0	0	0	91
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	0	2	100	2	50	0	75	0	2
Mvmt Flow	46	0	132	0	0	11	23	23	0	15	114	262

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	441	435	336	410	-	23	467	0	0	23	0	0
Stage 1	366	366	-	69	-	-	-	-	-	-	-	-
Stage 2	75	69	-	341	-	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	-	7.2	4.12	-	-	4.85	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	-	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	-	4.2	2.218	-	-	2.875	-	-
Pot Cap-1 Maneuver	527	514	706	556	0	830	1094	-	-	1225	-	-
Stage 1	653	623	-	946	0	-	-	-	-	-	-	-
Stage 2	934	837	-	678	0	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	466	456	652	430	-	830	1010	-	-	1225	-	-
Mov Cap-2 Maneuver	466	456	-	430	-	-	-	-	-	-	-	-
Stage 1	589	566	-	924	-	-	-	-	-	-	-	-
Stage 2	900	818	-	532	-	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	13.7		9.4		4.3		0.3	
HCM LOS	B		A					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1010	-	-	591	-	830	1225	-	-
HCM Lane V/C Ratio	0.023	-	-	0.301	-	0.013	0.012	-	-
HCM Control Delay (s)	8.6	-	-	13.7	0	9.4	8	0	-
HCM Lane LOS	A	-	-	B	A	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.3	-	0	0	-	-

Intersection						
Int Delay, s/veh	1.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	38	0	0	8	30	216
Future Vol, veh/h	38	0	0	8	30	216
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	0	0	8	30	216

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	146	138	246	0	-
Stage 1	138	-	-	-	-
Stage 2	8	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	846	910	1320	-	-
Stage 1	889	-	-	-	-
Stage 2	1015	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	846	910	1320	-	-
Mov Cap-2 Maneuver	846	-	-	-	-
Stage 1	889	-	-	-	-
Stage 2	1015	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.5	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1320	-	846	-	-	-
HCM Lane V/C Ratio	-	-	0.045	-	-	-
HCM Control Delay (s)	0	-	9.5	0	-	-
HCM Lane LOS	A	-	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-	-

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		T
Traffic Vol, veh/h	5	0	0	3	3	27
Future Vol, veh/h	5	0	0	3	3	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	0	0	3	3	27

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	20	17	30	0	0
Stage 1	17	-	-	-	-
Stage 2	3	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	997	1062	1583	-	-
Stage 1	1006	-	-	-	-
Stage 2	1020	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	997	1062	1583	-	-
Mov Cap-2 Maneuver	997	-	-	-	-
Stage 1	1006	-	-	-	-
Stage 2	1020	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.6	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1583	-	997	-	-
HCM Lane V/C Ratio	-	-	0.005	-	-
HCM Control Delay (s)	0	-	8.6	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

Future Total 2031 - PM Peak Hour
 3:00 PM - 4:00 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↑↑↑	↖	↗	↑↑↑	↖	↗	↖		↗	↖	
Traffic Volume (veh/h)	166	1877	118	60	1987	68	490	39	74	94	20	152
Future Volume (veh/h)	166	1877	118	60	1987	68	490	39	74	94	20	152
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	0.99		0.99
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1549	1633	1410	1526	1722	1413	1737	1483	1426	1767	1498	1441
Adj Flow Rate, veh/h	166	1877	0	60	1987	0	490	39	74	94	20	152
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	17	18	18	23	12	22	11	32	32	9	31	31
Cap, veh/h	125	2819		160	3197		177	107	204	243	35	267
Arrive On Green	0.63	0.63	0.00	0.03	0.68	0.00	0.24	0.24	0.24	0.24	0.24	0.24
Sat Flow, veh/h	181	4459	1171	1454	4701	1173	1120	454	861	1199	149	1129
Grp Volume(v), veh/h	166	1877	0	60	1987	0	490	0	113	94	0	172
Grp Sat Flow(s),veh/h/ln	181	1486	1171	1454	1567	1173	1120	0	1315	1199	0	1278
Q Serve(g_s), s	71.3	42.8	0.0	2.2	37.5	0.0	18.9	0.0	11.5	11.4	0.0	19.0
Cycle Q Clear(g_c), s	101.1	42.8	0.0	2.2	37.5	0.0	37.9	0.0	11.5	22.8	0.0	19.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.65	1.00		0.88
Lane Grp Cap(c), veh/h	125	2819		160	3197		177	0	311	243	0	303
V/C Ratio(X)	1.32	0.67		0.38	0.62		2.76	0.00	0.36	0.39	0.00	0.57
Avail Cap(c_a), veh/h	125	2819		281	3197		177	0	311	243	0	303
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	57.1	18.7	0.0	17.9	14.2	0.0	72.9	0.0	51.0	60.5	0.0	53.8
Incr Delay (d2), s/veh	190.2	1.3	0.0	1.5	0.9	0.0	809.1	0.0	1.5	2.1	0.0	4.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	21.0	22.9	0.0	1.8	21.1	0.0	78.2	0.0	7.5	6.9	0.0	11.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	247.3	20.0	0.0	19.3	15.1	0.0	882.1	0.0	52.5	62.7	0.0	57.9
LnGrp LOS	F	B		B	B		F	A	D	E	A	E
Approach Vol, veh/h		2043	A		2047	A		603				266
Approach Delay, s/veh		38.4			15.2			726.6				59.6
Approach LOS		D			B			F				E
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	7.7	107.3		45.0		115.0		45.0				
Change Period (Y+Rc), s	3.0	6.2		7.1		6.2		7.1				
Max Green Setting (Gmax), s	18.0	87.8		37.9		108.8		37.9				
Max Q Clear Time (g_c+I1), s	4.2	103.1		39.9		39.5		24.8				
Green Ext Time (p_c), s	0.2	0.0		0.0		67.0		3.4				

Intersection Summary

HCM 6th Ctrl Delay	113.7
HCM 6th LOS	F

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
 2: Bramalea Road & Derry Road E (RR 5)

Future Total 2031 - PM Peak Hour
 3:00 PM - 4:00 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↑	↗	↘	↖	↗
Traffic Volume (veh/h)	284	1748	62	101	1630	413	276	161	426	342	37	254
Future Volume (veh/h)	284	1748	62	101	1630	413	276	161	426	342	37	254
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		1.00	1.00		0.71	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.99
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1470	1678	1574	1737	1722	1625	1737	1811	1811	1737	1811	1604
Adj Flow Rate, veh/h	284	1748	62	101	1630	0	276	161	426	368	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	29	15	22	11	12	14	11	6	6	11	6	20
Cap, veh/h	278	2487	668	108	1701		146	30	78	755	0	
Arrive On Green	0.16	0.54	0.54	0.36	0.36	0.00	0.09	0.09	0.09	0.23	0.00	0.00
Sat Flow, veh/h	1400	4580	1230	240	4701	1327	1654	336	888	3309	0	1343
Grp Volume(v), veh/h	284	1748	62	101	1630	0	276	0	587	368	0	0
Grp Sat Flow(s),veh/h/ln	1400	1527	1230	240	1567	1327	1654	0	1224	1654	0	1343
Q Serve(g_s), s	26.0	45.1	3.9	41.8	54.2	0.0	14.1	0.0	14.1	15.5	0.0	0.0
Cycle Q Clear(g_c), s	26.0	45.1	3.9	57.9	54.2	0.0	14.1	0.0	14.1	15.5	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.73	1.00		1.00
Lane Grp Cap(c), veh/h	278	2487	668	108	1701		146	0	108	755	0	
V/C Ratio(X)	1.02	0.70	0.09	0.94	0.96		1.89	0.00	5.44	0.49	0.00	
Avail Cap(c_a), veh/h	278	2487	668	108	1701		146	0	108	891	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	51.1	27.0	17.6	67.0	49.9	0.0	72.9	0.0	73.0	53.6	0.0	0.0
Incr Delay (d2), s/veh	59.5	1.7	0.3	68.3	13.5	0.0	426.6	0.0	2018.6	1.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	23.3	25.1	2.3	10.5	32.5	0.0	37.5	0.0	98.1	11.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	110.6	28.7	17.9	135.4	63.4	0.0	499.6	0.0	2091.6	54.7	0.0	0.0
LnGrp LOS	F	C	B	F	E		F	A	F	D	A	
Approach Vol, veh/h		2094			1731	A		863			368	A
Approach Delay, s/veh		39.5			67.6			1582.4			54.7	
Approach LOS		D			E			F			D	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		93.6		22.0	29.0	64.6		44.4				
Change Period (Y+Rc), s		6.7		7.9	3.0	6.7		7.9				
Max Green Setting (Gmax), s		80.3		14.1	26.0	51.3		43.1				
Max Q Clear Time (g_c+I1), s		47.1		16.1	28.0	59.9		17.5				
Green Ext Time (p_c), s		32.1		0.0	0.0	0.0		4.4				

Intersection Summary

HCM 6th Ctrl Delay	313.6
HCM 6th LOS	F

Notes

User approved volume balancing among the lanes for turning movement.
 Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC
 3: Bramalea Road & Fed-Ex Employee Entrance

Future Total 2031 - PM Peak Hour
 3:00 PM - 4:00 PM

Intersection												
Int Delay, s/veh	2.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	23	0	0	6	0	76	0	764	3	52	133	15
Future Vol, veh/h	23	0	0	6	0	76	0	764	3	52	133	15
Conflicting Peds, #/hr	2	0	0	0	0	2	145	0	0	0	0	145
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	6	0	0	20	0	5	0	16	50	0	24	25
Mvmt Flow	23	0	0	6	0	76	0	764	3	52	133	15

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1196	1157	286	1011	1163	768	293	0	0	767	0	0
Stage 1	390	390	-	766	766	-	-	-	-	-	-	-
Stage 2	806	767	-	245	397	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.5	6.2	7.3	6.5	6.25	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.16	5.5	-	6.3	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.5	-	6.3	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4	3.3	3.68	4	3.345	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	160	198	758	202	196	397	1280	-	-	856	-	-
Stage 1	626	611	-	369	415	-	-	-	-	-	-	-
Stage 2	370	414	-	720	607	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	106	160	656	192	159	396	1109	-	-	856	-	-
Mov Cap-2 Maneuver	106	160	-	192	159	-	-	-	-	-	-	-
Stage 1	542	494	-	369	415	-	-	-	-	-	-	-
Stage 2	298	414	-	672	491	-	-	-	-	-	-	-

Approach	EB		WB		NB			SB		
HCM Control Delay, s	48.1		17.6		0			2.5		
HCM LOS	E		C							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1109	-	-	106	367	856	-	-
HCM Lane V/C Ratio	-	-	-	0.217	0.223	0.061	-	-
HCM Control Delay (s)	0	-	-	48.1	17.6	9.5	0	-
HCM Lane LOS	A	-	-	E	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.8	0.8	0.2	-	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	0	0	475	133	0
Future Vol, veh/h	0	0	0	475	133	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	29	44	0
Mvmt Flow	0	0	0	475	133	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	238	238	-	0
Stage 1	238	238	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	755	666	-	-
Stage 1	806	712	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	755	0	-	-
Mov Cap-2 Maneuver	755	0	-	-
Stage 1	806	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	4.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	93	34	9	387	0	83	1	115	1	4	5
Future Vol, veh/h	6	93	34	9	387	0	83	1	115	1	4	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	100	41	28	0	23	0	25	100	0	0	100	100
Mvmt Flow	6	93	34	9	387	0	83	1	115	1	4	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	387	0	0	127	0	0	532	527	110	585	544	387
Stage 1	-	-	-	-	-	-	122	122	-	405	405	-
Stage 2	-	-	-	-	-	-	410	405	-	180	139	-
Critical Hdwy	5.1	-	-	4.1	-	-	7.35	7.5	6.2	7.1	7.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Follow-up Hdwy	3.1	-	-	2.2	-	-	3.725	4.9	3.3	3.5	4.9	4.2
Pot Cap-1 Maneuver	789	-	-	1472	-	-	424	343	949	425	335	491
Stage 1	-	-	-	-	-	-	830	640	-	626	460	-
Stage 2	-	-	-	-	-	-	575	460	-	826	627	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	789	-	-	1472	-	-	411	338	949	368	330	491
Mov Cap-2 Maneuver	-	-	-	-	-	-	411	338	-	368	330	-
Stage 1	-	-	-	-	-	-	823	635	-	621	456	-
Stage 2	-	-	-	-	-	-	560	456	-	719	622	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.2			13.7			14.2		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	610	789	-	-	1472	-	-	400
HCM Lane V/C Ratio	0.326	0.008	-	-	0.006	-	-	0.025
HCM Control Delay (s)	13.7	9.6	0	-	7.5	0	-	14.2
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	1.4	0	-	-	0	-	-	0.1

Intersection						
Int Delay, s/veh	8.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	132	38	33	127	214	375
Future Vol, veh/h	132	38	33	127	214	375
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	132	38	33	127	214	375

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	170	0	344
Stage 1	-	-	-	-	151
Stage 2	-	-	-	-	193
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1407	-	652
Stage 1	-	-	-	-	877
Stage 2	-	-	-	-	840
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1407	-	636
Mov Cap-2 Maneuver	-	-	-	-	636
Stage 1	-	-	-	-	877
Stage 2	-	-	-	-	819

Approach	EB	WB	NB
HCM Control Delay, s	0	1.6	12.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	636	895	-	-	1407	-
HCM Lane V/C Ratio	0.336	0.419	-	-	0.023	-
HCM Control Delay (s)	13.5	11.9	-	-	7.6	0
HCM Lane LOS	B	B	-	-	A	A
HCM 95th %tile Q(veh)	1.5	2.1	-	-	0.1	-

Intersection												
Int Delay, s/veh	276.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕		↕		↕			↕	
Traffic Vol, veh/h	486	0	21	0	0	18	118	263	3	23	74	42
Future Vol, veh/h	486	0	21	0	0	18	118	263	3	23	74	42
Conflicting Peds, #/hr	0	0	0	0	0	0	145	0	0	0	0	145
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	0	2	50	2	5	0	67	2	2
Mvmt Flow	486	0	21	0	0	18	118	263	3	23	74	42

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	796	788	240	653	-	265	261	0	0	266	0	0
Stage 1	286	286	-	501	-	-	-	-	-	-	-	-
Stage 2	510	502	-	152	-	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	-	6.7	4.12	-	-	4.77	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	-	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	-	3.75	2.218	-	-	2.803	-	-
Pot Cap-1 Maneuver	~ 305	323	799	383	0	671	1303	-	-	1000	-	-
Stage 1	721	675	-	556	0	-	-	-	-	-	-	-
Stage 2	546	542	-	855	0	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 228	239	692	330	-	671	1128	-	-	1000	-	-
Mov Cap-2 Maneuver	~ 228	239	-	330	-	-	-	-	-	-	-	-
Stage 1	548	570	-	488	-	-	-	-	-	-	-	-
Stage 2	~ 466	475	-	808	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	568.3	10.5	2.6	1.4
HCM LOS	F	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1128	-	-	235	-	671	1000	-	-
HCM Lane V/C Ratio	0.105	-	-	2.157	-	0.027	0.023	-	-
HCM Control Delay (s)	8.6	-	-	568.3	0	10.5	8.7	0	-
HCM Lane LOS	A	-	-	F	A	B	A	A	-
HCM 95th %tile Q(veh)	0.3	-	-	38.9	-	0.1	0.1	-	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	7.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	289	0	0	95	61	34
Future Vol, veh/h	289	0	0	95	61	34
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	289	0	0	95	61	34

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	173	78	95	0	-	0
Stage 1	78	-	-	-	-	-
Stage 2	95	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	817	983	1499	-	-	-
Stage 1	945	-	-	-	-	-
Stage 2	929	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	817	983	1499	-	-	-
Mov Cap-2 Maneuver	817	-	-	-	-	-
Stage 1	945	-	-	-	-	-
Stage 2	929	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.8	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1499	-	817	-	-	-
HCM Lane V/C Ratio	-	-	0.354	-	-	-
HCM Control Delay (s)	0	-	11.8	0	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	1.6	-	-	-

Intersection						
Int Delay, s/veh	2.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	36	0	0	59	57	4
Future Vol, veh/h	36	0	0	59	57	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	0	0	59	57	4

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	118	59	61	0	0
Stage 1	59	-	-	-	-
Stage 2	59	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	878	1007	1542	-	-
Stage 1	964	-	-	-	-
Stage 2	964	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	878	1007	1542	-	-
Mov Cap-2 Maneuver	878	-	-	-	-
Stage 1	964	-	-	-	-
Stage 2	964	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.3	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1542	-	878	-	-
HCM Lane V/C Ratio	-	-	0.041	-	-
HCM Control Delay (s)	0	-	9.3	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

APPENDIX I-1

**Alternative Evaluation
No Alstep, Split Phasing**

Timing Report, Sorted By Phase
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

No Alstep, Split Phasing (2031 Horizon)
 AM Peak Hour

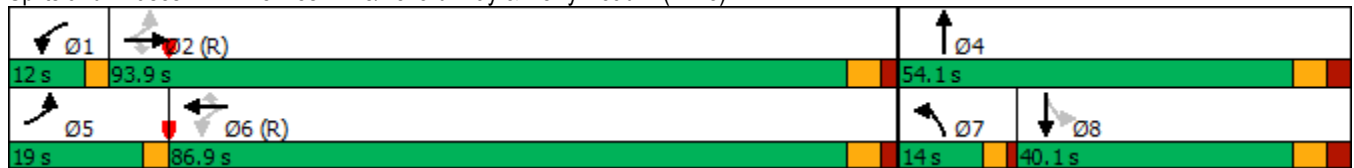


Phase Number	1	2	4	5	6	7	8
Movement	WBL	EBTL	NBT	EBL	WBTL	NBL	SBTL
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize						Yes	Yes
Recall Mode	None	C-Max	None	None	C-Max	None	None
Maximum Split (s)	12	93.9	54.1	19	86.9	14	40.1
Maximum Split (%)	7.5%	58.7%	33.8%	11.9%	54.3%	8.8%	25.1%
Minimum Split (s)	8	29.2	40.1	8	29.2	9.5	40.1
Yellow Time (s)	3	4.2	4	3	4.2	3	4
All-Red Time (s)	0	2	3.1	0	2	1	3.1
Minimum Initial (s)	5	12	8	5	12	5	8
Vehicle Extension (s)	3	5	5	3	5	3	5
Minimum Gap (s)	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0
Walk Time (s)		9	13		9		13
Flash Dont Walk (s)		14	20		14		20
Dual Entry	No	Yes	Yes	No	Yes	No	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	141	153	86.9	141	0	86.9	100.9
End Time (s)	153	86.9	141	0	86.9	100.9	141
Yield/Force Off (s)	150	80.7	133.9	157	80.7	96.9	133.9
Yield/Force Off 170(s)	150	66.7	113.9	157	66.7	96.9	113.9
Local Start Time (s)	141	153	86.9	141	0	86.9	100.9
Local Yield (s)	150	80.7	133.9	157	80.7	96.9	133.9
Local Yield 170(s)	150	66.7	113.9	157	66.7	96.9	113.9

Intersection Summary

Cycle Length	160
Control Type	Actuated-Coordinated
Natural Cycle	120
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

























Splits and Phases: 1: Menkes Drive/Telford Way & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

No Alstep, Split Phasing (2031 Horizon)

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	152	2312	456	99	1411	53	94	4	20	39	15	33
Future Volume (veh/h)	152	2312	456	99	1411	53	94	4	20	39	15	33
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	0.96		0.96
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1730	1737	1640	1628	1678	1519	1159	435	1159	1707	1976	1618
Adj Flow Rate, veh/h	152	2312	0	99	1411	0	94	4	20	39	15	33
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	4	11	0	16	15	14	50	100	50	13	0	19
Cap, veh/h	286	3061		141	2903		118	13	67	212	73	161
Arrive On Green	0.05	0.65	0.00	0.04	0.63	0.00	0.06	0.22	0.22	0.14	0.14	0.14
Sat Flow, veh/h	1648	4742	1362	1550	4580	1262	2141	62	308	1218	534	1174
Grp Volume(v), veh/h	152	2312	0	99	1411	0	94	0	24	39	0	48
Grp Sat Flow(s),veh/h/ln	1648	1581	1362	1550	1527	1262	1071	0	370	1218	0	1708
Q Serve(g_s), s	5.1	54.0	0.0	3.6	26.1	0.0	6.9	0.0	8.7	4.6	0.0	4.0
Cycle Q Clear(g_c), s	5.1	54.0	0.0	3.6	26.1	0.0	6.9	0.0	8.7	4.6	0.0	4.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.83	1.00		0.69
Lane Grp Cap(c), veh/h	286	3061		141	2903		118	0	80	212	0	234
V/C Ratio(X)	0.53	0.76		0.70	0.49		0.79	0.00	0.30	0.18	0.00	0.21
Avail Cap(c_a), veh/h	374	3061		174	2903		134	0	109	296	0	352
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.0	19.6	0.0	31.3	15.5	0.0	74.7	0.0	52.4	61.6	0.0	61.3
Incr Delay (d2), s/veh	1.5	1.8	0.0	9.1	0.6	0.0	24.7	0.0	4.3	0.9	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.9	29.6	0.0	5.4	15.4	0.0	4.3	0.0	1.7	2.8	0.0	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.5	21.4	0.0	40.4	16.1	0.0	99.4	0.0	56.8	62.4	0.0	62.2
LnGrp LOS	B	C		D	B		F	A	E	E	A	E
Approach Vol, veh/h		2464	A		1510	A		118				87
Approach Delay, s/veh		21.0			17.7			90.7				62.3
Approach LOS		C			B			F				E
Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.6	109.5		41.9	10.5	107.6	12.8	29.0				
Change Period (Y+Rc), s	3.0	6.2		7.1	3.0	6.2	4.0	7.1				
Max Green Setting (Gmax), s	9.0	87.7		47.0	16.0	80.7	10.0	33.0				
Max Q Clear Time (g_c+I1), s	5.6	57.0		10.7	7.1	29.1	8.9	6.6				
Green Ext Time (p_c), s	0.1	30.6		0.4	0.4	44.7	0.0	1.3				

Intersection Summary

HCM 6th Ctrl Delay	22.6
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Timing Report, Sorted By Phase
2: Bramalea Road & Derry Road E (RR 5)

No Alstep, Split Phasing (2031 Horizon)

AM Peak Hour

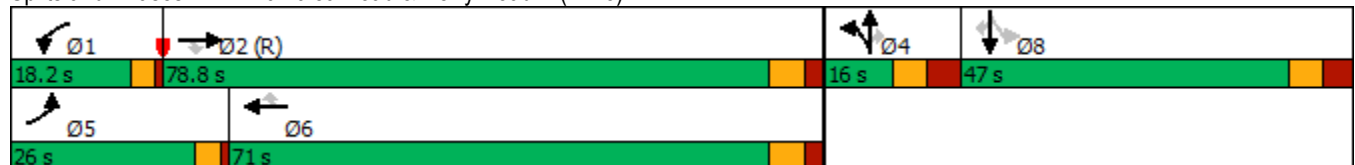


Phase Number	1	2	4	5	6	8
Movement	WBL	EBT	NBTL	EBL	WBT	SBTL
Lead/Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize	Yes	Yes				
Recall Mode	None	C-Max	None	None	None	None
Maximum Split (s)	18.2	78.8	16	26	71	47
Maximum Split (%)	11.4%	49.3%	10.0%	16.3%	44.4%	29.4%
Minimum Split (s)	9.5	35.7	15.9	9	35.7	46.9
Yellow Time (s)	3	4.2	4	3	4.2	4
All-Red Time (s)	1	2.5	3.9	1	2.5	3.9
Minimum Initial (s)	5	12	8	5	12	10
Vehicle Extension (s)	3	5	5	3	5	5
Minimum Gap (s)	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0
Walk Time (s)		11			11	15
Flash Dont Walk (s)		18			18	24
Dual Entry	No	Yes	Yes	No	Yes	No
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	141.8	0	78.8	141.8	7.8	94.8
End Time (s)	0	78.8	94.8	7.8	78.8	141.8
Yield/Force Off (s)	156	72.1	86.9	3.8	72.1	133.9
Yield/Force Off 170(s)	156	54.1	86.9	3.8	54.1	109.9
Local Start Time (s)	141.8	0	78.8	141.8	7.8	94.8
Local Yield (s)	156	72.1	86.9	3.8	72.1	133.9
Local Yield 170(s)	156	54.1	86.9	3.8	54.1	109.9

Intersection Summary

























Cycle Length	160
Control Type	Actuated-Coordinated
Natural Cycle	150
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green	

Splits and Phases: 2: Bramalea Road & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
2: Bramalea Road & Derry Road E (RR 5)

No Alstep, Split Phasing (2031 Horizon)
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	256	1930	93	268	1248	259	19	22	61	388	121	271
Future Volume (veh/h)	256	1930	93	268	1248	259	19	22	61	388	121	271
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		1.00	1.00		0.69	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.98
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1604	1737	1781	1826	1693	1625	1307	1411	1248	1722	1870	1870
Adj Flow Rate, veh/h	256	1930	93	268	1248	0	19	22	61	254	308	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	20	11	8	5	14	14	40	33	44	12	2	2
Cap, veh/h	303	2188	652	299	2070		63	71	37	383	437	
Arrive On Green	0.10	0.46	0.46	0.09	0.45	0.00	0.05	0.05	0.05	0.23	0.23	0.00
Sat Flow, veh/h	2963	4742	1414	3374	4621	1322	1245	1411	729	1640	1870	1560
Grp Volume(v), veh/h	256	1930	93	268	1248	0	19	22	61	254	308	0
Grp Sat Flow(s),veh/h/ln	1481	1581	1414	1687	1540	1322	1245	1411	729	1640	1870	1560
Q Serve(g_s), s	13.6	59.1	6.1	12.6	32.7	0.0	2.4	2.4	8.1	22.5	24.2	0.0
Cycle Q Clear(g_c), s	13.6	59.1	6.1	12.6	32.7	0.0	2.4	2.4	8.1	22.5	24.2	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	303	2188	652	299	2070		63	71	37	383	437	
V/C Ratio(X)	0.85	0.88	0.14	0.90	0.60		0.30	0.31	1.65	0.66	0.71	
Avail Cap(c_a), veh/h	407	2188	652	299	2070		63	71	37	401	457	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	70.6	39.1	24.8	72.2	33.4	0.0	73.2	73.2	75.9	55.6	56.3	0.0
Incr Delay (d2), s/veh	11.6	5.6	0.5	27.2	0.8	0.0	5.6	5.1	387.9	5.4	6.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	9.8	33.7	4.2	11.1	19.2	0.0	1.6	1.8	10.0	15.8	18.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	82.2	44.7	25.3	99.4	34.1	0.0	78.8	78.4	463.8	61.0	62.4	0.0
LnGrp LOS	F	D	C	F	C		E	E	F	E	E	
Approach Vol, veh/h		2279			1516	A		102			562	A
Approach Delay, s/veh		48.1			45.7			309.0			61.8	
Approach LOS		D			D			F			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	18.2	80.5		16.0	20.3	78.4		45.3				
Change Period (Y+Rc), s	4.0	6.7		7.9	4.0	6.7		7.9				
Max Green Setting (Gmax), s	14.2	72.1		8.1	22.0	64.3		39.1				
Max Q Clear Time (g_c+I1), s	14.6	62.1		10.1	15.6	35.7		26.2				
Green Ext Time (p_c), s	0.0	9.9		0.0	0.8	24.9		6.5				

Intersection Summary

HCM 6th Ctrl Delay	55.0
HCM 6th LOS	D

Notes

- User approved pedestrian interval to be less than phase max green.
- User approved volume balancing among the lanes for turning movement.
- Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC
3: Bramalea Road & Fed-Ex Employee Entrance

No Alstep, Split Phasing (2031 Horizon)
AM Peak Hour

Intersection												
Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	0	0	3	0	14	0	84	0	76	387	19
Future Vol, veh/h	4	0	0	3	0	14	0	84	0	76	387	19
Conflicting Peds, #/hr	1	0	0	0	0	1	91	0	0	0	0	91
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	50	0	1	0	67	2	0
Mvmt Flow	4	0	0	3	0	14	0	84	0	76	387	19

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	683	724	294	430	733	43	497	0	0	84	0	0
Stage 1	640	640	-	84	84	-	-	-	-	-	-	-
Stage 2	43	84	-	346	649	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	7.9	4.1	-	-	5.44	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.8	2.2	-	-	2.87	-	-
Pot Cap-1 Maneuver	339	354	708	514	350	882	1077	-	-	1142	-	-
Stage 1	435	473	-	920	829	-	-	-	-	-	-	-
Stage 2	972	829	-	649	469	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	287	299	653	480	295	881	994	-	-	1142	-	-
Mov Cap-2 Maneuver	287	299	-	480	295	-	-	-	-	-	-	-
Stage 1	402	399	-	920	829	-	-	-	-	-	-	-
Stage 2	955	829	-	593	396	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.7	9.8	0	1.6
HCM LOS	C	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	994	-	-	287	768	1142	-
HCM Lane V/C Ratio	-	-	-	0.014	0.022	0.067	-
HCM Control Delay (s)	0	-	-	17.7	9.8	8.4	0.3
HCM Lane LOS	A	-	-	C	A	A	A
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0.2	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	
Traffic Vol, veh/h	0	0	0	100	525	0
Future Vol, veh/h	0	0	0	100	525	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	78	11	0
Mvmt Flow	0	0	0	100	525	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	50	50	-	0
Stage 1	50	50	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	964	845	-	-
Stage 1	978	857	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	964	0	-	-
Mov Cap-2 Maneuver	964	0	-	-
Stage 1	978	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	0.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	456	64	0	86	0	13	1	1	0	0	1
Future Vol, veh/h	5	456	64	0	86	0	13	1	1	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	75	5	0	0	79	0	75	100	0	0	0	100
Mvmt Flow	5	456	64	0	86	0	13	1	1	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	86	0	0	520	0	0	585	584	488	585	616	86
Stage 1	-	-	-	-	-	-	498	498	-	86	86	-
Stage 2	-	-	-	-	-	-	87	86	-	499	530	-
Critical Hdwy	4.85	-	-	4.1	-	-	7.85	7.5	6.2	7.1	6.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Follow-up Hdwy	2.875	-	-	2.2	-	-	4.175	4.9	3.3	3.5	4	4.2
Pot Cap-1 Maneuver	1154	-	-	1056	-	-	332	315	584	425	409	759
Stage 1	-	-	-	-	-	-	440	412	-	927	827	-
Stage 2	-	-	-	-	-	-	768	667	-	557	530	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1154	-	-	1056	-	-	330	313	584	421	407	759
Mov Cap-2 Maneuver	-	-	-	-	-	-	330	313	-	421	407	-
Stage 1	-	-	-	-	-	-	437	410	-	921	827	-
Stage 2	-	-	-	-	-	-	767	667	-	551	527	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0			16.1			9.7		
HCM LOS							C			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	339	1154	-	-	1056	-	-	759
HCM Lane V/C Ratio	0.044	0.004	-	-	-	-	-	0.001
HCM Control Delay (s)	16.1	8.1	0	-	0	-	-	9.7
HCM Lane LOS	C	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	11	73	0	15	375
Future Vol, veh/h	0	11	73	0	15	375
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	100	50	0	75	0
Mvmt Flow	0	11	73	0	15	375

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	291	37	0	0	73
Stage 1	73	-	-	-	-
Stage 2	218	-	-	-	-
Critical Hdwy	6.8	8.9	-	-	5.6
Critical Hdwy Stg 1	5.8	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-
Follow-up Hdwy	3.5	4.3	-	-	2.95
Pot Cap-1 Maneuver	682	781	-	-	1122
Stage 1	947	-	-	-	-
Stage 2	803	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	670	781	-	-	1122
Mov Cap-2 Maneuver	670	-	-	-	-
Stage 1	947	-	-	-	-
Stage 2	789	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.7	0	0.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	-	781	1122
HCM Lane V/C Ratio	-	-	0.014	0.013
HCM Control Delay (s)	-	-	0	9.7
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

Intersection						
Int Delay, s/veh	1.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↙	↗		↖	↗	
Traffic Vol, veh/h	63	0	0	10	44	331
Future Vol, veh/h	63	0	0	10	44	331
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	63	0	0	10	44	331

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	220	188	375	0	-	0
Stage 1	210	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.63	6.93	4.13	-	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	758	823	1182	-	-	-
Stage 1	805	-	-	-	-	-
Stage 2	1013	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	758	823	1182	-	-	-
Mov Cap-2 Maneuver	758	-	-	-	-	-
Stage 1	805	-	-	-	-	-
Stage 2	1013	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1182	-	758	-	-	-
HCM Lane V/C Ratio	-	-	0.083	-	-	-
HCM Control Delay (s)	0	-	10.2	0	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-	-

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	7	0	0	3	3	41
Future Vol, veh/h	7	0	0	3	3	41
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	0	0	3	3	41

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	27	24	44	0	0
Stage 1	24	-	-	-	-
Stage 2	3	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	988	1052	1564	-	-
Stage 1	999	-	-	-	-
Stage 2	1020	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	988	1052	1564	-	-
Mov Cap-2 Maneuver	988	-	-	-	-
Stage 1	999	-	-	-	-
Stage 2	1020	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.7	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1564	-	988	-	-
HCM Lane V/C Ratio	-	-	0.007	-	-
HCM Control Delay (s)	0	-	8.7	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Timing Report, Sorted By Phase
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

No Alstep, Split Phasing (2031 Horizon)
 PM Peak Hour

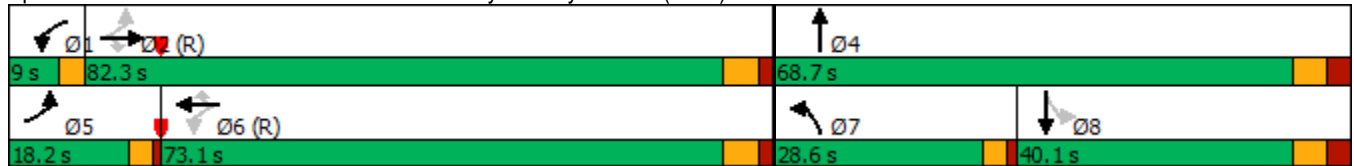


Phase Number	1	2	4	5	6	7	8
Movement	WBL	EBTL	NBT	EBL	WBTL	NBL	SBTL
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize				Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	None	C-Max	None	None
Maximum Split (s)	9	82.3	68.7	18.2	73.1	28.6	40.1
Maximum Split (%)	5.6%	51.4%	42.9%	11.4%	45.7%	17.9%	25.1%
Minimum Split (s)	8	29.2	40.1	9.5	29.2	9.5	40.1
Yellow Time (s)	3	4.2	4	3	4.2	3	4
All-Red Time (s)	0	2	3.1	1	2	1	3.1
Minimum Initial (s)	5	12	8	5	12	5	8
Vehicle Extension (s)	3	5	5	3	5	3	5
Minimum Gap (s)	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0
Walk Time (s)		9	13		9		13
Flash Dont Walk (s)		14	20		14		20
Dual Entry	No	Yes	Yes	No	Yes	No	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	141.8	150.8	73.1	141.8	0	73.1	101.7
End Time (s)	150.8	73.1	141.8	0	73.1	101.7	141.8
Yield/Force Off (s)	147.8	66.9	134.7	156	66.9	97.7	134.7
Yield/Force Off 170(s)	147.8	52.9	114.7	156	52.9	97.7	114.7
Local Start Time (s)	141.8	150.8	73.1	141.8	0	73.1	101.7
Local Yield (s)	147.8	66.9	134.7	156	66.9	97.7	134.7
Local Yield 170(s)	147.8	52.9	114.7	156	52.9	97.7	114.7

Intersection Summary

Cycle Length	160
Control Type	Actuated-Coordinated
Natural Cycle	150
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 1: Menkes Drive/Telford Way & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

No Alstep, Split Phasing (2031 Horizon)
 PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘↗	↑		↘	↗	
Traffic Volume (veh/h)	166	1883	111	66	2002	68	476	39	74	94	20	152
Future Volume (veh/h)	166	1883	111	66	2002	68	476	39	74	94	20	152
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	0.99		0.98
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1549	1633	1410	1526	1722	1413	1737	1483	1752	1767	1498	1693
Adj Flow Rate, veh/h	166	1883	0	66	2002	0	476	39	74	94	20	152
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	17	18	18	23	12	22	11	32	10	9	31	14
Cap, veh/h	182	2264		125	2108		493	162	307	255	26	198
Arrive On Green	0.09	0.51	0.00	0.04	0.45	0.00	0.15	0.36	0.36	0.18	0.18	0.18
Sat Flow, veh/h	1475	4459	1171	1454	4701	1173	3209	455	864	1191	148	1125
Grp Volume(v), veh/h	166	1883	0	66	2002	0	476	0	113	94	0	172
Grp Sat Flow(s),veh/h/ln	1475	1486	1171	1454	1567	1173	1605	0	1319	1191	0	1273
Q Serve(g_s), s	12.1	57.6	0.0	3.9	65.5	0.0	23.6	0.0	9.7	11.3	0.0	20.6
Cycle Q Clear(g_c), s	12.1	57.6	0.0	3.9	65.5	0.0	23.6	0.0	9.7	11.3	0.0	20.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.65	1.00		0.88
Lane Grp Cap(c), veh/h	182	2264		125	2108		493	0	468	255	0	225
V/C Ratio(X)	0.91	0.83		0.53	0.95		0.96	0.00	0.24	0.37	0.00	0.77
Avail Cap(c_a), veh/h	183	2264		129	2108		493	0	508	291	0	263
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	47.4	33.5	0.0	33.2	42.4	0.0	67.3	0.0	36.4	58.9	0.0	62.7
Incr Delay (d2), s/veh	42.0	3.7	0.0	3.7	10.9	0.0	31.5	0.0	0.6	1.9	0.0	14.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	14.1	30.7	0.0	2.9	37.6	0.0	18.1	0.0	6.2	6.8	0.0	12.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	89.4	37.3	0.0	36.9	53.3	0.0	98.8	0.0	36.9	60.8	0.0	77.2
LnGrp LOS	F	D		D	D		F	A	D	E	A	E
Approach Vol, veh/h		2049	A		2068	A		589			266	
Approach Delay, s/veh		41.5			52.8			86.9			71.4	
Approach LOS		D			D			F			E	
Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.6	87.5		63.9	18.1	77.9	28.6	35.3				
Change Period (Y+Rc), s	3.0	6.2		7.1	4.0	6.2	4.0	7.1				
Max Green Setting (Gmax), s	6.0	76.1		61.6	14.2	66.9	24.6	33.0				
Max Q Clear Time (g_c+I1), s	5.9	59.6		11.7	14.1	67.5	25.6	22.6				
Green Ext Time (p_c), s	0.0	16.3		3.2	0.0	0.0	0.0	2.9				

Intersection Summary

HCM 6th Ctrl Delay	53.2
HCM 6th LOS	D

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Timing Report, Sorted By Phase
2: Bramalea Road & Derry Road E (RR 5)

No Alstep, Split Phasing (2031 Horizon)

PM Peak Hour

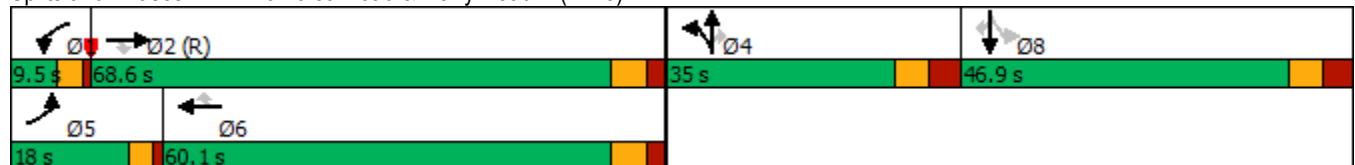


Phase Number	1	2	4	5	6	8
Movement	WBL	EBT	NBTL	EBL	WBT	SBTL
Lead/Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize	Yes	Yes				
Recall Mode	None	C-Max	None	None	None	None
Maximum Split (s)	9.5	68.6	35	18	60.1	46.9
Maximum Split (%)	5.9%	42.9%	21.9%	11.3%	37.6%	29.3%
Minimum Split (s)	9.5	35.7	15.9	9	35.7	46.9
Yellow Time (s)	3	4.2	4	3	4.2	4
All-Red Time (s)	1	2.5	3.9	1	2.5	3.9
Minimum Initial (s)	5	12	8	5	12	10
Vehicle Extension (s)	3	5	5	3	5	5
Minimum Gap (s)	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0
Walk Time (s)		11			11	15
Flash Dont Walk (s)		18			18	24
Dual Entry	No	Yes	Yes	No	Yes	No
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	150.5	0	68.6	150.5	8.5	103.6
End Time (s)	0	68.6	103.6	8.5	68.6	150.5
Yield/Force Off (s)	156	61.9	95.7	4.5	61.9	142.6
Yield/Force Off 170(s)	156	43.9	95.7	4.5	43.9	118.6
Local Start Time (s)	150.5	0	68.6	150.5	8.5	103.6
Local Yield (s)	156	61.9	95.7	4.5	61.9	142.6
Local Yield 170(s)	156	43.9	95.7	4.5	43.9	118.6

Intersection Summary

Cycle Length	160
Control Type	Actuated-Coordinated
Natural Cycle	150
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green	
































Splits and Phases: 2: Bramalea Road & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
2: Bramalea Road & Derry Road E (RR 5)

No Alstep, Split Phasing (2031 Horizon)

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	  		 	  							 
Traffic Volume (veh/h)	284	1748	68	95	1636	413	291	161	426	342	37	254
Future Volume (veh/h)	284	1748	68	95	1636	413	291	161	426	342	37	254
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.94	1.00		1.00	1.00		0.85	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.99
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1470	1678	1574	1737	1722	1625	1737	1811	1722	1737	1811	1604
Adj Flow Rate, veh/h	284	1748	68	95	1636	0	291	161	426	368	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	29	15	22	11	12	14	11	6	12	11	6	20
Cap, veh/h	238	1844	488	110	1644		280	307	210	754	0	
Arrive On Green	0.09	0.40	0.40	0.03	0.35	0.00	0.17	0.17	0.17	0.23	0.00	0.00
Sat Flow, veh/h	2716	4580	1211	3209	4701	1327	1654	1811	1240	3309	0	1343
Grp Volume(v), veh/h	284	1748	68	95	1636	0	291	161	426	368	0	0
Grp Sat Flow(s),veh/h/ln	1358	1527	1211	1605	1567	1327	1654	1811	1240	1654	0	1343
Q Serve(g_s), s	14.0	59.0	5.7	4.7	55.5	0.0	27.1	13.0	27.1	15.5	0.0	0.0
Cycle Q Clear(g_c), s	14.0	59.0	5.7	4.7	55.5	0.0	27.1	13.0	27.1	15.5	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	238	1844	488	110	1644		280	307	210	754	0	
V/C Ratio(X)	1.19	0.95	0.14	0.86	1.00		1.04	0.52	2.03	0.49	0.00	
Avail Cap(c_a), veh/h	238	1844	488	110	1644		280	307	210	806	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	73.0	46.2	30.2	76.9	51.9	0.0	66.4	60.6	66.4	53.7	0.0	0.0
Incr Delay (d2), s/veh	121.3	11.8	0.6	45.7	21.1	0.0	64.2	3.1	479.3	1.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	14.9	33.9	3.4	4.9	34.5	0.0	24.3	10.8	59.1	11.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	194.3	57.9	30.8	122.6	73.0	0.0	130.6	63.7	545.7	54.7	0.0	0.0
LnGrp LOS	F	E	C	F	E		F	E	F	D	A	
Approach Vol, veh/h		2100			1731	A		878			368	A
Approach Delay, s/veh		75.5			75.7			319.8			54.7	
Approach LOS		E			E			F			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.5	71.1		35.0	18.0	62.6		44.4				
Change Period (Y+Rc), s	4.0	6.7		7.9	4.0	6.7		7.9				
Max Green Setting (Gmax), s	5.5	61.9		27.1	14.0	53.4		39.0				
Max Q Clear Time (g_c+I1), s	6.7	61.0		29.1	16.0	57.5		17.5				
Green Ext Time (p_c), s	0.0	0.9		0.0	0.0	0.0		4.1				

Intersection Summary

HCM 6th Ctrl Delay	116.3
HCM 6th LOS	F

Notes

User approved volume balancing among the lanes for turning movement.
Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	23	0	0	6	0	76	0	779	3	52	133	15
Future Vol, veh/h	23	0	0	6	0	76	0	779	3	52	133	15
Conflicting Peds, #/hr	2	0	0	0	0	2	145	0	0	0	0	145
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	6	0	0	20	0	5	0	16	50	0	24	25
Mvmt Flow	23	0	0	6	0	76	0	779	3	52	133	15

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	782	1172	219	952	1178	393	293	0	0	782	0	0
Stage 1	390	390	-	781	781	-	-	-	-	-	-	-
Stage 2	392	782	-	171	397	-	-	-	-	-	-	-
Critical Hdwy	7.62	6.5	6.9	7.9	6.5	7	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.62	5.5	-	6.9	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.62	5.5	-	6.9	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.56	4	3.3	3.7	4	3.35	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	277	194	791	189	192	598	1280	-	-	845	-	-
Stage 1	595	611	-	317	408	-	-	-	-	-	-	-
Stage 2	593	408	-	764	607	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	198	157	685	179	155	597	1109	-	-	845	-	-
Mov Cap-2 Maneuver	198	157	-	179	155	-	-	-	-	-	-	-
Stage 1	515	494	-	317	408	-	-	-	-	-	-	-
Stage 2	516	408	-	713	490	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	25.6		13.4		0		2.6	
HCM LOS	D		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1109	-	-	198	510	845	-
HCM Lane V/C Ratio	-	-	-	0.116	0.161	0.062	-
HCM Control Delay (s)	0	-	-	25.6	13.4	9.5	0.2
HCM Lane LOS	A	-	-	D	B	A	A
HCM 95th %tile Q(veh)	0	-	-	0.4	0.6	0.2	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	0	0	461	132	0
Future Vol, veh/h	0	0	0	461	132	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	29	44	0
Mvmt Flow	0	0	0	461	132	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	231	231	-	0
Stage 1	231	231	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	762	672	-	-
Stage 1	812	717	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	762	0	-	-
Mov Cap-2 Maneuver	762	0	-	-
Stage 1	812	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	98	28	0	414	0	42	1	4	1	4	5
Future Vol, veh/h	6	98	28	0	414	0	42	1	4	1	4	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	100	41	28	0	23	0	25	100	0	0	100	100
Mvmt Flow	6	98	28	0	414	0	42	1	4	1	4	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	414	0	0	126	0	0	543	538	112	541	552	414
Stage 1	-	-	-	-	-	-	124	124	-	414	414	-
Stage 2	-	-	-	-	-	-	419	414	-	127	138	-
Critical Hdwy	5.1	-	-	4.1	-	-	7.35	7.5	6.2	7.1	7.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Follow-up Hdwy	3.1	-	-	2.2	-	-	3.725	4.9	3.3	3.5	4.9	4.2
Pot Cap-1 Maneuver	768	-	-	1473	-	-	417	338	947	455	331	472
Stage 1	-	-	-	-	-	-	827	638	-	620	455	-
Stage 2	-	-	-	-	-	-	569	455	-	882	628	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	768	-	-	1473	-	-	406	335	947	449	328	472
Mov Cap-2 Maneuver	-	-	-	-	-	-	406	335	-	449	328	-
Stage 1	-	-	-	-	-	-	820	633	-	615	455	-
Stage 2	-	-	-	-	-	-	558	455	-	870	623	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0	14.5	14.2
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	425	768	-	-	1473	-	-	400
HCM Lane V/C Ratio	0.111	0.008	-	-	-	-	-	0.025
HCM Control Delay (s)	14.5	9.7	0	-	0	-	-	14.2
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	0.1

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	18	764	3	23	116
Future Vol, veh/h	0	18	764	3	23	116
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	50	5	0	67	2
Mvmt Flow	0	18	764	3	23	116

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	870	384	0	0	767	0
Stage 1	766	-	-	-	-	-
Stage 2	104	-	-	-	-	-
Critical Hdwy	6.8	7.9	-	-	5.44	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.8	-	-	2.87	-
Pot Cap-1 Maneuver	295	496	-	-	526	-
Stage 1	425	-	-	-	-	-
Stage 2	915	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	281	496	-	-	526	-
Mov Cap-2 Maneuver	281	-	-	-	-	-
Stage 1	425	-	-	-	-	-
Stage 2	872	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.5	0	2.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	-	496	526
HCM Lane V/C Ratio	-	-	0.036	0.044
HCM Control Delay (s)	-	-	0	12.5
HCM Lane LOS	-	-	A	B
HCM 95th %tile Q(veh)	-	-	0.1	0.1

Intersection						
Int Delay, s/veh	21.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↙	↗		↖	↗	
Traffic Vol, veh/h	654	0	0	113	63	53
Future Vol, veh/h	654	0	0	113	63	53
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	654	0	0	113	63	53

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	203	58	116	0	0
Stage 1	90	-	-	-	-
Stage 2	113	-	-	-	-
Critical Hdwy	6.63	6.93	4.13	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-
Pot Cap-1 Maneuver	776	996	1472	-	-
Stage 1	924	-	-	-	-
Stage 2	911	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	776	996	1472	-	-
Mov Cap-2 Maneuver	776	-	-	-	-
Stage 1	924	-	-	-	-
Stage 2	911	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	29.1	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1472	-	776	-	-	-
HCM Lane V/C Ratio	-	-	0.843	-	-	-
HCM Control Delay (s)	0	-	29.1	0	-	-
HCM Lane LOS	A	-	D	A	-	-
HCM 95th %tile Q(veh)	0	-	9.8	-	-	-

Intersection						
Int Delay, s/veh	2.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	54	0	0	59	57	6
Future Vol, veh/h	54	0	0	59	57	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	54	0	0	59	57	6

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	119	60	63	0	0
Stage 1	60	-	-	-	-
Stage 2	59	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	877	1005	1540	-	-
Stage 1	963	-	-	-	-
Stage 2	964	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	877	1005	1540	-	-
Mov Cap-2 Maneuver	877	-	-	-	-
Stage 1	963	-	-	-	-
Stage 2	964	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1540	-	877	-	-
HCM Lane V/C Ratio	-	-	0.062	-	-
HCM Control Delay (s)	0	-	9.4	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

APPENDIX I-2

Alternative Evaluation
No Alstep, Unsplit Phasing

Timing Report, Sorted By Phase
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

No Alstep, Unsplit Phasing (2031 Horizon)
 AM Peak Hour

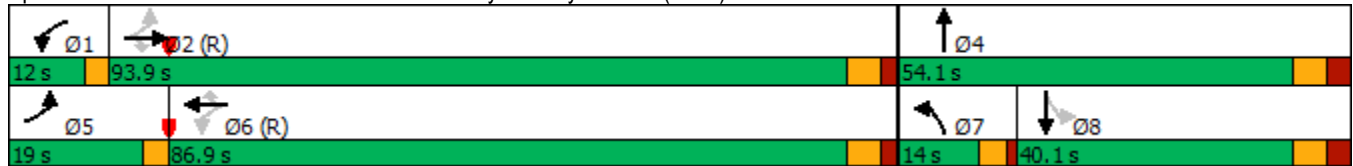


Phase Number	1	2	4	5	6	7	8
Movement	WBL	EBTL	NBT	EBL	WBTL	NBL	SBTL
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize						Yes	Yes
Recall Mode	None	C-Max	None	None	C-Max	None	None
Maximum Split (s)	12	93.9	54.1	19	86.9	14	40.1
Maximum Split (%)	7.5%	58.7%	33.8%	11.9%	54.3%	8.8%	25.1%
Minimum Split (s)	8	29.2	40.1	8	29.2	9.5	40.1
Yellow Time (s)	3	4.2	4	3	4.2	3.5	4
All-Red Time (s)	0	2	3.1	0	2	1	3.1
Minimum Initial (s)	5	12	8	5	12	5	8
Vehicle Extension (s)	3	5	5	3	5	3	5
Minimum Gap (s)	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0
Walk Time (s)		9	13		9		13
Flash Dont Walk (s)		14	20		14		20
Dual Entry	No	Yes	Yes	No	Yes	No	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	141	153	86.9	141	0	86.9	100.9
End Time (s)	153	86.9	141	0	86.9	100.9	141
Yield/Force Off (s)	150	80.7	133.9	157	80.7	96.4	133.9
Yield/Force Off 170(s)	150	66.7	113.9	157	66.7	96.4	113.9
Local Start Time (s)	141	153	86.9	141	0	86.9	100.9
Local Yield (s)	150	80.7	133.9	157	80.7	96.4	133.9
Local Yield 170(s)	150	66.7	113.9	157	66.7	96.4	113.9

Intersection Summary




























Cycle Length	160
Control Type	Actuated-Coordinated
Natural Cycle	120
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 1: Menkes Drive/Telford Way & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

No Alstep, Unsplit Phasing (2031 Horizon)
 AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  		 					
Traffic Volume (veh/h)	152	2312	456	99	1411	53	94	4	20	39	15	33
Future Volume (veh/h)	152	2312	456	99	1411	53	94	4	20	39	15	33
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	0.96		0.96
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1730	1737	1640	1628	1678	1519	1159	435	1159	1707	1976	1618
Adj Flow Rate, veh/h	152	2312	0	99	1411	0	94	4	20	39	15	33
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	4	11	0	16	15	14	50	100	50	13	0	19
Cap, veh/h	285	3046		141	2888		118	14	68	212	73	161
Arrive On Green	0.05	0.64	0.00	0.04	0.63	0.00	0.06	0.22	0.22	0.14	0.14	0.14
Sat Flow, veh/h	1648	4742	1362	1550	4580	1262	2141	62	308	1218	534	1174
Grp Volume(v), veh/h	152	2312	0	99	1411	0	94	0	24	39	0	48
Grp Sat Flow(s),veh/h/ln	1648	1581	1362	1550	1527	1262	1071	0	370	1218	0	1708
Q Serve(g_s), s	5.1	54.4	0.0	3.6	26.3	0.0	6.9	0.0	8.7	4.6	0.0	4.0
Cycle Q Clear(g_c), s	5.1	54.4	0.0	3.6	26.3	0.0	6.9	0.0	8.7	4.6	0.0	4.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.83	1.00		0.69
Lane Grp Cap(c), veh/h	285	3046		141	2888		118	0	82	212	0	234
V/C Ratio(X)	0.53	0.76		0.70	0.49		0.80	0.00	0.29	0.18	0.00	0.21
Avail Cap(c_a), veh/h	372	3046		173	2888		127	0	109	296	0	352
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.2	20.0	0.0	31.6	15.8	0.0	74.7	0.0	52.0	61.6	0.0	61.3
Incr Delay (d2), s/veh	1.5	1.8	0.0	9.3	0.6	0.0	27.1	0.0	4.2	0.9	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	4.0	29.8	0.0	5.4	15.5	0.0	4.4	0.0	1.7	2.8	0.0	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.8	21.8	0.0	40.9	16.4	0.0	101.8	0.0	56.2	62.4	0.0	62.2
LnGrp LOS	B	C		D	B		F	A	E	E	A	E
Approach Vol, veh/h		2464	A		1510	A		118				87
Approach Delay, s/veh		21.4			18.0			92.5				62.3
Approach LOS		C			B			F				E
Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.7	109.0		42.3	10.6	107.1	13.3	29.0				
Change Period (Y+Rc), s	3.0	6.2		7.1	3.0	6.2	4.5	7.1				
Max Green Setting (Gmax), s	9.0	87.7		47.0	16.0	80.7	9.5	33.0				
Max Q Clear Time (g_c+I1), s	5.6	57.4		10.7	7.1	29.3	8.9	6.6				
Green Ext Time (p_c), s	0.1	30.1		0.4	0.4	44.5	0.0	1.3				

Intersection Summary

HCM 6th Ctrl Delay	23.0
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Timing Report, Sorted By Phase
2: Bramalea Road & Derry Road E (RR 5)

No Alstep, Unsplit Phasing (2031 Horizon)

AM Peak Hour

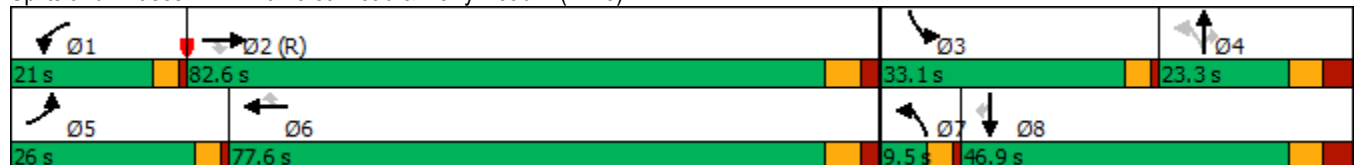


Phase Number	1	2	3	4	5	6	7	8
Movement	WBL	EBT	SBL	NBTL	EBL	WBT	NBL	SBT
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize	Yes	Yes	Yes	Yes			Yes	Yes
Recall Mode	None	C-Max	None	None	None	None	None	None
Maximum Split (s)	21	82.6	33.1	23.3	26	77.6	9.5	46.9
Maximum Split (%)	13.1%	51.6%	20.7%	14.6%	16.3%	48.5%	5.9%	29.3%
Minimum Split (s)	9.5	35.7	9.5	15.9	9	35.7	9.5	46.9
Yellow Time (s)	3	4.2	3	4	3	4.2	3	4
All-Red Time (s)	1	2.5	1	3.9	1	2.5	1	3.9
Minimum Initial (s)	5	12	5	8	5	12	5	10
Vehicle Extension (s)	3	5	3	5	3	5	3	5
Minimum Gap (s)	3	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0	0
Walk Time (s)		11				11		15
Flash Dont Walk (s)		18				18		24
Dual Entry	No	Yes	No	Yes	No	Yes	No	No
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	139	0	82.6	115.7	139	5	82.6	92.1
End Time (s)	0	82.6	115.7	139	5	82.6	92.1	139
Yield/Force Off (s)	156	75.9	111.7	131.1	1	75.9	88.1	131.1
Yield/Force Off 170(s)	156	57.9	111.7	131.1	1	57.9	88.1	107.1
Local Start Time (s)	139	0	82.6	115.7	139	5	82.6	92.1
Local Yield (s)	156	75.9	111.7	131.1	1	75.9	88.1	131.1
Local Yield 170(s)	156	57.9	111.7	131.1	1	57.9	88.1	107.1

Intersection Summary

































Cycle Length 160
Control Type Actuated-Coordinated
Natural Cycle 135
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green

Splits and Phases: 2: Bramalea Road & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
2: Bramalea Road & Derry Road E (RR 5)

No Alstep, Unsplit Phasing (2031 Horizon)
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	  		  	  					 		
Traffic Volume (veh/h)	256	1930	93	268	1248	259	19	22	61	388	121	271
Future Volume (veh/h)	256	1930	93	268	1248	259	19	22	61	388	121	271
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	0.82		0.79	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.98
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1604	1737	1781	1826	1693	1625	1307	1411	1248	1722	1870	1870
Adj Flow Rate, veh/h	256	1930	93	268	1248	0	19	22	61	388	121	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	20	11	8	5	14	14	40	33	44	12	2	2
Cap, veh/h	303	2557	766	314	2449		129	120	71	449	390	
Arrive On Green	0.10	0.54	0.54	0.09	0.53	0.00	0.02	0.09	0.09	0.14	0.21	0.00
Sat Flow, veh/h	2963	4742	1420	3374	4621	1322	1245	1411	835	3182	1870	1560
Grp Volume(v), veh/h	256	1930	93	268	1248	0	19	22	61	388	121	0
Grp Sat Flow(s),veh/h/ln	1481	1581	1420	1687	1540	1322	1245	1411	835	1591	1870	1560
Q Serve(g_s), s	13.6	50.6	5.2	12.5	27.8	0.0	2.2	2.3	11.5	19.1	8.8	0.0
Cycle Q Clear(g_c), s	13.6	50.6	5.2	12.5	27.8	0.0	2.2	2.3	11.5	19.1	8.8	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	303	2557	766	314	2449		129	120	71	449	390	
V/C Ratio(X)	0.85	0.75	0.12	0.85	0.51		0.15	0.18	0.86	0.86	0.31	
Avail Cap(c_a), veh/h	407	2557	766	358	2449		150	136	80	579	456	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	70.6	28.6	18.2	71.5	24.2	0.0	65.3	68.0	72.2	67.2	53.6	0.0
Incr Delay (d2), s/veh	11.6	2.1	0.3	16.3	0.4	0.0	0.5	1.5	58.5	10.5	1.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	9.8	28.6	3.6	10.5	16.6	0.0	1.4	1.7	6.8	13.7	8.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	82.2	30.8	18.5	87.8	24.6	0.0	65.9	69.5	130.8	77.7	54.5	0.0
LnGrp LOS	F	C	B	F	C		E	E	F	E	D	
Approach Vol, veh/h		2279			1516	A		102			509	A
Approach Delay, s/veh		36.0			35.7			105.5			72.2	
Approach LOS		D			D			F			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	18.9	93.0	26.6	21.6	20.3	91.5	6.9	41.3				
Change Period (Y+Rc), s	4.0	6.7	4.0	7.9	4.0	6.7	4.0	7.9				
Max Green Setting (Gmax), s	17.0	75.9	29.1	15.4	22.0	70.9	5.5	39.0				
Max Q Clear Time (g_c+I1), s	14.5	53.6	21.1	13.5	15.6	30.8	4.2	10.8				
Green Ext Time (p_c), s	0.4	22.0	1.5	0.1	0.8	33.5	0.0	2.5				

Intersection Summary

HCM 6th Ctrl Delay	41.7
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.
Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC
3: Bramalea Road & Fed-Ex Employee Entrance

No Alstep, Unsplit Phasing (2031 Horizon)
AM Peak Hour

Intersection												
Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	0	0	3	0	14	0	84	0	76	387	19
Future Vol, veh/h	4	0	0	3	0	14	0	84	0	76	387	19
Conflicting Peds, #/hr	1	0	0	0	0	1	91	0	0	0	0	91
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	50	0	1	0	67	2	0
Mvmt Flow	4	0	0	3	0	14	0	84	0	76	387	19

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	683	724	294	430	733	43	497	0	0	84	0	0
Stage 1	640	640	-	84	84	-	-	-	-	-	-	-
Stage 2	43	84	-	346	649	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	7.9	4.1	-	-	5.44	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.8	2.2	-	-	2.87	-	-
Pot Cap-1 Maneuver	339	354	708	514	350	882	1077	-	-	1142	-	-
Stage 1	435	473	-	920	829	-	-	-	-	-	-	-
Stage 2	972	829	-	649	469	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	287	299	653	480	295	881	994	-	-	1142	-	-
Mov Cap-2 Maneuver	287	299	-	480	295	-	-	-	-	-	-	-
Stage 1	402	399	-	920	829	-	-	-	-	-	-	-
Stage 2	955	829	-	593	396	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.7	9.8	0	1.6
HCM LOS	C	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	994	-	-	287	768	1142	-
HCM Lane V/C Ratio	-	-	-	0.014	0.022	0.067	-
HCM Control Delay (s)	0	-	-	17.7	9.8	8.4	0.3
HCM Lane LOS	A	-	-	C	A	A	A
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0.2	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	0	0	100	525	0
Future Vol, veh/h	0	0	0	100	525	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	78	11	0
Mvmt Flow	0	0	0	100	525	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	50	50	-	0
Stage 1	50	50	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	964	845	-	-
Stage 1	978	857	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	964	0	-	-
Mov Cap-2 Maneuver	964	0	-	-
Stage 1	978	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	0.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	456	64	0	86	0	13	1	1	0	0	1
Future Vol, veh/h	5	456	64	0	86	0	13	1	1	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	75	5	0	0	79	0	75	100	0	0	0	100
Mvmt Flow	5	456	64	0	86	0	13	1	1	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	86	0	0	520	0	0	585	584	488	585	616	86
Stage 1	-	-	-	-	-	-	498	498	-	86	86	-
Stage 2	-	-	-	-	-	-	87	86	-	499	530	-
Critical Hdwy	4.85	-	-	4.1	-	-	7.85	7.5	6.2	7.1	6.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Follow-up Hdwy	2.875	-	-	2.2	-	-	4.175	4.9	3.3	3.5	4	4.2
Pot Cap-1 Maneuver	1154	-	-	1056	-	-	332	315	584	425	409	759
Stage 1	-	-	-	-	-	-	440	412	-	927	827	-
Stage 2	-	-	-	-	-	-	768	667	-	557	530	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1154	-	-	1056	-	-	330	313	584	421	407	759
Mov Cap-2 Maneuver	-	-	-	-	-	-	330	313	-	421	407	-
Stage 1	-	-	-	-	-	-	437	410	-	921	827	-
Stage 2	-	-	-	-	-	-	767	667	-	551	527	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	16.1	9.7
HCM LOS			C	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	339	1154	-	-	1056	-	-	759
HCM Lane V/C Ratio	0.044	0.004	-	-	-	-	-	0.001
HCM Control Delay (s)	16.1	8.1	0	-	0	-	-	9.7
HCM Lane LOS	C	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙	↗	↕			↕
Traffic Vol, veh/h	0	11	73	0	15	375
Future Vol, veh/h	0	11	73	0	15	375
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	100	50	0	75	0
Mvmt Flow	0	11	73	0	15	375

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	291	37	0	0	73
Stage 1	73	-	-	-	-
Stage 2	218	-	-	-	-
Critical Hdwy	6.8	8.9	-	-	5.6
Critical Hdwy Stg 1	5.8	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-
Follow-up Hdwy	3.5	4.3	-	-	2.95
Pot Cap-1 Maneuver	682	781	-	-	1122
Stage 1	947	-	-	-	-
Stage 2	803	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	670	781	-	-	1122
Mov Cap-2 Maneuver	670	-	-	-	-
Stage 1	947	-	-	-	-
Stage 2	789	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.7	0	0.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	-	781	1122
HCM Lane V/C Ratio	-	-	0.014	0.013
HCM Control Delay (s)	-	-	0	9.7
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

Intersection						
Int Delay, s/veh	1.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↖	↗		↖	↗	
Traffic Vol, veh/h	63	0	0	10	44	331
Future Vol, veh/h	63	0	0	10	44	331
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	63	0	0	10	44	331

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	220	188	375	0	-	0
Stage 1	210	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.63	6.93	4.13	-	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	758	823	1182	-	-	-
Stage 1	805	-	-	-	-	-
Stage 2	1013	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	758	823	1182	-	-	-
Mov Cap-2 Maneuver	758	-	-	-	-	-
Stage 1	805	-	-	-	-	-
Stage 2	1013	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1182	-	758	-	-	-
HCM Lane V/C Ratio	-	-	0.083	-	-	-
HCM Control Delay (s)	0	-	10.2	0	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-	-

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	7	0	0	3	3	41
Future Vol, veh/h	7	0	0	3	3	41
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	0	0	3	3	41

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	27	24	44	0	0
Stage 1	24	-	-	-	-
Stage 2	3	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	988	1052	1564	-	-
Stage 1	999	-	-	-	-
Stage 2	1020	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	988	1052	1564	-	-
Mov Cap-2 Maneuver	988	-	-	-	-
Stage 1	999	-	-	-	-
Stage 2	1020	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.7	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1564	-	988	-	-
HCM Lane V/C Ratio	-	-	0.007	-	-
HCM Control Delay (s)	0	-	8.7	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Timing Report, Sorted By Phase
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

No Alstep, Unsplit Phasing (2031 Horizon)
 PM Peak Hour

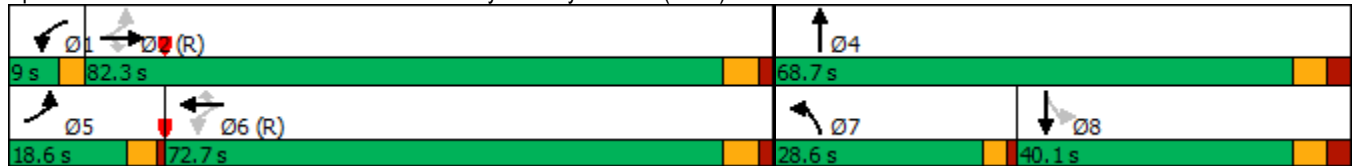


Phase Number	1	2	4	5	6	7	8
Movement	WBL	EBTL	NBT	EBL	WBTL	NBL	SBTL
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize				Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	None	C-Max	None	None
Maximum Split (s)	9	82.3	68.7	18.6	72.7	28.6	40.1
Maximum Split (%)	5.6%	51.4%	42.9%	11.6%	45.4%	17.9%	25.1%
Minimum Split (s)	8	29.2	40.1	9.5	29.2	9.5	40.1
Yellow Time (s)	3	4.2	4	3.5	4.2	3	4
All-Red Time (s)	0	2	3.1	1	2	1	3.1
Minimum Initial (s)	5	12	8	5	12	5	8
Vehicle Extension (s)	3	5	5	3	5	3	5
Minimum Gap (s)	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0
Walk Time (s)		9	13		9		13
Flash Dont Walk (s)		14	20		14		20
Dual Entry	No	Yes	Yes	No	Yes	No	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	141.4	150.4	72.7	141.4	0	72.7	101.3
End Time (s)	150.4	72.7	141.4	0	72.7	101.3	141.4
Yield/Force Off (s)	147.4	66.5	134.3	155.5	66.5	97.3	134.3
Yield/Force Off 170(s)	147.4	52.5	114.3	155.5	52.5	97.3	114.3
Local Start Time (s)	141.4	150.4	72.7	141.4	0	72.7	101.3
Local Yield (s)	147.4	66.5	134.3	155.5	66.5	97.3	134.3
Local Yield 170(s)	147.4	52.5	114.3	155.5	52.5	97.3	114.3

Intersection Summary

Cycle Length	160
Control Type	Actuated-Coordinated
Natural Cycle	150
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	






























Splits and Phases: 1: Menkes Drive/Telford Way & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

No Alstep, Unsplit Phasing (2031 Horizon)

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  		 					
Traffic Volume (veh/h)	166	1883	111	66	2002	68	476	39	74	94	20	152
Future Volume (veh/h)	166	1883	111	66	2002	68	476	39	74	94	20	152
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	0.99		0.98
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1549	1633	1410	1526	1722	1413	1737	1483	1752	1767	1498	1693
Adj Flow Rate, veh/h	166	1883	0	66	2002	0	476	39	74	94	20	152
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	17	18	18	23	12	22	11	32	10	9	31	14
Cap, veh/h	181	2264		125	2094		493	162	307	255	26	198
Arrive On Green	0.09	0.51	0.00	0.04	0.45	0.00	0.15	0.36	0.36	0.18	0.18	0.18
Sat Flow, veh/h	1475	4459	1171	1454	4701	1173	3209	455	864	1191	148	1125
Grp Volume(v), veh/h	166	1883	0	66	2002	0	476	0	113	94	0	172
Grp Sat Flow(s),veh/h/ln	1475	1486	1171	1454	1567	1173	1605	0	1319	1191	0	1273
Q Serve(g_s), s	12.3	57.6	0.0	4.0	65.8	0.0	23.6	0.0	9.7	11.3	0.0	20.6
Cycle Q Clear(g_c), s	12.3	57.6	0.0	4.0	65.8	0.0	23.6	0.0	9.7	11.3	0.0	20.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.65	1.00		0.88
Lane Grp Cap(c), veh/h	181	2264		125	2094		493	0	468	255	0	225
V/C Ratio(X)	0.92	0.83		0.53	0.96		0.96	0.00	0.24	0.37	0.00	0.77
Avail Cap(c_a), veh/h	181	2264		129	2094		493	0	508	291	0	263
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	47.8	33.6	0.0	33.3	42.9	0.0	67.3	0.0	36.4	58.9	0.0	62.7
Incr Delay (d2), s/veh	43.9	3.7	0.0	3.7	11.7	0.0	31.5	0.0	0.6	1.9	0.0	14.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	14.2	30.7	0.0	2.9	38.0	0.0	18.1	0.0	6.2	6.8	0.0	12.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	91.6	37.3	0.0	37.0	54.6	0.0	98.8	0.0	36.9	60.8	0.0	77.2
LnGrp LOS	F	D		D	D		F	A	D	E	A	E
Approach Vol, veh/h		2049	A		2068	A		589			266	
Approach Delay, s/veh		41.7			54.0			86.9			71.4	
Approach LOS		D			D			F			E	
Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.6	87.4		63.9	18.6	77.5	28.6	35.3				
Change Period (Y+Rc), s	3.0	6.2		7.1	4.5	6.2	4.0	7.1				
Max Green Setting (Gmax), s	6.0	76.1		61.6	14.1	66.5	24.6	33.0				
Max Q Clear Time (g_c+I1), s	6.0	59.6		11.7	14.3	67.8	25.6	22.6				
Green Ext Time (p_c), s	0.0	16.3		3.2	0.0	0.0	0.0	2.9				

Intersection Summary

HCM 6th Ctrl Delay	53.8
HCM 6th LOS	D

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Timing Report, Sorted By Phase
2: Bramalea Road & Derry Road E (RR 5)

No Alstep, Unsplit Phasing (2031 Horizon)

PM Peak Hour

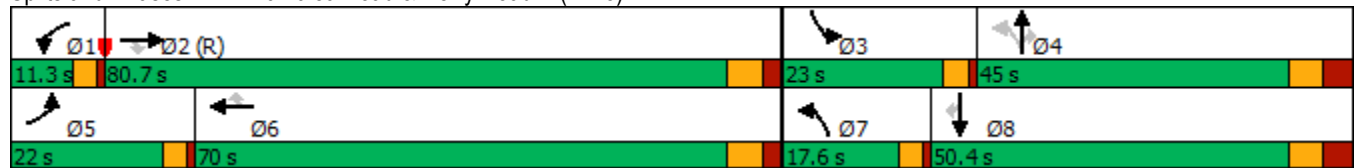


Phase Number	1	2	3	4	5	6	7	8
Movement	WBL	EBT	SBL	NBTL	EBL	WBT	NBL	SBT
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize	Yes	Yes	Yes	Yes			Yes	Yes
Recall Mode	None	C-Max	None	None	None	None	None	None
Maximum Split (s)	11.3	80.7	23	45	22	70	17.6	50.4
Maximum Split (%)	7.1%	50.4%	14.4%	28.1%	13.8%	43.8%	11.0%	31.5%
Minimum Split (s)	9.5	35.7	9.5	15.9	9	35.7	9.5	46.9
Yellow Time (s)	3	4.2	3	4	3	4.2	3	4
All-Red Time (s)	1	2.5	1	3.9	1	2.5	1	3.9
Minimum Initial (s)	5	12	5	8	5	12	5	10
Vehicle Extension (s)	3	5	3	5	3	5	3	5
Minimum Gap (s)	3	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0	0
Walk Time (s)		11				11		15
Flash Dont Walk (s)		18				18		24
Dual Entry	No	Yes	No	Yes	No	Yes	No	No
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	148.7	0	80.7	103.7	148.7	10.7	80.7	98.3
End Time (s)	0	80.7	103.7	148.7	10.7	80.7	98.3	148.7
Yield/Force Off (s)	156	74	99.7	140.8	6.7	74	94.3	140.8
Yield/Force Off 170(s)	156	56	99.7	140.8	6.7	56	94.3	116.8
Local Start Time (s)	148.7	0	80.7	103.7	148.7	10.7	80.7	98.3
Local Yield (s)	156	74	99.7	140.8	6.7	74	94.3	140.8
Local Yield 170(s)	156	56	99.7	140.8	6.7	56	94.3	116.8

Intersection Summary
































Cycle Length 160
Control Type Actuated-Coordinated
Natural Cycle 125
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green

Splits and Phases: 2: Bramalea Road & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
2: Bramalea Road & Derry Road E (RR 5)

No Alstep, Unsplit Phasing (2031 Horizon)
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	  		 	  					 		
Traffic Volume (veh/h)	284	1748	68	95	1636	413	291	161	426	342	37	254
Future Volume (veh/h)	284	1748	68	95	1636	413	291	161	426	342	37	254
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		1.00	0.90		0.89	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.99
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1470	1678	1574	1737	1722	1625	1737	1811	1722	1737	1811	1604
Adj Flow Rate, veh/h	284	1748	68	95	1636	0	291	161	426	342	37	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	29	15	22	11	12	14	11	6	12	11	6	20
Cap, veh/h	306	2142	571	132	1864		450	420	301	379	480	
Arrive On Green	0.11	0.47	0.47	0.04	0.40	0.00	0.09	0.23	0.23	0.12	0.26	0.00
Sat Flow, veh/h	2716	4580	1222	3209	4701	1327	1654	1811	1299	3209	1811	1343
Grp Volume(v), veh/h	284	1748	68	95	1636	0	291	161	426	342	37	0
Grp Sat Flow(s),veh/h/ln	1358	1527	1222	1605	1567	1327	1654	1811	1299	1605	1811	1343
Q Serve(g_s), s	16.6	52.6	5.0	4.7	51.5	0.0	13.6	12.0	37.1	16.8	2.5	0.0
Cycle Q Clear(g_c), s	16.6	52.6	5.0	4.7	51.5	0.0	13.6	12.0	37.1	16.8	2.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	306	2142	571	132	1864		450	420	301	379	480	
V/C Ratio(X)	0.93	0.82	0.12	0.72	0.88		0.65	0.38	1.41	0.90	0.08	
Avail Cap(c_a), veh/h	306	2142	571	146	1864		450	420	301	381	481	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	70.4	36.7	24.0	75.8	44.7	0.0	46.1	51.8	61.4	69.7	44.1	0.0
Incr Delay (d2), s/veh	33.5	3.6	0.4	14.0	5.5	0.0	3.2	1.2	205.0	24.1	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	11.9	29.2	3.0	4.1	29.8	0.0	8.5	10.0	46.1	13.3	2.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	103.9	40.2	24.4	89.7	50.2	0.0	49.3	53.0	266.5	93.7	44.3	0.0
LnGrp LOS	F	D	C	F	D		D	D	F	F	D	
Approach Vol, veh/h		2100			1731	A		878			379	A
Approach Delay, s/veh		48.3			52.3			155.4			88.9	
Approach LOS		D			D			F			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.6	81.5	22.9	45.0	22.0	70.1	17.6	50.3				
Change Period (Y+Rc), s	4.0	6.7	4.0	7.9	4.0	6.7	4.0	7.9				
Max Green Setting (Gmax), s	7.3	74.0	19.0	37.1	18.0	63.3	13.6	42.5				
Max Q Clear Time (g_c+I1), s	6.7	54.6	18.8	39.1	18.6	53.5	15.6	4.5				
Green Ext Time (p_c), s	0.0	19.0	0.0	0.0	0.0	9.5	0.0	0.6				

Intersection Summary

HCM 6th Ctrl Delay	71.2
HCM 6th LOS	E

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC
 3: Bramalea Road & Fed-Ex Employee Entrance

No Alstep, Unsplit Phasing (2031 Horizon)
 PM Peak Hour

Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	23	0	0	6	0	76	0	779	3	52	133	15
Future Vol, veh/h	23	0	0	6	0	76	0	779	3	52	133	15
Conflicting Peds, #/hr	2	0	0	0	0	2	145	0	0	0	0	145
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	6	0	0	20	0	5	0	16	50	0	24	25
Mvmt Flow	23	0	0	6	0	76	0	779	3	52	133	15

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	782	1172	219	952	1178	393	293	0	0	782	0	0
Stage 1	390	390	-	781	781	-	-	-	-	-	-	-
Stage 2	392	782	-	171	397	-	-	-	-	-	-	-
Critical Hdwy	7.62	6.5	6.9	7.9	6.5	7	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.62	5.5	-	6.9	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.62	5.5	-	6.9	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.56	4	3.3	3.7	4	3.35	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	277	194	791	189	192	598	1280	-	-	845	-	-
Stage 1	595	611	-	317	408	-	-	-	-	-	-	-
Stage 2	593	408	-	764	607	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	198	157	685	179	155	597	1109	-	-	845	-	-
Mov Cap-2 Maneuver	198	157	-	179	155	-	-	-	-	-	-	-
Stage 1	515	494	-	317	408	-	-	-	-	-	-	-
Stage 2	516	408	-	713	490	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	25.6		13.4		0		2.6	
HCM LOS	D		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1109	-	-	198	510	845	-	-
HCM Lane V/C Ratio	-	-	-	0.116	0.161	0.062	-	-
HCM Control Delay (s)	0	-	-	25.6	13.4	9.5	0.2	-
HCM Lane LOS	A	-	-	D	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0.6	0.2	-	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	0	0	461	132	0
Future Vol, veh/h	0	0	0	461	132	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	29	44	0
Mvmt Flow	0	0	0	461	132	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	231	231	-	0
Stage 1	231	231	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	762	672	-	-
Stage 1	812	717	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	762	0	-	-
Mov Cap-2 Maneuver	762	0	-	-
Stage 1	812	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	98	28	0	414	0	42	1	4	1	4	5
Future Vol, veh/h	6	98	28	0	414	0	42	1	4	1	4	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	100	41	28	0	23	0	25	100	0	0	100	100
Mvmt Flow	6	98	28	0	414	0	42	1	4	1	4	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	414	0	0	126	0	0	543	538	112	541	552	414
Stage 1	-	-	-	-	-	-	124	124	-	414	414	-
Stage 2	-	-	-	-	-	-	419	414	-	127	138	-
Critical Hdwy	5.1	-	-	4.1	-	-	7.35	7.5	6.2	7.1	7.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Follow-up Hdwy	3.1	-	-	2.2	-	-	3.725	4.9	3.3	3.5	4.9	4.2
Pot Cap-1 Maneuver	768	-	-	1473	-	-	417	338	947	455	331	472
Stage 1	-	-	-	-	-	-	827	638	-	620	455	-
Stage 2	-	-	-	-	-	-	569	455	-	882	628	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	768	-	-	1473	-	-	406	335	947	449	328	472
Mov Cap-2 Maneuver	-	-	-	-	-	-	406	335	-	449	328	-
Stage 1	-	-	-	-	-	-	820	633	-	615	455	-
Stage 2	-	-	-	-	-	-	558	455	-	870	623	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0			14.5			14.2		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	425	768	-	-	1473	-	-	400
HCM Lane V/C Ratio	0.111	0.008	-	-	-	-	-	0.025
HCM Control Delay (s)	14.5	9.7	0	-	0	-	-	14.2
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	0.1

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	18	764	3	23	116
Future Vol, veh/h	0	18	764	3	23	116
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	50	5	0	67	2
Mvmt Flow	0	18	764	3	23	116

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	870	384	0	0	767
Stage 1	766	-	-	-	-
Stage 2	104	-	-	-	-
Critical Hdwy	6.8	7.9	-	-	5.44
Critical Hdwy Stg 1	5.8	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-
Follow-up Hdwy	3.5	3.8	-	-	2.87
Pot Cap-1 Maneuver	295	496	-	-	526
Stage 1	425	-	-	-	-
Stage 2	915	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	281	496	-	-	526
Mov Cap-2 Maneuver	281	-	-	-	-
Stage 1	425	-	-	-	-
Stage 2	872	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.5	0	2.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	-	496	526
HCM Lane V/C Ratio	-	-	0.036	0.044
HCM Control Delay (s)	-	-	0	12.5
HCM Lane LOS	-	-	A	B
HCM 95th %tile Q(veh)	-	-	0.1	0.1

Intersection						
Int Delay, s/veh	21.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↙	↗		↖	↗	
Traffic Vol, veh/h	654	0	0	113	63	53
Future Vol, veh/h	654	0	0	113	63	53
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	654	0	0	113	63	53

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	203	58	116	0	-	0
Stage 1	90	-	-	-	-	-
Stage 2	113	-	-	-	-	-
Critical Hdwy	6.63	6.93	4.13	-	-	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.219	-	-	-
Pot Cap-1 Maneuver	776	996	1472	-	-	-
Stage 1	924	-	-	-	-	-
Stage 2	911	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	776	996	1472	-	-	-
Mov Cap-2 Maneuver	776	-	-	-	-	-
Stage 1	924	-	-	-	-	-
Stage 2	911	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	29.1	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1472	-	776	-	-	-
HCM Lane V/C Ratio	-	-	0.843	-	-	-
HCM Control Delay (s)	0	-	29.1	0	-	-
HCM Lane LOS	A	-	D	A	-	-
HCM 95th %tile Q(veh)	0	-	9.8	-	-	-

Intersection						
Int Delay, s/veh	2.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	54	0	0	59	57	6
Future Vol, veh/h	54	0	0	59	57	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	54	0	0	59	57	6

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	119	60	63	0	0
Stage 1	60	-	-	-	-
Stage 2	59	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	877	1005	1540	-	-
Stage 1	963	-	-	-	-
Stage 2	964	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	877	1005	1540	-	-
Mov Cap-2 Maneuver	877	-	-	-	-
Stage 1	963	-	-	-	-
Stage 2	964	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1540	-	877	-	-
HCM Lane V/C Ratio	-	-	0.062	-	-
HCM Control Delay (s)	0	-	9.4	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

APPENDIX I-3

Alternative Evaluation
With Alstep, Split Phasing

Timing Report, Sorted By Phase
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

Alstep, Split Phasing (2031 Horizon)
 AM Peak Hour



Phase Number	1	2	4	5	6	7	8
Movement	WBL	EBTL	NBT	EBL	WBTL	NBL	SBTL
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize						Yes	Yes
Recall Mode	None	C-Max	None	None	C-Max	None	None
Maximum Split (s)	8	62.9	49.1	16	54.9	15	34.1
Maximum Split (%)	6.7%	52.4%	40.9%	13.3%	45.8%	12.5%	28.4%
Minimum Split (s)	8	29.2	40.1	8	29.2	9	40.1
Yellow Time (s)	3	4.2	4	3	4.2	3	4
All-Red Time (s)	0	2	3.1	0	2	1	3.1
Minimum Initial (s)	5	12	8	5	12	5	8
Vehicle Extension (s)	3	5	5	3	5	3	5
Minimum Gap (s)	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0
Walk Time (s)		9	13		9		13
Flash Dont Walk (s)		14	20		14		20
Dual Entry	No	Yes	Yes	No	Yes	No	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	104	112	54.9	104	0	54.9	69.9
End Time (s)	112	54.9	104	0	54.9	69.9	104
Yield/Force Off (s)	109	48.7	96.9	117	48.7	65.9	96.9
Yield/Force Off 170(s)	109	34.7	76.9	117	34.7	65.9	76.9
Local Start Time (s)	104	112	54.9	104	0	54.9	69.9
Local Yield (s)	109	48.7	96.9	117	48.7	65.9	96.9
Local Yield 170(s)	109	34.7	76.9	117	34.7	65.9	76.9

Intersection Summary

Cycle Length	120
Control Type	Actuated-Coordinated
Natural Cycle	120
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 1: Menkes Drive/Telford Way & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

Alstep, Split Phasing (2031 Horizon)
 AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘↗	↑		↘	↗	
Traffic Volume (veh/h)	152	2270	498	56	1405	53	100	4	20	39	15	33
Future Volume (veh/h)	152	2270	498	56	1405	53	100	4	20	39	15	33
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	0.96		0.96
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1730	1737	1640	1628	1678	1519	1159	435	1159	1707	1976	1618
Adj Flow Rate, veh/h	152	2270	0	56	1405	0	100	4	20	39	15	33
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	4	11	0	16	15	14	50	100	50	13	0	19
Cap, veh/h	286	2825		146	2637		132	14	72	228	74	162
Arrive On Green	0.06	0.60	0.00	0.04	0.58	0.00	0.06	0.23	0.23	0.14	0.14	0.14
Sat Flow, veh/h	1648	4742	1362	1550	4580	1262	2141	62	309	1218	534	1174
Grp Volume(v), veh/h	152	2270	0	56	1405	0	100	0	24	39	0	48
Grp Sat Flow(s),veh/h/ln	1648	1581	1362	1550	1527	1262	1071	0	371	1218	0	1708
Q Serve(g_s), s	4.4	44.5	0.0	1.7	22.5	0.0	5.5	0.0	6.4	3.4	0.0	3.0
Cycle Q Clear(g_c), s	4.4	44.5	0.0	1.7	22.5	0.0	5.5	0.0	6.4	3.4	0.0	3.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.83	1.00		0.69
Lane Grp Cap(c), veh/h	286	2825		146	2637		132	0	86	228	0	236
V/C Ratio(X)	0.53	0.80		0.38	0.53		0.76	0.00	0.28	0.17	0.00	0.20
Avail Cap(c_a), veh/h	373	2825		156	2637		196	0	130	334	0	384
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.0	18.8	0.0	22.1	15.6	0.0	55.4	0.0	37.7	46.0	0.0	45.8
Incr Delay (d2), s/veh	1.5	2.5	0.0	1.7	0.8	0.0	9.2	0.0	3.7	0.7	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.3	24.9	0.0	1.8	13.5	0.0	3.1	0.0	1.3	2.1	0.0	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.5	21.3	0.0	23.8	16.4	0.0	64.6	0.0	41.4	46.8	0.0	46.7
LnGrp LOS	B	C		C	B		E	A	D	D	A	D
Approach Vol, veh/h		2422	A		1461	A		124				87
Approach Delay, s/veh		20.9			16.6			60.1				46.8
Approach LOS		C			B			E				D
Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.2	77.7		35.1	9.7	75.3	11.4	23.7				
Change Period (Y+Rc), s	3.0	6.2		7.1	3.0	6.2	4.0	7.1				
Max Green Setting (Gmax), s	5.0	56.7		42.0	13.0	48.7	11.0	27.0				
Max Q Clear Time (g_c+I1), s	3.7	47.5		8.4	6.4	25.5	7.5	5.4				
Green Ext Time (p_c), s	0.0	9.1		0.4	0.3	21.5	0.1	1.1				

Intersection Summary

HCM 6th Ctrl Delay	21.1
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.
 Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Timing Report, Sorted By Phase
2: Bramalea Road & Derry Road E (RR 5)

Alstep, Split Phasing (2031 Horizon)
AM Peak Hour

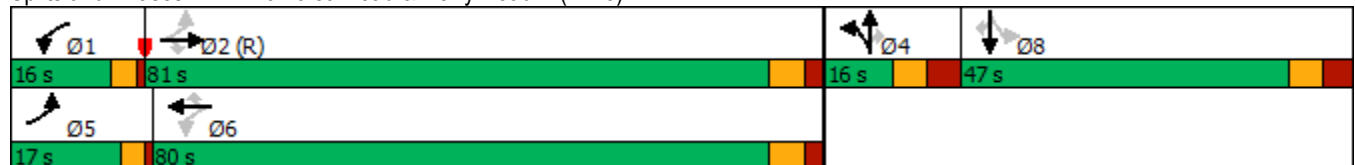


Phase Number	1	2	4	5	6	8
Movement	WBL	EBTL	NBTL	EBL	WBTL	SBTL
Lead/Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize	Yes	Yes				
Recall Mode	None	C-Max	None	None	None	None
Maximum Split (s)	16	81	16	17	80	47
Maximum Split (%)	10.0%	50.6%	10.0%	10.6%	50.0%	29.4%
Minimum Split (s)	9.5	35.7	15.9	9	35.7	46.9
Yellow Time (s)	3	4.2	4	3	4.2	4
All-Red Time (s)	1	2.5	3.9	1	2.5	3.9
Minimum Initial (s)	5	12	8	5	12	10
Vehicle Extension (s)	3	5	5	3	5	5
Minimum Gap (s)	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0
Walk Time (s)		11			11	15
Flash Dont Walk (s)		18			18	24
Dual Entry	No	Yes	Yes	No	Yes	No
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	144	0	81	144	1	97
End Time (s)	0	81	97	1	81	144
Yield/Force Off (s)	156	74.3	89.1	157	74.3	136.1
Yield/Force Off 170(s)	156	56.3	89.1	157	56.3	112.1
Local Start Time (s)	144	0	81	144	1	97
Local Yield (s)	156	74.3	89.1	157	74.3	136.1
Local Yield 170(s)	156	56.3	89.1	157	56.3	112.1

Intersection Summary



































Cycle Length	160
Control Type	Actuated-Coordinated
Natural Cycle	140
Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green	

Splits and Phases: 2: Bramalea Road & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
2: Bramalea Road & Derry Road E (RR 5)

Alstep, Split Phasing (2031 Horizon)
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	  		  	  					 	 	 
Traffic Volume (veh/h)	256	1930	51	311	1205	259	13	24	61	388	121	271
Future Volume (veh/h)	256	1930	51	311	1205	259	13	24	61	388	121	271
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		1.00	1.00		0.69	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.98
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1604	1737	1781	1826	1693	1625	1307	1411	1248	1722	1870	1870
Adj Flow Rate, veh/h	256	1930	51	311	1205	0	13	24	61	254	308	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	20	11	8	5	14	14	40	33	44	12	2	2
Cap, veh/h	500	2309	689	357	2271		63	71	37	383	437	
Arrive On Green	0.06	0.49	0.49	0.06	0.49	0.00	0.05	0.05	0.05	0.23	0.23	0.00
Sat Flow, veh/h	2963	4742	1416	3374	4621	1322	1245	1411	729	1640	1870	1560
Grp Volume(v), veh/h	256	1930	51	311	1205	0	13	24	61	254	308	0
Grp Sat Flow(s),veh/h/ln	1481	1581	1416	1687	1540	1322	1245	1411	729	1640	1870	1560
Q Serve(g_s), s	6.9	56.3	3.1	7.7	28.7	0.0	1.6	2.6	8.1	22.5	24.2	0.0
Cycle Q Clear(g_c), s	6.9	56.3	3.1	7.7	28.7	0.0	1.6	2.6	8.1	22.5	24.2	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	500	2309	689	357	2271		63	71	37	383	437	
V/C Ratio(X)	0.51	0.84	0.07	0.87	0.53		0.21	0.34	1.65	0.66	0.71	
Avail Cap(c_a), veh/h	567	2309	689	396	2271		63	71	37	401	457	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	22.0	35.5	21.8	37.1	28.0	0.0	72.9	73.4	75.9	55.6	56.3	0.0
Incr Delay (d2), s/veh	0.8	3.8	0.2	17.4	0.4	0.0	3.4	5.8	387.9	5.4	6.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	4.8	31.9	2.1	7.6	17.1	0.0	1.1	2.0	10.0	15.8	18.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.8	39.3	22.1	54.5	28.4	0.0	76.3	79.1	463.8	61.0	62.4	0.0
LnGrp LOS	C	D	C	D	C		E	E	F	E	E	
Approach Vol, veh/h		2237			1516	A		98			562	A
Approach Delay, s/veh		37.0			33.8			318.2			61.8	
Approach LOS		D			C			F			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.1	84.6		16.0	13.4	85.3		45.3				
Change Period (Y+Rc), s	4.0	6.7		7.9	4.0	6.7		7.9				
Max Green Setting (Gmax), s	12.0	74.3		8.1	13.0	73.3		39.1				
Max Q Clear Time (g_c+I1), s	9.7	59.3		10.1	8.9	31.7		26.2				
Green Ext Time (p_c), s	0.4	14.8		0.0	0.5	33.8		6.5				

Intersection Summary

HCM 6th Ctrl Delay	45.3
HCM 6th LOS	D

Notes

- User approved pedestrian interval to be less than phase max green.
- User approved volume balancing among the lanes for turning movement.
- Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	0	0	3	0	14	0	80	0	76	388	19
Future Vol, veh/h	4	0	0	3	0	14	0	80	0	76	388	19
Conflicting Peds, #/hr	1	0	0	0	0	1	91	0	0	0	0	91
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	50	0	1	0	67	2	0
Mvmt Flow	4	0	0	3	0	14	0	80	0	76	388	19

Major/Minor	Minor2		Minor1			Major1		Major2				
Conflicting Flow All	682	721	295	426	730	41	498	0	0	80	0	0
Stage 1	641	641	-	80	80	-	-	-	-	-	-	-
Stage 2	41	80	-	346	650	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	7.9	4.1	-	-	5.44	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.8	2.2	-	-	2.87	-	-
Pot Cap-1 Maneuver	340	356	707	517	352	885	1076	-	-	1147	-	-
Stage 1	434	473	-	925	832	-	-	-	-	-	-	-
Stage 2	974	832	-	649	468	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	288	300	653	483	297	884	993	-	-	1147	-	-
Mov Cap-2 Maneuver	288	300	-	483	297	-	-	-	-	-	-	-
Stage 1	401	399	-	925	832	-	-	-	-	-	-	-
Stage 2	957	832	-	593	395	-	-	-	-	-	-	-

Approach	EB		WB			NB		SB		
HCM Control Delay, s	17.7		9.8			0		1.6		
HCM LOS	C		A							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	993	-	-	288	771	1147	-
HCM Lane V/C Ratio	-	-	-	0.014	0.022	0.066	-
HCM Control Delay (s)	0	-	-	17.7	9.8	8.4	0.3
HCM Lane LOS	A	-	-	C	A	A	A
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0.2	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	0	0	106	523	0
Future Vol, veh/h	0	0	0	106	523	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	78	11	0
Mvmt Flow	0	0	0	106	523	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	53	53	-	0
Stage 1	53	53	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	960	842	-	-
Stage 1	975	855	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	960	0	-	-
Mov Cap-2 Maneuver	960	0	-	-
Stage 1	975	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	419	99	60	83	0	22	1	11	0	0	1
Future Vol, veh/h	5	419	99	60	83	0	22	1	11	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	75	5	0	0	79	0	75	100	0	0	0	100
Mvmt Flow	5	419	99	60	83	0	22	1	11	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	83	0	0	518	0	0	683	682	469	688	731	83
Stage 1	-	-	-	-	-	-	479	479	-	203	203	-
Stage 2	-	-	-	-	-	-	204	203	-	485	528	-
Critical Hdwy	4.85	-	-	4.1	-	-	7.85	7.5	6.2	7.1	6.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Follow-up Hdwy	2.875	-	-	2.2	-	-	4.175	4.9	3.3	3.5	4	4.2
Pot Cap-1 Maneuver	1157	-	-	1058	-	-	282	272	598	363	351	762
Stage 1	-	-	-	-	-	-	452	421	-	804	737	-
Stage 2	-	-	-	-	-	-	657	583	-	567	531	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1157	-	-	1058	-	-	268	254	598	338	328	762
Mov Cap-2 Maneuver	-	-	-	-	-	-	268	254	-	338	328	-
Stage 1	-	-	-	-	-	-	449	418	-	799	694	-
Stage 2	-	-	-	-	-	-	617	549	-	552	528	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	3.6	17.3	9.7
HCM LOS			C	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	326	1157	-	-	1058	-	-	762
HCM Lane V/C Ratio	0.104	0.004	-	-	0.057	-	-	0.001
HCM Control Delay (s)	17.3	8.1	0	-	8.6	0	-	9.7
HCM Lane LOS	C	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.3	0	-	-	0.2	-	-	0

Intersection												
Int Delay, s/veh	4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖		↗		↔	
Traffic Vol, veh/h	0	142	238	202	83	0	42	0	36	0	0	0
Future Vol, veh/h	0	142	238	202	83	0	42	0	36	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	0	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	142	238	202	83	0	42	0	36	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	83	0	0	380	0	0	748	-	261	766	867	83
Stage 1	-	-	-	-	-	-	261	-	-	487	487	-
Stage 2	-	-	-	-	-	-	487	-	-	279	380	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	-	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	-	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1514	-	-	1178	-	-	329	0	778	320	291	976
Stage 1	-	-	-	-	-	-	744	0	-	562	550	-
Stage 2	-	-	-	-	-	-	562	0	-	728	614	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1514	-	-	1178	-	-	286	-	778	265	241	976
Mov Cap-2 Maneuver	-	-	-	-	-	-	286	-	-	265	241	-
Stage 1	-	-	-	-	-	-	744	-	-	562	456	-
Stage 2	-	-	-	-	-	-	466	-	-	694	614	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			6.2			15.2			0		
HCM LOS							C			A		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	286	778	1514	-	-	1178	-	-	-
HCM Lane V/C Ratio	0.147	0.046	-	-	-	0.171	-	-	-
HCM Control Delay (s)	19.7	9.9	0	-	-	8.7	-	-	0
HCM Lane LOS	C	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.5	0.1	0	-	-	0.6	-	-	-

Timing Report, Sorted By Phase
 7: Bramalea Road & Alstep Drive/Fed-Ex Truck Entrance

Alstep, Split Phasing (2031 Horizon)
 AM Peak Hour

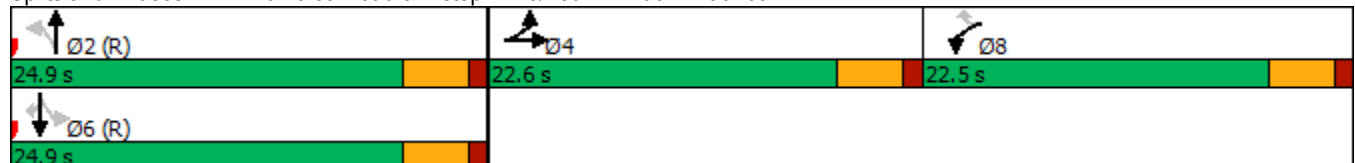


Phase Number	2	4	6	8
Movement	NBTL	EBTL	SBTL	WBL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	C-Max	None	C-Max	None
Maximum Split (s)	24.9	22.6	24.9	22.5
Maximum Split (%)	35.6%	32.3%	35.6%	32.1%
Minimum Split (s)	22.5	22.5	22.5	22.5
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	1	1	1	1
Minimum Initial (s)	5	5	5	5
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)	7	7	7	7
Flash Dont Walk (s)	11	11	11	11
Dual Entry	Yes	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes
Start Time (s)	0	24.9	0	47.5
End Time (s)	24.9	47.5	24.9	0
Yield/Force Off (s)	20.4	43	20.4	65.5
Yield/Force Off 170(s)	9.4	32	9.4	54.5
Local Start Time (s)	0	24.9	0	47.5
Local Yield (s)	20.4	43	20.4	65.5
Local Yield 170(s)	9.4	32	9.4	54.5

Intersection Summary





















Cycle Length	70
Control Type	Actuated-Coordinated
Natural Cycle	70
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	

Splits and Phases: 7: Bramalea Road & Alstep Drive/Fed-Ex Truck Entrance



HCM 6th Signalized Intersection Summary
 7: Bramalea Road & Alstep Drive/Fed-Ex Truck Entrance

Alstep, Split Phasing (2031 Horizon)
 AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	46	0	132	0	0	11	23	23	0	15	114	262
Future Volume (veh/h)	46	0	132	0	0	11	23	23	0	15	114	262
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.97		1.00	0.97		0.94
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1976	0	435	1870	1205	1900	788	1976	1870
Adj Flow Rate, veh/h	46	0	132	0	0	11	23	23	0	15	114	262
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	0	0	100	2	50	0	75	0	2
Cap, veh/h	205	0	182	0	0	0	823	912	0	178	1327	1127
Arrive On Green	0.12	0.00	0.12	0.00	0.00	0.00	0.76	0.76	0.00	0.76	0.76	0.76
Sat Flow, veh/h	1781	0	1585		0		973	1205	0	159	1754	1490
Grp Volume(v), veh/h	46	0	132		0.0		23	23	0	129	0	262
Grp Sat Flow(s),veh/h/ln	1781	0	1585				973	1205	0	1913	0	1490
Q Serve(g_s), s	1.6	0.0	5.6				0.4	0.3	0.0	0.0	0.0	3.6
Cycle Q Clear(g_c), s	1.6	0.0	5.6				1.6	0.3	0.0	1.2	0.0	3.6
Prop In Lane	1.00		1.00				1.00		0.00	0.12		1.00
Lane Grp Cap(c), veh/h	205	0	182				823	912	0	1504	0	1127
V/C Ratio(X)	0.22	0.00	0.72				0.03	0.03	0.00	0.09	0.00	0.23
Avail Cap(c_a), veh/h	461	0	410				823	912	0	1504	0	1127
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	28.1	0.0	29.9				2.4	2.1	0.0	2.2	0.0	2.5
Incr Delay (d2), s/veh	0.5	0.0	5.3				0.1	0.1	0.0	0.1	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.4	0.0	4.6				0.2	0.2	0.0	1.0	0.0	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.7	0.0	35.2				2.5	2.2	0.0	2.3	0.0	3.0
LnGrp LOS	C	A	D				A	A	A	A	A	A
Approach Vol, veh/h		178						46			391	
Approach Delay, s/veh		33.5						2.3			2.8	
Approach LOS		C						A			A	
Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		57.4		12.6		57.4						
Change Period (Y+Rc), s		4.5		4.5		4.5						
Max Green Setting (Gmax), s		20.4		18.1		20.4						
Max Q Clear Time (g_c+I1), s		3.6		7.6		5.6						
Green Ext Time (p_c), s		0.2		0.7		2.6						
Intersection Summary												
HCM 6th Ctrl Delay				11.7								
HCM 6th LOS				B								

Intersection						
Int Delay, s/veh	1.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	38	0	0	8	30	216
Future Vol, veh/h	38	0	0	8	30	216
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	0	0	8	30	216

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	146	138	246	0	-
Stage 1	138	-	-	-	-
Stage 2	8	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	846	910	1320	-	-
Stage 1	889	-	-	-	-
Stage 2	1015	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	846	910	1320	-	-
Mov Cap-2 Maneuver	846	-	-	-	-
Stage 1	889	-	-	-	-
Stage 2	1015	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.5	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1320	-	846	-	-	-
HCM Lane V/C Ratio	-	-	0.045	-	-	-
HCM Control Delay (s)	0	-	9.5	0	-	-
HCM Lane LOS	A	-	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-	-

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	0	0	3	3	27
Future Vol, veh/h	5	0	0	3	3	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	0	0	3	3	27

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	20	17	30	0	0
Stage 1	17	-	-	-	-
Stage 2	3	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	997	1062	1583	-	-
Stage 1	1006	-	-	-	-
Stage 2	1020	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	997	1062	1583	-	-
Mov Cap-2 Maneuver	997	-	-	-	-
Stage 1	1006	-	-	-	-
Stage 2	1020	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.6	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1583	-	997	-	-
HCM Lane V/C Ratio	-	-	0.005	-	-
HCM Control Delay (s)	0	-	8.6	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Timing Report, Sorted By Phase
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

Alstep, Split Phasing (2031 Horizon)
 PM Peak Hour

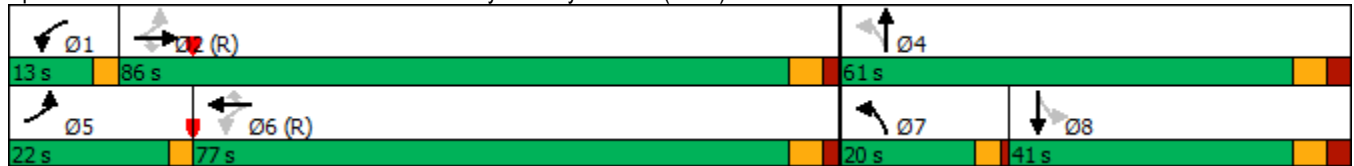


Phase Number	1	2	4	5	6	7	8
Movement	WBL	EBTL	NBTL	EBL	WBTL	NBL	SBTL
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize				Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	None	C-Max	None	None
Maximum Split (s)	13	86	61	22	77	20	41
Maximum Split (%)	8.1%	53.8%	38.1%	13.8%	48.1%	12.5%	25.6%
Minimum Split (s)	8	29.2	40.1	9.5	29.2	9.5	40.1
Yellow Time (s)	3	4.2	4	3	4.2	3	4
All-Red Time (s)	0	2	3.1	0	2	1	3.1
Minimum Initial (s)	5	12	8	5	12	5	8
Vehicle Extension (s)	3	5	5	3	5	3	5
Minimum Gap (s)	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0
Walk Time (s)		9	13		9		13
Flash Dont Walk (s)		14	20		14		20
Dual Entry	No	Yes	Yes	No	Yes	No	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	138	151	77	138	0	77	97
End Time (s)	151	77	138	0	77	97	138
Yield/Force Off (s)	148	70.8	130.9	157	70.8	93	130.9
Yield/Force Off 170(s)	148	56.8	110.9	157	56.8	93	110.9
Local Start Time (s)	138	151	77	138	0	77	97
Local Yield (s)	148	70.8	130.9	157	70.8	93	130.9
Local Yield 170(s)	148	56.8	110.9	157	56.8	93	110.9

Intersection Summary






























Cycle Length	160
Control Type	Actuated-Coordinated
Natural Cycle	120
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 1: Menkes Drive/Telford Way & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

Alstep, Split Phasing (2031 Horizon)
 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  		 					
Traffic Volume (veh/h)	166	1877	118	60	1987	68	490	39	74	94	20	152
Future Volume (veh/h)	166	1877	118	60	1987	68	490	39	74	94	20	152
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	0.99		0.98
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1549	1633	1410	1526	1722	1413	1737	1483	1752	1767	1498	1693
Adj Flow Rate, veh/h	166	1877	0	60	1987	0	490	39	74	94	20	152
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	17	18	18	23	12	22	11	32	10	9	31	14
Cap, veh/h	186	2524		138	2452		516	137	261	256	26	199
Arrive On Green	0.07	0.57	0.00	0.03	0.52	0.00	0.10	0.30	0.30	0.18	0.18	0.18
Sat Flow, veh/h	1475	4459	1171	1454	4701	1173	3209	455	863	1191	148	1125
Grp Volume(v), veh/h	166	1877	0	60	1987	0	490	0	113	94	0	172
Grp Sat Flow(s),veh/h/ln	1475	1486	1171	1454	1567	1173	1605	0	1317	1191	0	1273
Q Serve(g_s), s	9.5	50.5	0.0	3.1	56.0	0.0	16.0	0.0	10.5	11.3	0.0	20.6
Cycle Q Clear(g_c), s	9.5	50.5	0.0	3.1	56.0	0.0	16.0	0.0	10.5	11.3	0.0	20.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.65	1.00		0.88
Lane Grp Cap(c), veh/h	186	2524		138	2452		516	0	398	256	0	225
V/C Ratio(X)	0.89	0.74		0.43	0.81		0.95	0.00	0.28	0.37	0.00	0.76
Avail Cap(c_a), veh/h	251	2524		185	2452		516	0	444	297	0	270
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	39.5	26.0	0.0	25.2	31.7	0.0	54.1	0.0	42.6	58.8	0.0	62.6
Incr Delay (d2), s/veh	25.0	2.0	0.0	2.1	3.0	0.0	27.3	0.0	0.8	1.9	0.0	13.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	13.0	26.9	0.0	2.2	31.2	0.0	9.3	0.0	6.8	6.7	0.0	12.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	64.5	28.1	0.0	27.4	34.8	0.0	81.4	0.0	43.4	60.7	0.0	76.5
LnGrp LOS	E	C		C	C		F	A	D	E	A	E
Approach Vol, veh/h		2043	A		2047	A		603			266	
Approach Delay, s/veh		31.0			34.5			74.3			70.9	
Approach LOS		C			C			E			E	
Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.8	96.8		55.4	14.9	89.6	20.0	35.4				
Change Period (Y+Rc), s	3.0	6.2		7.1	3.0	6.2	4.0	7.1				
Max Green Setting (Gmax), s	10.0	79.8		53.9	19.0	70.8	16.0	33.9				
Max Q Clear Time (g_c+I1), s	5.1	52.5		12.5	11.5	58.0	18.0	22.6				
Green Ext Time (p_c), s	0.1	26.7		3.0	0.4	12.6	0.0	3.1				

Intersection Summary												
HCM 6th Ctrl Delay				39.9								
HCM 6th LOS				D								

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Timing Report, Sorted By Phase
2: Bramalea Road & Derry Road E (RR 5)

Alstep, Split Phasing (2031 Horizon)
PM Peak Hour

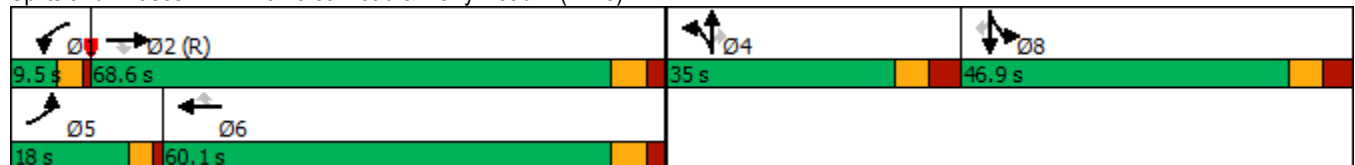


Phase Number	1	2	4	5	6	8
Movement	WBL	EBT	NBTL	EBL	WBT	SBTL
Lead/Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize	Yes	Yes				
Recall Mode	None	C-Max	None	None	None	None
Maximum Split (s)	9.5	68.6	35	18	60.1	46.9
Maximum Split (%)	5.9%	42.9%	21.9%	11.3%	37.6%	29.3%
Minimum Split (s)	9.5	35.7	15.9	9	35.7	46.9
Yellow Time (s)	3	4.2	4	3	4.2	4
All-Red Time (s)	1	2.5	3.9	1	2.5	3.9
Minimum Initial (s)	5	12	8	5	12	10
Vehicle Extension (s)	3	5	5	3	5	5
Minimum Gap (s)	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0
Walk Time (s)		11			11	15
Flash Dont Walk (s)		18			18	24
Dual Entry	No	Yes	Yes	No	Yes	No
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	150.5	0	68.6	150.5	8.5	103.6
End Time (s)	0	68.6	103.6	8.5	68.6	150.5
Yield/Force Off (s)	156	61.9	95.7	4.5	61.9	142.6
Yield/Force Off 170(s)	156	43.9	95.7	4.5	43.9	118.6
Local Start Time (s)	150.5	0	68.6	150.5	8.5	103.6
Local Yield (s)	156	61.9	95.7	4.5	61.9	142.6
Local Yield 170(s)	156	43.9	95.7	4.5	43.9	118.6

Intersection Summary

























Cycle Length	160
Control Type	Actuated-Coordinated
Natural Cycle	150
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green	

Splits and Phases: 2: Bramalea Road & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
2: Bramalea Road & Derry Road E (RR 5)

Alstep, Split Phasing (2031 Horizon)
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	284	1748	62	101	1630	413	276	161	426	342	37	254
Future Volume (veh/h)	284	1748	62	101	1630	413	276	161	426	342	37	254
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.94	1.00		1.00	1.00		0.85	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.99
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1470	1678	1574	1737	1722	1625	1737	1811	1722	1737	1811	1604
Adj Flow Rate, veh/h	284	1748	62	101	1630	0	276	161	426	368	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	29	15	22	11	12	14	11	6	12	11	6	20
Cap, veh/h	238	1844	488	110	1644		280	307	210	754	0	
Arrive On Green	0.09	0.40	0.40	0.03	0.35	0.00	0.17	0.17	0.17	0.23	0.00	0.00
Sat Flow, veh/h	2716	4580	1211	3209	4701	1327	1654	1811	1240	3309	0	1343
Grp Volume(v), veh/h	284	1748	62	101	1630	0	276	161	426	368	0	0
Grp Sat Flow(s),veh/h/ln	1358	1527	1211	1605	1567	1327	1654	1811	1240	1654	0	1343
Q Serve(g_s), s	14.0	59.0	5.2	5.0	55.2	0.0	26.6	13.0	27.1	15.5	0.0	0.0
Cycle Q Clear(g_c), s	14.0	59.0	5.2	5.0	55.2	0.0	26.6	13.0	27.1	15.5	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	238	1844	488	110	1644		280	307	210	754	0	
V/C Ratio(X)	1.19	0.95	0.13	0.92	0.99		0.99	0.52	2.03	0.49	0.00	
Avail Cap(c_a), veh/h	238	1844	488	110	1644		280	307	210	806	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	73.0	46.2	30.1	77.0	51.8	0.0	66.2	60.6	66.4	53.7	0.0	0.0
Incr Delay (d2), s/veh	121.3	11.8	0.5	59.7	20.2	0.0	49.7	3.1	479.3	1.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	14.9	33.9	3.1	5.5	34.2	0.0	22.2	10.8	59.1	11.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	194.3	57.9	30.6	136.7	72.0	0.0	115.9	63.7	545.7	54.7	0.0	0.0
LnGrp LOS	F	E	C	F	E		F	E	F	D	A	
Approach Vol, veh/h		2094			1731	A		863			368	A
Approach Delay, s/veh		75.6			75.8			318.3			54.7	
Approach LOS		E			E			F			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.5	71.1		35.0	18.0	62.6		44.4				
Change Period (Y+Rc), s	4.0	6.7		7.9	4.0	6.7		7.9				
Max Green Setting (Gmax), s	5.5	61.9		27.1	14.0	53.4		39.0				
Max Q Clear Time (g_c+I1), s	7.0	61.0		29.1	16.0	57.2		17.5				
Green Ext Time (p_c), s	0.0	0.9		0.0	0.0	0.0		4.1				

Intersection Summary

HCM 6th Ctrl Delay	115.6
HCM 6th LOS	F

Notes

User approved volume balancing among the lanes for turning movement.
Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	23	0	0	6	0	76	0	764	3	52	133	15
Future Vol, veh/h	23	0	0	6	0	76	0	764	3	52	133	15
Conflicting Peds, #/hr	2	0	0	0	0	2	145	0	0	0	0	145
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	6	0	0	20	0	5	0	16	50	0	24	25
Mvmt Flow	23	0	0	6	0	76	0	764	3	52	133	15

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	774	1157	219	937	1163	386	293	0	0	767	0	0
Stage 1	390	390	-	766	766	-	-	-	-	-	-	-
Stage 2	384	767	-	171	397	-	-	-	-	-	-	-
Critical Hdwy	7.62	6.5	6.9	7.9	6.5	7	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.62	5.5	-	6.9	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.62	5.5	-	6.9	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.56	4	3.3	3.7	4	3.35	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	281	198	791	194	196	604	1280	-	-	856	-	-
Stage 1	595	611	-	324	415	-	-	-	-	-	-	-
Stage 2	600	414	-	764	607	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	201	160	685	184	159	603	1109	-	-	856	-	-
Mov Cap-2 Maneuver	201	160	-	184	159	-	-	-	-	-	-	-
Stage 1	515	494	-	324	415	-	-	-	-	-	-	-
Stage 2	523	414	-	714	491	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	25.2		13.3		0		2.6	
HCM LOS	D		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1109	-	-	201	517	856	-
HCM Lane V/C Ratio	-	-	-	0.114	0.159	0.061	-
HCM Control Delay (s)	0	-	-	25.2	13.3	9.5	0.2
HCM Lane LOS	A	-	-	D	B	A	A
HCM 95th %tile Q(veh)	0	-	-	0.4	0.6	0.2	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	
Traffic Vol, veh/h	0	0	0	475	133	0
Future Vol, veh/h	0	0	0	475	133	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	29	44	0
Mvmt Flow	0	0	0	475	133	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	238	238	-	0
Stage 1	238	238	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	755	666	-	-
Stage 1	806	712	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	755	0	-	-
Mov Cap-2 Maneuver	755	0	-	-
Stage 1	806	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	4.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	93	34	9	387	0	83	1	115	1	4	5
Future Vol, veh/h	6	93	34	9	387	0	83	1	115	1	4	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	100	41	28	0	23	0	25	100	0	0	100	100
Mvmt Flow	6	93	34	9	387	0	83	1	115	1	4	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	387	0	0	127	0	0	532	527	110	585	544	387
Stage 1	-	-	-	-	-	-	122	122	-	405	405	-
Stage 2	-	-	-	-	-	-	410	405	-	180	139	-
Critical Hdwy	5.1	-	-	4.1	-	-	7.35	7.5	6.2	7.1	7.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Follow-up Hdwy	3.1	-	-	2.2	-	-	3.725	4.9	3.3	3.5	4.9	4.2
Pot Cap-1 Maneuver	789	-	-	1472	-	-	424	343	949	425	335	491
Stage 1	-	-	-	-	-	-	830	640	-	626	460	-
Stage 2	-	-	-	-	-	-	575	460	-	826	627	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	789	-	-	1472	-	-	411	338	949	368	330	491
Mov Cap-2 Maneuver	-	-	-	-	-	-	411	338	-	368	330	-
Stage 1	-	-	-	-	-	-	823	635	-	621	456	-
Stage 2	-	-	-	-	-	-	560	456	-	719	622	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.2			13.7			14.2		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	610	789	-	-	1472	-	-	400
HCM Lane V/C Ratio	0.326	0.008	-	-	0.006	-	-	0.025
HCM Control Delay (s)	13.7	9.6	0	-	7.5	0	-	14.2
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	1.4	0	-	-	0	-	-	0.1

Intersection												
Int Delay, s/veh	8.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖		↗		↔	
Traffic Vol, veh/h	0	132	38	33	127	0	214	0	375	0	0	0
Future Vol, veh/h	0	132	38	33	127	0	214	0	375	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	0	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	132	38	33	127	0	214	0	375	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	127	0	0	170	0	0	344	-	151	532	363	127
Stage 1	-	-	-	-	-	-	151	-	-	193	193	-
Stage 2	-	-	-	-	-	-	193	-	-	339	170	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	-	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	-	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1459	-	-	1407	-	-	610	0	895	458	565	923
Stage 1	-	-	-	-	-	-	851	0	-	809	741	-
Stage 2	-	-	-	-	-	-	809	0	-	676	758	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1459	-	-	1407	-	-	599	-	895	262	552	923
Mov Cap-2 Maneuver	-	-	-	-	-	-	599	-	-	262	552	-
Stage 1	-	-	-	-	-	-	851	-	-	809	724	-
Stage 2	-	-	-	-	-	-	790	-	-	393	758	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			1.6			12.8			0		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	599	895	1459	-	-	1407	-	-	-
HCM Lane V/C Ratio	0.357	0.419	-	-	-	0.023	-	-	-
HCM Control Delay (s)	14.3	11.9	0	-	-	7.6	-	-	0
HCM Lane LOS	B	B	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	1.6	2.1	0	-	-	0.1	-	-	-

Timing Report, Sorted By Phase
 7: Bramalea Road & Alstep Drive/Fed-Ex Truck Entrance

Alstep, Split Phasing (2031 Horizon)
 PM Peak Hour

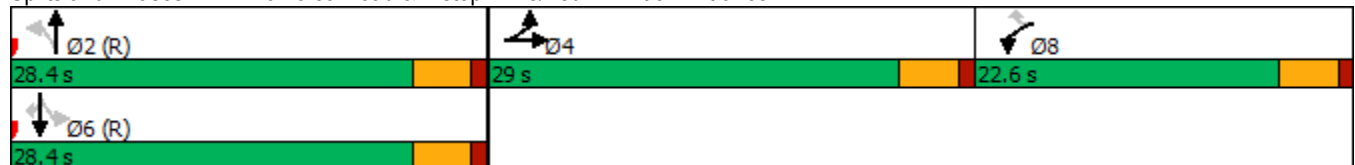


Phase Number	2	4	6	8
Movement	NBTL	EBTL	SBTL	WBL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	C-Max	None	C-Max	None
Maximum Split (s)	28.4	29	28.4	22.6
Maximum Split (%)	35.5%	36.3%	35.5%	28.3%
Minimum Split (s)	22.5	22.5	22.5	22.5
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	1	1	1	1
Minimum Initial (s)	5	5	5	5
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)	7	7	7	7
Flash Dont Walk (s)	11	11	11	11
Dual Entry	Yes	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes
Start Time (s)	0	28.4	0	57.4
End Time (s)	28.4	57.4	28.4	0
Yield/Force Off (s)	23.9	52.9	23.9	75.5
Yield/Force Off 170(s)	12.9	41.9	12.9	64.5
Local Start Time (s)	0	28.4	0	57.4
Local Yield (s)	23.9	52.9	23.9	75.5
Local Yield 170(s)	12.9	41.9	12.9	64.5

Intersection Summary





















Cycle Length	80
Control Type	Actuated-Coordinated
Natural Cycle	70
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	

Splits and Phases: 7: Bramalea Road & Alstep Drive/Fed-Ex Truck Entrance



HCM 6th Signalized Intersection Summary
 7: Bramalea Road & Alstep Drive/Fed-Ex Truck Entrance

Alstep, Split Phasing (2031 Horizon)
 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	486	0	21	0	0	18	118	263	3	23	74	42
Future Volume (veh/h)	486	0	21	0	0	18	118	263	3	23	74	42
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.91		0.93	0.97		0.88
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1976	0	1205	1870	1899	1900	907	1945	1870
Adj Flow Rate, veh/h	486	0	21	0	0	18	118	263	3	23	74	42
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	0	0	50	2	5	0	67	2	2
Cap, veh/h	524	0	466	0	0	0	752	1110	13	257	804	825
Arrive On Green	0.29	0.00	0.29	0.00	0.00	0.00	0.59	0.59	0.59	0.59	0.59	0.59
Sat Flow, veh/h	1781	0	1585		0		1158	1872	21	339	1355	1391
Grp Volume(v), veh/h	486	0	21		0.0		118	0	266	97	0	42
Grp Sat Flow(s),veh/h/ln	1781	0	1585				1158	0	1893	1694	0	1391
Q Serve(g_s), s	21.2	0.0	0.8				3.9	0.0	5.3	0.0	0.0	1.0
Cycle Q Clear(g_c), s	21.2	0.0	0.8				5.6	0.0	5.3	1.7	0.0	1.0
Prop In Lane	1.00		1.00				1.00		0.01	0.24		1.00
Lane Grp Cap(c), veh/h	524	0	466				752	0	1123	1061	0	825
V/C Ratio(X)	0.93	0.00	0.05				0.16	0.00	0.24	0.09	0.00	0.05
Avail Cap(c_a), veh/h	546	0	485				752	0	1123	1061	0	825
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.4	0.0	20.2				8.2	0.0	7.7	7.0	0.0	6.8
Incr Delay (d2), s/veh	21.8	0.0	0.0				0.4	0.0	0.5	0.2	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	18.8	0.0	0.6				2.1	0.0	4.7	1.5	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	49.2	0.0	20.2				8.6	0.0	8.2	7.1	0.0	6.9
LnGrp LOS	D	A	C				A	A	A	A	A	A
Approach Vol, veh/h		507						384			139	
Approach Delay, s/veh		48.0						8.3			7.1	
Approach LOS		D						A			A	
Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		52.0		28.0		52.0						
Change Period (Y+Rc), s		4.5		4.5		4.5						
Max Green Setting (Gmax), s		23.9		24.5		23.9						
Max Q Clear Time (g_c+I1), s		7.6		23.2		3.7						
Green Ext Time (p_c), s		3.9		0.4		1.4						
Intersection Summary												
HCM 6th Ctrl Delay				27.7								
HCM 6th LOS				C								

Intersection						
Int Delay, s/veh	7.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	289	0	0	95	61	34
Future Vol, veh/h	289	0	0	95	61	34
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	289	0	0	95	61	34

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	173	78	95	0	0
Stage 1	78	-	-	-	-
Stage 2	95	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	817	983	1499	-	-
Stage 1	945	-	-	-	-
Stage 2	929	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	817	983	1499	-	-
Mov Cap-2 Maneuver	817	-	-	-	-
Stage 1	945	-	-	-	-
Stage 2	929	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.8	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1499	-	817	-	-	-
HCM Lane V/C Ratio	-	-	0.354	-	-	-
HCM Control Delay (s)	0	-	11.8	0	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	1.6	-	-	-

Intersection						
Int Delay, s/veh	2.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	36	0	0	59	57	4
Future Vol, veh/h	36	0	0	59	57	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	0	0	59	57	4

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	118	59	61	0	0
Stage 1	59	-	-	-	-
Stage 2	59	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	878	1007	1542	-	-
Stage 1	964	-	-	-	-
Stage 2	964	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	878	1007	1542	-	-
Mov Cap-2 Maneuver	878	-	-	-	-
Stage 1	964	-	-	-	-
Stage 2	964	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.3	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1542	-	878	-	-
HCM Lane V/C Ratio	-	-	0.041	-	-
HCM Control Delay (s)	0	-	9.3	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

APPENDIX I-4

Alternative Evaluation
With Alstep, Unsplit Phasing

Timing Report, Sorted By Phase
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

Alstep, Unsplit Phasing (2031 Horizon)
 AM Peak Hour

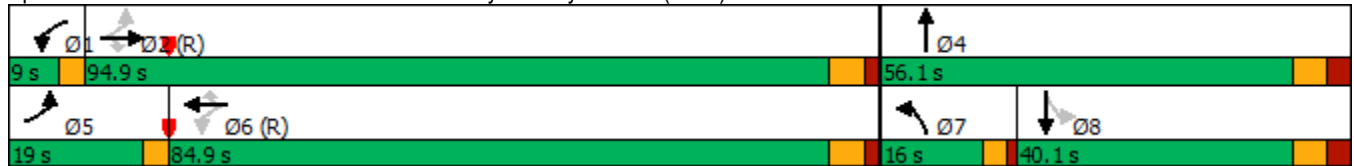


Phase Number	1	2	4	5	6	7	8
Movement	WBL	EBTL	NBT	EBL	WBTL	NBL	SBTL
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize						Yes	Yes
Recall Mode	None	C-Max	None	None	C-Max	None	None
Maximum Split (s)	9	94.9	56.1	19	84.9	16	40.1
Maximum Split (%)	5.6%	59.3%	35.1%	11.9%	53.1%	10.0%	25.1%
Minimum Split (s)	8	29.2	40.1	8	29.2	9.5	40.1
Yellow Time (s)	3	4.2	4	3	4.2	3	4
All-Red Time (s)	0	2	3.1	0	2	1	3.1
Minimum Initial (s)	5	12	8	5	12	5	8
Vehicle Extension (s)	3	5	5	3	5	3	5
Minimum Gap (s)	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0
Walk Time (s)		9	13		9		13
Flash Dont Walk (s)		14	20		14		20
Dual Entry	No	Yes	Yes	No	Yes	No	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	141	150	84.9	141	0	84.9	100.9
End Time (s)	150	84.9	141	0	84.9	100.9	141
Yield/Force Off (s)	147	78.7	133.9	157	78.7	96.9	133.9
Yield/Force Off 170(s)	147	64.7	113.9	157	64.7	96.9	113.9
Local Start Time (s)	141	150	84.9	141	0	84.9	100.9
Local Yield (s)	147	78.7	133.9	157	78.7	96.9	133.9
Local Yield 170(s)	147	64.7	113.9	157	64.7	96.9	113.9

Intersection Summary

Cycle Length	160
Control Type	Actuated-Coordinated
Natural Cycle	120
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	






























Splits and Phases: 1: Menkes Drive/Telford Way & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

Alstep, Unsplit Phasing (2031 Horizon)

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  		 					
Traffic Volume (veh/h)	152	2270	498	56	1405	53	100	4	20	39	15	33
Future Volume (veh/h)	152	2270	498	56	1405	53	100	4	20	39	15	33
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	0.96		0.96
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1730	1737	1640	1628	1678	1519	1159	435	1159	1707	1976	1618
Adj Flow Rate, veh/h	152	2270	0	56	1405	0	100	4	20	39	15	33
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	4	11	0	16	15	14	50	100	50	13	0	19
Cap, veh/h	285	3077		135	2890		125	14	68	212	73	161
Arrive On Green	0.05	0.65	0.00	0.03	0.63	0.00	0.06	0.22	0.22	0.14	0.14	0.14
Sat Flow, veh/h	1648	4742	1362	1550	4580	1262	2141	62	308	1218	534	1174
Grp Volume(v), veh/h	152	2270	0	56	1405	0	100	0	24	39	0	48
Grp Sat Flow(s),veh/h/ln	1648	1581	1362	1550	1527	1262	1071	0	370	1218	0	1708
Q Serve(g_s), s	5.1	51.6	0.0	2.0	26.1	0.0	7.4	0.0	8.6	4.6	0.0	4.0
Cycle Q Clear(g_c), s	5.1	51.6	0.0	2.0	26.1	0.0	7.4	0.0	8.6	4.6	0.0	4.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.83	1.00		0.69
Lane Grp Cap(c), veh/h	285	3077		135	2890		125	0	82	212	0	234
V/C Ratio(X)	0.53	0.74		0.41	0.49		0.80	0.00	0.29	0.18	0.00	0.21
Avail Cap(c_a), veh/h	373	3077		149	2890		161	0	113	296	0	352
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.1	18.9	0.0	22.3	15.7	0.0	74.4	0.0	52.0	61.6	0.0	61.3
Incr Delay (d2), s/veh	1.5	1.6	0.0	2.0	0.6	0.0	19.0	0.0	4.2	0.9	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.9	28.3	0.0	2.2	15.4	0.0	4.4	0.0	1.7	2.8	0.0	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.7	20.5	0.0	24.3	16.3	0.0	93.4	0.0	56.2	62.4	0.0	62.2
LnGrp LOS	B	C		C	B		F	A	E	E	A	E
Approach Vol, veh/h		2422	A		1461	A		124				87
Approach Delay, s/veh		20.2			16.6			86.2				62.3
Approach LOS		C			B			F				E
Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.6	110.0		42.4	10.5	107.1	13.4	29.0				
Change Period (Y+Rc), s	3.0	6.2		7.1	3.0	6.2	4.0	7.1				
Max Green Setting (Gmax), s	6.0	88.7		49.0	16.0	78.7	12.0	33.0				
Max Q Clear Time (g_c+I1), s	4.0	54.6		10.6	7.1	29.1	9.4	6.6				
Green Ext Time (p_c), s	0.0	33.9		0.4	0.4	43.0	0.1	1.3				

Intersection Summary

HCM 6th Ctrl Delay	21.8
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Timing Report, Sorted By Phase
2: Bramalea Road & Derry Road E (RR 5)

Alstep, Unsplit Phasing (2031 Horizon)
AM Peak Hour

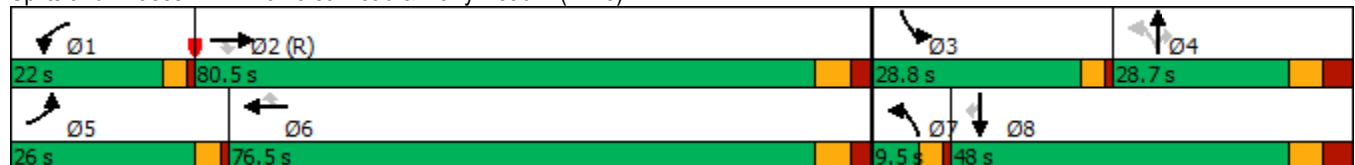


Phase Number	1	2	3	4	5	6	7	8
Movement	WBL	EBT	SBL	NBTL	EBL	WBT	NBL	SBT
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize	Yes	Yes	Yes	Yes			Yes	Yes
Recall Mode	None	C-Max	None	None	None	None	None	None
Maximum Split (s)	22	80.5	28.8	28.7	26	76.5	9.5	48
Maximum Split (%)	13.8%	50.3%	18.0%	17.9%	16.3%	47.8%	5.9%	30.0%
Minimum Split (s)	9.5	35.7	9.5	15.9	9	35.7	9.5	46.9
Yellow Time (s)	3	4.2	3	4	3	4.2	3	4
All-Red Time (s)	1	2.5	1	3.9	1	2.5	1	3.9
Minimum Initial (s)	5	12	5	8	5	12	5	10
Vehicle Extension (s)	3	5	3	5	3	5	3	5
Minimum Gap (s)	3	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0	0
Walk Time (s)		11				11		15
Flash Dont Walk (s)		18				18		24
Dual Entry	No	Yes	No	Yes	No	Yes	No	No
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	138	0	80.5	109.3	138	4	80.5	90
End Time (s)	0	80.5	109.3	138	4	80.5	90	138
Yield/Force Off (s)	156	73.8	105.3	130.1	0	73.8	86	130.1
Yield/Force Off 170(s)	156	55.8	105.3	130.1	0	55.8	86	106.1
Local Start Time (s)	138	0	80.5	109.3	138	4	80.5	90
Local Yield (s)	156	73.8	105.3	130.1	0	73.8	86	130.1
Local Yield 170(s)	156	55.8	105.3	130.1	0	55.8	86	106.1

Intersection Summary
































Cycle Length 160
Control Type Actuated-Coordinated
Natural Cycle 135
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green

Splits and Phases: 2: Bramalea Road & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
2: Bramalea Road & Derry Road E (RR 5)

Alstep, Unsplit Phasing (2031 Horizon)
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	  		 	  					 		
Traffic Volume (veh/h)	256	1930	51	311	1205	259	13	24	61	388	121	271
Future Volume (veh/h)	256	1930	51	311	1205	259	13	24	61	388	121	271
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	0.82		0.79	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.98
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1604	1737	1781	1826	1693	1625	1307	1411	1248	1722	1870	1870
Adj Flow Rate, veh/h	256	1930	51	311	1205	0	13	24	61	388	121	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	20	11	8	5	14	14	40	33	44	12	2	2
Cap, veh/h	303	2510	751	354	2459		126	123	73	437	394	
Arrive On Green	0.10	0.53	0.53	0.11	0.53	0.00	0.01	0.09	0.09	0.14	0.21	0.00
Sat Flow, veh/h	2963	4742	1419	3374	4621	1322	1245	1411	838	3182	1870	1560
Grp Volume(v), veh/h	256	1930	51	311	1205	0	13	24	61	388	121	0
Grp Sat Flow(s),veh/h/ln	1481	1581	1419	1687	1540	1322	1245	1411	838	1591	1870	1560
Q Serve(g_s), s	13.6	51.7	2.8	14.5	26.4	0.0	1.5	2.5	11.5	19.2	8.7	0.0
Cycle Q Clear(g_c), s	13.6	51.7	2.8	14.5	26.4	0.0	1.5	2.5	11.5	19.2	8.7	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	303	2510	751	354	2459		126	123	73	437	394	
V/C Ratio(X)	0.85	0.77	0.07	0.88	0.49		0.10	0.20	0.84	0.89	0.31	
Avail Cap(c_a), veh/h	407	2510	751	380	2459		151	183	109	493	469	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	70.6	29.9	18.4	70.6	23.7	0.0	65.4	67.9	71.9	67.8	53.3	0.0
Incr Delay (d2), s/veh	11.6	2.3	0.2	19.3	0.3	0.0	0.4	1.6	42.4	16.3	0.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	9.8	29.2	1.9	12.0	15.8	0.0	0.9	1.8	6.2	14.2	8.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	82.2	32.2	18.6	89.9	24.0	0.0	65.8	69.5	114.3	84.1	54.2	0.0
LnGrp LOS	F	C	B	F	C		E	E	F	F	D	
Approach Vol, veh/h		2237			1516	A		98			509	A
Approach Delay, s/veh		37.6			37.5			96.9			77.0	
Approach LOS		D			D			F			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	20.8	91.4	26.0	21.8	20.3	91.9	6.2	41.6				
Change Period (Y+Rc), s	4.0	6.7	4.0	7.9	4.0	6.7	4.0	7.9				
Max Green Setting (Gmax), s	18.0	73.8	24.8	20.8	22.0	69.8	5.5	40.1				
Max Q Clear Time (g_c+I1), s	16.5	54.7	21.2	13.5	15.6	29.4	3.5	10.7				
Green Ext Time (p_c), s	0.3	18.9	0.8	0.4	0.8	33.0	0.0	2.6				

Intersection Summary

HCM 6th Ctrl Delay	43.5
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.
Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	0	0	3	0	14	0	80	0	76	388	19
Future Vol, veh/h	4	0	0	3	0	14	0	80	0	76	388	19
Conflicting Peds, #/hr	1	0	0	0	0	1	91	0	0	0	0	91
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	50	0	1	0	67	2	0
Mvmt Flow	4	0	0	3	0	14	0	80	0	76	388	19

Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	682	721	295	426	730	41	498	0	0	80	0	0
Stage 1	641	641	-	80	80	-	-	-	-	-	-	-
Stage 2	41	80	-	346	650	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	7.9	4.1	-	-	5.44	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.8	2.2	-	-	2.87	-	-
Pot Cap-1 Maneuver	340	356	707	517	352	885	1076	-	-	1147	-	-
Stage 1	434	473	-	925	832	-	-	-	-	-	-	-
Stage 2	974	832	-	649	468	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	288	300	653	483	297	884	993	-	-	1147	-	-
Mov Cap-2 Maneuver	288	300	-	483	297	-	-	-	-	-	-	-
Stage 1	401	399	-	925	832	-	-	-	-	-	-	-
Stage 2	957	832	-	593	395	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.7	9.8	0	1.6
HCM LOS	C	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	993	-	-	288	771	1147	-
HCM Lane V/C Ratio	-	-	-	0.014	0.022	0.066	-
HCM Control Delay (s)	0	-	-	17.7	9.8	8.4	0.3
HCM Lane LOS	A	-	-	C	A	A	A
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0.2	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	0	0	106	523	0
Future Vol, veh/h	0	0	0	106	523	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	78	11	0
Mvmt Flow	0	0	0	106	523	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	53	53	-	0
Stage 1	53	53	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	960	842	-	-
Stage 1	975	855	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	960	0	-	-
Mov Cap-2 Maneuver	960	0	-	-
Stage 1	975	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	419	99	60	83	0	22	1	11	0	0	1
Future Vol, veh/h	5	419	99	60	83	0	22	1	11	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	75	5	0	0	79	0	75	100	0	0	0	100
Mvmt Flow	5	419	99	60	83	0	22	1	11	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	83	0	0	518	0	0	683	682	469	688	731	83
Stage 1	-	-	-	-	-	-	479	479	-	203	203	-
Stage 2	-	-	-	-	-	-	204	203	-	485	528	-
Critical Hdwy	4.85	-	-	4.1	-	-	7.85	7.5	6.2	7.1	6.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.85	6.5	-	6.1	5.5	-
Follow-up Hdwy	2.875	-	-	2.2	-	-	4.175	4.9	3.3	3.5	4	4.2
Pot Cap-1 Maneuver	1157	-	-	1058	-	-	282	272	598	363	351	762
Stage 1	-	-	-	-	-	-	452	421	-	804	737	-
Stage 2	-	-	-	-	-	-	657	583	-	567	531	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1157	-	-	1058	-	-	268	254	598	338	328	762
Mov Cap-2 Maneuver	-	-	-	-	-	-	268	254	-	338	328	-
Stage 1	-	-	-	-	-	-	449	418	-	799	694	-
Stage 2	-	-	-	-	-	-	617	549	-	552	528	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			3.6			17.3			9.7		
HCM LOS							C			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	326	1157	-	-	1058	-	-	762
HCM Lane V/C Ratio	0.104	0.004	-	-	0.057	-	-	0.001
HCM Control Delay (s)	17.3	8.1	0	-	8.6	0	-	9.7
HCM Lane LOS	C	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.3	0	-	-	0.2	-	-	0

Intersection												
Int Delay, s/veh	4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖		↗		↔	
Traffic Vol, veh/h	0	142	238	202	83	0	42	0	36	0	0	0
Future Vol, veh/h	0	142	238	202	83	0	42	0	36	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	0	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	142	238	202	83	0	42	0	36	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	83	0	0	380	0	0	748	-	261	766	867	83
Stage 1	-	-	-	-	-	-	261	-	-	487	487	-
Stage 2	-	-	-	-	-	-	487	-	-	279	380	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	-	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	-	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1514	-	-	1178	-	-	329	0	778	320	291	976
Stage 1	-	-	-	-	-	-	744	0	-	562	550	-
Stage 2	-	-	-	-	-	-	562	0	-	728	614	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1514	-	-	1178	-	-	286	-	778	265	241	976
Mov Cap-2 Maneuver	-	-	-	-	-	-	286	-	-	265	241	-
Stage 1	-	-	-	-	-	-	744	-	-	562	456	-
Stage 2	-	-	-	-	-	-	466	-	-	694	614	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	6.2	15.2	0
HCM LOS			C	A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	286	778	1514	-	-	1178	-	-	-
HCM Lane V/C Ratio	0.147	0.046	-	-	-	0.171	-	-	-
HCM Control Delay (s)	19.7	9.9	0	-	-	8.7	-	-	0
HCM Lane LOS	C	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.5	0.1	0	-	-	0.6	-	-	-

Timing Report, Sorted By Phase
 7: Bramalea Road & Alstep Drive/Fed-Ex Truck Entrance

Alstep, Unsplit Phasing (2031 Horizon)
 AM Peak Hour

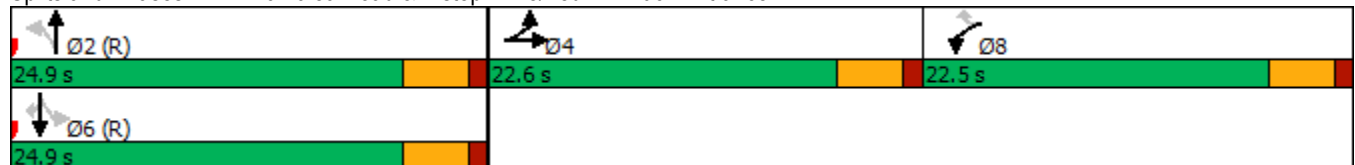


Phase Number	2	4	6	8
Movement	NBTL	EBTL	SBTL	WBL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	C-Max	None	C-Max	None
Maximum Split (s)	24.9	22.6	24.9	22.5
Maximum Split (%)	35.6%	32.3%	35.6%	32.1%
Minimum Split (s)	22.5	22.5	22.5	22.5
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	1	1	1	1
Minimum Initial (s)	5	5	5	5
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)	7	7	7	7
Flash Dont Walk (s)	11	11	11	11
Dual Entry	Yes	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes
Start Time (s)	0	24.9	0	47.5
End Time (s)	24.9	47.5	24.9	0
Yield/Force Off (s)	20.4	43	20.4	65.5
Yield/Force Off 170(s)	9.4	32	9.4	54.5
Local Start Time (s)	0	24.9	0	47.5
Local Yield (s)	20.4	43	20.4	65.5
Local Yield 170(s)	9.4	32	9.4	54.5

Intersection Summary

Cycle Length	70
Control Type	Actuated-Coordinated
Natural Cycle	70
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	

Splits and Phases: 7: Bramalea Road & Alstep Drive/Fed-Ex Truck Entrance



HCM 6th Signalized Intersection Summary

Alstep, Unsplit Phasing (2031 Horizon)

7: Bramalea Road & Alstep Drive/Fed-Ex Truck Entrance

AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	46	0	132	0	0	11	23	23	0	15	114	262
Future Volume (veh/h)	46	0	132	0	0	11	23	23	0	15	114	262
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.97		1.00	0.97		0.94
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1976	0	435	1870	1205	1900	788	1976	1870
Adj Flow Rate, veh/h	46	0	132	0	0	11	23	23	0	15	114	262
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	0	0	100	2	50	0	75	0	2
Cap, veh/h	205	0	182	0	0	0	823	912	0	178	1327	1127
Arrive On Green	0.12	0.00	0.12	0.00	0.00	0.00	0.76	0.76	0.00	0.76	0.76	0.76
Sat Flow, veh/h	1781	0	1585		0		973	1205	0	159	1754	1490
Grp Volume(v), veh/h	46	0	132		0.0		23	23	0	129	0	262
Grp Sat Flow(s),veh/h/ln	1781	0	1585				973	1205	0	1913	0	1490
Q Serve(g_s), s	1.6	0.0	5.6				0.4	0.3	0.0	0.0	0.0	3.6
Cycle Q Clear(g_c), s	1.6	0.0	5.6				1.6	0.3	0.0	1.2	0.0	3.6
Prop In Lane	1.00		1.00				1.00		0.00	0.12		1.00
Lane Grp Cap(c), veh/h	205	0	182				823	912	0	1504	0	1127
V/C Ratio(X)	0.22	0.00	0.72				0.03	0.03	0.00	0.09	0.00	0.23
Avail Cap(c_a), veh/h	461	0	410				823	912	0	1504	0	1127
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00				1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	28.1	0.0	29.9				2.4	2.1	0.0	2.2	0.0	2.5
Incr Delay (d2), s/veh	0.5	0.0	5.3				0.1	0.1	0.0	0.1	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.4	0.0	4.6				0.2	0.2	0.0	1.0	0.0	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.7	0.0	35.2				2.5	2.2	0.0	2.3	0.0	3.0
LnGrp LOS	C	A	D				A	A	A	A	A	A
Approach Vol, veh/h		178						46			391	
Approach Delay, s/veh		33.5						2.3			2.8	
Approach LOS		C						A			A	
Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		57.4		12.6		57.4						
Change Period (Y+Rc), s		4.5		4.5		4.5						
Max Green Setting (Gmax), s		20.4		18.1		20.4						
Max Q Clear Time (g_c+I1), s		3.6		7.6		5.6						
Green Ext Time (p_c), s		0.2		0.7		2.6						
Intersection Summary												
HCM 6th Ctrl Delay			11.7									
HCM 6th LOS			B									

Intersection						
Int Delay, s/veh	1.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	38	0	0	8	30	216
Future Vol, veh/h	38	0	0	8	30	216
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	0	0	8	30	216

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	146	138	246	0	-	0
Stage 1	138	-	-	-	-	-
Stage 2	8	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	846	910	1320	-	-	-
Stage 1	889	-	-	-	-	-
Stage 2	1015	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	846	910	1320	-	-	-
Mov Cap-2 Maneuver	846	-	-	-	-	-
Stage 1	889	-	-	-	-	-
Stage 2	1015	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.5	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1320	-	846	-	-	-
HCM Lane V/C Ratio	-	-	0.045	-	-	-
HCM Control Delay (s)	0	-	9.5	0	-	-
HCM Lane LOS	A	-	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-	-

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	0	0	3	3	27
Future Vol, veh/h	5	0	0	3	3	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	0	0	3	3	27

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	20	17	30	0	0
Stage 1	17	-	-	-	-
Stage 2	3	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	997	1062	1583	-	-
Stage 1	1006	-	-	-	-
Stage 2	1020	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	997	1062	1583	-	-
Mov Cap-2 Maneuver	997	-	-	-	-
Stage 1	1006	-	-	-	-
Stage 2	1020	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.6	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1583	-	997	-	-
HCM Lane V/C Ratio	-	-	0.005	-	-
HCM Control Delay (s)	0	-	8.6	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Timing Report, Sorted By Phase
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

Alstep, Unsplit Phasing (2031 Horizon)
 PM Peak Hour

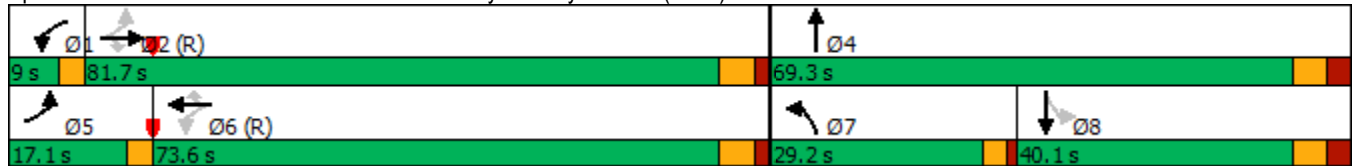


Phase Number	1	2	4	5	6	7	8
Movement	WBL	EBTL	NBT	EBL	WBTL	NBL	SBTL
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize				Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	None	C-Max	None	None
Maximum Split (s)	9	81.7	69.3	17.1	73.6	29.2	40.1
Maximum Split (%)	5.6%	51.1%	43.3%	10.7%	46.0%	18.3%	25.1%
Minimum Split (s)	8	29.2	40.1	9.5	29.2	9.5	40.1
Yellow Time (s)	3	4.2	4	3	4.2	3	4
All-Red Time (s)	0	2	3.1	0	2	1	3.1
Minimum Initial (s)	5	12	8	5	12	5	8
Vehicle Extension (s)	3	5	5	3	5	3	5
Minimum Gap (s)	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0
Walk Time (s)		9	13		9		13
Flash Dont Walk (s)		14	20		14		20
Dual Entry	No	Yes	Yes	No	Yes	No	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	142.9	151.9	73.6	142.9	0	73.6	102.8
End Time (s)	151.9	73.6	142.9	0	73.6	102.8	142.9
Yield/Force Off (s)	148.9	67.4	135.8	157	67.4	98.8	135.8
Yield/Force Off 170(s)	148.9	53.4	115.8	157	53.4	98.8	115.8
Local Start Time (s)	142.9	151.9	73.6	142.9	0	73.6	102.8
Local Yield (s)	148.9	67.4	135.8	157	67.4	98.8	135.8
Local Yield 170(s)	148.9	53.4	115.8	157	53.4	98.8	115.8

Intersection Summary

Cycle Length	160
Control Type	Actuated-Coordinated
Natural Cycle	150
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 1: Menkes Drive/Telford Way & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
 1: Menkes Drive/Telford Way & Derry Road E (RR 5)

Alstep, Unsplit Phasing (2031 Horizon)

PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘↗	↗		↘	↗	
Traffic Volume (veh/h)	166	1877	118	60	1987	68	490	39	74	94	20	152
Future Volume (veh/h)	166	1877	118	60	1987	68	490	39	74	94	20	152
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	0.99		0.98
Parking Bus, Adj	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No				No
Adj Sat Flow, veh/h/ln	1549	1633	1410	1526	1722	1413	1737	1483	1752	1767	1498	1693
Adj Flow Rate, veh/h	166	1877	0	60	1987	0	490	39	74	94	20	152
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	17	18	18	23	12	22	11	32	10	9	31	14
Cap, veh/h	182	2260		121	2127		505	163	310	255	26	198
Arrive On Green	0.09	0.51	0.00	0.03	0.45	0.00	0.16	0.36	0.36	0.18	0.18	0.18
Sat Flow, veh/h	1475	4459	1171	1454	4701	1173	3209	455	864	1191	148	1125
Grp Volume(v), veh/h	166	1877	0	60	1987	0	490	0	113	94	0	172
Grp Sat Flow(s),veh/h/ln	1475	1486	1171	1454	1567	1173	1605	0	1319	1191	0	1273
Q Serve(g_s), s	11.9	57.4	0.0	3.6	64.1	0.0	24.3	0.0	9.6	11.3	0.0	20.6
Cycle Q Clear(g_c), s	11.9	57.4	0.0	3.6	64.1	0.0	24.3	0.0	9.6	11.3	0.0	20.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.65	1.00		0.88
Lane Grp Cap(c), veh/h	182	2260		121	2127		505	0	473	255	0	225
V/C Ratio(X)	0.91	0.83		0.49	0.93		0.97	0.00	0.24	0.37	0.00	0.77
Avail Cap(c_a), veh/h	184	2260		129	2127		505	0	513	291	0	263
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	46.5	33.6	0.0	32.8	41.6	0.0	67.0	0.0	36.0	58.9	0.0	62.7
Incr Delay (d2), s/veh	41.6	3.7	0.0	3.1	9.2	0.0	32.2	0.0	0.6	1.9	0.0	14.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	14.0	30.6	0.0	2.6	36.6	0.0	18.6	0.0	6.2	6.8	0.0	12.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	88.1	37.3	0.0	35.9	50.8	0.0	99.2	0.0	36.5	60.8	0.0	77.2
LnGrp LOS	F	D		D	D		F	A	D	E	A	E
Approach Vol, veh/h		2043	A		2047	A		603				266
Approach Delay, s/veh		41.4			50.3			87.5				71.4
Approach LOS		D			D			F				E
Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.2	87.3		64.5	16.9	78.6	29.2	35.3				
Change Period (Y+Rc), s	3.0	6.2		7.1	3.0	6.2	4.0	7.1				
Max Green Setting (Gmax), s	6.0	75.5		62.2	14.1	67.4	25.2	33.0				
Max Q Clear Time (g_c+I1), s	5.6	59.4		11.6	13.9	66.1	26.3	22.6				
Green Ext Time (p_c), s	0.0	15.9		3.2	0.0	1.3	0.0	2.9				

Intersection Summary

HCM 6th Ctrl Delay	52.3
HCM 6th LOS	D

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Timing Report, Sorted By Phase
2: Bramalea Road & Derry Road E (RR 5)

Alstep, Unsplit Phasing (2031 Horizon)

PM Peak Hour

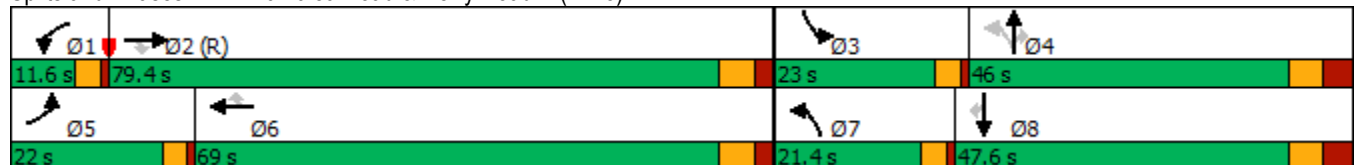


Phase Number	1	2	3	4	5	6	7	8
Movement	WBL	EBT	SBL	NBTL	EBL	WBT	NBL	SBT
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize	Yes	Yes	Yes	Yes			Yes	Yes
Recall Mode	None	C-Max	None	None	None	None	None	None
Maximum Split (s)	11.6	79.4	23	46	22	69	21.4	47.6
Maximum Split (%)	7.3%	49.6%	14.4%	28.8%	13.8%	43.1%	13.4%	29.8%
Minimum Split (s)	9.5	35.7	9.5	15.9	9	35.7	9.5	46.9
Yellow Time (s)	3	4.2	3	4	3	4.2	3	4
All-Red Time (s)	1	2.5	1	3.9	1	2.5	1	3.9
Minimum Initial (s)	5	12	5	8	5	12	5	10
Vehicle Extension (s)	3	5	3	5	3	5	3	5
Minimum Gap (s)	3	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0	0
Walk Time (s)		11				11		15
Flash Dont Walk (s)		18				18		24
Dual Entry	No	Yes	No	Yes	No	Yes	No	No
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	148.4	0	79.4	102.4	148.4	10.4	79.4	100.8
End Time (s)	0	79.4	102.4	148.4	10.4	79.4	100.8	148.4
Yield/Force Off (s)	156	72.7	98.4	140.5	6.4	72.7	96.8	140.5
Yield/Force Off 170(s)	156	54.7	98.4	140.5	6.4	54.7	96.8	116.5
Local Start Time (s)	148.4	0	79.4	102.4	148.4	10.4	79.4	100.8
Local Yield (s)	156	72.7	98.4	140.5	6.4	72.7	96.8	140.5
Local Yield 170(s)	156	54.7	98.4	140.5	6.4	54.7	96.8	116.5

Intersection Summary

































Cycle Length	160
Control Type	Actuated-Coordinated
Natural Cycle	125
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green	

Splits and Phases: 2: Bramalea Road & Derry Road E (RR 5)



HCM 6th Signalized Intersection Summary
2: Bramalea Road & Derry Road E (RR 5)

Alstep, Unsplit Phasing (2031 Horizon)
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	  		  	  					 		
Traffic Volume (veh/h)	284	1748	62	101	1630	413	276	161	426	342	37	254
Future Volume (veh/h)	284	1748	62	101	1630	413	276	161	426	342	37	254
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		1.00	0.90		0.89	1.00		1.00
Parking Bus, Adj	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.99
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1470	1678	1574	1737	1722	1625	1737	1811	1722	1737	1811	1604
Adj Flow Rate, veh/h	284	1748	62	101	1630	0	276	161	426	342	37	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	29	15	22	11	12	14	11	6	12	11	6	20
Cap, veh/h	306	2104	561	139	1834		490	431	310	379	448	
Arrive On Green	0.11	0.46	0.46	0.04	0.39	0.00	0.11	0.24	0.24	0.12	0.25	0.00
Sat Flow, veh/h	2716	4580	1220	3209	4701	1327	1654	1811	1303	3209	1811	1343
Grp Volume(v), veh/h	284	1748	62	101	1630	0	276	161	426	342	37	0
Grp Sat Flow(s),veh/h/ln	1358	1527	1220	1605	1567	1327	1654	1811	1303	1605	1811	1343
Q Serve(g_s), s	16.6	53.4	4.6	5.0	51.8	0.0	17.4	11.9	38.1	16.8	2.5	0.0
Cycle Q Clear(g_c), s	16.6	53.4	4.6	5.0	51.8	0.0	17.4	11.9	38.1	16.8	2.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	306	2104	561	139	1834		490	431	310	379	448	
V/C Ratio(X)	0.93	0.83	0.11	0.73	0.89		0.56	0.37	1.37	0.90	0.08	
Avail Cap(c_a), veh/h	306	2104	561	152	1834		490	431	310	381	449	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	70.4	37.8	24.6	75.6	45.5	0.0	41.2	51.0	60.9	69.7	46.3	0.0
Incr Delay (d2), s/veh	33.5	4.0	0.4	14.6	6.1	0.0	1.5	1.1	186.9	24.1	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	11.9	29.6	2.8	4.3	30.0	0.0	3.0	9.9	44.8	13.3	2.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	103.9	41.8	25.0	90.2	51.7	0.0	42.7	52.1	247.9	93.7	46.4	0.0
LnGrp LOS	F	D	C	F	D		D	D	F	F	D	
Approach Vol, veh/h		2094			1731	A		863			379	A
Approach Delay, s/veh		49.7			53.9			145.7			89.1	
Approach LOS		D			D			F			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.9	80.2	22.9	46.0	22.0	69.1	21.4	47.5				
Change Period (Y+Rc), s	4.0	6.7	4.0	7.9	4.0	6.7	4.0	7.9				
Max Green Setting (Gmax), s	7.6	72.7	19.0	38.1	18.0	62.3	17.4	39.7				
Max Q Clear Time (g_c+I1), s	7.0	55.4	18.8	40.1	18.6	53.8	19.4	4.5				
Green Ext Time (p_c), s	0.0	17.0	0.0	0.0	0.0	8.3	0.0	0.6				

Intersection Summary

HCM 6th Ctrl Delay	70.5
HCM 6th LOS	E

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	23	0	0	6	0	76	0	764	3	52	133	15
Future Vol, veh/h	23	0	0	6	0	76	0	764	3	52	133	15
Conflicting Peds, #/hr	2	0	0	0	0	2	145	0	0	0	0	145
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	6	0	0	20	0	5	0	16	50	0	24	25
Mvmt Flow	23	0	0	6	0	76	0	764	3	52	133	15

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	774	1157	219	937	1163	386	293	0	0	767	0	0
Stage 1	390	390	-	766	766	-	-	-	-	-	-	-
Stage 2	384	767	-	171	397	-	-	-	-	-	-	-
Critical Hdwy	7.62	6.5	6.9	7.9	6.5	7	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.62	5.5	-	6.9	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.62	5.5	-	6.9	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.56	4	3.3	3.7	4	3.35	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	281	198	791	194	196	604	1280	-	-	856	-	-
Stage 1	595	611	-	324	415	-	-	-	-	-	-	-
Stage 2	600	414	-	764	607	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	201	160	685	184	159	603	1109	-	-	856	-	-
Mov Cap-2 Maneuver	201	160	-	184	159	-	-	-	-	-	-	-
Stage 1	515	494	-	324	415	-	-	-	-	-	-	-
Stage 2	523	414	-	714	491	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	25.2		13.3		0		2.6	
HCM LOS	D		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1109	-	-	201	517	856	-	-
HCM Lane V/C Ratio	-	-	-	0.114	0.159	0.061	-	-
HCM Control Delay (s)	0	-	-	25.2	13.3	9.5	0.2	-
HCM Lane LOS	A	-	-	D	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0.6	0.2	-	-

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	0	0	475	133	0
Future Vol, veh/h	0	0	0	475	133	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	16965	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	29	44	0
Mvmt Flow	0	0	0	475	133	0

Major/Minor	Minor2	Major2		
Conflicting Flow All	238	238	-	0
Stage 1	238	238	-	-
Stage 2	0	0	-	-
Critical Hdwy	6.4	6.5	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	3.5	4	-	-
Pot Cap-1 Maneuver	755	666	-	-
Stage 1	806	712	-	-
Stage 2	-	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	755	0	-	-
Mov Cap-2 Maneuver	755	0	-	-
Stage 1	806	0	-	-
Stage 2	-	0	-	-

Approach	EB	WB
HCM Control Delay, s	0	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	WBT	WBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection												
Int Delay, s/veh	4.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	93	34	9	387	0	83	1	115	1	4	5
Future Vol, veh/h	6	93	34	9	387	0	83	1	115	1	4	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	100	41	28	0	23	0	25	100	0	0	100	100
Mvmt Flow	6	93	34	9	387	0	83	1	115	1	4	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	387	0	0	127	0	0	532	527	110	585	544	387
Stage 1	-	-	-	-	-	-	122	122	-	405	405	-
Stage 2	-	-	-	-	-	-	410	405	-	180	139	-
Critical Hdwy	5.1	-	-	4.1	-	-	7.35	7.5	6.2	7.1	7.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.35	6.5	-	6.1	6.5	-
Follow-up Hdwy	3.1	-	-	2.2	-	-	3.725	4.9	3.3	3.5	4.9	4.2
Pot Cap-1 Maneuver	789	-	-	1472	-	-	424	343	949	425	335	491
Stage 1	-	-	-	-	-	-	830	640	-	626	460	-
Stage 2	-	-	-	-	-	-	575	460	-	826	627	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	789	-	-	1472	-	-	411	338	949	368	330	491
Mov Cap-2 Maneuver	-	-	-	-	-	-	411	338	-	368	330	-
Stage 1	-	-	-	-	-	-	823	635	-	621	456	-
Stage 2	-	-	-	-	-	-	560	456	-	719	622	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.2			13.7			14.2		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	610	789	-	-	1472	-	-	400
HCM Lane V/C Ratio	0.326	0.008	-	-	0.006	-	-	0.025
HCM Control Delay (s)	13.7	9.6	0	-	7.5	0	-	14.2
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	1.4	0	-	-	0	-	-	0.1

Intersection												
Int Delay, s/veh	8.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖		↗		↔	
Traffic Vol, veh/h	0	132	38	33	127	0	214	0	375	0	0	0
Future Vol, veh/h	0	132	38	33	127	0	214	0	375	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	0	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	132	38	33	127	0	214	0	375	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	127	0	0	170	0	0	344	-	151	532	363	127
Stage 1	-	-	-	-	-	-	151	-	-	193	193	-
Stage 2	-	-	-	-	-	-	193	-	-	339	170	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	-	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	-	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1459	-	-	1407	-	-	610	0	895	458	565	923
Stage 1	-	-	-	-	-	-	851	0	-	809	741	-
Stage 2	-	-	-	-	-	-	809	0	-	676	758	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1459	-	-	1407	-	-	599	-	895	262	552	923
Mov Cap-2 Maneuver	-	-	-	-	-	-	599	-	-	262	552	-
Stage 1	-	-	-	-	-	-	851	-	-	809	724	-
Stage 2	-	-	-	-	-	-	790	-	-	393	758	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			1.6			12.8			0		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	599	895	1459	-	-	1407	-	-	-
HCM Lane V/C Ratio	0.357	0.419	-	-	-	0.023	-	-	-
HCM Control Delay (s)	14.3	11.9	0	-	-	7.6	-	-	0
HCM Lane LOS	B	B	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	1.6	2.1	0	-	-	0.1	-	-	-

Timing Report, Sorted By Phase
 7: Bramalea Road & Alstep Drive/Fed-Ex Truck Entrance

Alstep, Unsplit Phasing (2031 Horizon)
 PM Peak Hour

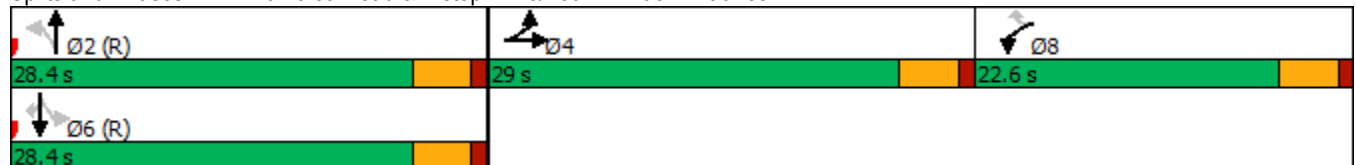


Phase Number	2	4	6	8
Movement	NBTL	EBTL	SBTL	WBL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	C-Max	None	C-Max	None
Maximum Split (s)	28.4	29	28.4	22.6
Maximum Split (%)	35.5%	36.3%	35.5%	28.3%
Minimum Split (s)	22.5	22.5	22.5	22.5
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	1	1	1	1
Minimum Initial (s)	5	5	5	5
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)	7	7	7	7
Flash Dont Walk (s)	11	11	11	11
Dual Entry	Yes	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes
Start Time (s)	0	28.4	0	57.4
End Time (s)	28.4	57.4	28.4	0
Yield/Force Off (s)	23.9	52.9	23.9	75.5
Yield/Force Off 170(s)	12.9	41.9	12.9	64.5
Local Start Time (s)	0	28.4	0	57.4
Local Yield (s)	23.9	52.9	23.9	75.5
Local Yield 170(s)	12.9	41.9	12.9	64.5

Intersection Summary

Cycle Length	80
Control Type	Actuated-Coordinated
Natural Cycle	70
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	

Splits and Phases: 7: Bramalea Road & Alstep Drive/Fed-Ex Truck Entrance



HCM 6th Signalized Intersection Summary

Alstep, Unsplit Phasing (2031 Horizon)

7: Bramalea Road & Alstep Drive/Fed-Ex Truck Entrance

PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	486	0	21	0	0	18	118	263	3	23	74	42
Future Volume (veh/h)	486	0	21	0	0	18	118	263	3	23	74	42
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.91		0.93	0.97		0.88
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1976	0	1205	1870	1899	1900	907	1945	1870
Adj Flow Rate, veh/h	486	0	21	0	0	18	118	263	3	23	74	42
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	0	0	50	2	5	0	67	2	2
Cap, veh/h	524	0	466	0	0	0	752	1110	13	257	804	825
Arrive On Green	0.29	0.00	0.29	0.00	0.00	0.00	0.59	0.59	0.59	0.59	0.59	0.59
Sat Flow, veh/h	1781	0	1585		0		1158	1872	21	339	1355	1391
Grp Volume(v), veh/h	486	0	21		0.0		118	0	266	97	0	42
Grp Sat Flow(s),veh/h/ln	1781	0	1585				1158	0	1893	1694	0	1391
Q Serve(g_s), s	21.2	0.0	0.8				3.9	0.0	5.3	0.0	0.0	1.0
Cycle Q Clear(g_c), s	21.2	0.0	0.8				5.6	0.0	5.3	1.7	0.0	1.0
Prop In Lane	1.00		1.00				1.00		0.01	0.24		1.00
Lane Grp Cap(c), veh/h	524	0	466				752	0	1123	1061	0	825
V/C Ratio(X)	0.93	0.00	0.05				0.16	0.00	0.24	0.09	0.00	0.05
Avail Cap(c_a), veh/h	546	0	485				752	0	1123	1061	0	825
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.4	0.0	20.2				8.2	0.0	7.7	7.0	0.0	6.8
Incr Delay (d2), s/veh	21.8	0.0	0.0				0.4	0.0	0.5	0.2	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	18.8	0.0	0.6				2.1	0.0	4.7	1.5	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	49.2	0.0	20.2				8.6	0.0	8.2	7.1	0.0	6.9
LnGrp LOS	D	A	C				A	A	A	A	A	A
Approach Vol, veh/h		507						384			139	
Approach Delay, s/veh		48.0						8.3			7.1	
Approach LOS		D						A			A	
Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		52.0		28.0		52.0						
Change Period (Y+Rc), s		4.5		4.5		4.5						
Max Green Setting (Gmax), s		23.9		24.5		23.9						
Max Q Clear Time (g_c+I1), s		7.6		23.2		3.7						
Green Ext Time (p_c), s		3.9		0.4		1.4						
Intersection Summary												
HCM 6th Ctrl Delay				27.7								
HCM 6th LOS				C								

Intersection						
Int Delay, s/veh	7.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	289	0	0	95	61	34
Future Vol, veh/h	289	0	0	95	61	34
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	289	0	0	95	61	34

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	173	78	95	0	0
Stage 1	78	-	-	-	-
Stage 2	95	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	817	983	1499	-	-
Stage 1	945	-	-	-	-
Stage 2	929	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	817	983	1499	-	-
Mov Cap-2 Maneuver	817	-	-	-	-
Stage 1	945	-	-	-	-
Stage 2	929	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.8	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1499	-	817	-	-	-
HCM Lane V/C Ratio	-	-	0.354	-	-	-
HCM Control Delay (s)	0	-	11.8	0	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	1.6	-	-	-

Intersection						
Int Delay, s/veh	2.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	36	0	0	59	57	4
Future Vol, veh/h	36	0	0	59	57	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	0	0	59	57	4

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	118	59	61	0	0
Stage 1	59	-	-	-	-
Stage 2	59	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	878	1007	1542	-	-
Stage 1	964	-	-	-	-
Stage 2	964	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	878	1007	1542	-	-
Mov Cap-2 Maneuver	878	-	-	-	-
Stage 1	964	-	-	-	-
Stage 2	964	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.3	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1542	-	878	-	-
HCM Lane V/C Ratio	-	-	0.041	-	-
HCM Control Delay (s)	0	-	9.3	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-