



**1480 Derry Road East  
Mississauga, Ontario  
Transportation Impact  
Assessment**

Paradigm Transportation Solutions Limited

September 2019





## Project Summary



**Project Number**  
190265

**1480 Derry Road East, Mississauga, Ontario**  
**Transportation Impact Assessment**

**September 2019**

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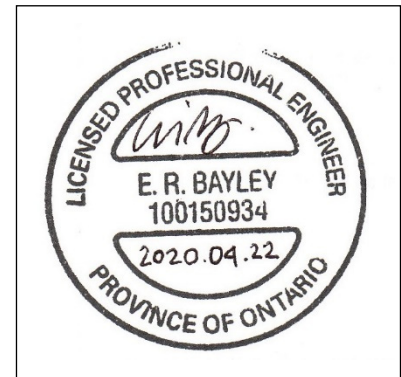
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A handwritten signature in black ink, appearing to read 'Stefan Hajgato', written over a horizontal line.

Signature



Engineer's Seal

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# Executive Summary

## Content

Paradigm Transportation Solutions Limited (Paradigm) has been retained by Prabh Aulakh Limited to conduct a Transportation Impact Assessment (TIA) for the proposed development of 1480 Derry Road East in the City of Mississauga.

This study determines the impacts of the development traffic on the surrounding road network and identifies the recommended improvements to accommodate the site generated traffic.

## Development Concept

The proposed development consists of a gasoline / service station with convenience market. The site plan includes 3 gasoline pumps with 6 fueling positions and a two-storey, 356 m<sup>2</sup> convenience market/office. The site plan includes 13 parking spaces. Vehicular access is provided by a right-in/right-out (RIRO) driveway to Derry Road East at the west limits of the site's frontage.

## Conclusions

Based on the investigations carried out, it is concluded that:

- ▶ **Existing Traffic Operations:** The intersection analysis of Derry Road East and Dixie Road shows critical v/c ratios in the AM and PM peak hours. The 95<sup>th</sup> percentile northbound left-turn queue length is estimated to extend the current available storage length.
- ▶ **Development Generated Traffic:** The subject site is estimated to generate approximately 75 AM peak hour trips and 84 PM peak hour trips. Pass-by trips are anticipated to reduce the site's net generation to approximately 27 and 36 new trips during the AM and PM peak hour, respectively;
- ▶ **Heavy Vehicle Circulation:** The swept path analysis suggests that the layout and design of the site is appropriately designed to accommodate the design vehicle. However, the design vehicle may cause short delays to vehicles accessing or maneuvering on-site;
- ▶ **Background Traffic Operations:** The capacity issues forecast to occur at the Derry Road East and Dixie Road intersection



under existing conditions are anticipated to continue to occur under forecast background conditions;

- ▶ **Total Traffic Operations:** The capacity issues forecast to occur at the Derry Road East and Dixie Road intersection under background conditions are anticipated to continue to occur with the development of the subject site.

The Derry Road East and Site Driveway intersection is forecast to operate within acceptable levels of services with delays in the LOS B range with a low v/c ratio.

Queue lengths generated by the downstream signalized intersection of Derry Road East and Dixie Road are expected to extend across the site's frontage during the AM and PM peak hours. This condition is expected to result in short-term delays for vehicles existing the site.

## Recommendations

The following actions are recommended based on the findings of this study:

- ▶ Fuel deliveries be scheduled by the site operator to occur during off-peak hours to minimize the impact to both the site operations and the operations of the Derry Road East driveway; and
- ▶ A traffic controller be on site to assist the reversing maneuver of the design vehicle



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# 1 Introduction

## 1.1 Overview

This study determines the traffic impacts of the proposed development on the surrounding road network and identifies the recommended improvements to accommodate the site-generated traffic. The scope of the study includes:

- ▶ determine and assess the current study area traffic conditions;
- ▶ forecast the additional traffic generated by the proposed development;
- ▶ assess the site's heavy vehicle circulation;
- ▶ analyze the impacts of this additional traffic on the study area street network; and
- ▶ recommend any necessary remedial measures required to mitigate these impacts.

The subject site is located at 1480 Derry Road East in Mississauga, Ontario. **Figure 1.1** illustrates the subject site location. The subject site is bounded by Derry Road East to the north, industrial land uses to the west, and vacant land to the south and east.

The study scope was developed in consultation with the City of Mississauga and the Region of Peel via e-mail in August 2019. The agreed upon scope includes:

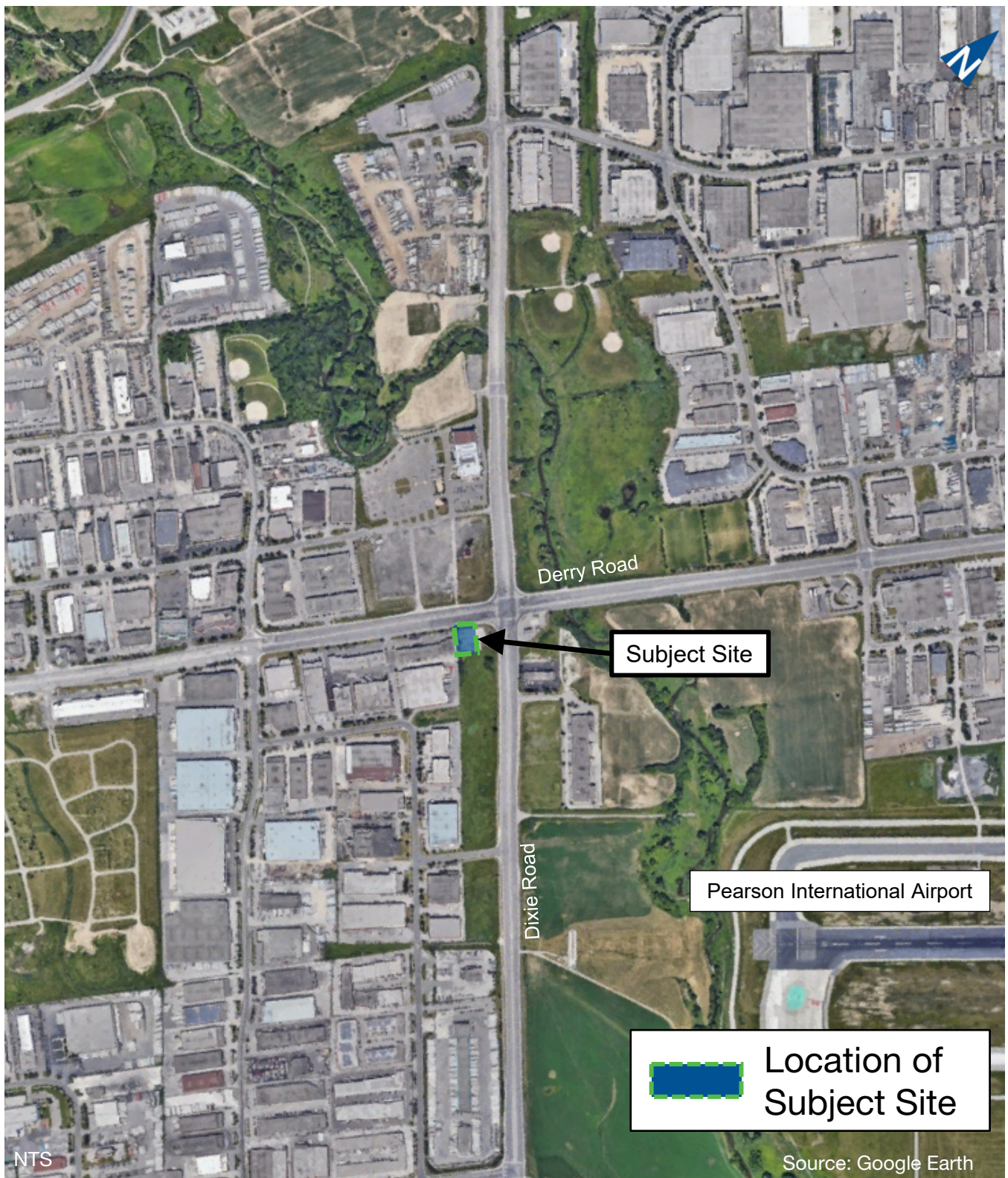
- ▶ AM and PM peak hour traffic conditions analyses for existing (2019), 2024 background (without development) and 2024 total (with development) planning horizons; and
- ▶ Study area to include:
  - Derry Road East and Dixie Road; and
  - Derry Road East & Proposed Access.

This study has been prepared in accordance with the City of Mississauga Traffic Impact Study Guidelines<sup>1</sup>. **Appendix A** contains the pre-study consultation material.

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<sup>1</sup> *Traffic Impact Study Guidelines*, City of Mississauga





## 2 Existing Conditions

### 2.1 Road Network

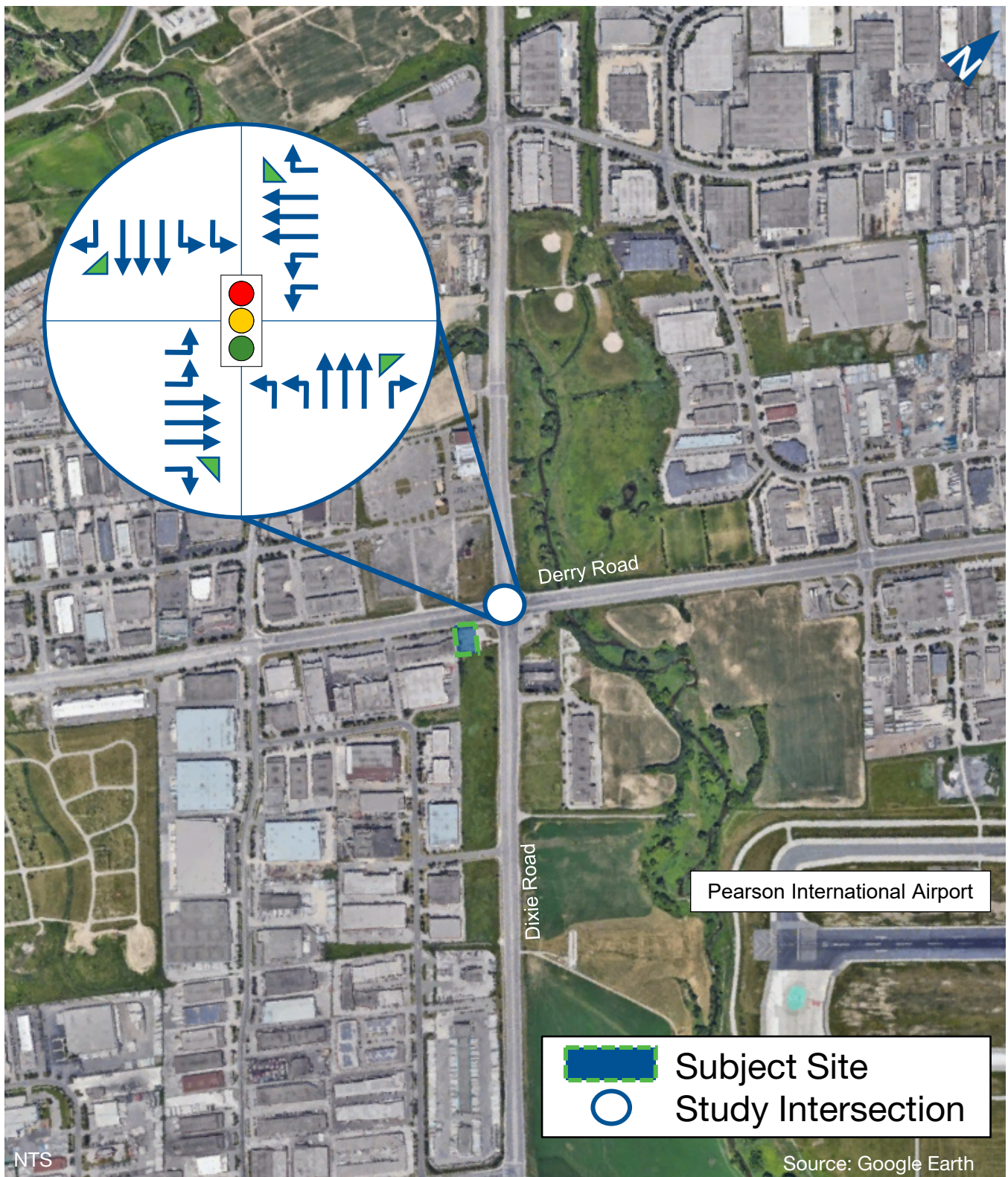
The roadways of interest within the study area include:

- ▶ **Derry Road East (Regional Road 5)** is an east / west Regional road under the jurisdiction of the Region of Peel. The road has a 6-lane urban cross-section, sidewalks on both sides of the road, and a posted speed limit of 70 km/h throughout the study area. The intersection with Dixie Road operates with a traffic control signal; and
- ▶ **Dixie Road (Regional Road 4)** is a north / south Regional road under the jurisdiction of the Region of Peel. The road has a 6-lane urban cross-section, sidewalks on both sides of the road, and a posted speed limit of 70 km/h throughout the study area.

**Figure 2.1** illustrates the existing lane configuration and traffic control at study area intersections.







## 2.2 Traffic Volumes

**Figure 2.2** illustrates the existing AM and PM weekday peak hour turning movement traffic volumes collected by the Region of Peel in March 2018. **Appendix B** contains the detailed traffic count for study area intersection.

## 2.3 Transit Service

Mississauga Transit (MiWay) currently operates 6 bus routes near the subject site:

- ▶ **Route 5** (Dixie) services the Dixie Road corridor between Cardiff Boulevard and Long Branch Go Terminal. The route operates on 10-minute headways during weekday peak hour periods and 20-minute headways during all other periods;
- ▶ **Route 15** (Drew) services the Drew Road and Rena Road corridor between Tomken Road and Westwood Square. The route operates on 30-minute headways during weekdays and does not operate on weekends;
- ▶ **Route 42** (Derry) services the Derry Road corridor between Meadowvale Town Centre and Westwood Square. The route operates on 10-minute headways during weekday peak hour periods, 20-minute headways weekday off-peak periods, and 30-35-minute headways on weekends;
- ▶ **Route 104** (Derry Express) services the Derry Road corridor between Meadowvale Town Centre and Westwood Square. The route operates on 15-minute headways during weekdays and does not operate on weekends; and
- ▶ **Route 185** (Dixie Express) services the Dixie Road corridor between Bramalea Terminal and Dixie Terminal. The route operates on 15-minute headways during weekdays and does not operate on weekends.

Brampton Transit operates Route 18 near the subject site, which services the Dixie Road corridor between Bramalea Terminal and Meyerside Drive. The route operates on 10-minute headways during weekday peak hour periods, 20-25-minute headways during all other periods.

The eastbound and westbound bus stops are located adjacent to the subject site on the north and south side of Derry Road East. The northbound bus stops are located on Dixie Road approximately 175 metres north and south of the Derry Road East intersection. The

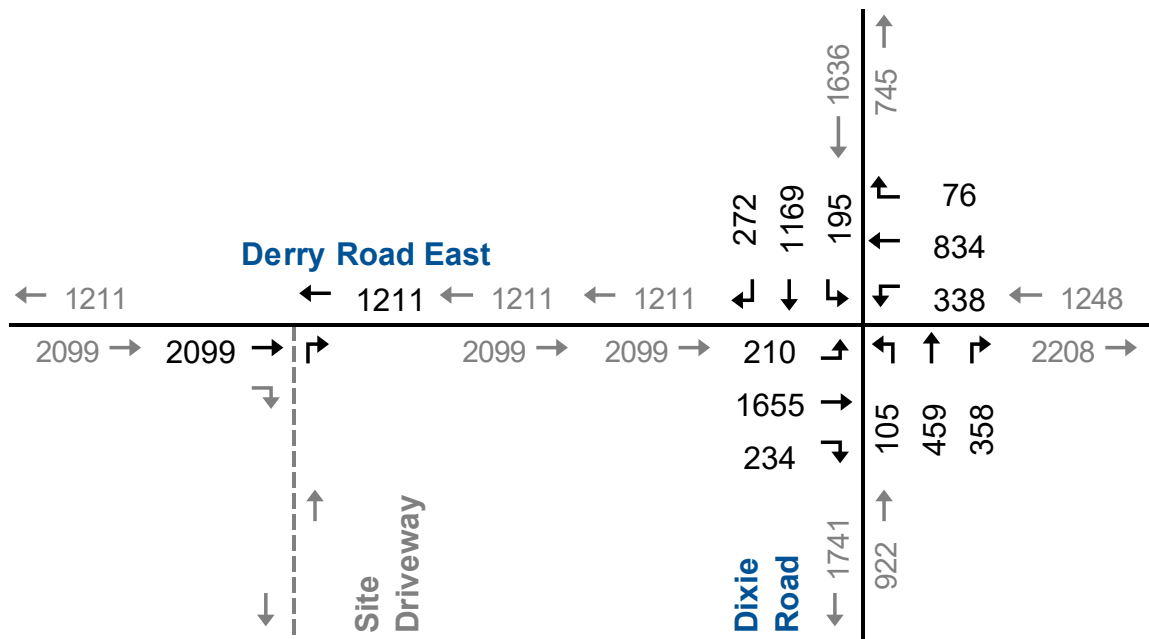


southbound bus stops are located approximately 175 metres north of the Derry Road East intersection.

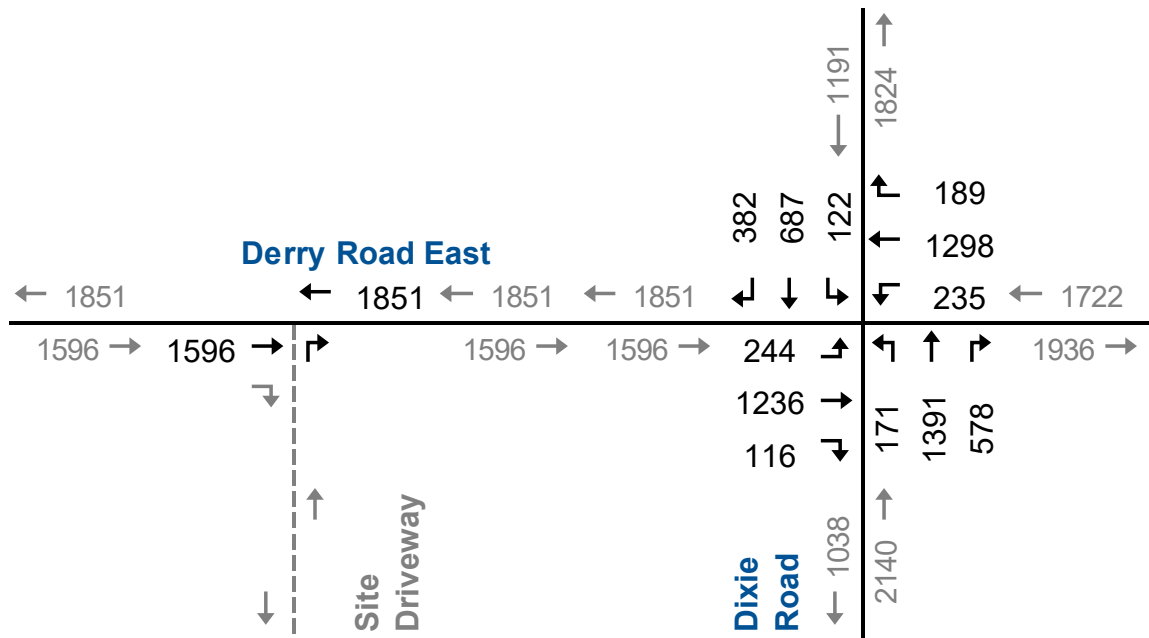
**Figure 2.3** illustrates the transit routes near the subject site.



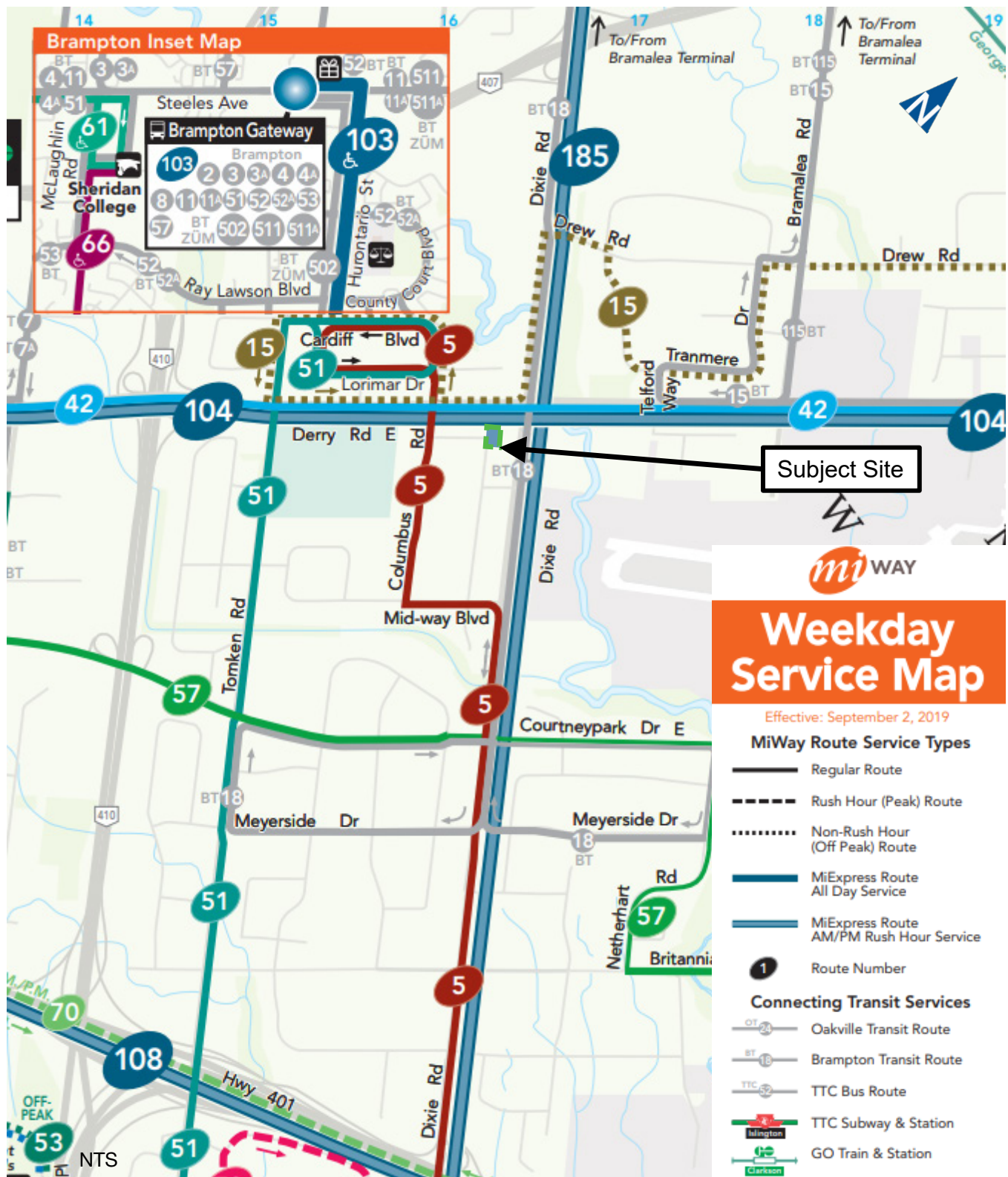
# AM Peak Hour



# PM Peak Hour









## 2.4 Traffic Operations

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 the various movements. 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. The highest 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 (50 seconds at unsignalized), the movement is considered to have a LOS F and remedial measures are usually implemented, if they are feasible.

The operations of the intersections in the study area were evaluated using the existing lane configuration and traffic control along with the existing traffic volumes. The intersection analysis considered three separate measures of performance:

- ▶ The LOS for each turning movement;
- ▶ The volume to capacity ratio (v/c) for each movement; and
- ▶ The 95th percentile queue lengths.

Under the City of Mississauga TIS Guidelines, the operational analysis must include identification of signalized and unsignalized intersections where:

- ▶ Volume to Capacity ratios (v/c) for overall intersection operations, through movements, or shared through / turning movements increase to 0.85 or above for signalized intersections;
- ▶ V/C ratios for exclusive turning movements increase to 0.90 or above for signalized intersections;
- ▶ Queues for an individual movement are projected to exceed available turning lane storage for signalized and unsignalized intersections; and
- ▶ LOS, based on average delay per vehicle on individual movements is LOS E or greater for unsignalized intersections.

The operations of the intersections in the study area were evaluated with the existing turning movement volumes using Synchro 9 with HCM 2000 procedures. The key parameters used in the analysis include:



- ▶ Existing lane configurations;
- ▶ Heavy vehicle percentages derived from existing traffic counts;
- ▶ Ideal saturation flows rates of 1,900 vehicles per hour per lane (vphpl), as specified in the Region of Peel's Synchro Guidelines<sup>2</sup>;
- ▶ Peak hour factor (PHF) of 1.00, as specified in the Region's Synchro Guidelines;
- ▶ Signal timing plans as provided by the Region;
- ▶ Posted maximum speed limits; and
- ▶ Synchro default values for all other inputs.

**Table 2.1** summarizes the level of service conditions at the intersection of Derry Road and Dixie Road. The following critical movements are noted:

#### **AM Peak Hour**

- ▶ The eastbound through movement is estimated to operate with delays in the LOS E range with a v/c ratio greater than 0.90; and
- ▶ The overall intersection is estimated to operate at LOS E with a v/c of greater than 0.90.

#### **PM Peak Hour**

- ▶ The eastbound through movement is estimated to operate at LOS E with a v/c of greater than 0.90;
- ▶ The westbound through movement is estimated to operate at LOS E with a v/c of greater than 0.90; and
- ▶ The 95<sup>th</sup> percentile queue length for the northbound right-turn lane is estimated to extend beyond the current available storage length.
- ▶ The overall intersection is estimated to operate at LOS E with a v/c of greater than 0.85.

**Appendix C** contains the detailed Synchro 9 reports.

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<sup>2</sup> *Regional Guidelines for Using Synchro 7.73 Rev 8*, Region of Peel, December 2010.



**TABLE 2.1: EXISTING TRAFFIC OPERATIONS**

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach															
				Eastbound				Westbound				Northbound				Southbound			
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach
AM Peak Hour	Derry Road & Dixie Road	TCS	LOS	E	E	D	E	F	D	C	D	F	D	D	D	E	E	D	E
			Delay	72	68	37	65	81	38	31	49	81	49	50	53	74	57	42	57
			V/C	0.68	0.98	0.26		0.85	0.50	0.06		0.66	0.44	0.44		0.68	0.85	0.22	0.92
			95th	49	247	42		82	99	0		31	60	59		47	151	24	
			Storage	170	-	190		215	-	215		65	-	65		125	-	150	
PM Peak Hour	Derry Road & Dixie Road	TCS	Avail.	121	-	148		133	-	215		34	-	6		78	-	126	
			LOS	E	E	D	E	E	D	E	E	D	D	D	D	E	D	D	E
			Delay	69	68	39	66	69	66	40	63	67	50	50	52	67	40	38	42
			V/C	0.72	0.96	0.08		0.70	0.95	0.13		0.59	0.86	0.76		0.52	0.51	0.35	0.86
			95th	49	170	15		47	174	18		36	156	126		27	72	38	
			Storage	170	-	190		215	-	215		65	-	65		125	-	150	
			Avail.	121	-	175		168	-	197		29	-	-61		98	-	112	

TWSC - Two-Way Stop Control

LOS - Level of Service

Storage - Existing Storage (m)

TCS - Traffic Control Signal

V/C - Volume to Capacity Ratio

Avail. - Available Storage (m)

MOE - Measure of Effectiveness

95th - 95th Percentile Queue Length



## 3 Development Concept

### 3.1 Development Description

The proposed development consists of a gasoline / service station with convenience market. The site plan includes 3 pumps with 6 fueling positions and a two-storey, 356 m<sup>2</sup> convenience market / office.

The site plan includes 13 parking spaces, two of which are designed as accessible. Three post and ring bike rack are illustrated adjacent to the site's refuse collection area in the southwest corner.

Vehicular access is provided by a right-in/right-out (RIRO) driveway to Derry Road East at the west limit of the site's frontage located approximately 85 metres (centreline to centreline) east of Dixie Road. Build-out is anticipated to occur by Year 2020.

The on-site drive aisles surrounding the 3-pump canopy measure at least 6.0 m in width. The drive aisle width adjacent to the canopy's northeast corner measures 5.4 m in width. When the fueling position on the northeast corner is occupied, the driveway aisle may temporarily function as a single lane two-way drive aisle.

The site's fuel tanks are located on the western property line and have been integrated into the site's loading zone area.

There are no dedicated pedestrian facilities linking the convenience market / office to the sidewalks along Derry Road East or Dixie Road.

**Figure 3.1** illustrates the site concept plan.

### 3.2 Site Traffic Forecasts

The Institute of Transportation Engineers (ITE) Trip Generation methods<sup>3</sup> predict the site trip generation. Land Use Code 945 (Gasoline / Service Station with Convenience Market) was used to estimate the site's trip generation.

The subject site is forecast to generate approximately 75 vehicle trips during the AM peak hour and approximately 84 vehicle trips during the PM peak hour. Pass-by trips are anticipated to lower the site's net generation to approximately 27 new vehicle trips during the AM peak hour and approximately 36 new vehicle trips during the PM Peak hour.

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<sup>3</sup> *Trip Generation Tenth Edition*, Institute of Transportation Engineers, Washington D.C., 2017



A pass-by rate of 63% and 56% is provided for Land Use Code 945<sup>4</sup> during the AM and PM peak hours, respectively. **Table 3.1** shows the trip generation.

**TABLE 3.1: ESTIMATED TRIP GENERATION**

Land Use Code	GFA / Fueling Positions	Formula or Rate	AM Peak Hour				PM Peak Hour			
			Rate per Unit	In	Out	Total	Rate per Unit	In	Out	Total
945: Gasoline/Service Station with Convenience Market	6 Fueling Positions	Rate	12.47	38	37	75	13.99	43	41	84
<b>Total Net Trips</b>				<b>38</b>	<b>37</b>	<b>75</b>		<b>43</b>	<b>41</b>	<b>84</b>
<i>Pass-By Trips</i>			63%	24	24	48	56%	24	24	48
<b>Total New Trips</b>				<b>14</b>	<b>13</b>	<b>27</b>		<b>19</b>	<b>17</b>	<b>36</b>

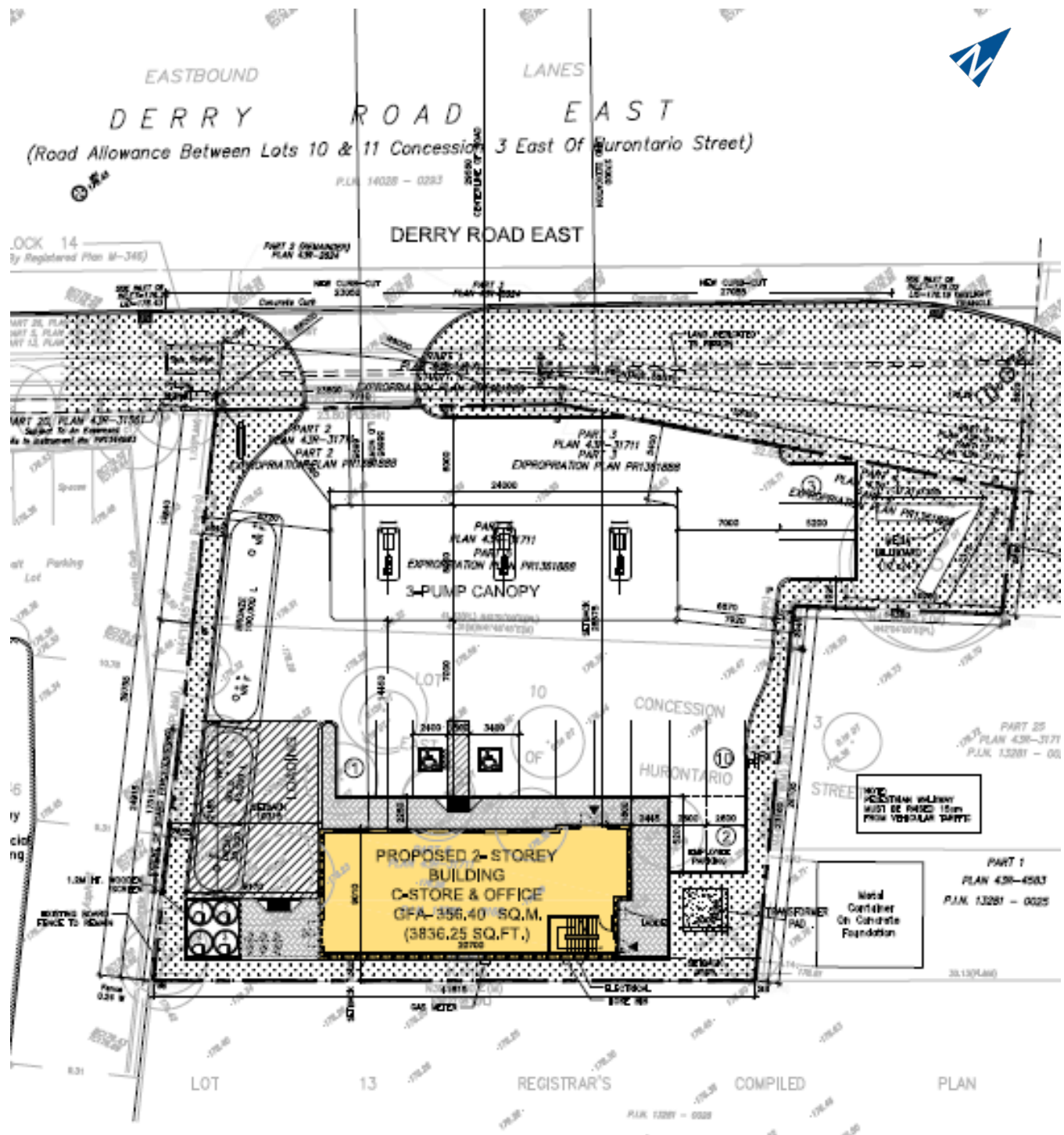
Due to the site's proximity to the Derry Road East and Dixie Road intersection, the trip assignment and distribution was based on existing travel patterns. As the site access to the proposed development is restricted to RIRO, all inbound trips are assumed to originate to the west of the subject site. **Table 3.2** summarizes the estimated trip distribution for site generated traffic. **Figure 3.2** illustrates the site-generated traffic volumes for the AM and PM peak hours, respectively.

**TABLE 3.2: ESTIMATED TRIP DISTRIBUTION**

Direction of Travel	AM Peak Hour	PM Peak Hour
<b>Northbound on Dixie Road</b>	10%	15%
<b>Eastbound on Derry Road</b>	80%	80%
<b>Southbound on Dixie Road</b>	10%	5%
<b>Total</b>	<b>100%</b>	<b>100%</b>

<sup>4</sup> Trip Generation Handbook Third Edition, Institute of Transportation Engineers, Washington D.C., 2017





NTS

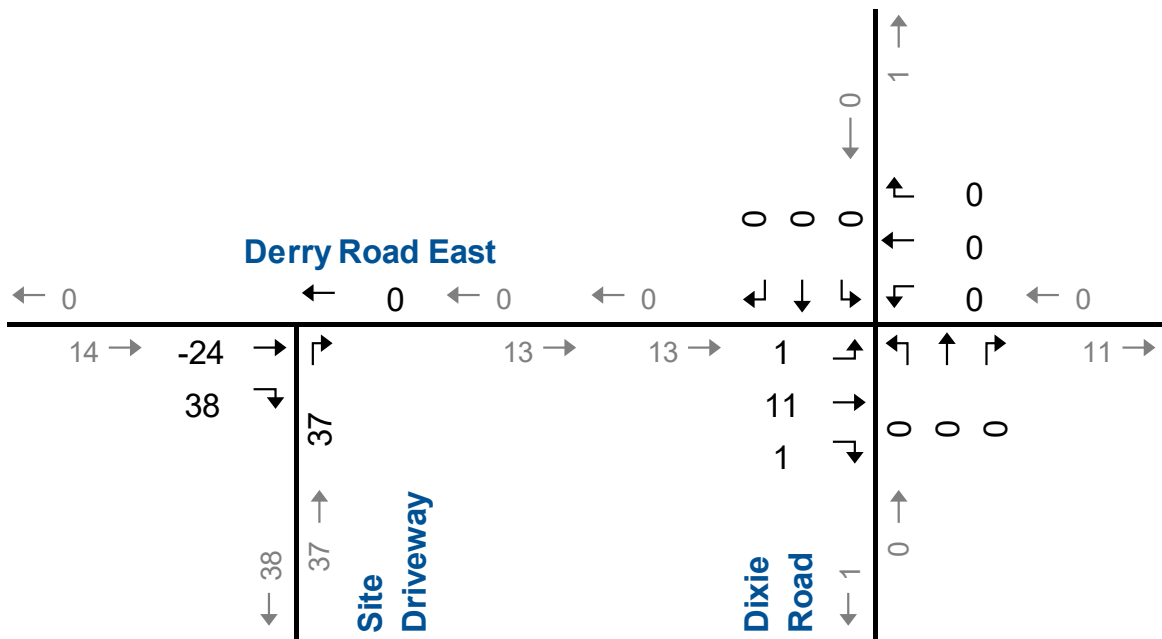


## Site Concept Plan

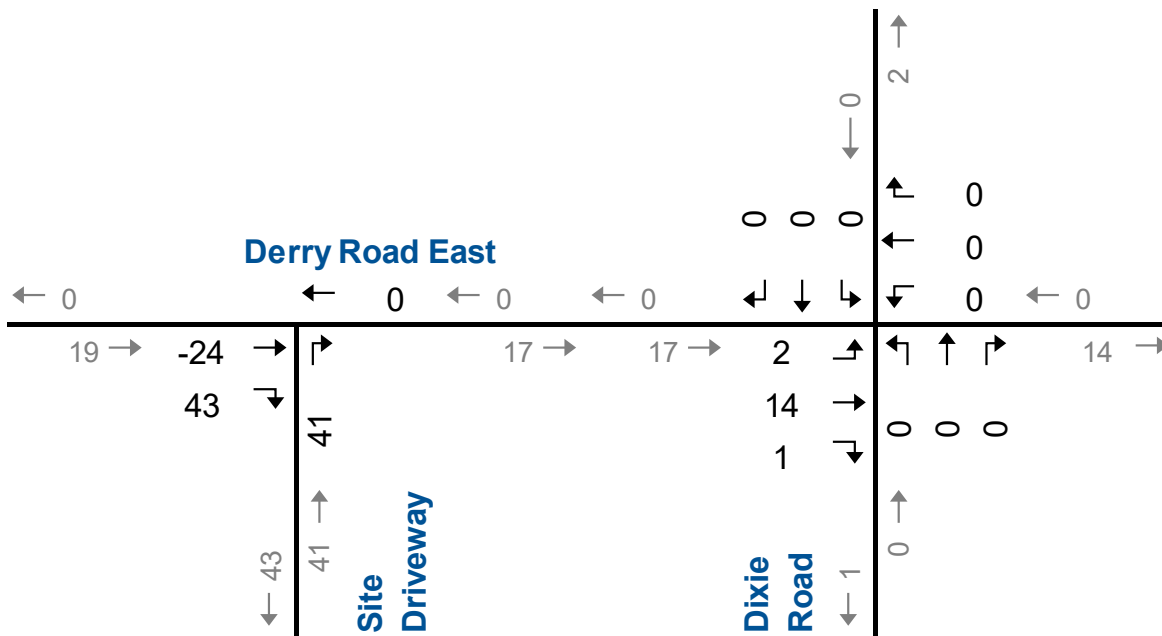
1480 Derry Road TIA  
190265

Figure 3.1

## AM Peak Hour



## PM Peak Hour



### 3.3 Heavy Vehicle Circulation

The applicant has indicated that the fuel delivers to the subject site will be completed by a small fuel delivery vehicle. The design vehicle is assumed as an American Association of State Highway and Transportation Officials (AASHTO) WB-12M.

**Figure 3.3** and **Figure 3.4** illustrate the on-site circulation of the WB-12M design vehicle and the following is noted:

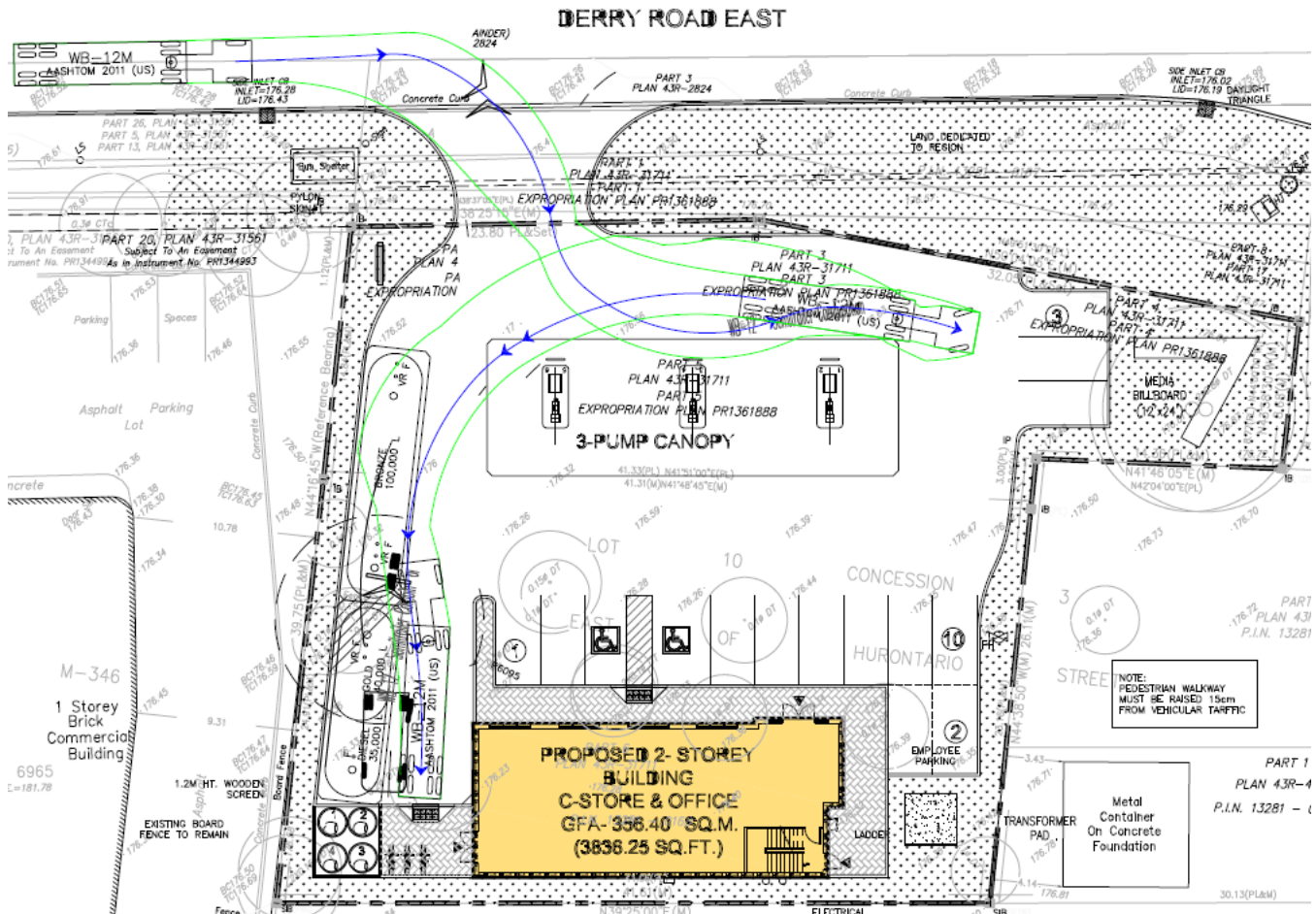
- ▶ The design vehicle will enter the site via the Derry Road East driveway and position itself north of the gasoline pumps;
- ▶ The design vehicle will then reverse towards the southwest corner of the site where the underground fuel tanks are located. The clearance provided under the canopy is noted by the Architect to be 5 metres and is designed to provide sufficient vertical clearance. As the vehicle reverses the site driveway to Derry Road East will be momentarily blocked;
- ▶ To exit the site the design vehicle will pull forward to exit the site in a forward movement. The vehicle is anticipated to utilize the entire width of the site driveway. While the vehicle waits on-site to enter the Derry Road East right-of-way, the site driveway to Derry Road East will be momentarily blocked.

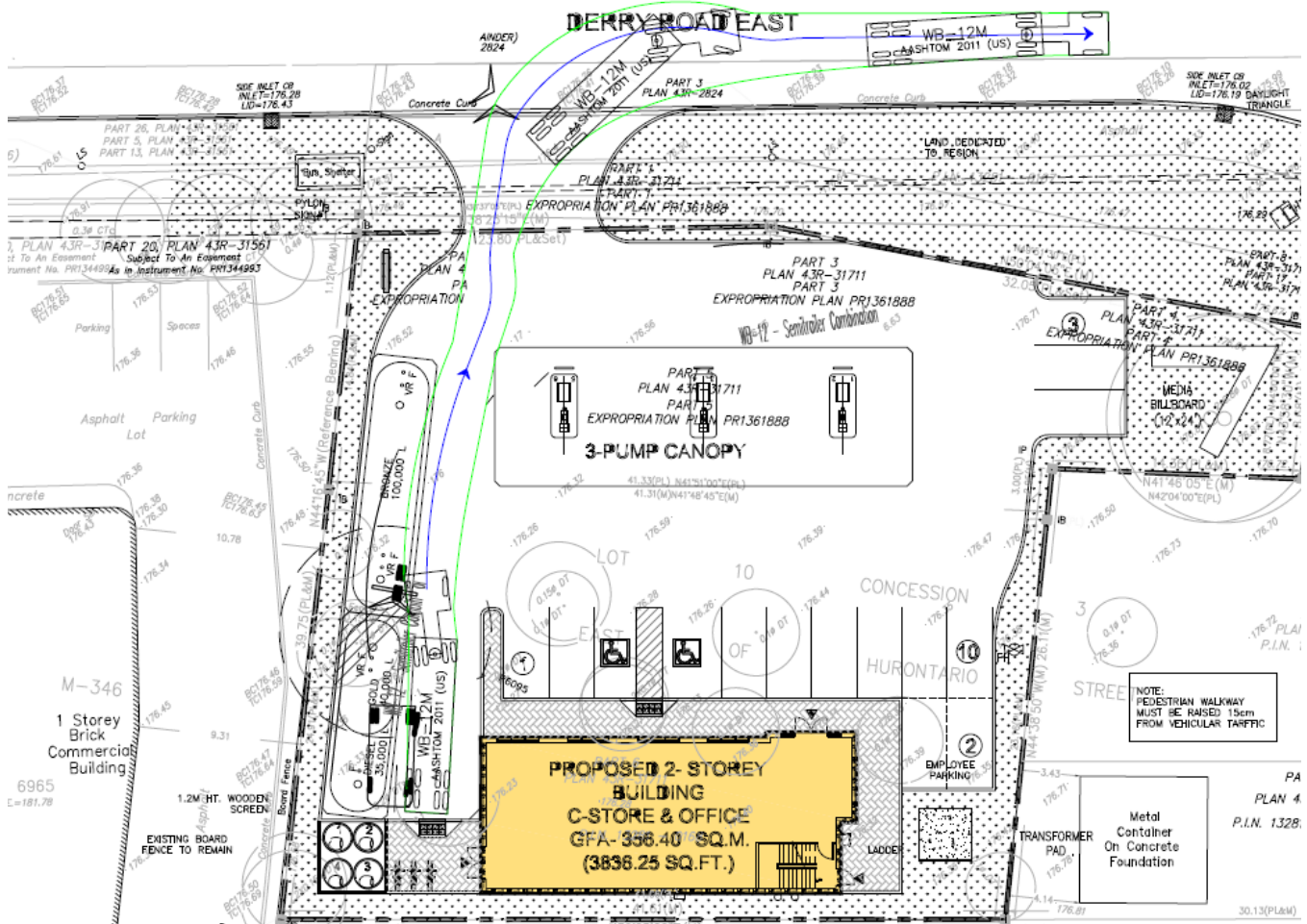
The swept path analysis suggests that the layout and design of the site is appropriately designed to accommodate the design vehicle. It is recommended that fuel deliveries be scheduled by the site operator to occur during off-peak hours to minimize impact to both the site operations and the operations of the Derry Road East driveway. The reversing maneuver on-site by the design vehicle should ideally be carried out with the assistance of a flag man.

The site's waste collection is anticipated to be completed privately. Four Molok waste containers are located in the site's southwest corner. No circulation issues are anticipated to occur for the waste collection vehicle. The fuel delivery vehicle shapes the site's geometry.









## 4 Evaluation of Future Traffic Conditions

The assessment of the future traffic conditions contained in this section includes the traffic forecasts as well as the level of service analysis.

### 4.1 Traffic Forecasts

A five-year horizon (2024) from the date of the study has been assessed. The likely future traffic volumes near the subject site are estimated to consist of:

- ▶ increased non-site traffic (generalized background traffic growth);
- ▶ traffic generated by the following adjacent development applications; and
  - 6900 Dixie Road<sup>5</sup>, located southeast of the subject site. The development is intended to be a self-storage facility; however, the site is assessed as a 500 m<sup>2</sup> fast food restaurant with a drive-through window as this represents the worst-case scenario for the site; and
  - 1150 Derry Road East<sup>6</sup>, located to the west of the subject site. The development is proposed to consist of 8 light industrial units.
- ▶ traffic generated by the subject site.

The non-site traffic increase is the generalized traffic growth on study area roads. The generalized background traffic growth forecast assumes an annual growth rate of 0.5% which was confirmed by Region of Peel staff during pre-study consultation.

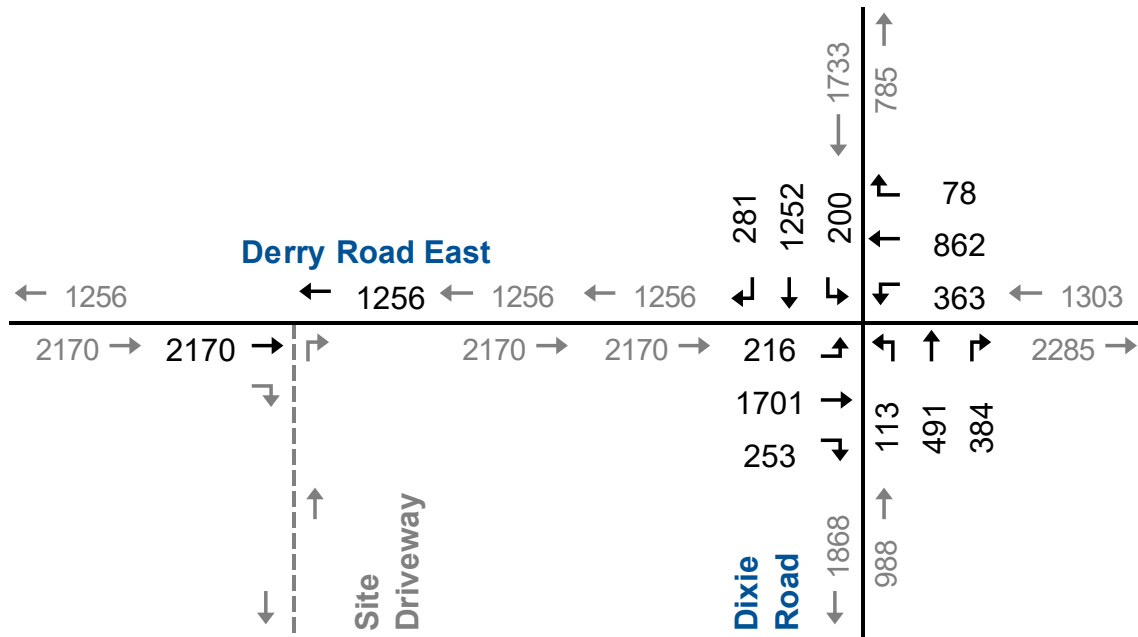
**Figure 4.1** illustrates the forecast background traffic volumes which is the combination of the generalized growth and the traffic generated by the two background development. **Figure 4.2** illustrates the forecast total traffic volumes which includes the addition of the subject site traffic.

<sup>5</sup> Traffic Study prepared by MMM Group.

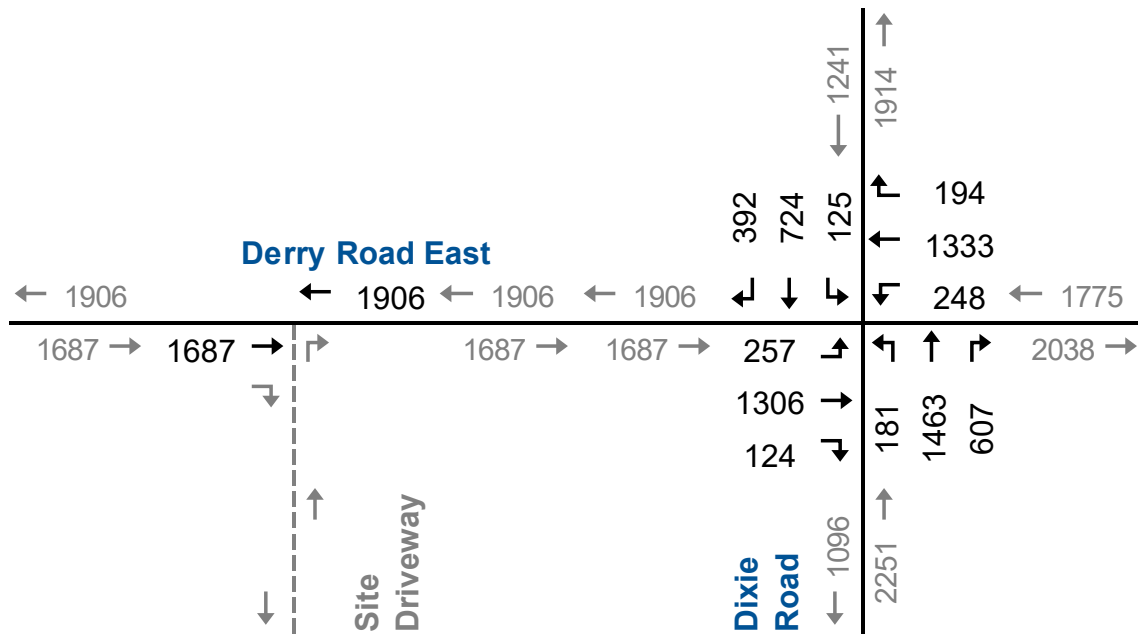
<sup>6</sup> Traffic Impact Study Update – Proposed Industrial Development, Trans-Plan Transportation Engineering



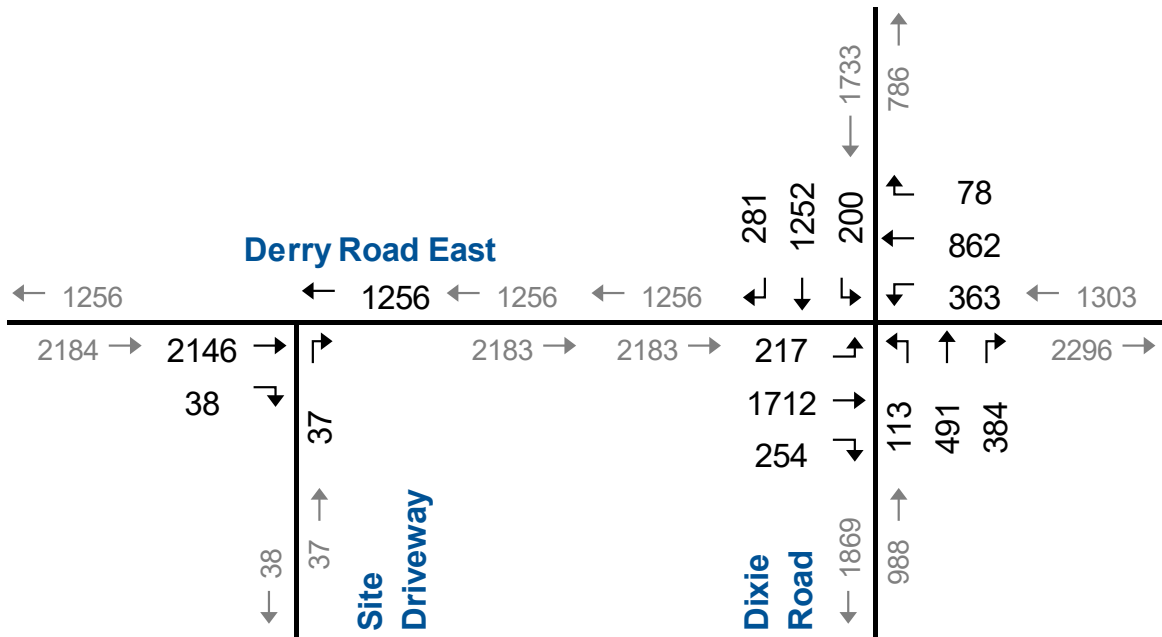
## AM Peak Hour



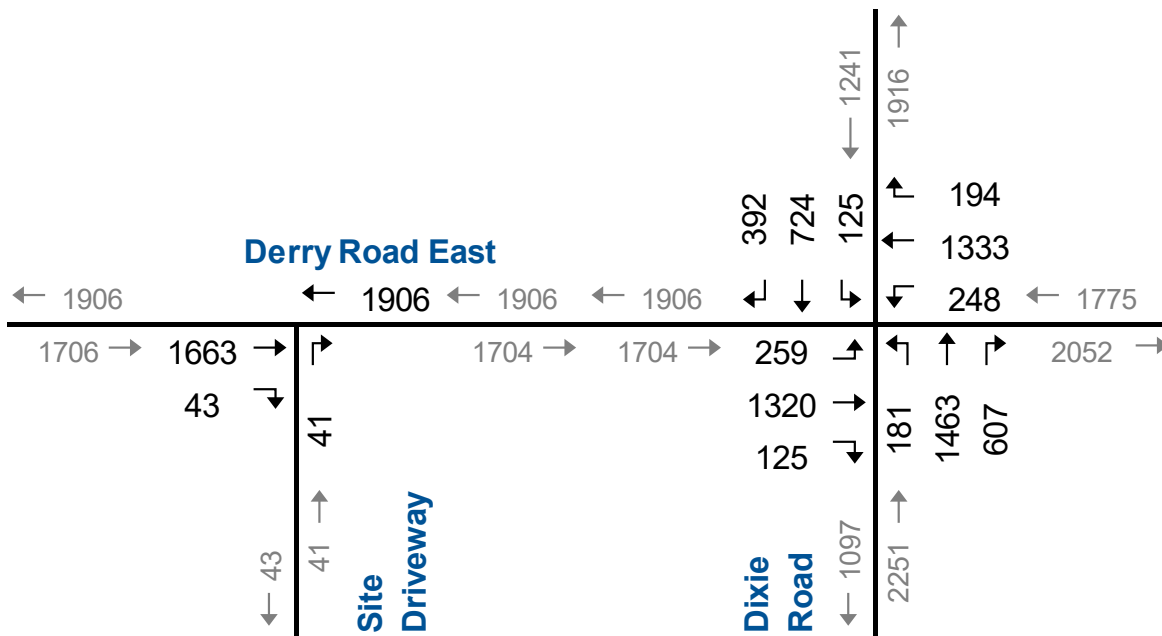
## PM Peak Hour



## AM Peak Hour



## PM Peak Hour



## 4.1 Background Traffic Operations

The study area intersection operations analyses followed the same methodology used for existing conditions. **Table 4.1** summarizes the level of service conditions for the intersection of Dixie Road and Derry Road and notes:

### AM Peak Hour

- ▶ The 95<sup>th</sup> percentile queue length for the northbound right-turn lane is forecast to extend beyond the current available storage length. The existing storage lane length is approximately 65 metres. Extending the storage lane length for this movement may not be possible given the spacing between Carlscrest Road and Derry Road East; and
- ▶ The overall intersection is forecast to operate at LOS E with a v/c of greater than 0.95.

### PM Peak Hour

- ▶ The overall intersection is estimated to operate at LOS E with a v/c of approximately 0.90.

**Appendix D** contains the detailed Synchro 9 reports.



**TABLE 4.1: BACKGROUND TRAFFIC OPERATIONS**

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				OVERALL
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Derry Road & Dixie Road	TCS	LOS	E	F	D	E	F	D	C	D	F	D	D	D	E	E	D	E	E
			Delay	74	82	39	76	88	40	32	53	86	49	51	54	76	60	42	59	63
			V/C	0.70	1.03	0.30		0.90	0.52	0.06		0.71	0.46	0.51		0.70	0.89	0.23		0.96
			95th	50	258	49		91	103	0		35	64	72		48	165	25		
			Storage Avail.	170	-	190		215	-	215		65	-	65		125	-	150		
			120	-	141		124	-	215		31	-	-7		77	-	125			
PM Peak Hour	Derry Road & Dixie Road	TCS	LOS	E	F	D	F	E	E	D	E	E	D	D	D	E	D	D	D	E
			Delay	71	87	40	81	71	76	41	72	69	52	55	54	68	41	39	43	63
			V/C	0.74	1.03	0.09		0.73	0.99	0.14		0.61	0.89	0.81		0.53	0.53	0.38		0.90
			95th	51	185	15		50	181	18		38	167	155		28	76	44		
			Storage Avail.	170	-	190		215	-	215		65	-	65		125	-	150		
			119	-	175		165	-	197		27	-	-90		97	-	106			

TWSC - Two-Way Stop Control

LOS - Level of Service

Storage - Existing Storage (m)

TCS - Traffic Control Signal

V/C - Volume to Capacity Ratio

Avail. - Available Storage (m)

MOE - Measure of Effectiveness

95th - 95th Percentile Queue Length



## 4.2 Total Traffic Operations

The study area intersection operations analyses followed the same methodology used for existing conditions. **Table 4.2** summarizes the level of service conditions and notes:

- ▶ The capacity issues forecast to occur at the Derry Road East and Dixie Road intersection under background conditions are anticipated to continue to occur with the development of the subject site.
- ▶ Due to the limitations of HCM analysis, the Derry Road East and Site Driveway intersection was modelled with three through lanes and one shared through-right lane, instead of five through lanes and one shared through-right lane. No operational issues are forecast at this intersection despite this conservative approach.
- ▶ The Derry Road East and Site Driveway intersection is forecast to operate within acceptable levels of services with delays in the LOS B range with a low v/c ratio.
- ▶ Queue lengths generated by the downstream signalized intersection of Derry Road East and Dixie Road are expected to extend complete across the site driveway during the AM and PM peak hours. This condition is expected to result in short-term delays for vehicles exiting the site. The proposed driveway spacing between the signalized intersection coupled with the extensive queuing of vehicles on Derry Road East may present a challenge for vehicles to exit the site and travel north on Dixie Road.
- ▶ The overall the Derry Road East and Dixie Road intersection is forecast to operate at LOS E with a v/c of greater than 0.90.

**Appendix E** contains the detailed Synchro 9 reports.





**TABLE 4.2: TOTAL TRAFFIC OPERATIONS**

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				OVERALL
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Derry Road & Dixie Road	TCS	LOS	E	F	D	E	F	D	C	D	F	D	D	D	E	E	D	E	E
			Delay	74	84	39	78	88	40	32	53	86	49	51	54	76	60	42	59	63
			V/C	0.70	1.04	0.30		0.90	0.52	0.06		0.71	0.46	0.51		0.70	0.89	0.23		0.97
			95th	51	261	49		91	103	0		35	64	72		48	165	25		
	Storage	Avail.	170	-	190		215	-	215		65	-	65		125	-	150			
			119	-	141		124	-	215		31	-	-7		77	-	125			
			LOS		A	A	A		A		A			B	B					
			Delay		0	0	0		0		0			13	13					
	Derry Road & Site Driveway	TWSC	V/C		0.36	0.20			0.25				0.08							
			95th		0	0			0				2							
			LOS	E	F	D	F	E	E	D	E	E	D	D	D	E	D	D	D	E
			Delay	72	90	40	84	71	77	41	72	69	53	55	54	69	41	39	43	64
	Derry Road & Dixie Road	TCS	V/C	0.74	1.04	0.10		0.73	0.99	0.14		0.61	0.89	0.81		0.53	0.53	0.38		0.91
			95th	52	188	17		50	181	18		38	167	155		28	76	44		
			Storage	170	-	190		215	-	215		65	-	65		125	-	150		
			Avail.	118	-	173		165	-	197		27	-	-90		97	-	106		
	Derry Road & Site Driveway	TWSC	LOS		A	A	A		A		A			B	B					
			Delay		0	0	0		0		0			12	12					
			V/C		0.28	0.16			0.37					0.07						
			95th		0	0			0					2						

TWSC - Two-Way Stop Control

LOS - Level of Service

Storage - Existing Storage (m)

TCS - Traffic Control Signal

V/C - Volume to Capacity Ratio

Avail. - Available Storage (m)

MOE - Measure of Effectiveness

95th - 95th Percentile Queue Length



## 5 Conclusions and Recommendations

### 5.1 Conclusions

Based on the investigations carried out, it is concluded that:

- ▶ **Existing Traffic Operations:** The intersection analysis of Derry Road East and Dixie Road shows critical v/c ratios in the AM and PM peak hours. The 95<sup>th</sup> percentile northbound left-turn queue length is estimated to extend the current available storage length.
- ▶ **Development Generated Traffic:** The subject site is estimated to generate approximately 75 AM peak hour trips and 84 PM peak hour trips. Pass-by trips are anticipated to reduce the site's net generation to approximately 27 and 36 new trips during the AM and PM peak hour, respectively;
- ▶ **Heavy Vehicle Circulation:** The swept path analysis suggests that the layout and design of the site is appropriately designed to accommodate the design vehicle. However, the design vehicle may cause short delays to vehicles accessing or maneuvering on-site;
- ▶ **Background Traffic Operations:** The capacity issues forecast to occur at the Derry Road East and Dixie Road intersection under existing conditions are anticipated to continue to occur under forecast background conditions;
- ▶ **Total Traffic Operations:** The capacity issues forecast to occur at the Derry Road East and Dixie Road intersection under background conditions are anticipated to continue to occur with the development of the subject site.

The Derry Road East and Site Driveway intersection is forecast to operate within acceptable levels of services with delays in the LOS B range with a low v/c ratio.

Queue lengths generated by the downstream signalized intersection of Derry Road East and Dixie Road are expected to extend across the site's frontage during the AM and PM peak hours. This condition is expected to result in short-term delays for vehicles existing the site.

### 5.2 Recommendations

The following actions are recommended based on the findings of this study:



- ▶ Fuel deliveries be scheduled by the site operator to occur during off-peak hours to minimize the impact to both the site operations and the operations of the Derry Road East driveway; and
- ▶ A traffic controller be on site to assist the reversing maneuver of the design vehicle.





# Appendix A

## Terms of Reference





## Stefan Hajgato

---

**From:** Zain Zia <Zain.Zia@mississauga.ca>  
**Sent:** September 4, 2019 12:49 PM  
**To:** Scott Catton  
**Cc:** Lin Rogers; Stefan Hajgato  
**Subject:** RE: (190265: 1480 Derry Rd TIS) Pre-Study Consultation  
**Attachments:** Jan 2019 - 6900 Dixie Road.pdf; September 2015 - 1150 Derry Road East.pdf

Hi Scott,

No studies were requested for the 7895 Transmere development. Regarding 6900 Dixie and 1150 Derry, I have attached the trip generation and distribution study components for your reference.

Please note that these development applications are still in progress and the full TIS studies cannot be released.

Thanks,  
Zain

---

**From:** Scott Catton [mailto:scatton@ptsl.com]  
**Sent:** Wednesday, September 4, 2019 9:48 AM  
**To:** Stefan Hajgato; Zain Zia  
**Cc:** Lin Rogers  
**Subject:** RE: (190265: 1480 Derry Rd TIS) Pre-Study Consultation

Hi Zain,  
Just following up regarding the adjacent development applications listed below. The Region has stated that they do not provide copies of the supportive studies. Would you be able to provide us with the supportive studies so we can forecast background traffic?

Thanks.

**Scott Catton, Dipl. T., C.E.T., MITE**  
*Senior Project Manager*



### Paradigm Transportation Solutions Limited

5A-150 Pinebush Road, Cambridge, ON N1R 8J8  
p: 905.381.2229 x302  
e: scatton@ptsl.com  
w: www.ptsl.com

---

**From:** Stefan Hajgato <shajgato@ptsl.com>  
**Sent:** Thursday, 29 August, 2019 03:01  
**To:** Zain Zia <Zain.Zia@mississauga.ca>  
**Cc:** Scott Catton <scatton@ptsl.com>; Carrick, Sean <sean.carrick@peelregion.ca>; Lin Rogers <Lin.Rogers@mississauga.ca>  
**Subject:** RE: (190265: 1480 Derry Rd TIS) Pre-Study Consultation

Good morning Zain,

I will make sure to submit the inbound and outbound movements as separate drawings in the future.

Based on the link you previously provided, I have identified the following nearby developments that may impact our study area:

1. 7895 Tranmere Drive.
2. 6900 Dixie Road.
3. 1150 Derry Road East.

Are Traffic Impact Studies available for any of the above noted developments?

Thanks,

**Stefan Hajgato, B.Eng. & Mgmt., EIT, MITE**  
*Transportation Consultant*



**Paradigm Transportation Solutions Limited**  
p: 519.896.3163 x209

---

**From:** Zain Zia <[Zain.Zia@mississauga.ca](mailto:Zain.Zia@mississauga.ca)>  
**Sent:** August 26, 2019 10:59 PM  
**To:** Stefan Hajgato <[shajgato@ptsl.com](mailto:shajgato@ptsl.com)>  
**Cc:** Scott Catton <[scatton@ptsl.com](mailto:scatton@ptsl.com)>; Carrick, Sean <[sean.carrick@peelregion.ca](mailto:sean.carrick@peelregion.ca)>; Lin Rogers <[Lin.Rogers@mississauga.ca](mailto:Lin.Rogers@mississauga.ca)>  
**Subject:** RE: (190265: 1480 Derry Rd TIS) Pre-Study Consultation

Hi Stefan,

Thank you for the updated design. The City has no further changes regarding the scope of the TIS and defer to the Region for any additional comments.

I would note that when you are submitting the turning templates to provide two drawings, one for inbound and one for outbound movements. Having both movements on one drawing makes it difficult to separate the paths.

Thanks,  
Zain

---

**From:** Stefan Hajgato [<mailto:shajgato@ptsl.com>]  
**Sent:** Friday, August 23, 2019 9:20 AM  
**To:** Zain Zia  
**Cc:** Scott Catton; Carrick, Sean; Lin Rogers  
**Subject:** RE: (190265: 1480 Derry Rd TIS) Pre-Study Consultation

Hi Zain,

As per discussions with the Region, the site plan has been updated to include a single driveway access to Derry Road. I have also attached the AutoTURN simulation for a typical fuel delivery truck to the site. The



clearance under the canopy will be 5 metres, so no conflicts with delivery or waste management vehicles are anticipated.

Please let us know if you have any additional comments regarding the below scope.

Thanks,

**Stefan Hajgato, B.Eng. & Mgmt., EIT, MITE**

*Transportation Consultant*



**Paradigm Transportation Solutions Limited**

p: 519.896.3163 x209

---

**From:** Zain Zia <[Zain.Zia@mississauga.ca](mailto:Zain.Zia@mississauga.ca)>

**Sent:** June 6, 2019 11:30 AM

**To:** Stefan Hajgato <[shaigato@ptsl.com](mailto:shaigato@ptsl.com)>

**Cc:** Scott Catton <[scatton@ptsl.com](mailto:scatton@ptsl.com)>; Carrick, Sean <[sean.carrick@peelregion.ca](mailto:sean.carrick@peelregion.ca)>; Lin Rogers <[Lin.Rogers@mississauga.ca](mailto:Lin.Rogers@mississauga.ca)>

**Subject:** RE: (190265: 1480 Derry Rd TIS) Pre-Study Consultation

Hi Stefan,

Based on our review of the Terms of Reference for **1480 Derry Road** dated May 24, 2019 , the following comments are provided:

- Study Area – Please revise the study area to include Derry Road East & Dixie Road, and a **single** site driveway with right-in/right-out access to Derry Road East (as per the Region of Peel's correspondence). Note that Derry Road East & Dixie Road are regional roads.
- Please contact the Region of Peel for regional road Turning Movement Counts.
- Please contact the Region of Peel for regional road growth rates.
- Please use the following link to gather information of any developments proposed in the neighbouring lands for background traffic: <http://www.mississauga.ca/portal/residents/developmentinformation>. Please contact the Region of Peel for additional development proposals.
  - Note: A development proposal at 6900 Dixie Road is in progress for a 3 storey storage building.
  - Note: A development proposal at 1150 Derry Road East is in progress for 8 industrial units.
- Please contact the Region of Peel for signal timing plans for regional roads.
- The Traffic Impact Study is to discuss internal site circulation including but not limited to; vehicle manoeuvring for gas truck unloading, waste management, access to/from parking areas etc. There must be satisfactory vertical clearance between any vehicle movements and the gas bar canopy to ensure there are no conflicts.
- Please incorporate proper pedestrian connectivity from the roadways and parking lots to the building accesses.
- The Traffic Impact Study is to comply with the City of Mississauga Traffic Impact Study Guidelines.
- The Traffic Impact Study is required to be signed and stamped by a Professional Engineer.

Please note that these are preliminary comments based off the received site plan drawing to date. Additional comments may be forthcoming as the application progresses, with the anticipation that the site plan is to be revised to a single access point as per the Region of Peel's comments.

Please let me know if you have any questions.

Regards,  
Zain



**Zain Zia, B.Eng.Mgt**

Engineer in Training, Transportation Projects  
T 905-615-3200 ext.5318 | M 289-937-6567  
[zain.zia@mississauga.ca](mailto:zain.zia@mississauga.ca)

[City of Mississauga](#) | Transportation & Infrastructure Planning,  
Transportation & Works

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---

**From:** Carrick, Sean [<mailto:sean.carrick@peelregion.ca>]

**Sent:** Thursday, May 30, 2019 1:46 PM

**To:** Stefan Hajgato

**Cc:** Scott Catton; Lin Rogers; Zain Zia; Kol, Rani; Hamdani, Hashim; Marzo, Christina; Martino, Alexander

**Subject:** RE: (190265: 1480 Derry Rd TIS) Pre-Study Consultation

Hi Stefan,

As we have mentioned in previous comments, we will only be able to support one right-in/right-out access at the westerly limits of the lands due to serious safety concerns related to the proximity of the Dixie Road intersection.

Thanks and please let us know if you need any additional info,

Sean

**Sean Carrick, C.E.T.**

Supervisor

Traffic Development & Permits

Region of Peel

10 Peel Centre Drive Suite B, 4<sup>th</sup> Floor

Brampton, ON L6T 4B9

905 791-7800 Ext. 7868



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---

**From:** Stefan Hajgato <[shaigato@ptsl.com](mailto:shaigato@ptsl.com)>

**Sent:** May 28, 2019 8:24 AM

**To:** Zain Zia <[Zain.Zia@mississauga.ca](mailto:Zain.Zia@mississauga.ca)>; Hassan, Mohammad <[mohammad.hassan@peelregion.ca](mailto:mohammad.hassan@peelregion.ca)>

**Cc:** Scott Catton <[scatton@ptsl.com](mailto:scatton@ptsl.com)>; Lin Rogers <[Lin.Rogers@mississauga.ca](mailto:Lin.Rogers@mississauga.ca)>

**Subject:** RE: (190265: 1480 Derry Rd TIS) Pre-Study Consultation

Hi Zain,

I am not aware of any recent development applications along Derry Road East where Peel Region has permitted additional accesses. The subject site only has frontage to Derry Road East and based on the proposed gas station land use, two points of access would be required to allow the fuel truck to circulate the site.

Mohammad, do you have any comments on the below scope? I have attached the proposed site plan for reference.

Regards,

**Stefan Hajgato, B.Eng. & Mgmt., EIT, MITE**  
*Transportation Engineering Consultant*



**Paradigm Transportation Solutions Limited**  
p: 519.896.3163 x209

---

**From:** Zain Zia <[Zain.Zia@mississauga.ca](mailto:Zain.Zia@mississauga.ca)>  
**Sent:** May 27, 2019 3:19 PM  
**To:** Stefan Hajgato <[shajgato@ptsl.com](mailto:shajgato@ptsl.com)>  
**Cc:** Scott Catton <[scatton@ptsl.com](mailto:scatton@ptsl.com)>; Lin Rogers <[Lin.Rogers@mississauga.ca](mailto:Lin.Rogers@mississauga.ca)>; [gordon.hui@peelregion.ca](mailto:gordon.hui@peelregion.ca)  
**Subject:** RE: (190265: 1480 Derry Rd TIS) Pre-Study Consultation

Hi Stefan,

Thank you for the email. Can you confirm if the Region of Peel has allowed additional access points on Derry Road East?

Prior to providing further comments, the City would like this to be confirmed as it will change the scope of the project otherwise.

Thanks,  
Zain

---

**From:** Stefan Hajgato [<mailto:shajgato@ptsl.com>]  
**Sent:** Friday, May 24, 2019 5:04 PM  
**To:** [gordon.hui@peelregion.ca](mailto:gordon.hui@peelregion.ca); Lin Rogers  
**Cc:** Scott Catton; Zain Zia  
**Subject:** (190265: 1480 Derry Rd TIS) Pre-Study Consultation

Good morning Gordon and Lin,

We have been retained to prepare a Transportation Impact Assessment for a proposed gasoline station with an attached convenience market / office (site plan attached). The proposed development is located at the corner of Derry Road East and Dixie Road in Mississauga. We are proposing the following scope:

- **Study area to include:**
  - Derry Road East & Dixie Road; and
  - Two (2) proposed site driveways with right-in / right-out access to Derry Road East.
- **Size of development:**
  - Three (3) fuel pumps where each fuel pump has two (2) fueling positions; and

- 289 m<sup>2</sup> convenience market / office.
- **Horizon years:** Five (5) years from date of TIS commission (2024)
- AM & PM weekday peak hour
- **Growth rate:** 2.0% pa – please confirm
- **Trip Generation:** Land Use 945 – Gasoline / Service Station with Convenience Market

**Could you please provide:**

- Other approved developments that impact our study area;
- Identify any capital works projects in the area that could impact intersection capacity; and
- Signal timing for the intersection of Derry Road East and Dixie Road

Please let me know if you have any comments about the above scope.

Best regards,

**Stefan Hajgato, B.Eng. & Mgmt., EIT, MITE**  
*Transportation Engineering Consultant*



**Paradigm Transportation Solutions Limited**

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 w: [www.ptsl.com](http://www.ptsl.com)

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## Stefan Hajgato

---

**From:** Carrick, Sean <sean.carrick@peelregion.ca>  
**Sent:** August 28, 2019 10:40 AM  
**To:** Stefan Hajgato  
**Cc:** Scott Catton; Khan, Ayesha  
**Subject:** RE: (190265: 1480 Derry Rd TIS) Pre-Study Consultation

**Follow Up Flag:** Follow up  
**Flag Status:** Completed

Hi Stefan,

I have included contact info below for the required data; also we do not provide TIS's for other developments, you may be able to obtain them from the City of Mississauga planning department if they are available.

Thanks,

Sean

**Sean Carrick, C.E.T.**  
Supervisor  
Traffic Development & Permits  
Region of Peel  
10 Peel Centre Drive Suite B, 4<sup>th</sup> Floor  
Brampton, ON L6T 4B9  
905 791-7800 Ext. 7868



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---

**From:** Stefan Hajgato <shajgato@ptsl.com>  
**Sent:** August 27, 2019 3:01 PM  
**To:** Carrick, Sean <sean.carrick@peelregion.ca>  
**Cc:** Scott Catton <scatton@ptsl.com>  
**Subject:** RE: (190265: 1480 Derry Rd TIS) Pre-Study Consultation

Good morning Sean,

Would a growth rate of 1.5% per annum be acceptable? [Sabbir.saiyed@peelregion.ca](mailto:Sabbir.saiyed@peelregion.ca) – Transportation planning to confirm growth rate

Additionally, could you please provide the following:

- 1) Turning Movement Counts for the intersection of Derry Road and Dixie Road.  
[Sharon.mannie@peelregion.ca](mailto:Sharon.mannie@peelregion.ca) – traffic operations for TMC's

- 2) Signal Timing for the intersection of Derry Road and Dixie Road. [Rick.laing@peelregion.ca](mailto:Rick.laing@peelregion.ca) – Traffic Signals and streetlighting for timing plans
- 3) Traffic Impact Studies for the following nearby developments (if available):
  - a. 7895 Tranmere Drive.
  - b. 6900 Dixie Road.
  - c. 1150 Derry Road East.
  - d. Any other developments that may impact our study area.

Thanks,

**Stefan Hajgato, B.Eng. & Mgmt., EIT, MITE**  
*Transportation Consultant*



**Paradigm Transportation Solutions Limited**

p: 519.896.3163 x209

---

**From:** Zain Zia <[Zain.Zia@mississauga.ca](mailto:Zain.Zia@mississauga.ca)>

**Sent:** June 6, 2019 11:30 AM

**To:** Stefan Hajgato <[shajgato@ptsl.com](mailto:shajgato@ptsl.com)>

**Cc:** Scott Catton <[scatton@ptsl.com](mailto:scatton@ptsl.com)>; Carrick, Sean <[sean.carrick@peelregion.ca](mailto:sean.carrick@peelregion.ca)>; Lin Rogers <[Lin.Rogers@mississauga.ca](mailto:Lin.Rogers@mississauga.ca)>

**Subject:** RE: (190265: 1480 Derry Rd TIS) Pre-Study Consultation

Hi Stefan,

Based on our review of the Terms of Reference for **1480 Derry Road** dated May 24, 2019 , the following comments are provided:

- Study Area – Please revise the study area to include Derry Road East & Dixie Road, and a **single** site driveway with right-in/right-out access to Derry Road East (as per the Region of Peel's correspondence). Note that Derry Road East & Dixie Road are regional roads.
- Please contact the Region of Peel for regional road Turning Movement Counts.
- Please contact the Region of Peel for regional road growth rates.
- Please use the following link to gather information of any developments proposed in the neighbouring lands for background traffic: <http://www.mississauga.ca/portal/residents/developmentinformation>. Please contact the Region of Peel for additional development proposals.
  - Note: A development proposal at 6900 Dixie Road is in progress for a 3 storey storage building.
  - Note: A development proposal at 1150 Derry Road East is in progress for 8 industrial units.
- Please contact the Region of Peel for signal timing plans for regional roads.
- The Traffic Impact Study is to discuss internal site circulation including but not limited to; vehicle manoeuvring for gas truck unloading, waste management, access to/from parking areas etc. There must be satisfactory vertical clearance between any vehicle movements and the gas bar canopy to ensure there are no conflicts.
- Please incorporate proper pedestrian connectivity from the roadways and parking lots to the building accesses.
- The Traffic Impact Study is to comply with the City of Mississauga Traffic Impact Study Guidelines.
- The Traffic Impact Study is required to be signed and stamped by a Professional Engineer.

Please note that these are preliminary comments based off the received site plan drawing to date. Additional comments may be forthcoming as the application progresses, with the anticipation that the site plan is to be revised to a single access point as per the Region of Peel's comments.

Please let me know if you have any questions.

Regards,  
Zain



**Zain Zia, B.Eng.Mgt**

Engineer in Training, Transportation Projects  
T 905-615-3200 ext.5318 | M 289-937-6567  
[zain.zia@mississauga.ca](mailto:zain.zia@mississauga.ca)

[City of Mississauga](#) | Transportation & Infrastructure Planning,  
Transportation & Works

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---

**From:** Carrick, Sean [<mailto:sean.carrick@peelregion.ca>]

**Sent:** Thursday, May 30, 2019 1:46 PM

**To:** Stefan Hajgato

**Cc:** Scott Catton; Lin Rogers; Zain Zia; Kol, Rani; Hamdani, Hashim; Marzo, Christina; Martino, Alexander

**Subject:** RE: (190265: 1480 Derry Rd TIS) Pre-Study Consultation

Hi Stefan,

As we have mentioned in previous comments, we will only be able to support one right-in/right-out access at the westerly limits of the lands due to serious safety concerns related to the proximity of the Dixie Road intersection.

Thanks and please let us know if you need any additional info,

Sean

**Sean Carrick, C.E.T.**

Supervisor  
Traffic Development & Permits  
Region of Peel  
10 Peel Centre Drive Suite B, 4<sup>th</sup> Floor  
Brampton, ON L6T 4B9  
905 791-7800 Ext. 7868



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---

**From:** Stefan Hajgato <[shaigato@ptsl.com](mailto:shaigato@ptsl.com)>

**Sent:** May 28, 2019 8:24 AM

**To:** Zain Zia <[Zain.Zia@mississauga.ca](mailto:Zain.Zia@mississauga.ca)>; Hassan, Mohammad <[mohammad.hassan@peelregion.ca](mailto:mohammad.hassan@peelregion.ca)>

**Cc:** Scott Catton <[scatton@ptsl.com](mailto:scatton@ptsl.com)>; Lin Rogers <[Lin.Rogers@mississauga.ca](mailto:Lin.Rogers@mississauga.ca)>

**Subject:** RE: (190265: 1480 Derry Rd TIS) Pre-Study Consultation

Hi Zain,

I am not aware of any recent development applications along Derry Road East where Peel Region has permitted additional accesses. The subject site only has frontage to Derry Road East and based on the proposed gas station land use, two points of access would be required to allow the fuel truck to circulate the site.

Mohammad, do you have any comments on the below scope? I have attached the proposed site plan for reference.

Regards,

**Stefan Hajgato, B.Eng. & Mgmt., EIT, MITE**  
*Transportation Engineering Consultant*



**Paradigm Transportation Solutions Limited**  
p: 519.896.3163 x209

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**From:** Zain Zia <[Zain.Zia@mississauga.ca](mailto:Zain.Zia@mississauga.ca)>  
**Sent:** May 27, 2019 3:19 PM  
**To:** Stefan Hajgato <[shajgato@ptsl.com](mailto:shajgato@ptsl.com)>  
**Cc:** Scott Catton <[scatton@ptsl.com](mailto:scatton@ptsl.com)>; Lin Rogers <[Lin.Rogers@mississauga.ca](mailto:Lin.Rogers@mississauga.ca)>; [gordon.hui@peelregion.ca](mailto:gordon.hui@peelregion.ca)  
**Subject:** RE: (190265: 1480 Derry Rd TIS) Pre-Study Consultation

Hi Stefan,

Thank you for the email. Can you confirm if the Region of Peel has allowed additional access points on Derry Road East?

Prior to providing further comments, the City would like this to be confirmed as it will change the scope of the project otherwise.

Thanks,  
Zain

---

**From:** Stefan Hajgato [<mailto:shajgato@ptsl.com>]  
**Sent:** Friday, May 24, 2019 5:04 PM  
**To:** [gordon.hui@peelregion.ca](mailto:gordon.hui@peelregion.ca); Lin Rogers  
**Cc:** Scott Catton; Zain Zia  
**Subject:** (190265: 1480 Derry Rd TIS) Pre-Study Consultation

Good morning Gordon and Lin,

We have been retained to prepare a Transportation Impact Assessment for a proposed gasoline station with an attached convenience market / office (site plan attached). The proposed development is located at the corner of Derry Road East and Dixie Road in Mississauga. We are proposing the following scope:

- **Study area to include:**
  - Derry Road East & Dixie Road; and



- Two (2) proposed site driveways with right-in / right-out access to Derry Road East.
- **Size of development:**
  - Three (3) fuel pumps where each fuel pump has two (2) fueling positions; and
  - 289 m<sup>2</sup> convenience market / office.
- **Horizon years:** Five (5) years from date of TIS commission (2024)
- AM & PM weekday peak hour
- **Growth rate:** 2.0% pa – please confirm
- **Trip Generation:** Land Use 945 – Gasoline / Service Station with Convenience Market

**Could you please provide:**

- Other approved developments that impact our study area;
- Identify any capital works projects in the area that could impact intersection capacity; and
- Signal timing for the intersection of Derry Road East and Dixie Road

Please let me know if you have any comments about the above scope.

Best regards,

**Stefan Hajgato, B.Eng. & Mgmt., EIT, MITE**  
*Transportation Engineering Consultant*



**Paradigm Transportation Solutions Limited**

150 Pinebush Road, Unit 5A, Cambridge ON N1R 8J8  
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## Stefan Hajgato

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**From:** Lavoie, Brenden <brenden.lavoie@peelregion.ca>  
**Sent:** September 9, 2019 2:00 PM  
**To:** Stefan Hajgato  
**Cc:** Bahrami, Parshan; Khan, Sabrina; Saiyed, Sabbir  
**Subject:** 1480 Derry Rd Information Request

Hello Stefan,

Below you should find the growth rates for both Dixie Road and Derry Road:

### Dixie Rd

Year	Present-2021	2021-2031	2031-2041
Annual Growth Rates	1.0%	0.5%	0.5%

### Derry Rd

Year	Present-2021	2021-2031	2031-2041
Annual Growth Rates	0.5%	0.5%	0.5%

The following numbers were concluded from the historical and forecasted land use data as well as EMME forecasting model that is calibrated for years 2011, 2021, 2031 and 2041. If you require further assistance, please contact me at (905)791 7800 ext. 4810.

**Brenden Lavoie** | Transportation Analyst

### Region of Peel

Public Works Services  
Transportation Division  
10 Peel Centre Drive, Suite B, 4<sup>th</sup> Floor  
Brampton, Ontario L6T 4B9  
Tel: (905) 791-7800 ext. 4810  
E-Mail: [brenden.lavoie@peelregion.ca](mailto:brenden.lavoie@peelregion.ca)



# Appendix B

## Existing Data







Turning Movement Count (29 . DIXIE RD & DERRY RD) CustID: 00413970 MioID: 502134

Start Time	Southbound DIXIE RD						Westbound DERRY RD						Northbound DIXIE RD						Eastbound DERRY RD						Int. Total (15 min)	Int. Total (1 hr)	
	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total			
07:00:00	43	235	53	0	3	331	95	190	9	0	0	294	26	78	83	0	0	187	59	358	43	0	1	460	1272		
07:15:00	50	300	52	0	5	402	75	178	21	0	4	274	21	116	93	0	2	230	50	365	56	0	6	471	1377		
07:30:00	58	293	66	0	10	417	87	184	16	0	3	287	28	103	98	0	1	229	48	441	50	0	11	539	1472		
07:45:00	46	292	86	0	3	424	93	216	13	0	10	322	23	142	100	0	3	265	58	382	65	0	10	505	1516	5637	
08:00:00	53	321	58	0	2	432	82	192	25	0	0	299	25	114	89	0	0	228	62	376	59	0	7	497	1456	5821	
08:15:00	38	263	62	0	2	363	76	242	22	0	1	340	29	100	71	0	2	200	42	456	60	0	6	558	1461	5905	
08:30:00	39	243	61	0	1	343	102	282	23	0	1	407	15	114	92	0	1	221	68	331	58	0	5	457	1428	5861	
08:45:00	44	258	77	0	0	379	86	182	21	0	0	289	27	118	86	0	0	231	37	347	66	0	6	450	1349	5694	
***BREAK***																											
11:00:00	25	145	71	0	1	241	91	219	17	0	0	327	33	118	99	0	1	250	40	247	40	2	0	329	1147		
11:15:00	9	130	60	0	2	199	107	201	27	0	1	335	41	155	122	0	0	318	47	242	33	2	5	324	1176		
11:30:00	22	157	64	0	0	243	69	204	23	0	0	296	39	152	95	1	0	287	70	252	35	1	2	358	1184		
11:45:00	20	151	82	0	3	253	119	235	23	0	2	377	37	138	113	0	0	288	53	297	37	1	5	388	1306	4813	
12:00:00	27	145	73	0	3	245	76	262	20	4	0	362	41	164	101	0	0	306	63	223	33	2	1	321	1234	4900	
12:15:00	25	130	67	0	2	222	95	226	34	0	0	355	52	160	90	0	2	302	43	277	41	2	4	363	1242	4966	
12:30:00	31	136	49	0	0	216	97	261	33	0	0	391	50	158	119	0	1	327	67	239	33	2	0	341	1275	5057	
12:45:00	29	147	72	0	2	248	84	209	30	1	1	324	48	169	122	0	1	339	59	234	49	2	6	344	1255	5006	
13:00:00	23	144	53	0	1	220	121	240	33	1	0	395	47	147	109	0	0	303	56	259	52	0	1	367	1285	5057	
13:15:00	29	136	73	0	2	238	101	236	19	1	0	357	43	169	114	1	0	327	66	226	38	0	2	330	1252	5067	
13:30:00	35	135	77	0	4	247	93	225	36	1	2	355	56	165	111	0	1	332	60	266	46	1	1	373	1307	5099	
13:45:00	16	138	48	0	2	202	116	264	34	2	0	416	52	153	112	0	0	317	58	285	55	2	3	400	1335	5179	
***BREAK***																											
15:00:00	33	163	88	0	6	284	74	281	42	0	2	397	43	243	114	0	2	400	55	303	33	0	13	391	1472		
15:15:00	40	189	75	1	7	305	64	244	38	1	4	347	65	303	126	0	2	494	62	318	42	0	13	422	1568		
15:30:00	35	156	94	0	8	285	81	330	44	0	3	455	59	293	127	0	5	479	59	310	32	0	5	401	1620		
15:45:00	31	186	98	0	13	315	59	304	44	1	3	408	46	344	135	0	4	525	62	264	37	0	10	363	1611	6271	
16:00:00	28	210	94	0	6	332	46	318	36	0	3	400	38	344	143	0	2	525	49	329	32	1	5	411	1668	6467	
16:15:00	22	132	70	1	4	225	64	327	51	0	2	442	44	353	157	0	2	554	66	281	32	2	2	381	1602	6501	
16:30:00	34	173	112	0	7	319	54	317	54	0	6	425	35	379	141	0	7	555	73	303	23	0	8	399	1698	6579	
16:45:00	38	172	106	0	8	316	71	336	48	1	6	456	54	315	137	0	8	506	56	323	29	0	9	408	1686	6654	
17:00:00	31	147	86	0	7	264	41	361	41	0	0	443	31	318	124	0	4	473	65	280	25	0	7	370	1550	6536	
17:15:00	39	185	87	0	3	311	38	289	61	0	1	388	49	362	141	0	1	552	63	326	33	1	7	423	1674	6608	



Turning Movement Count  
 Location Name: DIXIE RD & DERRY RD  
 Date: Thu, Mar 08, 2018 Deployment Lead: Theo Daglis

Peel Region  
 10 Peel Centre Drive  
 Suite B - 4th Floor  
 Brampton ON, Canada, L6T 4B9

17:30:00	36	107	69	0	12	212	51	328	45	0	3	424	50	326	137	0	2	513	67	328	37	1	7	433	1582	6492
17:45:00	25	112	63	0	7	200	64	303	45	0	0	412	32	252	95	0	4	379	73	250	32	0	5	355	1346	6152
Grand Total	1054	5831	2346	2	136	9233	2572	8186	1028	13	58	11799	1279	6565	3596	2	58	11442	1856	9718	1336	22	173	12932	45406	-
Approach%	11.4%	63.2%	25.4%	0%		-	21.8%	69.4%	8.7%	0.1%		-	11.2%	57.4%	31.4%	0%		-	14.4%	75.1%	10.3%	0.2%		-	-	-
Totals %	2.3%	12.8%	5.2%	0%		20.3%	5.7%	18%	2.3%	0%		26%	2.8%	14.5%	7.9%	0%		25.2%	4.1%	21.4%	2.9%	0%		28.5%	-	-
Heavy	182	1053	512	1		-	447	1242	166	0		-	168	962	668	0		-	423	1561	189	0		-	-	-
Heavy %	17.3%	18.1%	21.8%	50%		-	17.4%	15.2%	16.1%	0%		-	13.1%	14.7%	18.6%	0%		-	22.8%	16.1%	14.1%	0%		-	-	-
Bicycles	0	0	1	0		-	0	0	0	0		-	0	0	0	0		-	0	0	0	0		-	-	-
Bicycle %	0%	0%	0%	0%		-	0%	0%	0%	0%		-	0%	0%	0%	0%		-	0%	0%	0%	0%		-	-	-





Peak Hour: 07:30 AM - 08:30 AM Weather: Overcast (-3.4 °C)

Start Time	Southbound DIXIE RD						Westbound DERRY RD						Northbound DIXIE RD						Eastbound DERRY RD						Int. Total (15 min)
	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	
07:30:00	58	293	66	0	10	417	87	184	16	0	3	287	28	103	98	0	1	229	48	441	50	0	11	539	1472
07:45:00	46	292	86	0	3	424	93	216	13	0	10	322	23	142	100	0	3	265	58	382	65	0	10	505	1516
08:00:00	53	321	58	0	2	432	82	192	25	0	0	299	25	114	89	0	0	228	62	376	59	0	7	497	1456
08:15:00	38	263	62	0	2	363	76	242	22	0	1	340	29	100	71	0	2	200	42	456	60	0	6	558	1461
Grand Total	195	1169	272	0	17	1636	338	834	76	0	14	1248	105	459	358	0	6	922	210	1655	234	0	34	2099	5905
Approach%	11.9%	71.5%	16.6%	0%	-	-	27.1%	66.8%	6.1%	0%	-	-	11.4%	49.8%	38.8%	0%	-	-	10%	78.8%	11.1%	0%	-	-	-
Totals %	3.3%	19.8%	4.6%	0%	27.7%	-	5.7%	14.1%	1.3%	0%	21.1%	-	1.8%	7.8%	6.1%	0%	15.6%	-	3.6%	28%	4%	0%	35.5%	-	-
PHF	0.84	0.91	0.79	0	0.95	-	0.91	0.86	0.76	0	0.92	-	0.91	0.81	0.9	0	0.87	-	0.85	0.91	0.9	0	0.94	-	-
Heavy	33	112	65	0	210	-	47	143	23	0	213	-	28	121	74	0	223	-	42	152	27	0	221	-	-
Heavy %	16.9%	9.6%	23.9%	0%	12.8%	-	13.9%	17.1%	30.3%	0%	17.1%	-	26.7%	26.4%	20.7%	0%	24.2%	-	20%	9.2%	11.5%	0%	10.5%	-	-
Lights	162	1057	207	0	1426	-	291	691	53	0	1035	-	77	338	284	0	699	-	168	1503	207	0	1878	-	-
Lights %	83.1%	90.4%	76.1%	0%	87.2%	-	86.1%	82.9%	69.7%	0%	82.9%	-	73.3%	73.6%	79.3%	0%	75.8%	-	80%	90.8%	88.5%	0%	89.5%	-	-
Single-Unit Trucks	16	54	29	0	99	-	21	64	9	0	94	-	12	61	46	0	119	-	26	65	17	0	108	-	-
Single-Unit Trucks %	8.2%	4.6%	10.7%	0%	6.1%	-	6.2%	7.7%	11.8%	0%	7.5%	-	11.4%	13.3%	12.8%	0%	12.9%	-	12.4%	3.9%	7.3%	0%	5.1%	-	-
Buses	0	12	2	0	14	-	0	11	0	0	11	-	0	10	0	0	10	-	2	6	4	0	12	-	-
Buses %	0%	1%	0.7%	0%	0.9%	-	0%	1.3%	0%	0%	0.9%	-	0%	2.2%	0%	0%	1.1%	-	1%	0.4%	1.7%	0%	0.6%	-	-
Articulated Trucks	17	46	34	0	97	-	26	68	14	0	108	-	16	50	28	0	94	-	14	81	6	0	101	-	-
Articulated Trucks %	8.7%	3.9%	12.5%	0%	5.9%	-	7.7%	8.2%	18.4%	0%	8.7%	-	15.2%	10.9%	7.8%	0%	10.2%	-	6.7%	4.9%	2.6%	0%	4.8%	-	-
Pedestrians	-	-	-	-	17	-	-	-	-	14	-	-	-	-	-	6	-	-	-	-	-	34	-	-	-
Pedestrians%	-	-	-	-	23.9%	-	-	-	-	19.7%	-	-	-	-	-	8.5%	-	-	-	-	-	47.9%	-	-	-
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	-	-	0	0	0	0	0	-	0	0	0	0	0	-	-
Bicycles on Road%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-



Peak Hour: 01:00 PM - 02:00 PM Weather: Overcast (2 °C)

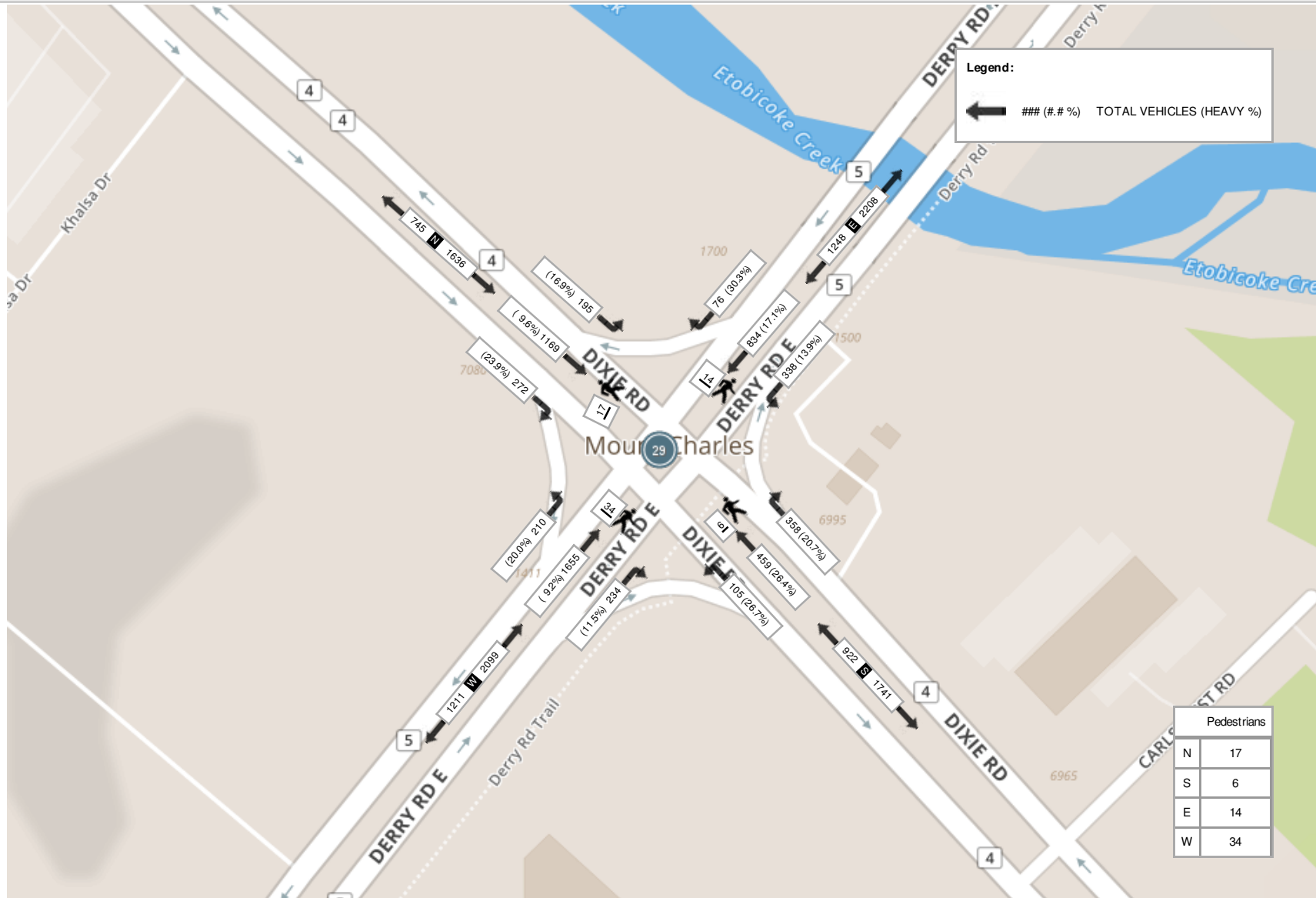
Start Time	Southbound DIXIE RD						Westbound DERRY RD						Northbound DIXIE RD						Eastbound DERRY RD						Int. Total (15 min)
	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	
13:00:00	23	144	53	0	1	220	121	240	33	1	0	395	47	147	109	0	0	303	56	259	52	0	1	367	1285
13:15:00	29	136	73	0	2	238	101	236	19	1	0	357	43	169	114	1	0	327	66	226	38	0	2	330	1252
13:30:00	35	135	77	0	4	247	93	225	36	1	2	355	56	165	111	0	1	332	60	266	46	1	1	373	1307
13:45:00	16	138	48	0	2	202	116	264	34	2	0	416	52	153	112	0	0	317	58	285	55	2	3	400	1335
Grand Total	103	553	251	0	9	907	431	965	122	5	2	1523	198	634	446	1	1	1279	240	1036	191	3	7	1470	5179
Approach%	11.4%	61%	27.7%	0%	-	-	28.3%	63.4%	8%	0.3%	-	-	15.5%	49.6%	34.9%	0.1%	-	-	16.3%	70.5%	13%	0.2%	-	-	-
Totals %	2%	10.7%	4.8%	0%	17.5%	8.3%	18.6%	2.4%	0.1%	29.4%	3.8%	12.2%	8.6%	0%	24.7%	4.6%	20%	3.7%	0.1%	28.4%	-	-	-	-	-
PHF	0.74	0.96	0.81	0	0.92	0.89	0.91	0.85	0.63	0.92	0.88	0.94	0.98	0.25	0.96	0.91	0.91	0.87	0.38	0.92	-	-	-	-	-
Heavy	20	123	59	0	202	77	198	24	0	299	29	133	110	0	272	54	203	34	0	291	-	-	-	-	-
Heavy %	19.4%	22.2%	23.5%	0%	22.3%	17.9%	20.5%	19.7%	0%	19.6%	14.6%	21%	24.7%	0%	21.3%	22.5%	19.6%	17.8%	0%	19.8%	-	-	-	-	-
Lights	83	430	192	0	705	354	767	98	5	1224	169	501	336	1	1007	186	833	157	3	1179	-	-	-	-	-
Lights %	80.6%	77.8%	76.5%	0%	77.7%	82.1%	79.5%	80.3%	100%	80.4%	85.4%	79%	75.3%	100%	78.7%	77.5%	80.4%	82.2%	100%	80.2%	-	-	-	-	-
Single-Unit Trucks	8	66	30	0	104	42	91	14	0	147	17	65	71	0	153	26	86	21	0	133	-	-	-	-	-
Single-Unit Trucks %	7.8%	11.9%	12%	0%	11.5%	9.7%	9.4%	11.5%	0%	9.7%	8.6%	10.3%	15.9%	0%	12%	10.8%	8.3%	11%	0%	9%	-	-	-	-	-
Buses	0	4	0	0	4	0	9	0	0	9	0	8	1	0	9	1	13	1	0	15	-	-	-	-	-
Buses %	0%	0.7%	0%	0%	0.4%	0%	0.9%	0%	0%	0.6%	0%	1.3%	0.2%	0%	0.7%	0.4%	1.3%	0.5%	0%	1%	-	-	-	-	-
Articulated Trucks	12	53	29	0	94	35	98	10	0	143	12	60	38	0	110	27	104	12	0	143	-	-	-	-	-
Articulated Trucks %	11.7%	9.6%	11.6%	0%	10.4%	8.1%	10.2%	8.2%	0%	9.4%	6.1%	9.5%	8.5%	0%	8.6%	11.3%	10%	6.3%	0%	9.7%	-	-	-	-	-
Pedestrians	-	-	-	-	9	-	-	-	-	2	-	-	-	-	1	-	-	-	-	7	-	-	-	-	-
Pedestrians%	-	-	-	-	47.4%	-	-	-	-	10.5%	-	-	-	-	5.3%	-	-	-	-	36.8%	-	-	-	-	-
Bicycles on Road	0	0	1	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	-	-	-	-
Bicycles on Road%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	-



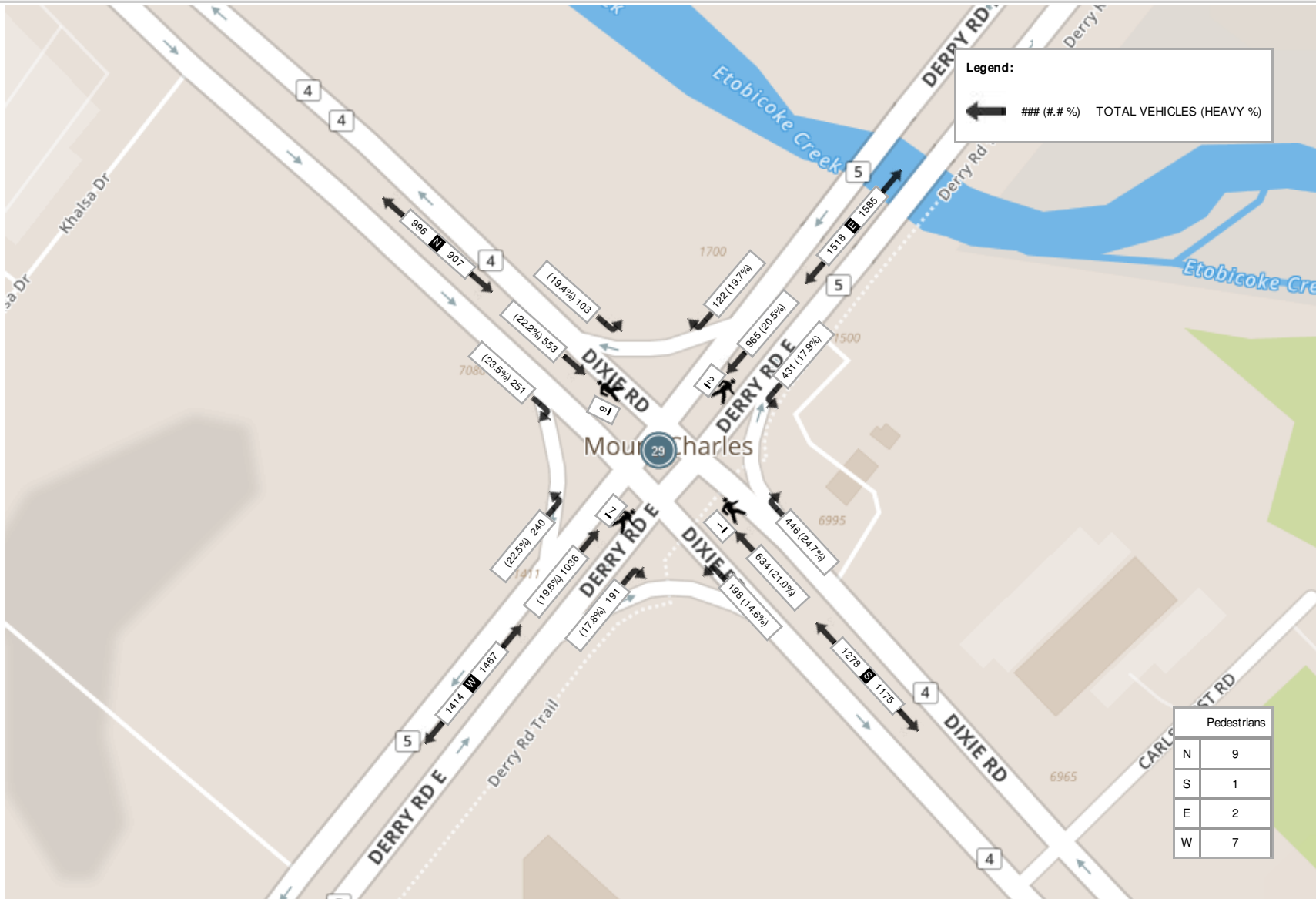
Peak Hour: 04:00 PM - 05:00 PM Weather: Snow (-0.4 °C)

Start Time	Southbound DIXIE RD						Westbound DERRY RD						Northbound DIXIE RD						Eastbound DERRY RD						Int. Total (15 min)
	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	
16:00:00	28	210	94	0	6	332	46	318	36	0	3	400	38	344	143	0	2	525	49	329	32	1	5	411	1668
16:15:00	22	132	70	1	4	225	64	327	51	0	2	442	44	353	157	0	2	554	66	281	32	2	2	381	1602
16:30:00	34	173	112	0	7	319	54	317	54	0	6	425	35	379	141	0	7	555	73	303	23	0	8	399	1698
16:45:00	38	172	106	0	8	316	71	336	48	1	6	456	54	315	137	0	8	506	56	323	29	0	9	408	1686
Grand Total	122	687	382	1	25	1192	235	1298	189	1	17	1723	171	1391	578	0	19	2140	244	1236	116	3	24	1599	6654
Approach%	10.2%	57.6%	32%	0.1%		-	13.6%	75.3%	11%	0.1%		-	8%	65%	27%	0%		-	15.3%	77.3%	7.3%	0.2%		-	-
Totals %	1.8%	10.3%	5.7%	0%		17.9%	3.5%	19.5%	2.8%	0%		25.9%	2.6%	20.9%	8.7%	0%		32.2%	3.7%	18.6%	1.7%	0%		24%	-
PHF	0.8	0.82	0.85	0.25		0.9	0.83	0.97	0.88	0.25		0.94	0.79	0.92	0.92	0		0.96	0.84	0.94	0.91	0.38		0.97	-
Heavy	18	176	48	0		242	47	119	18	0		184	13	126	87	0		226	51	211	15	0		277	-
Heavy %	14.8%	25.6%	12.6%	0%		20.3%	20%	9.2%	9.5%	0%		10.7%	7.6%	9.1%	15.1%	0%		10.6%	20.9%	17.1%	12.9%	0%		17.3%	-
Lights	104	511	334	1		950	188	1179	171	1		1539	158	1265	491	0		1914	193	1025	101	3		1322	-
Lights %	85.2%	74.4%	87.4%	100%		79.7%	80%	90.8%	90.5%	100%		89.3%	92.4%	90.9%	84.9%	0%		89.4%	79.1%	82.9%	87.1%	100%		82.7%	-
Single-Unit Trucks	8	101	25	0		134	27	44	8	0		79	12	62	48	0		122	20	80	6	0		106	-
Single-Unit Trucks %	6.6%	14.7%	6.5%	0%		11.2%	11.5%	3.4%	4.2%	0%		4.6%	7%	4.5%	8.3%	0%		5.7%	8.2%	6.5%	5.2%	0%		6.6%	-
Buses	0	13	3	0		16	0	8	0	0		8	0	11	0	0		11	2	9	0	0		11	-
Buses %	0%	1.9%	0.8%	0%		1.3%	0%	0.6%	0%	0%		0.5%	0%	0.8%	0%	0%		0.5%	0.8%	0.7%	0%	0%		0.7%	-
Articulated Trucks	10	62	20	0		92	20	67	10	0		97	1	53	39	0		93	29	122	9	0		160	-
Articulated Trucks %	8.2%	9%	5.2%	0%		7.7%	8.5%	5.2%	5.3%	0%		5.6%	0.6%	3.8%	6.7%	0%		4.3%	11.9%	9.9%	7.8%	0%		10%	-
Pedestrians	-	-	-	-	25	-	-	-	-	-	17	-	-	-	-	-	19	-	-	-	-	-	24	-	-
Pedestrians%	-	-	-	-	29.4%	-	-	-	-	-	20%	-	-	-	-	-	22.4%	-	-	-	-	-	28.2%	-	-
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-
Bicycles on Road%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-

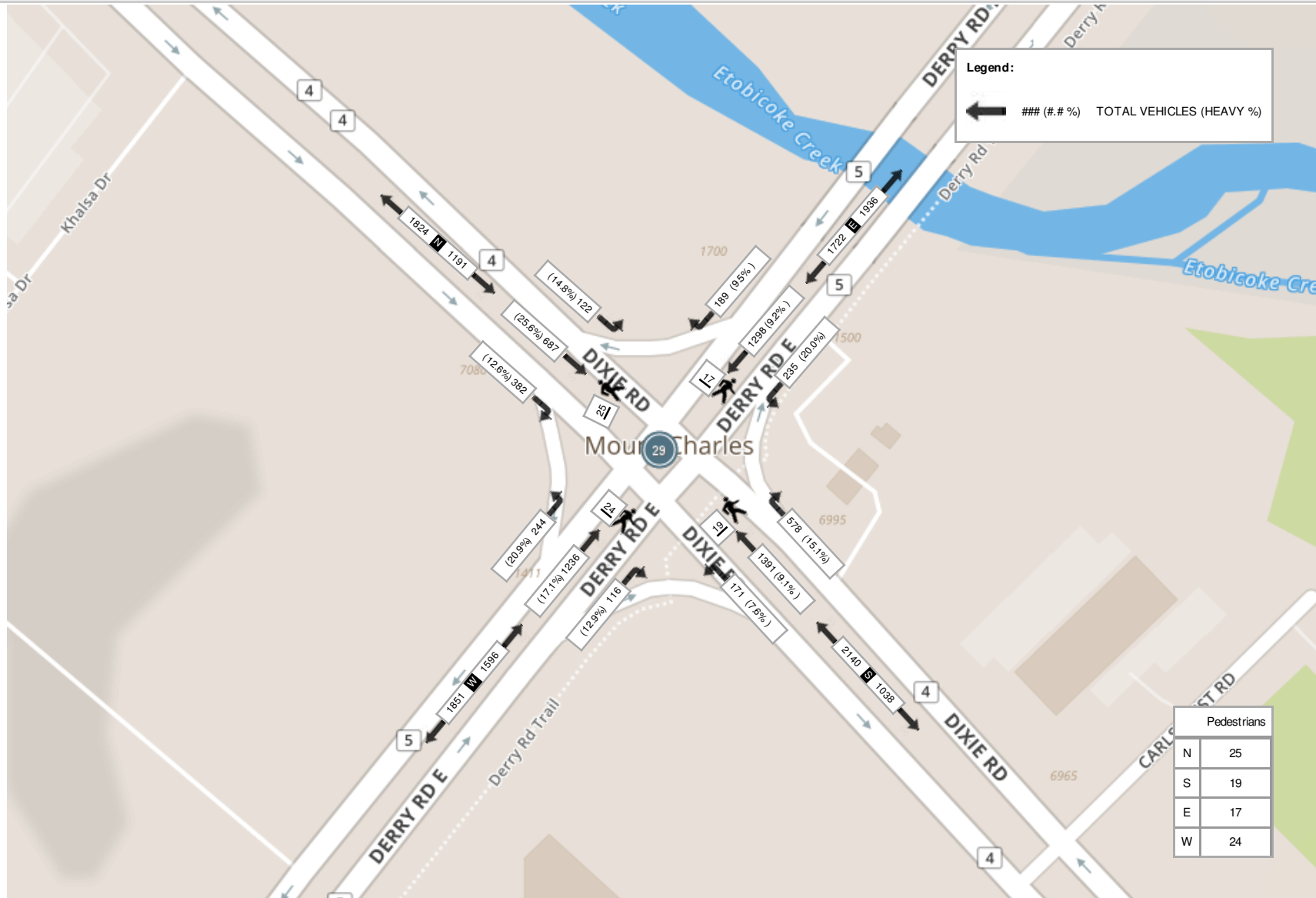
**Peak Hour: 07:30 AM - 08:30 AM    Weather: Overcast (-3.4 °C)**



**Peak Hour: 01:00 PM - 02:00 PM    Weather: Overcast (2 °C)**



**Peak Hour: 04:00 PM - 05:00 PM    Weather: Snow (-0.4 °C)**



# Appendix C

## Existing Traffic Operations







## Queues

## 1: Dixie Road &amp; Derry Road

## Existing AM Peak Hour

1480 Derry Road TIA

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	210	1655	234	338	834	76	105	459	358	195	1169	272
v/c Ratio	0.68	0.99	0.39	0.85	0.50	0.14	0.66	0.44	0.66	0.68	0.85	0.50
Control Delay	78.0	68.1	14.5	85.5	39.5	0.5	91.6	50.3	17.8	80.5	58.6	7.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	78.0	68.1	14.5	85.5	39.5	0.5	91.6	50.3	17.8	80.5	58.6	7.6
Queue Length 50th (m)	34.8	-203.4	16.4	56.4	77.4	0.0	17.7	46.6	19.2	32.3	132.0	0.0
Queue Length 95th (m)	49.1	#246.9	42.1	#82.1	99.1	0.0	#31.3	59.7	59.2	47.2	151.0	24.2
Internal Link Dist (m)		364.1			471.0			407.4			439.6	
Turn Bay Length (m)	170.0		190.0	215.0		215.0	65.0		65.0	125.0		150.0
Base Capacity (vph)	404	1680	603	425	1673	552	165	1124	560	335	1537	581
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.99	0.39	0.80	0.50	0.14	0.64	0.41	0.64	0.58	0.76	0.47

## Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

## HCM Signalized Intersection Capacity Analysis

## 1: Dixie Road &amp; Derry Road

## Existing AM Peak Hour

1480 Derry Road TIA

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	210	1655	234	338	834	76	105	459	358	195	1169	272
Future Volume (vph)	210	1655	234	338	834	76	105	459	358	195	1169	272
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.94
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	2886	4812	1427	3038	4483	1209	2727	4162	1305	2960	4768	1234
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	2886	4812	1427	3038	4483	1209	2727	4162	1305	2960	4768	1234
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	210	1655	234	338	834	76	105	459	358	195	1169	272
RTOR Reduction (vph)	0	0	105	0	0	48	0	0	215	0	0	194
Lane Group Flow (vph)	210	1655	129	338	834	28	105	459	143	195	1169	78
Confl. Peds. (#/hr)	17		6	6		17	34		14	14		34
Heavy Vehicles (%)	20%	9%	12%	14%	17%	30%	27%	26%	21%	17%	10%	24%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Actuated Green, G (s)	16.4	53.6	53.6	20.1	57.3	57.3	9.0	38.3	38.3	14.8	44.1	44.1
Effective Green, g (s)	16.4	53.6	53.6	20.1	57.3	57.3	9.0	38.3	38.3	14.8	44.1	44.1
Actuated g/C Ratio	0.11	0.35	0.35	0.13	0.37	0.37	0.06	0.25	0.25	0.10	0.29	0.29
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.7	6.7	6.7	6.7	6.7	6.7
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	308	1681	498	398	1674	451	159	1039	325	285	1370	354
v/s Ratio Prot	0.07	c0.34		c0.11	c0.19		0.04	0.11		c0.07	c0.25	
v/s Ratio Perm			0.09			0.02			0.11			0.06
v/c Ratio	0.68	0.98	0.26	0.85	0.50	0.06	0.66	0.44	0.44	0.68	0.85	0.22
Uniform Delay, d1	66.0	49.5	35.7	65.2	37.0	30.8	70.7	48.5	48.5	67.0	51.6	41.6
Progression 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
Incremental Delay, d2	6.1	18.6	1.3	15.4	1.1	0.3	9.8	0.3	1.0	6.6	5.4	0.3
Delay (s)	72.1	68.1	36.9	80.6	38.0	31.1	80.5	48.8	49.5	73.7	57.0	41.9
Level of Service	E	E	D	F	D	C	F	D	D	E	E	D
Approach Delay (s)		65.0			49.2			52.7			56.5	
Approach LOS		E			D			D			E	

## Intersection Summary

HCM 2000 Control Delay	57.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	153.4	Sum of lost time (s)	26.6
Intersection Capacity Utilization	92.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

## Queues

## 1: Dixie Road &amp; Derry Road

## Existing PM Peak Hour

1480 Derry Road TIA

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	244	1236	116	235	1298	189	171	1391	578	122	687	382
v/c Ratio	0.72	0.96	0.24	0.70	0.95	0.35	0.59	0.86	0.84	0.52	0.51	0.57
Control Delay	75.5	68.9	8.4	75.0	66.7	7.6	73.8	52.1	29.8	74.7	42.1	10.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	75.5	68.9	8.4	75.0	66.7	7.6	73.8	52.1	29.8	74.7	42.1	10.0
Queue Length 50th (m)	33.9	125.0	0.0	32.6	131.0	0.0	23.8	127.6	64.7	17.0	54.7	8.7
Queue Length 95th (m)	48.7	#169.5	14.7	47.1	#173.7	18.0	36.0	155.5	#125.5	27.4	71.7	38.2
Internal Link Dist (m)	364.1		471.0		407.4		439.6					
Turn Bay Length (m)	170.0	190.0		215.0	215.0		65.0	65.0		125.0	150.0	
Base Capacity (vph)	420	1287	480	424	1367	535	468	1760	718	357	1437	694
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.96	0.24	0.55	0.95	0.35	0.37	0.79	0.81	0.34	0.48	0.55

## Intersection Summary

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

Queue shown is maximum after two cycles.

## HCM Signalized Intersection Capacity Analysis

## 1: Dixie Road &amp; Derry Road

## Existing PM Peak Hour

1480 Derry Road TIA

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	244	1236	116	235	1298	189	171	1391	578	122	687	382
Future Volume (vph)	244	1236	116	235	1298	189	171	1391	578	122	687	382
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.95	1.00	1.00	0.96	1.00	1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	2862	4483	1388	2886	4812	1413	3206	4812	1368	3011	4162	1378
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	2862	4483	1388	2886	4812	1413	3206	4812	1368	3011	4162	1378
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	244	1236	116	235	1298	189	171	1391	578	122	687	382
RTOR Reduction (vph)	0	0	83	0	0	135	0	0	229	0	0	227
Lane Group Flow (vph)	244	1236	33	235	1298	54	171	1391	349	122	687	155
Confl. Peds. (#/hr)	25		19	19		25	24		17	17		24
Heavy Vehicles (%)	21%	17%	13%	20%	9%	10%	8%	9%	15%	15%	26%	13%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Actuated Green, G (s)	17.4	42.1	42.1	17.0	41.7	41.7	13.3	49.3	49.3	11.4	47.4	47.4
Effective Green, g (s)	17.4	42.1	42.1	17.0	41.7	41.7	13.3	49.3	49.3	11.4	47.4	47.4
Actuated g/C Ratio	0.12	0.29	0.29	0.12	0.28	0.28	0.09	0.34	0.34	0.08	0.32	0.32
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.7	6.7	6.7	6.7	6.7	6.7
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	340	1289	399	335	1370	402	291	1620	460	234	1347	446
v/s Ratio Prot	c0.09	c0.28		0.08	0.27		c0.05	c0.29		0.04	0.17	
v/s Ratio Perm			0.02			0.04			0.25			0.11
v/c Ratio	0.72	0.96	0.08	0.70	0.95	0.13	0.59	0.86	0.76	0.52	0.51	0.35
Uniform Delay, d1	62.1	51.3	38.1	62.3	51.3	38.9	63.9	45.3	43.2	64.9	40.1	37.7
Progression 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
Incremental Delay, d2	7.1	17.0	0.4	6.5	14.6	0.7	3.0	4.8	7.0	2.1	0.3	0.5
Delay (s)	69.2	68.3	38.5	68.8	65.9	39.6	66.9	50.1	50.2	67.0	40.4	38.2
Level of Service	E	E	D	E	E	D	E	D	D	E	D	D
Approach Delay (s)	66.3		63.4		51.5		42.4					
Approach LOS	E		E		D		D					

## Intersection Summary

HCM 2000 Control Delay	56.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	146.4	Sum of lost time (s)	26.6
Intersection Capacity Utilization	85.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# Appendix D

## Background Traffic Operations





## Queues

## 1: Dixie Road &amp; Derry Road

## 2024 Background AM Peak Hour

1480 Derry Road TIA

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	216	1700	253	362	862	77	112	491	383	199	1251	280
v/c Ratio	0.69	1.03	0.43	0.90	0.52	0.14	0.71	0.46	0.70	0.70	0.89	0.50
Control Delay	79.5	80.1	16.7	91.7	41.0	0.5	96.5	50.7	21.1	82.2	61.4	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	79.5	80.1	16.7	91.7	41.0	0.5	96.5	50.7	21.1	82.2	61.4	7.5
Queue Length 50th (m)	36.5	-227.8	22.1	62.4	83.7	0.0	19.3	50.5	28.7	33.7	144.5	0.0
Queue Length 95th (m)	50.4	#258.3	49.0	#91.4	103.0	0.0	#34.5	64.1	71.9	48.0	164.5	24.7
Internal Link Dist (m)		364.1			471.0			407.4			439.6	
Turn Bay Length (m)	170.0		190.0	215.0		215.0	65.0		65.0	125.0		150.0
Base Capacity (vph)	396	1649	595	417	1649	547	162	1109	557	328	1508	581
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.55	1.03	0.43	0.87	0.52	0.14	0.69	0.44	0.69	0.61	0.83	0.48

## Intersection Summary

- Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

## HCM Signalized Intersection Capacity Analysis

## 1: Dixie Road &amp; Derry Road

## 2024 Background AM Peak Hour

1480 Derry Road TIA

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	216	1700	253	362	862	77	112	491	383	199	1251	280
Future Volume (vph)	216	1700	253	362	862	77	112	491	383	199	1251	280
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.94
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	2886	4812	1427	3038	4483	1208	2727	4162	1304	2960	4768	1233
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	2886	4812	1427	3038	4483	1208	2727	4162	1304	2960	4768	1233
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	216	1700	253	362	862	77	112	491	383	199	1251	280
RTOR Reduction (vph)	0	0	106	0	0	49	0	0	212	0	0	197
Lane Group Flow (vph)	216	1700	147	362	862	28	112	491	171	199	1251	83
Confl. Peds. (#/hr)	17		6	6		17	34		14	14		34
Heavy Vehicles (%)	20%	9%	12%	14%	17%	30%	27%	26%	21%	17%	10%	24%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Actuated Green, G (s)	16.8	53.5	53.5	20.8	57.5	57.5	9.1	40.2	40.2	15.0	46.1	46.1
Effective Green, g (s)	16.8	53.5	53.5	20.8	57.5	57.5	9.1	40.2	40.2	15.0	46.1	46.1
Actuated g/C Ratio	0.11	0.34	0.34	0.13	0.37	0.37	0.06	0.26	0.26	0.10	0.30	0.30
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.7	6.7	6.7	6.7	6.7	6.7
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	310	1649	489	404	1651	444	158	1071	335	284	1408	364
v/s Ratio Prot	0.07	c0.35		c0.12	c0.19		0.04	0.12		c0.07	c0.26	
v/s Ratio Perm			0.10			0.02			0.13			0.07
v/c Ratio	0.70	1.03	0.30	0.90	0.52	0.06	0.71	0.46	0.51	0.70	0.89	0.23
Uniform Delay, d1	67.2	51.3	37.6	66.6	38.6	31.9	72.2	48.8	49.5	68.4	52.5	41.5
Progression 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
Incremental Delay, d2	6.7	30.5	1.6	21.6	1.2	0.3	13.6	0.3	1.2	7.6	7.2	0.3
Delay (s)	73.9	81.8	39.1	88.2	39.7	32.2	85.8	49.1	50.7	76.0	59.7	41.9
Level of Service	E	F	D	F	D	C	F	D	D	E	E	D
Approach Delay (s)		76.0			52.8			53.9			58.7	
Approach LOS		E			D			D			E	

## Intersection Summary

HCM 2000 Control Delay	62.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	156.1	Sum of lost time (s)	26.6
Intersection Capacity Utilization	94.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

## Queues

## 1: Dixie Road &amp; Derry Road

## 2024 Background PM Peak Hour

1480 Derry Road TIA

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	257	1306	123	248	1332	193	181	1463	606	125	723	392
v/c Ratio	0.74	1.03	0.26	0.73	0.99	0.36	0.61	0.89	0.87	0.53	0.53	0.58
Control Delay	77.4	86.2	8.3	76.9	76.1	7.6	75.0	54.2	34.3	75.8	42.9	11.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	77.4	86.2	8.3	76.9	76.1	7.6	75.0	54.2	34.3	75.8	42.9	11.3
Queue Length 50th (m)	35.9	-144.7	0.0	34.6	-142.3	0.0	25.3	138.5	77.6	17.5	59.0	11.8
Queue Length 95th (m)	51.3	#185.3	14.9	49.6	#181.3	18.3	37.6	166.6	#154.9	28.0	76.3	43.6
Internal Link Dist (m)		364.1			471.0			407.4			439.6	
Turn Bay Length (m)	170.0		190.0	215.0		215.0	65.0		65.0	125.0		150.0
Base Capacity (vph)	412	1263	478	416	1342	532	460	1728	710	351	1413	684
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.62	1.03	0.26	0.60	0.99	0.36	0.39	0.85	0.85	0.36	0.51	0.57

## Intersection Summary

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

## HCM Signalized Intersection Capacity Analysis

## 1: Dixie Road &amp; Derry Road

## 2024 Background PM Peak Hour

1480 Derry Road TIA

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	257	1306	123	248	1332	193	181	1463	606	125	723	392
Future Volume (vph)	257	1306	123	248	1332	193	181	1463	606	125	723	392
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.95	1.00	1.00	0.96	1.00	1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	2862	4483	1388	2886	4812	1412	3206	4812	1368	3011	4162	1377
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	2862	4483	1388	2886	4812	1412	3206	4812	1368	3011	4162	1377
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	257	1306	123	248	1332	193	181	1463	606	125	723	392
RTOR Reduction (vph)	0	0	88	0	0	139	0	0	226	0	0	222
Lane Group Flow (vph)	257	1306	35	248	1332	54	181	1463	380	125	723	170
Confl. Peds. (#/hr)	25		19	19		25	24		17	17		24
Heavy Vehicles (%)	21%	17%	13%	20%	9%	10%	8%	9%	15%	15%	26%	13%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Actuated Green, G (s)	18.1	42.1	42.1	17.6	41.6	41.6	13.8	51.1	51.1	11.6	48.9	48.9
Effective Green, g (s)	18.1	42.1	42.1	17.6	41.6	41.6	13.8	51.1	51.1	11.6	48.9	48.9
Actuated g/C Ratio	0.12	0.28	0.28	0.12	0.28	0.28	0.09	0.34	0.34	0.08	0.33	0.33
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.7	6.7	6.7	6.7	6.7	6.7
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	347	1266	392	340	1343	394	296	1650	469	234	1365	451
v/s Ratio Prot	c0.09	c0.29		0.09	0.28		c0.06	c0.30		0.04	0.17	
v/s Ratio Perm			0.03			0.04			0.28			0.12
v/c Ratio	0.74	1.03	0.09	0.73	0.99	0.14	0.61	0.89	0.81	0.53	0.53	0.38
Uniform Delay, d1	63.2	53.4	39.3	63.4	53.5	40.2	65.0	46.2	44.5	66.1	40.7	38.4
Progression 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
Incremental Delay, d2	8.2	33.8	0.4	7.6	22.7	0.7	3.7	6.2	10.2	2.3	0.4	0.5
Delay (s)	71.4	87.2	39.8	71.0	76.2	41.0	68.7	52.4	54.7	68.4	41.1	38.9
Level of Service	E	F	D	E	E	D	E	D	D	E	D	D
Approach Delay (s)		81.3			71.7			54.3			43.1	
Approach LOS		F			E			D			D	

## Intersection Summary

HCM 2000 Control Delay	63.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	149.0	Sum of lost time (s)	26.6
Intersection Capacity Utilization	87.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# Appendix E

## Total Traffic Operations







## Queues

## 1: Dixie Road &amp; Derry Road

## 2024 Background AM Peak Hour

1480 Derry Road TIA

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	217	1711	254	362	862	77	112	491	383	199	1251	280
v/c Ratio	0.70	1.04	0.43	0.90	0.52	0.14	0.71	0.46	0.70	0.70	0.89	0.50
Control Delay	79.5	81.9	16.8	91.7	41.0	0.5	96.5	50.7	21.1	82.2	61.4	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	79.5	81.9	16.8	91.7	41.0	0.5	96.5	50.7	21.1	82.2	61.4	7.5
Queue Length 50th (m)	36.7	-230.6	22.4	62.4	83.8	0.0	19.3	50.5	28.7	33.7	144.5	0.0
Queue Length 95th (m)	50.6	#261.1	49.4	#91.4	103.0	0.0	#34.5	64.1	71.9	48.0	164.5	24.7
Internal Link Dist (m)		67.0			471.0			407.4			439.6	
Turn Bay Length (m)	170.0		190.0	215.0		215.0	65.0		65.0	125.0		150.0
Base Capacity (vph)	396	1649	595	417	1648	546	162	1109	557	328	1508	581
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.55	1.04	0.43	0.87	0.52	0.14	0.69	0.44	0.69	0.61	0.83	0.48

## Intersection Summary

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

## HCM Signalized Intersection Capacity Analysis

## 1: Dixie Road &amp; Derry Road

## 2024 Background AM Peak Hour

1480 Derry Road TIA










	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	217	1711	254	362	862	77	112	491	383	199	1251	280
Future Volume (vph)	217	1711	254	362	862	77	112	491	383	199	1251	280
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.94
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	2886	4812	1427	3038	4483	1208	2727	4162	1304	2960	4768	1233
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	2886	4812	1427	3038	4483	1208	2727	4162	1304	2960	4768	1233
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	217	1711	254	362	862	77	112	491	383	199	1251	280
RTOR Reduction (vph)	0	0	106	0	0	49	0	0	212	0	0	197
Lane Group Flow (vph)	217	1711	148	362	862	28	112	491	171	199	1251	83
Confl. Peds. (#/hr)	17		6	6		17	34		14	14		34
Heavy Vehicles (%)	20%	9%	12%	14%	17%	30%	27%	26%	21%	17%	10%	24%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Actuated Green, G (s)	16.9	53.5	53.5	20.8	57.4	57.4	9.1	40.2	40.2	15.0	46.1	46.1
Effective Green, g (s)	16.9	53.5	53.5	20.8	57.4	57.4	9.1	40.2	40.2	15.0	46.1	46.1
Actuated g/C Ratio	0.11	0.34	0.34	0.13	0.37	0.37	0.06	0.26	0.26	0.10	0.30	0.30
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.7	6.7	6.7	6.7	6.7	6.7
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	312	1649	489	404	1648	444	158	1071	335	284	1408	364
v/s Ratio Prot	0.08	c0.36		c0.12	c0.19		0.04	0.12		c0.07	c0.26	
v/s Ratio Perm			0.10			0.02			0.13			0.07
v/c Ratio	0.70	1.04	0.30	0.90	0.52	0.06	0.71	0.46	0.51	0.70	0.89	0.23
Uniform Delay, d1	67.1	51.3	37.6	66.6	38.6	32.0	72.2	48.8	49.5	68.4	52.5	41.5
Progression 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
Incremental Delay, d2	6.6	32.6	1.6	21.6	1.2	0.3	13.6	0.3	1.2	7.6	7.2	0.3
Delay (s)	73.7	83.9	39.2	88.2	39.8	32.2	85.8	49.1	50.7	76.0	59.7	41.9
Level of Service	E	F	D	F	D	C	F	D	D	E	E	D
Approach Delay (s)		77.7			52.8			53.9			58.7	
Approach LOS		E			D			D			E	

## Intersection Summary

HCM 2000 Control Delay	63.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	156.1	Sum of lost time (s)	26.6
Intersection Capacity Utilization	94.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
2: Site Driveway & Derry Road

2024 Background AM Peak Hour  
1480 Derry Road TIA

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	2146	38	0	1255	0	36		
Future Volume (Veh/h)	2146	38	0	1255	0	36		
Sign Control	Free			Free	Stop			
Grade	0%			0%	0%			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00		
Hourly flow rate (vph)	2146	38	0	1255	0	36		
Pedestrians								
Lane Width (m)								
Walking Speed (m/s)								
Percent Blockage								
Right turn flare (veh)								
Median type	None			None				
Median storage (veh)								
Upstream signal (m)				91				
pX, platoon unblocked					0.86			
vC, conflicting volume			2184		2583	556		
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol			2184		2260	556		
tC, single (s)			4.1		6.8	6.9		
tC, 2 stage (s)								
tF (s)			2.2		3.5	3.3		
p0 queue free %			100		100	92		
cM capacity (veh/h)			239		30	475		
Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1
Volume Total	613	613	613	345	418	418	418	36
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	0	38	0	0	0	36
cSH	1700	1700	1700	1700	1700	1700	1700	475
Volume to Capacity	0.36	0.36	0.36	0.20	0.25	0.25	0.25	0.08
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.2
Lane LOS								B
Approach Delay (s)	0.0				0.0			13.2
Approach LOS								B
Intersection Summary								
Average Delay			0.1					
Intersection Capacity Utilization			41.7%		ICU Level of Service			A
Analysis Period (min)			15					

Queues

1: Dixie Road & Derry Road

2024 Total PM Peak Hour  
1480 Derry Road TIA

	↖	→	↘	↙	←	↖	↗	↑	↘	↙	↓	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	260	1320	124	248	1332	193	181	1463	606	125	723	392
v/c Ratio	0.75	1.04	0.26	0.73	0.99	0.36	0.61	0.89	0.87	0.54	0.53	0.58
Control Delay	77.7	88.7	10.0	77.0	76.4	7.6	75.1	54.3	34.3	75.9	42.9	11.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	77.7	88.7	10.0	77.0	76.4	7.6	75.1	54.3	34.3	75.9	42.9	11.4
Queue Length 50th (m)	36.3	-147.4	1.6	34.6	-142.7	0.0	25.4	138.8	77.7	17.5	59.1	11.8
Queue Length 95th (m)	51.9	#188.4	16.9	49.6	#181.3	18.3	37.6	166.6	#154.9	28.0	76.3	43.6
Internal Link Dist (m)		66.8			471.0			407.4			439.6	
Turn Bay Length (m)				215.0		215.0	65.0		65.0	125.0		150.0
Base Capacity (vph)	412	1265	474	415	1341	531	459	1727	710	350	1412	684
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.63	1.04	0.26	0.60	0.99	0.36	0.39	0.85	0.85	0.36	0.51	0.57

Intersection Summary

- Volume exceeds capacity, queue is theoretically infinite.

































Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis 1: Dixie Road & Derry Road

2024 Total PM Peak Hour  
1480 Derry Road TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			  			  	
Traffic Volume (vph)	260	1320	124	248	1332	193	181	1463	606	125	723	392
Future Volume (vph)	260	1320	124	248	1332	193	181	1463	606	125	723	392
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.95	1.00	1.00	0.96	1.00	1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	2862	4483	1388	2886	4812	1412	3206	4812	1368	3011	4162	1377
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	2862	4483	1388	2886	4812	1412	3206	4812	1368	3011	4162	1377
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	260	1320	124	248	1332	193	181	1463	606	125	723	392
RTOR Reduction (vph)	0	0	83	0	0	139	0	0	226	0	0	222
Lane Group Flow (vph)	260	1320	41	248	1332	54	181	1463	380	125	723	170
Confl. Peds. (#/hr)	25		19	19		25	24		17	17		24
Heavy Vehicles (%)	21%	17%	13%	20%	9%	10%	8%	9%	15%	15%	26%	13%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Actuated Green, G (s)	18.2	42.2	42.2	17.6	41.6	41.6	13.8	51.1	51.1	11.6	48.9	48.9
Effective Green, g (s)	18.2	42.2	42.2	17.6	41.6	41.6	13.8	51.1	51.1	11.6	48.9	48.9
Actuated g/C Ratio	0.12	0.28	0.28	0.12	0.28	0.28	0.09	0.34	0.34	0.08	0.33	0.33
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.7	6.7	6.7	6.7	6.7	6.7
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	349	1268	392	340	1342	393	296	1649	468	234	1365	451
v/s Ratio Prot	c0.09	c0.29		0.09	0.28		c0.06	c0.30		0.04	0.17	
v/s Ratio Perm			0.03			0.04			0.28			0.12
v/c Ratio	0.74	1.04	0.10	0.73	0.99	0.14	0.61	0.89	0.81	0.53	0.53	0.38
Uniform Delay, d1	63.2	53.4	39.5	63.5	53.6	40.3	65.1	46.3	44.6	66.2	40.7	38.4
Progression 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
Incremental Delay, d2	8.4	36.6	0.5	7.6	22.9	0.7	3.7	6.2	10.3	2.3	0.4	0.5
Delay (s)	71.6	90.1	40.0	71.1	76.5	41.0	68.8	52.5	54.9	68.5	41.1	38.9
Level of Service	E	F	D	E	E	D	E	D	D	E	D	D
Approach Delay (s)		83.6			71.8			54.4			43.2	
Approach LOS		F			E			D			D	
Intersection Summary												
HCM 2000 Control Delay			64.0			HCM 2000 Level of Service				E		
HCM 2000 Volume to Capacity ratio			0.91									
Actuated Cycle Length (s)			149.1			Sum of lost time (s)				26.6		
Intersection Capacity Utilization			87.8%			ICU Level of Service				E		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Unsignalized Intersection Capacity Analysis 2: Site Driveway & Derry Road

2024 Total PM Peak Hour  
1480 Derry Road TIA

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱	↱	↰	↱	↰	↱
Traffic Volume (veh/h)	1663	42	0	1905	0	41
Future Volume (Veh/h)	1663	42	0	1905	0	41
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1663	42	0	1905	0	41
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type						
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked				0.73		
vC, conflicting volume			1705		2319	437
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1705		1507	437
IC, single (s)			4.1		6.8	6.9
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			100		100	93
cM capacity (veh/h)			369		81	568
<b>Direction, Lane #</b>						
Volume Total	475	475	475	280	635	635
Volume Left	0	0	0	0	0	0
Volume Right	0	0	0	42	0	0
cSH	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.28	0.28	0.28	0.16	0.37	0.37
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS						B
Approach Delay (s)	0.0				0.0	
Approach LOS						B
<b>Intersection Summary</b>						
Average Delay			0.1			
Intersection Capacity Utilization			40.1%		ICU Level of Service	
Analysis Period (min)			15		A	