



6620 Rothschild Trail Transportation Impact Study, Loading and Functional Design Assessment and TDM Options Report

Paradigm Transportation Solutions Limited

December 2018

Project Summary



Project Number

180231

December 2018

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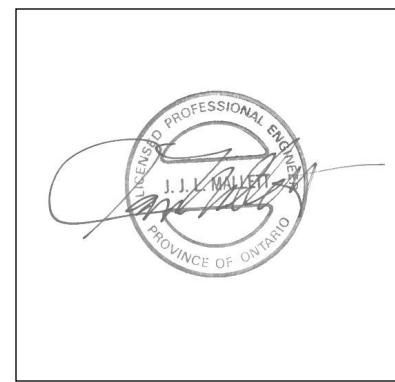
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6620 Rothschild Trail Transportation Impact Study, Loading and Functional Design Assessment and TDM Options Report

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A handwritten signature in black ink, appearing to read "J.J.L. MULLETT".

Signature



Engineer's Seal

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Executive Summary

Content

Paradigm Transportation Solutions Limited (Paradigm) was retained to carry out this Transportation Impact Study (TIS) for a proposed residential redevelopment located at 6620 Rothschild Trail in the City of Mississauga, Region of Peel.

The study includes an analysis of existing traffic conditions, a description of the proposed redevelopment, site traffic estimates, traffic forecasts, loading and functional design, outlines recommendations to improve future traffic conditions and strategies to reduce dependency on single occupancy vehicle travel.

Development Concept

The subject site is currently occupied by a single-family home with an individual driveway connection to Rothschild Trail. The existing building will be removed to permit the redevelopment to proceed. The redevelopment is planned to include a four (4)-storey apartment building containing 43 residential units. The site's parking supply is noted to consist of 88 underground resident parking spaces and 17 surface visitor parking spaces. The parking supply may be amended to reflect the final unit count.

Vehicular access is provided via the existing all-turns private driveway connection to Rothschild Trail. Build-out is anticipated to occur by the Year 2022; however, the timing and final unit count are subject to market conditions.

Conclusions

The main findings and conclusions of this study are as follows:

- ▶ **Study Area:** The intersections that form the study area include the McLaughlin Road intersections with Rothschild Trail/Ramonet Drive, Novo Star Drive/Arrowsmith Drive and Derry Road West.
- ▶ **Existing Traffic Conditions:** Intersection capacity issues are identified at the intersection of McLaughlin Road and Derry Road West, McLaughlin Road and Novo Star Drive and McLaughlin Road and Rothschild Trail/Ramonet Drive.
- ▶ **Development Generated Traffic:** The subject site is estimated to generate approximately 12 new AM peak hour trips and approximately 17 new PM peak hour trips after mode split reductions.
- ▶ **Forecast Traffic:** The forecast traffic volumes near the subject site have been assessed for five years (Year 2023) beyond the date of the

study. The likely future traffic volumes near the subject site are estimated to consist of:

- Generalized background traffic growth;
 - Build-out of one (1) adjacent development application; and
 - Traffic generated by the subject site.
- **Background Traffic Conditions:** The existing capacity constraints are expected to worsen with the growth in background traffic unrelated to the subject redevelopment.
- **Total Traffic Conditions:** The study area intersections are anticipated to continue to operate with levels of service similar to background traffic conditions.
- **Remedial Measures:** No remedial measures are necessary to accommodate the increase in traffic due to redevelopment of the subject site

Recommendations

Based on the findings of this study, the following is recommended:

- The development should be allowed to redevelop as planned;
- The applicant implements the recommendations outlined as part of the TDM review in Section 7. These include:
- Providing safe, well-lit and attractive walkways for pedestrian throughout the site, including connections to the surrounding City sidewalk and multi-use path network;
 - Providing a minimum of three short-term bicycle parking spaces near the main building entrance and consider providing some long-term bicycle parking for residents and visitors who choose to access the site via bicycle;
 - Consultation with Miway to determine potential amenity improvements to the transit stops on McLaughlin Road at Rothschild Trail;
 - Unbundling parking from the purchase and sale agreement so that the supply and demand is matched; and
 - Provide general education of all travel mode options that identify benefits and how residents can best utilize these modes. New residents should be provided with a welcome package that outlines proximity to transit, cycling facilities and the proximity to local activity centres.

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1 Introduction

1.1 Overview

Paradigm Transportation Solutions Limited (Paradigm) was retained to carry out this Transportation Impact Study (TRIS) for a proposed residential redevelopment located at 6620 Rothschild Trail in the City of Mississauga.

Figure 1.1 details the location of the subject site.

The study includes an analysis of existing traffic conditions, a description of the proposed redevelopment, site traffic estimates, traffic forecasts, loading and functional design, outlines recommendations to improve future traffic conditions and strategies to reduce dependency on single occupancy vehicle travel.

- ▶ Assessment of the current traffic and site conditions within the study area;
- ▶ Estimates of background traffic growth;
- ▶ Estimates of additional traffic generated by the subject site;
- ▶ Analyses of the impact of the future traffic on the surrounding road network;
- ▶ Recommendations necessary to mitigate the site generated traffic in a satisfactory manner.

Appendix A contains the pre-study consultation material and responses from the City. This study has been conducted in accordance with the City of Mississauga Traffic Impact Study Guidelines¹. This study assessed the 2023 horizon year to conform to the TIS guidelines and was approved through consultation with City staff.

1.2 Current Zoning Designation

The applicant is seeking a Zoning By-law Amendment (ZBA) and Official Plan Amendment (OPA) to permit the redevelopment to proceed. Under the current Official Plan, the site is identified as Residential Low Density 2 which allows a maximum density of 15 units per residential acre. The site comprises 2.3 acres; therefore, a maximum of 34 residential units are currently permitted on the site.

¹ City of Mississauga Traffic Impact Study Guidelines 2008



1.3 Study Area

The municipal roadway intersections assessed in this study include:

- ▶ McLaughlin Road and Rothschild Trail/Ramonet Drive (signalized);
- ▶ McLaughlin Road and Derry Road West (signalized); and
- ▶ McLaughlin Road and Novo Star Drive (signalized).





2 Existing Conditions

2.1 Existing Roadways

The main roadways near the subject site considered in assessing the traffic impacts of the redevelopment include:

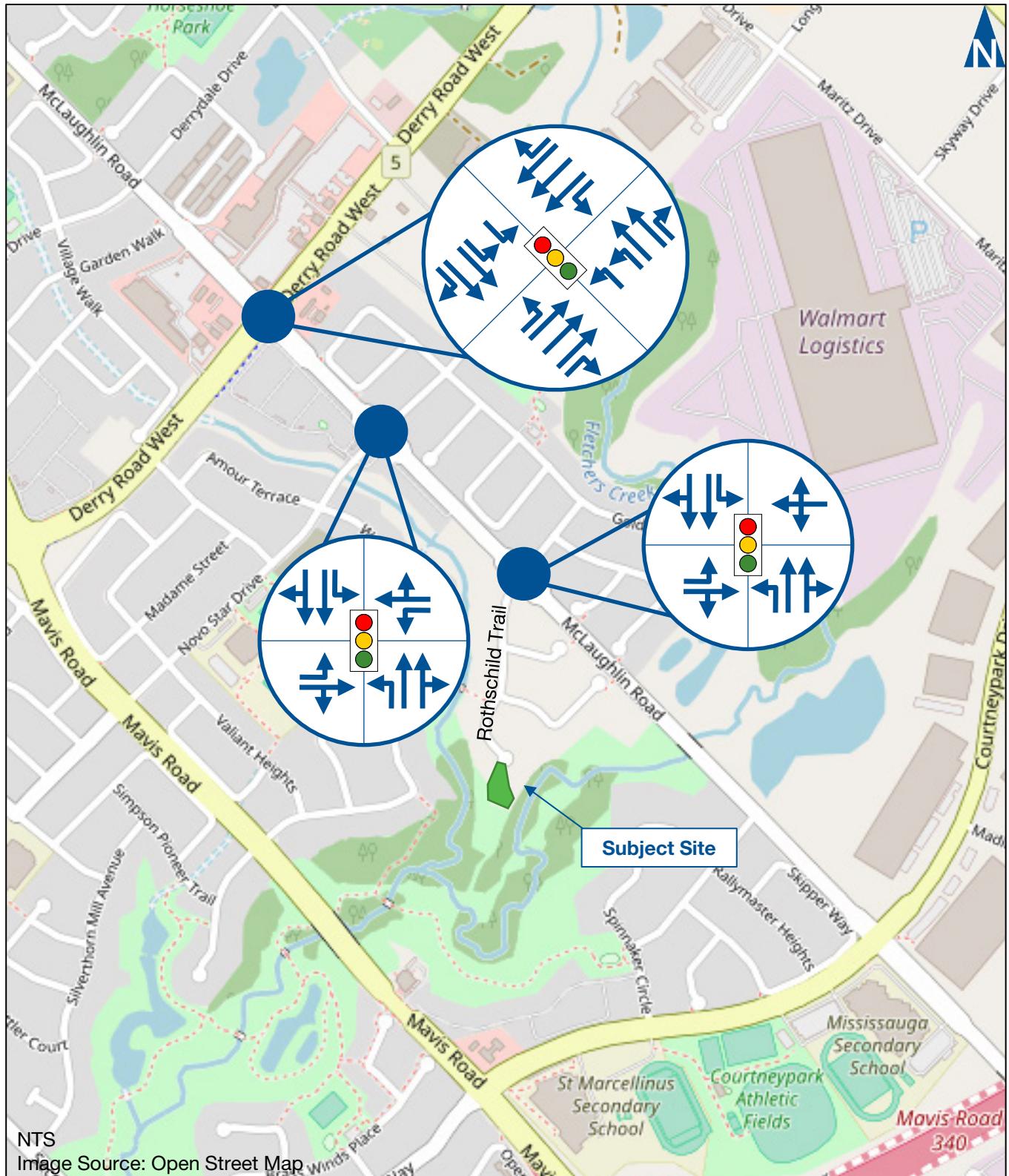
- ▶ **McLaughlin Road** is a north-south major collector² roadway with a four-lane urban cross-section with a posted speed limit of 70 kilometres per hour.
- ▶ **Derry Road West** is an east-west regional arterial roadway with a six-lane urban cross-section and a posted speed limit of 70 kilometres per hour.
- ▶ **Novo Star Drive** is an east-west minor collector roadway with a two-lane urban cross-section and a posted speed limit of 50 kilometres per hour.
- ▶ **Rothschild Trail/Ramonet Drive** is an east-west local roadway with a two-lane urban cross section and an assumed speed limit of 50 kilometres per hour.

No visible cycling infrastructure is present along all study area roadways. Sidewalks are provided along both sides of all study area roadways.

Figure 2.1 details the existing lane configurations and traffic control at the study area intersections.

² City of Mississauga Official Plan – Schedule 5: Long Term Road Network





Existing Lane Configuration & Traffic Control

6620 Rothschild Trail TIS, L & FD and TDM Options Report
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Figure 2.1

2.2 Existing Transit Service

MiWay, Mississauga Transitway, operates one (1) route within proximity of the subject site. **Figure 2.2** details the existing transit network. The transit routes include:

- ▶ **Route 66 McLaughlin** operates along McLaughlin Road from Sheridan College to City Centre Transit Terminal. The route operates from Monday to Sunday (05:22-01:14) with headways of approximately 30 minutes. Sunday service is provided (08:30-21:33) with headways of approximately 30 minutes. This route has bus stops located at McLaughlin Road and Rothschild Trail which is approximately 400 metres from the subject site.

Direct connections to the larger Miway network are available along this route as well as at the City Centre Transit Terminal.





2.3 Existing Traffic Volumes

Table 2.1 summarizes the location, date and start of the peak hour of the intersection turning movement count (TMC) data used to develop the existing AM and PM peak hour traffic volumes for the study area intersections. The TMC data were collected using Miovision Scout Unit technology on Tuesday, September 25, 2018

TABLE 2.1: EXISTING COUNT DATA SUMMARY

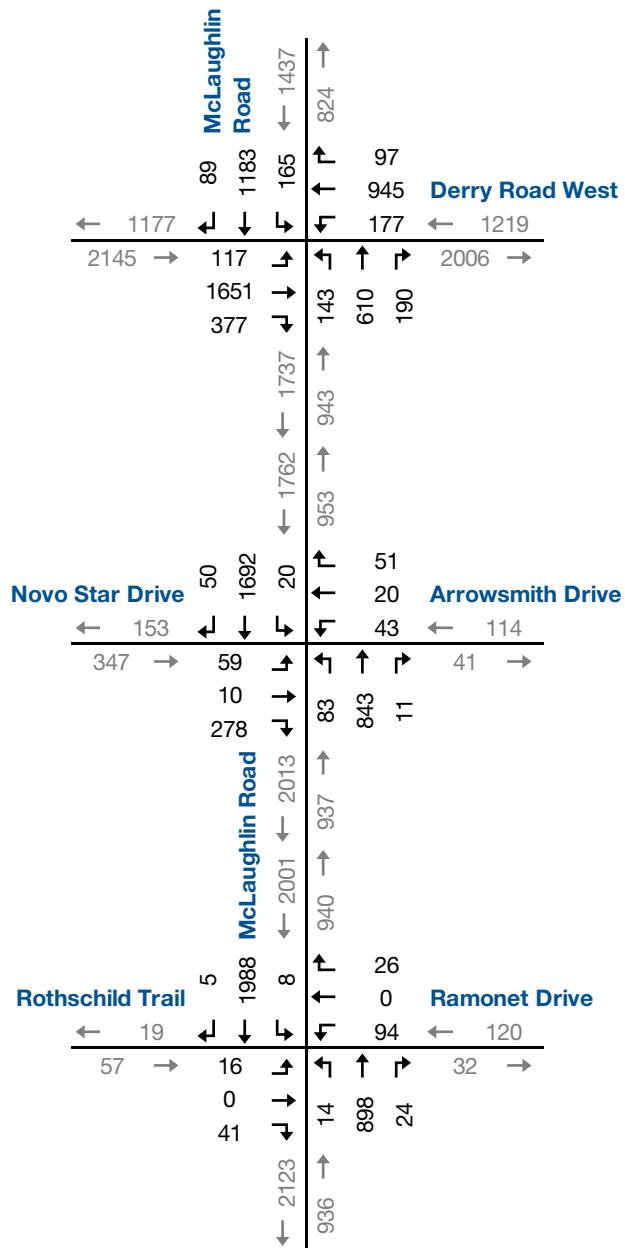
Date	Intersection	Peak Hour	
		AM	PM
Tuesday, 25 September 2018	McLaughlin Road & Derry Road West	7:45	17:00
	McLaughlin Road & Novo Star Drive	7:30	16:45
	McLaughlin Road & Rothschild Trail/Ramonet Drive	7:30	15:45

Appendix B contains the detailed count data. **Figure 2.3** illustrates the existing weekday AM and PM peak hour traffic volumes at the study area intersections.

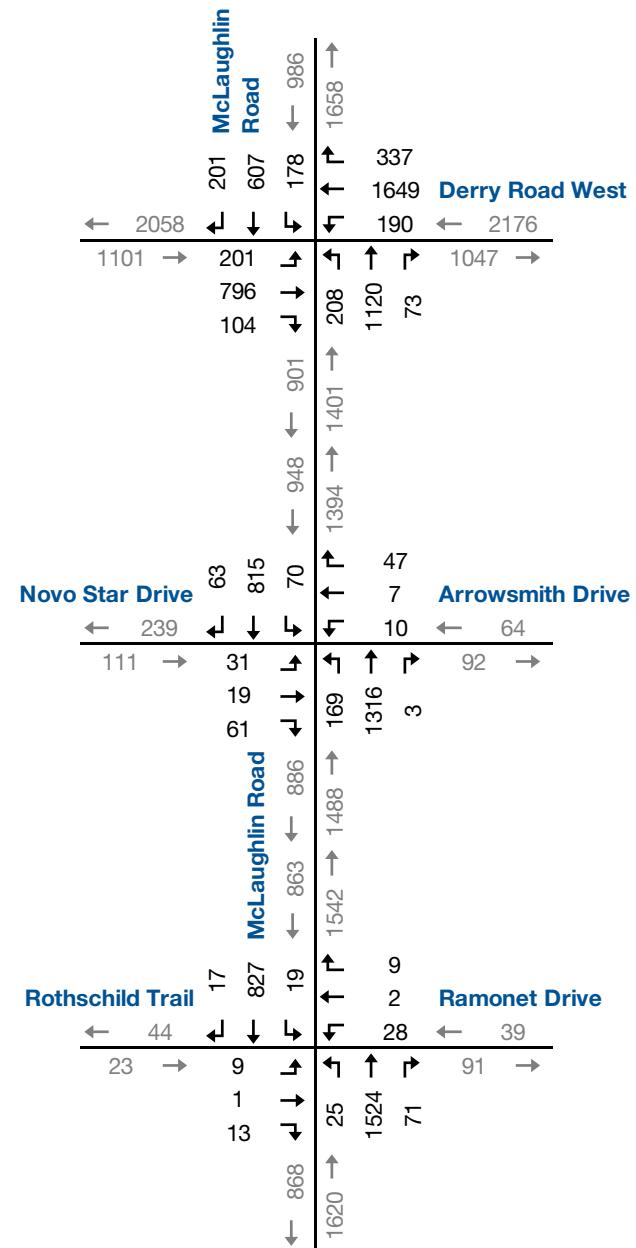




AM Peak Hour



PM Peak Hour



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2.4 Existing 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 intersections), 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 Synchro 9 and the existing lane configurations, traffic controls and the existing peak hour traffic volumes.

The level of service conditions on the existing road network have been assessed using Synchro 9 with HCM 2000 procedures. As per the City's TIS guidelines, movements are considered critical under the following conditions³:

- ▶ Volume/capacity (V/C) ratios for overall intersection operations, through movements or shared through/turning movements increased to 0.85 or above for signalized intersections;
- ▶ V/C ratios for exclusive movements increased to 0.95 or above for signalized intersections; and
- ▶ 95th percentile queue lengths for individual movements exceeds available lane storage. Queue lengths estimated using Synchro 9.

Table 2.2 details the existing level of service conditions at the study area intersections and are summarized below:

AM Peak Hour

- ▶ McLaughlin Road & Derry Road West
 - The overall intersection is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00;
 - Eastbound right-turn movement is forecast to operate with Synchro 95th percentile back of queue exceeding the available storage by 77 metres;
 - Westbound left-turn movement is forecast to operate with delays in the LOS F range and v/c ratios greater than 1.00;

³ City of Mississauga Traffic Impact Study Guidelines 2008



- Northbound left-turn movement Synchro 95th percentile back of queue is forecast to exceed available storage by 8 metres; and
 - Eastbound and southbound through movements are forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00.
- McLaughlin Road & Novo Star Drive/Arrowsmith Drive
- The overall intersection is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00;
 - Eastbound shared through/right-turn movement is forecast to operate with delays in the LOS F range and a v/c ratio greater than 0.85;
 - Westbound left-turn movement is forecast to operate with delays in the LOS F range, a v/c ratio greater than 1.00 and Synchro 95th percentile back of queue is forecast to exceed available storage by 27 metres;
 - Northbound and eastbound left-turn movements are forecast to operate with Synchro 95th percentile back of queues exceeding the available storage by 2 metres and 15 metres respectively; and
 - Southbound through shared through/right-turn movement is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00.
- McLaughlin Road & Rothschild Trail/Ramonet Drive
- The overall intersection is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00;
 - Westbound shared left-turn/through/right-turn movement is forecast to operate with delays in the LOS F range and a v/c ratio greater than 0.85; and
 - Southbound shared through/right-turn movement and is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00.

PM Peak Hour

- McLaughlin Road & Derry Road West
- The overall intersection is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00;
 - Eastbound and northbound left-turn movements are forecast to operate with delays in the LOS F range, v/c ratios greater than 1.00 and Synchro 95th percentile back of queue is forecast to exceed available storage by 61 metres and 35 metres respectively;
 - Westbound through movement is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00; and



- Westbound right-turn movement is forecast to operate with Synchro 95th percentile back of queue exceeding the available storage by 3 metres.
- ▶ McLaughlin Road & Novo Star Drive/Arrowsmith Drive
 - Eastbound left-turn movement is forecast to operate with Synchro 95th percentile back of queue exceeding the available storage by 7 metres.
- ▶ McLaughlin Road & Rothschild Trail/Ramonet Drive
 - No Critical Movements

Appendix C contains the supporting detailed Synchro 9 reports.



TABLE 2.2: EXISTING 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	McLaughlin Road & Derry Road West	TCS	LOS	D	F	E	F	F	D	D	E	F	D	E	E	E	E	C	E	1.11
			Delay	44	134	55	115	197	48	37	68	102	50	59	60	75	72	29	69	85
			V/C	0.70	1.16	0.72		1.25	0.66	0.08		0.87	0.59	0.25		0.63	1.00	0.09		
			95th	40	278	127		112	124	12		48	125	44		43	265	16		
			Storage	70	-	50		140	-	105		40	-	45		80	-	75		
	Avail.		Avail.	30	-	-77		28	-	93		-8	-	1		37	-	59		
PM Peak Hour	McLaughlin Road & Novo Star Drive/Arrowsmith Drive	TCS	LOS	D	F	>	E	F	D	>	F	F	B	>	B	B	F	>	F	F
			Delay	49	83	>	77	323	47	>	151	96	12	>	20	10	144	>	143	99
			V/C	0.29	0.91	>		1.38	0.12	>		0.83	0.55	>		0.15	1.26	>		
			95th	30	96	>		42	12	>		37	62	>		3	351	>		
			Storage	15	-	>		15	-	>		35	-	>		55	-	>		
	Avail.		Avail.	-15	-	>		-27	-	>		-2	-	>		52	-	>		
	McLaughlin Road & Rothschild Trail/Ramonet Drive	TCS	LOS	E	E	>	E	<	F	>	F	D	B	>	B	A	F	>	F	F
			Delay	56	57	>	57	<	90	>	90	53	11	>	12	3	165	>	164	114
			V/C	0.12	0.19	>		<	0.86	>		0.57	0.64	>		0.11	1.34	>		1.25
			95th	11	14	>		<	49	>		8	77	>		1	169	>		
			Storage	20	-	>		<	-	>		30	-	>		35	-	>		
	Avail.		Avail.	9	-	>		<	-	>		22	-	>		34	-	>		
PM Peak Hour	McLaughlin Road & Derry Road West	TCS	LOS	F	D	D	E	E	F	D	F	D	C	E	F	D	C	D	E	
			Delay	176	44	37	67	56	106	50	93	160	50	23	65	113	38	33	50	74
			V/C	1.20	0.51	0.13		0.83	1.09	0.59		1.07	0.93	0.06		0.92	0.53	0.23		
			95th	131	102	22		83	286	108		75	227	7		60	108	35		
			Storage	70	-	50		140	-	105		40	-	45		80	-	75		
	Avail.		Avail.	-61	-	28		57	-	-3		-35	-	38		21	-	40		
	McLaughlin Road & Novo Star Drive/Arrowsmith Drive	TCS	LOS	E	E	>	E	E	E	>	E	B	A	>	A	C	A	>	A	A
			Delay	76	72	>	73	72	75	>	74	13	2	>	4	22	4	>	6	9
			V/C	0.48	0.28	>		0.23	0.48	>		0.58	0.62	>		0.62	0.46	>		0.62
			95th	22	17	>		10	25	>		5	24	>		12	44	>		
			Storage	15	-	>		15	-	>		35	-	>		55	-	>		
	Avail.		Avail.	-7	-	>		5	-	>		30	-	>		44	-	>		
	McLaughlin Road & Rothschild Trail/Ramonet Drive	TCS	LOS	E	E	>	E	<	F	>	F	A	A	>	A	C	A	>	A	A
			Delay	72	71	>	71	<	84	>	84	3	8	>	8	25	2	>	3	8
			V/C	0.16	0.03	>		<	0.60	>		0.12	0.81	>		0.46	0.43	>		0.80
			95th	9	6	>		<	22	>		4	109	>		3	26	>		
			Storage	20	-	>		<	-	>		30	-	>		35	-	>		
	Avail.		Avail.	11	-	>		<	-	>		27	-	>		32	-	>		

MOE - Measure of Effectiveness

V/C - Volume to Capacity Ratio

> - Shared Right-Turn Lane

TCS - Traffic Control Signal

95th - 95th Percentile Queue Length

< - Shared Left-Turn Lane

LOS - Level of Service

Storage - Existing Storage (m)

Avail. - Available Storage (m)



3 Development Concept

3.1 Site Description

The subject site is located at 6620 Rothschild Trail in the City of Mississauga, Region of Peel. **Figure 3.1** details the layout of the subject site.

The subject site is currently occupied by a single-family home with an individual driveway connection to Rothschild Trail. The existing building will be removed to permit the redevelopment to proceed. The redevelopment is planned to include a four (4)-storey apartment building containing 43 residential units. The site's parking supply is noted to consist of 88 underground resident parking spaces and 17 surface visitor parking spaces. The parking supply will be amended as needed to reflect the final unit count.

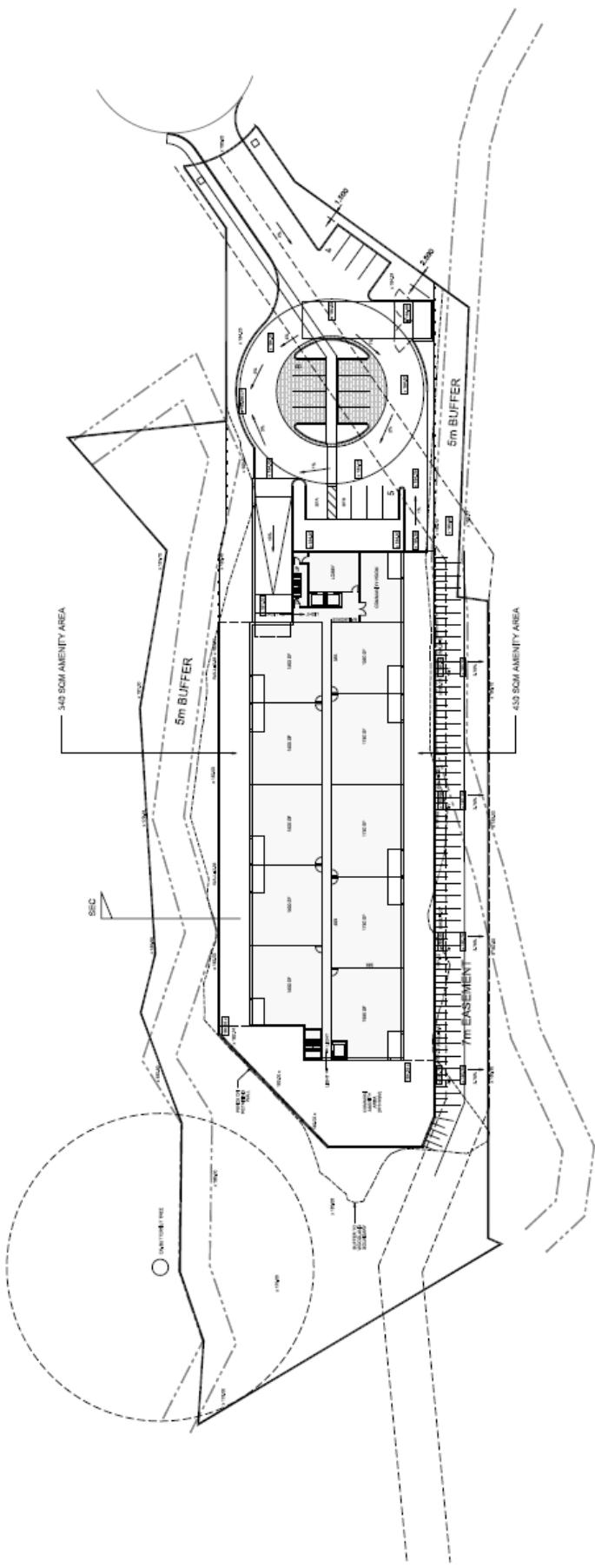
Vehicular access is provided via the existing all-turns private driveway connection to Rothschild Trail. Build-out is anticipated to occur by the Year 2022; however, timing is subject to market conditions.





Site Concept Plan

Figure 3.1



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3.2 Site Traffic Generation

The Institute of Transportation Engineers (ITE) Trip Generation⁴ methods predict the site trip generation. Land Use Code 221 (Multifamily Housing (Mid-Rise) equation rates were used to estimate the site's trip generation since all criteria for their use were met.

Table 3.1 indicates that the subject site's total base trip generation is estimated to be 15 vehicle trips during the AM peak hour and 20 vehicle trips during the PM peak hour.

TABLE 3.1: BASE DEVELOPMENT TRIP GENERATION

Land Use	Number of Units	AM Peak Hour				PM Peak Hour			
		Rate	In	Out	Total	Rate	In	Out	Total
221 - Multifamily Housing (Mid-Rise)	43	Eq ¹	4	11	15	Eq ²	12	8	20
Total Generation			4	11	15		12	8	20

¹ $\ln(T) = 0.98\ln(X)-0.98$

² $\ln(T) = 0.96\ln(X)-0.63$

Due to the proposed redevelopment's proximity to transit services, it is likely that some percentage of the trips generated by the site will be made by other modes (transit, walking, etc.). In order to determine the modal split for the site, the results of the 2016 Transportation Tomorrow Survey⁵ (TTS) were reviewed. The data is structured so that it can be accessed by traffic analysis zone (TAZ) and trip mode to produce more accurate and site-specific results. The data was queried to display results for all inbound and outbound trips for subject site TAZ, 3619 (**Figure 3.2**). **Table 3.2** displays the resulting 14% modal split reduction for transit.

When the modal split reduction is applied to the base trip generation (**Table 3.1**), it is reduced by three (3) trips during the AM peak hour and three (3) trips during the PM peak hour. After reduction, the subject site is estimated to generate 12 trips during the AM peak hour and 17 trips during the PM peak hour as shown in **Table 3.2**.

TABLE 3.2: ADJUSTED DEVELOPMENT TRIP GENERATION

Land Use	Number of Units	AM Peak Hour				PM Peak Hour			
		Rate	In	Out	Total	Rate	In	Out	Total
221 - Multifamily Housing (Mid-Rise)	43	Eq ¹	4	11	15	Eq ²	12	8	20
Total Trip Generation			4	11	15		12	8	20
<i>Transit Mode Split</i>	14%		1	2	3	14%	2	1	3
Net Trip Generation			3	9	12		10	7	17

¹ $\ln(T) = 0.98\ln(X)-0.98$

² $\ln(T) = 0.96\ln(X)-0.63$

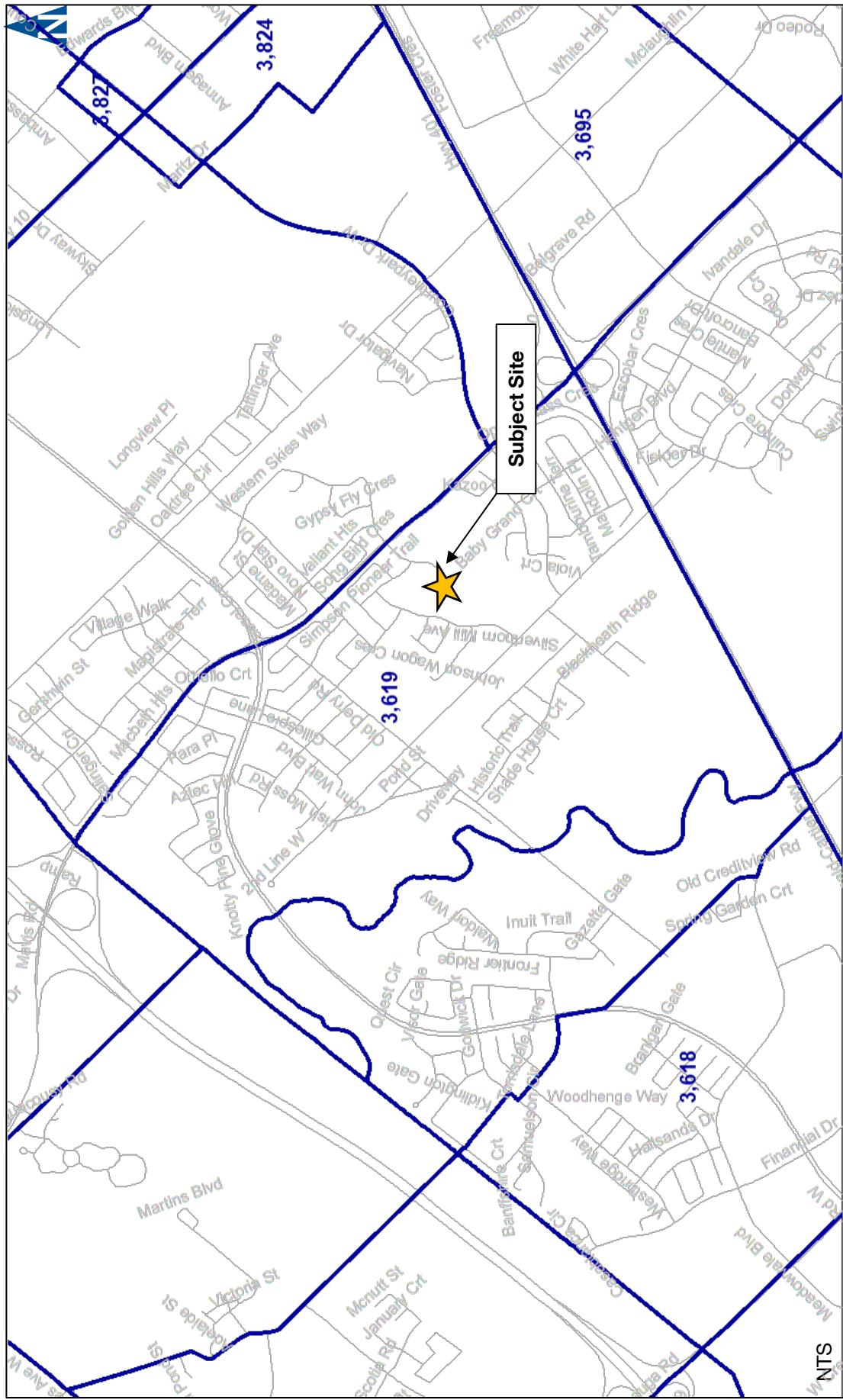
⁴ Trip Generation Manual 10th Edition Institute of Transportation Engineers Washington DC

⁵ www.joint.utoronto.ca/drs



Figure 3.2

Subject Site Traffic Analysis Zone



In order to determine the distribution of the traffic on the study area network, the results from the 2016 TTS were reviewed. The data was queried to display results for all inbound and outbound trips between the subject site TAZ (3619) and TTS regional municipalities. Trips within the Region of Peel were also taken into consideration by generating TTS data between the subject site TAZ and Region of Peel wards. **Table 3.3** summarizes the estimated trip distribution.

TABLE 3.3: ESTIMATED TRIP DISTRIBUTION

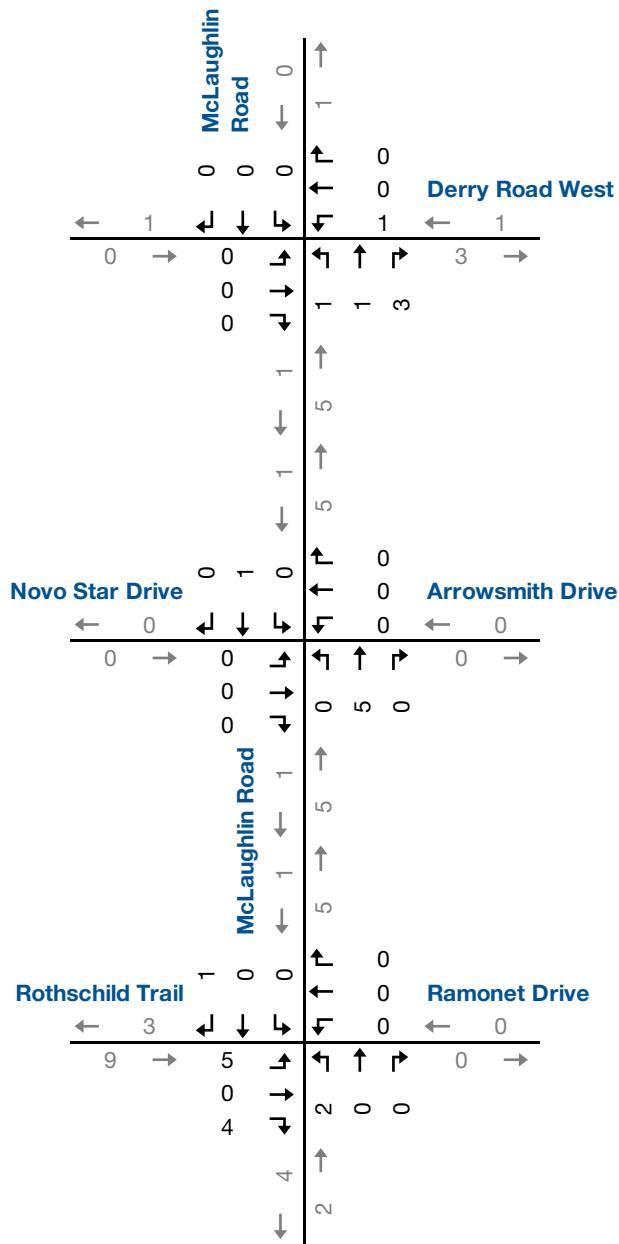
Origin/Destination	AM/PM Peak Hour
North via McLaughlin Road	10%
South via McLaughlin Road	45%
East via Derry Road West	35%
West via Derry Road West	10%
Total	100%

The site-generated trips were assigned to the roadway network using the TTS distribution. **Figure 3.3** illustrates the resulting AM and PM peak hour assignments.

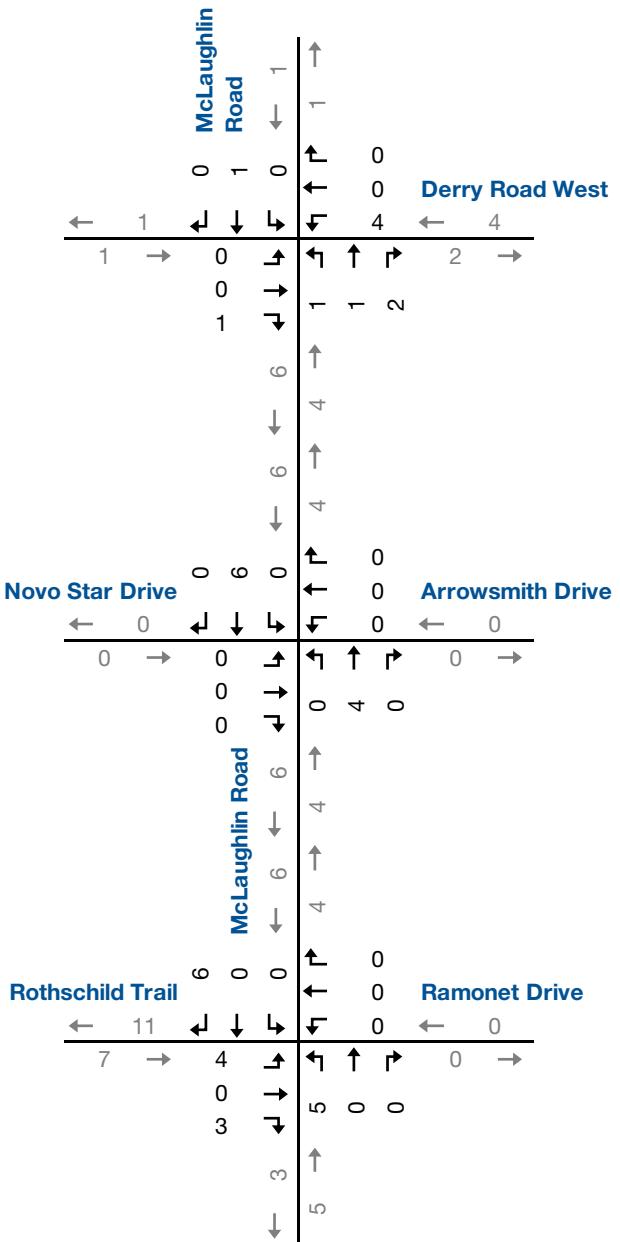




AM Peak Hour



PM Peak Hour



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Estimated Site Generated Traffic

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Figure 3.3

4 Future Traffic Conditions

The assessment of the future traffic conditions contained in this section includes the future background and total traffic forecasts as well as the level of service analyses.

4.1 General Background Traffic Growth

In order to derive the 2023 generalized background traffic volumes, a growth rate of 0.5% per annum compounded for five years (total growth of 2.5%) was applied to the existing traffic volumes. This growth rate was confirmed with the City of Mississauga during the pre-study consultation. **Figure 4.1** illustrates the 2023 AM and PM peak hour general background growth traffic forecasts.

4.2 Other Planned Developments

The City requested that the traffic generated by nearby proposed developments be included in the background traffic forecasts over and above the general growth. The City's Development Applications Map⁶ was used to determine the applicable development(s). 376 and 390 Derry Road West is currently in the application approval process for 126 townhouse units and 818 square metres (8,805 square feet) of commercial space.

Figure 4.2 details the location of the subject site.

Peak hour trips forecast to be generated by the components of the development are based on the Institute of Transportation Engineers (ITE) Trip Generation Manual for the following Land Use Codes (LUC):

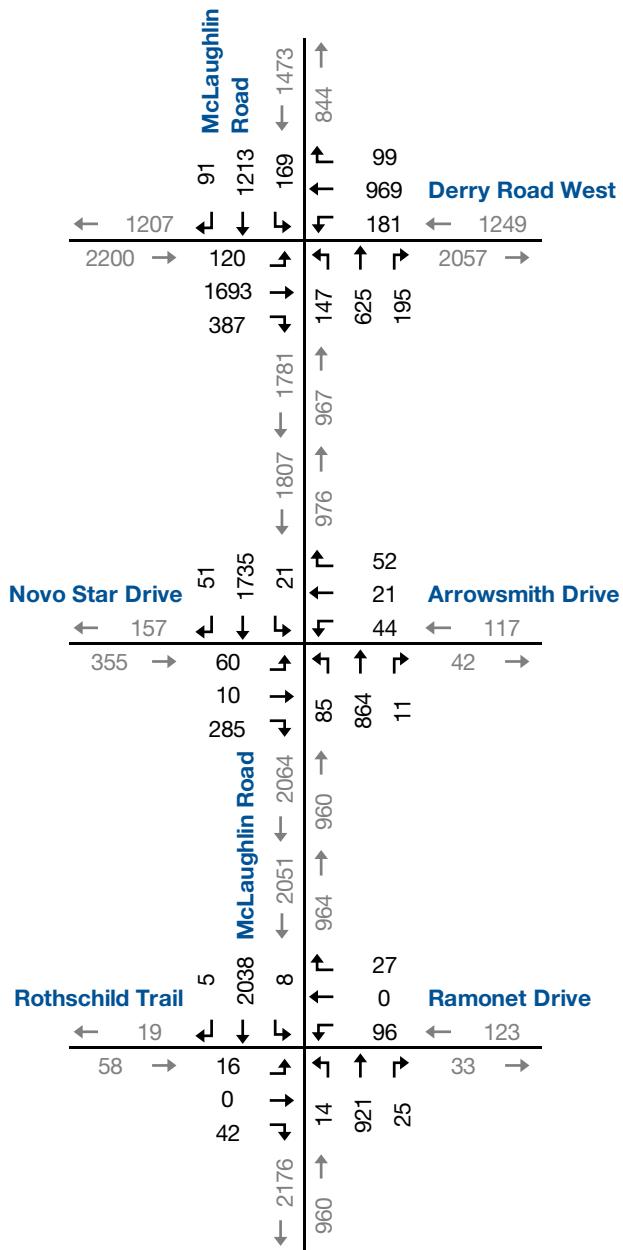
- ▶ **LUC 221 (Multifamily Housing (Mid-Rise)):** Includes apartments, townhouses and condominiums located within the same building with at least three other dwelling units and that have between three and ten levels (floors).
- ▶ **LUC 820 (Shopping Center):** An integrated group of commercial establishments that is planned, developed, owned, and managed as a unit. A shopping center's composition is related to its market area in terms of size, location and type of store. A shopping center also provides on-site parking facilities sufficient to serve its own parking demands.

⁶<http://mississauga.maps.arcgis.com/apps/Viewer/index.html?appid=a5ba296f43514bf59dccfdf76cd07e14>

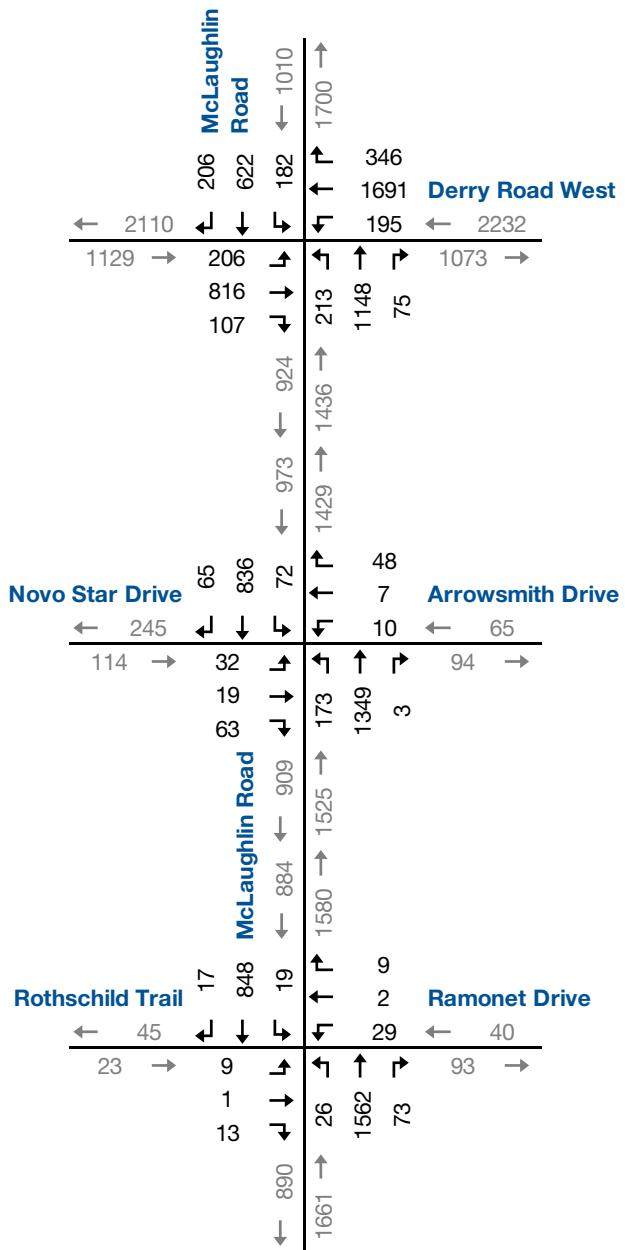




AM Peak Hour



PM Peak Hour



NTS



Forecast Background Growth Volumes

The estimated trip generation for the background development is displayed in **Table 4.1**, which indicates a total of 199 and 145 new trips are forecast to be generated during the AM and PM peak hours, respectively.

TABLE 4.1: BACKGROUND DEVELOPMENT TRIP GENERATION

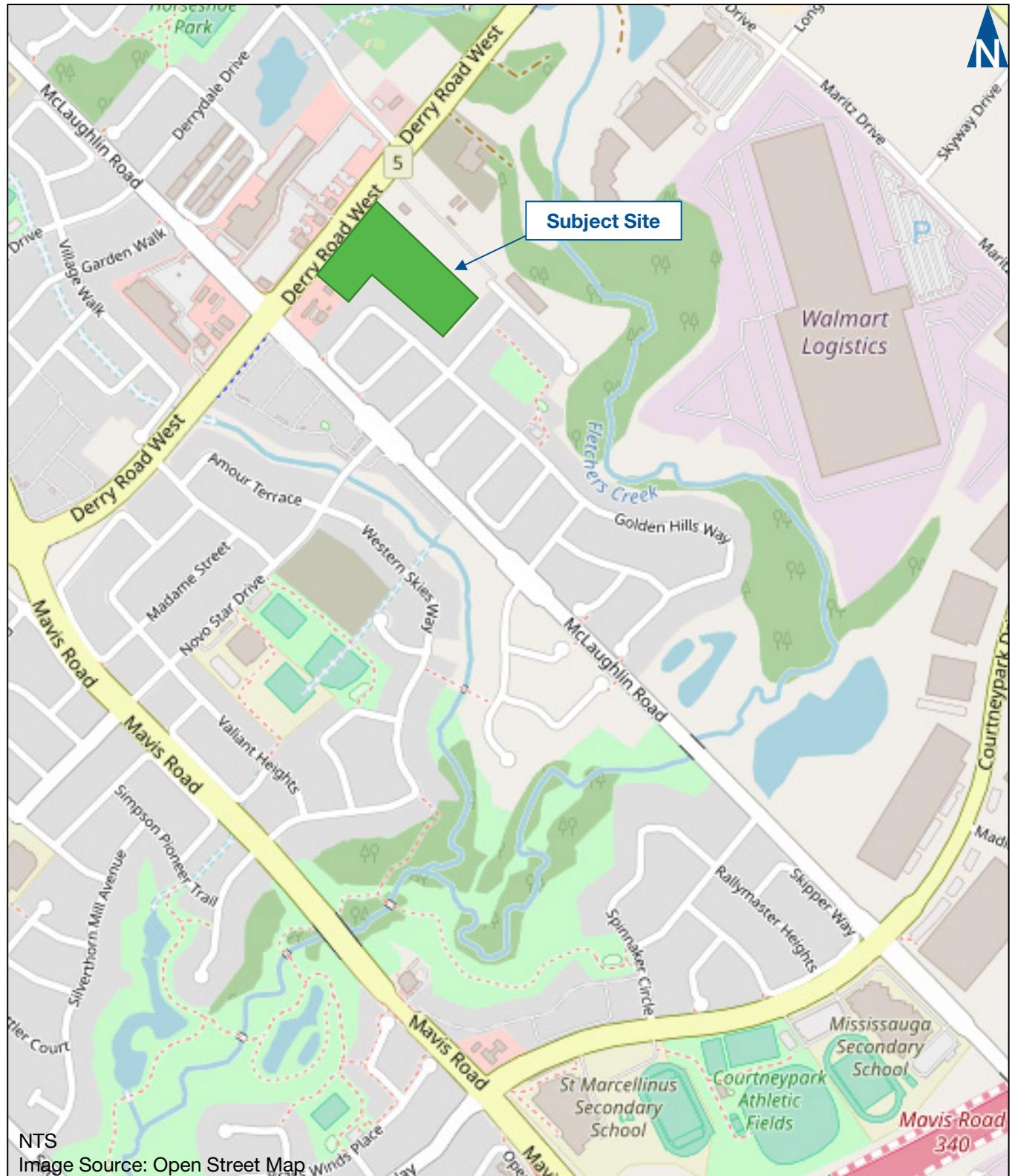
Land Use	Number of Units	Unit	AM Peak Hour				PM Peak Hour			
			Rate	In	Out	Total	Rate	In	Out	Total
221 - Multifamily Housing (Mid-Rise)	126	Units	Eq ¹	11	32	43	Eq ²	34	21	55
820 - Shopping Centre	9	1000 sq.ft.	Eq ³	97	59	156	Eq ⁴	43	47	90
Total Generation				108	91	199		77	68	145

$$\begin{array}{ll} ^1 \ln(T) = 0.98\ln(X)-0.98 & ^2 \ln(T) = 0.96\ln(X)-0.63 \\ ^3 T = 0.50(X)+151.78 & ^4 \ln(T) = 0.74\ln(X)+2.89 \end{array}$$

The trips were assigned to the road network based on the distribution of traffic outlined in **Table 3.3**. Note that due to its location at the northerly limits of the study area, not all trips generated by the background development will enter the study area.

Figure 4.3 details the site-generated traffic assignments for the background development.





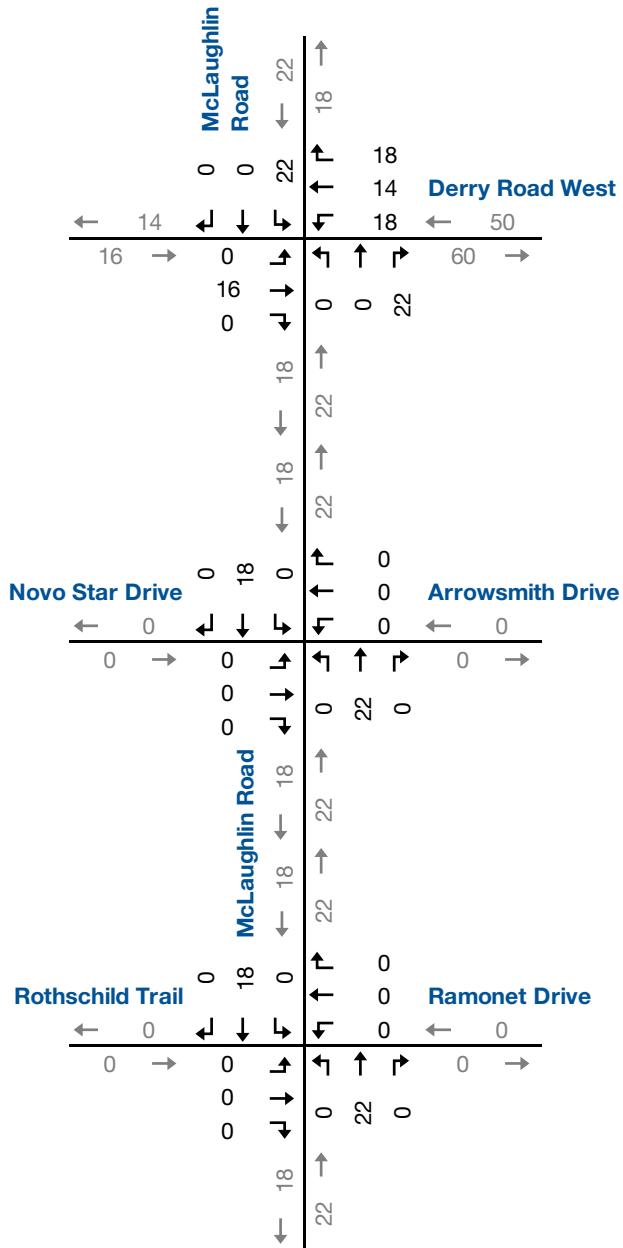
Location of Background Development

6620 Rothschild Trail TIS, L & FD and TDM Options Report
180231

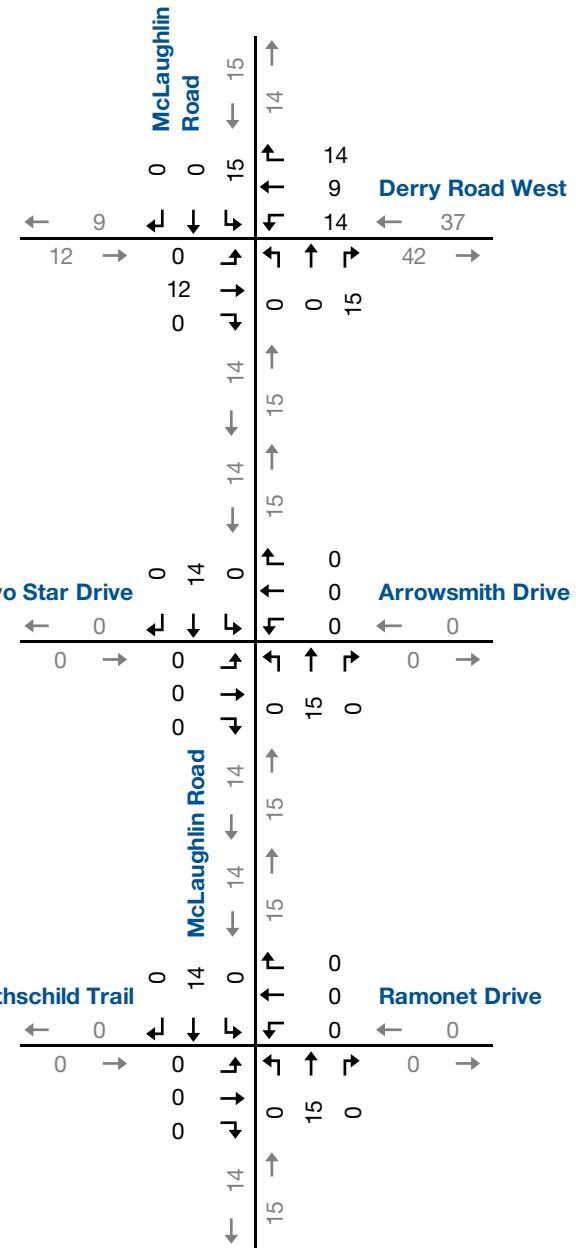
Figure 4.2



AM Peak Hour



PM Peak Hour



NTS



Background Development Traffic Volumes

6620 Rothschild Trail TIS, L & FD and TDM Options Report
180231

Figure 4.3

4.3 Future Total Background Traffic

Figure 4.2 illustrates the 2023 forecast total background (general growth + background development) traffic forecasts for the AM and PM peak hours.

4.4 Background Traffic Operations

The operations of the study area intersections under background traffic volumes were evaluated following the same methodology used for existing conditions. Signal timings have been optimized. **Table 4.2** details the background traffic level of service conditions at the study area intersections. The critical movements are summarized below:

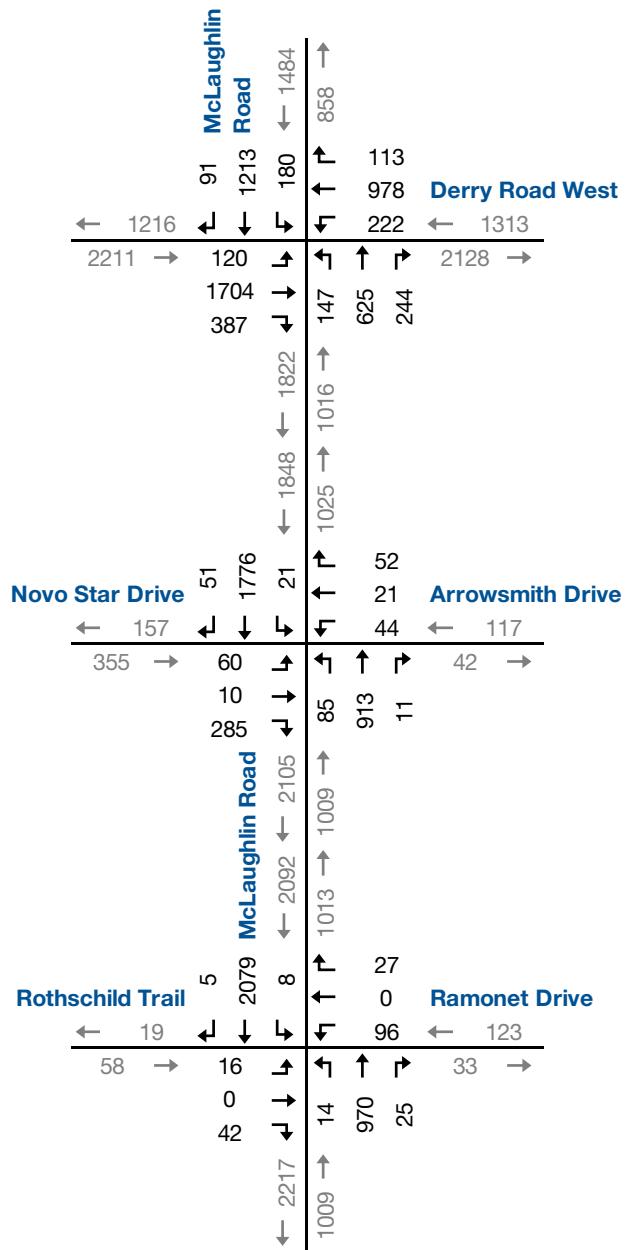
AM Peak Hour

- ▶ McLaughlin Road & Derry Road West
 - The overall intersection is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00;
 - Eastbound right-turn movement is forecast to operate with Synchro 95th percentile back of queue exceeding the available storage by 86 metres;
 - Westbound left-turn movement is forecast to operate with delays in the LOS F range, v/c ratios greater than 1.00 and Synchro 95th percentile back of queue is forecast to exceed available storage by 11 metres;
 - Northbound left-turn and right-turn movement Synchro 95th percentile back of queues are forecast to exceed available storage by 10 metres and 8 metres respectively;
 - Eastbound and southbound through movements are forecast to operate with delays in the LOS F range and v/c ratios greater than 1.00; and
 - Southbound left-turn movement is forecast to operate with delays in the LOS F range and a v/c ratio greater than 0.95.
- ▶ McLaughlin Road & Novo Star Drive/Arrowsmith Drive
 - The overall intersection is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00;
 - Eastbound shared through/right-turn movement is forecast to operate with delays in the LOS F range and a v/c ratio greater than 0.85;
 - Westbound left-turn movement is forecast to operate with delays in the LOS F range, a v/c ratio greater than 1.00 and Synchro 95th percentile back of queue is forecast to exceed available storage by 28 metres;

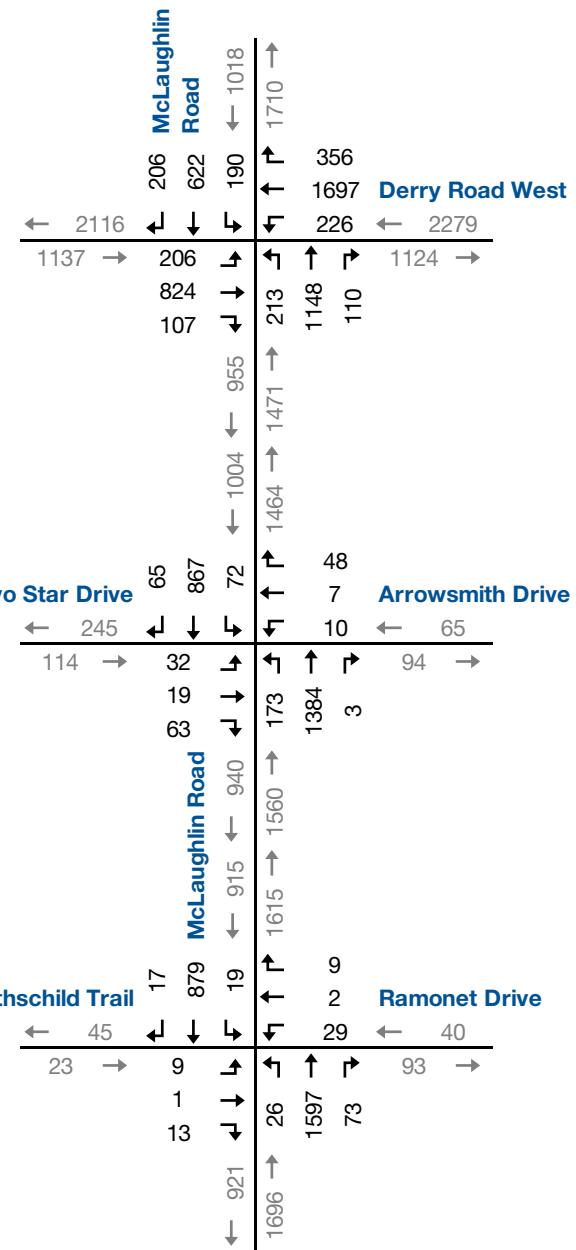




AM Peak Hour



PM Peak Hour



NTS



Forecast Background Traffic Plus Other Developments

- Northbound and eastbound left-turn movements are forecast to operate with Synchro 95th percentile back of queues exceeding the available storage by 3 metres and 15 metres respectively; and
 - Southbound through shared through/right-turn movement is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00.
- McLaughlin Road & Rothschild Trail/Ramonet Drive
- The overall intersection is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00;
 - Westbound shared left-turn/through /right-turn movement is forecast to operate with delays in the LOS F range and v/c ratios greater than 0.85; and
 - Southbound shared through/right-turn movement and is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00.

PM Peak Hour

- McLaughlin Road & Derry Road West
- The overall intersection is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00;
 - Eastbound and northbound left-turn movements are forecast to operate with delays in the LOS F range, v/c ratios greater than 1.00 and Synchro 95th percentile back of queues are forecast to exceed available storage by 66 metres and 36 metres respectively;
 - Westbound through and left-turn movements are forecast to operate with delays in the LOS F range and v/c ratios greater than 1.00;
 - Westbound right-turn movement is forecast to operate with Synchro 95th percentile back of queue exceeding the available storage by 14 metres; and
 - Southbound left-turn movement is forecast to operate with delays in the LOS F range and a v/c ratio greater than 0.95.
- McLaughlin Road & Novo Star Drive/Arrowsmith Drive
- Eastbound left-turn movement is forecast to operate with Synchro 95th percentile back of queue exceeding the available storage by 7 metres.
- McLaughlin Road & Rothschild Trail/Ramonet Drive
- Northbound shared through/right-turn movement is forecast to operate with delays in the LOS A range and a v/c ratio equivalent to 0.85.

Appendix E contains the detailed Synchro 9 reports.



TABLE 4.2: BACKGROUND TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																OVERALL	
				Eastbound				Westbound				Northbound				Southbound					
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach		
AM Peak Hour	McLaughlin Road & Derry Road West	TCS	LOS	D	F	E	F	F	D	D	F	F	D	E	E	F	E	C	F	F	
			Delay	49	150	58	128	322	48	37	93	105	46	57	57	133	79	30	82	97	
			V/C	0.75	1.20	0.76		1.55	0.68	0.10		0.90	0.57	0.31		0.99	1.03	0.10		1.28	
			95th	41	293	136		151	129	13		50	102	53		60	277	17			
			Storage	70	-	50		140	-	105		40	-	45		80	-	75			
			Avail.	29	-	-86		-11	-	92		-10	-	-8		20	-	59			
PM Peak Hour	McLaughlin Road & Novo Star Drive/Arrowsmith Drive	TCS	LOS	D	F	>	F	F	D	>	F	F	B	>	B	B	F	>	F	F	
			Delay	50	89	>	82	340	47	>	157	95	13	>	20	11	172	>	170	115	
			V/C	0.30	0.94	>		1.43	0.15	>		0.84	0.60	>		0.19	1.32	>		1.31	
			95th	30	100	>		43	16	>		38	70	>		3	367	>			
			Storage	15	-	>		15	-	>		35	-	>		55	-	>			
			Avail.	-15	-	>		-28	-	>		-3	-	>		52	-	>			
PM Peak Hour	McLaughlin Road & Rothschild Trail/Ramonet Drive	TCS	LOS	E	E	>	E	<	F	>	F	D	B	>	B	A	F	>	F	F	
			Delay	56	57	>	56	<	91	>	91	53	13	>	13	3	195	>	195	133	
			V/C	0.12	0.19	>		<	0.86	>		0.57	0.69	>		0.14	1.41	>		1.30	
			95th	11	15	>		<	50	>		8	85	>		1	250	>			
			Storage	20	-	>		<	-	>		30	-	>		35	-	>			
			Avail.	9	-	>		<	-	>		22	-	>		34	-	>			
PM Peak Hour	McLaughlin Road & Derry Road West	TCS	LOS	F	D	D	E	F	F	D	F	D	C	E	F	D	C	D	F		
			Delay	191	45	38	71	105	122	52	109	166	52	25	67	129	38	33	54	82	
			V/C	1.24	0.54	0.14		1.02	1.13	0.64		1.10	0.94	0.13		0.98	0.54	0.24		1.10	
			95th	136	106	23		119	300	119		76	238	14		65	111	37			
			Storage	70	-	50		140	-	105		40	-	45		80	-	75			
			Avail.	-66	-	27		21	-	-14		-36	-	31		15	-	38			
PM Peak Hour	McLaughlin Road & Novo Star Drive/Arrowsmith Drive	TCS	LOS	E	E	>	E	E	E	>	E	C	A	>	A	C	A	>	A	A	
			Delay	75	71	>	72	72	75	>	75	20	3	>	5	34	5	>	7	10	
			V/C	0.47	0.28	>		0.22	0.51	>		0.62	0.65	>		0.73	0.50	>		0.70	
			95th	22	17	>		10	27	>		6	30	>		38	51	>			
			Storage	15	-	>		15	-	>		35	-	>		55	-	>			
			Avail.	-7	-	>		5	-	>		29	-	>		18	-	>			
PM Peak Hour	McLaughlin Road & Rothschild Trail/Ramonet Drive	TCS	LOS	E	E	>	E	<	F	>	F	A	A	>	A	D	A	>	A	A	
			Delay	71	70	>	71	<	85	>	85	3	10	>	10	48	3	>	3	9	
			V/C	0.15	0.03	>		<	0.61	>		0.14	0.85	>		0.60	0.46	>		0.83	
			95th	9	6	>		<	23	>		4	121	>		13	31	>			
			Storage	20	-	>		<	-	>		30	-	>		35	-	>			
			Avail.	11	-	>		<	-	>		26	-	>		22	-	>			

MOE - Measure of Effectiveness

TCS - Traffic Control Signal

LOS - Level of Service

V/C - Volume to Capacity Ratio

95th - 95th Percentile Queue Length

Storage - Existing Storage (m)

> - Shared Right-Turn Lane

< - Shared Left-Turn Lane

Avail. - Available Storage (m)



4.5 Future Total Traffic

A five-year horizon (Year 2023) beyond the date of the study has been assessed. The total future traffic volumes are estimated to consist of the site generated traffic and the background traffic volumes.

Figure 4.2 details the forecast Total Traffic Volumes.

4.6 Future Total Traffic Operations

The operations of the study area intersection under future total traffic volumes were evaluated following the same methodology used for existing conditions. Signal timings have been optimized. **Table 4.3** details the total traffic level of service conditions at the study area intersections, and the critical movements are summarized below:

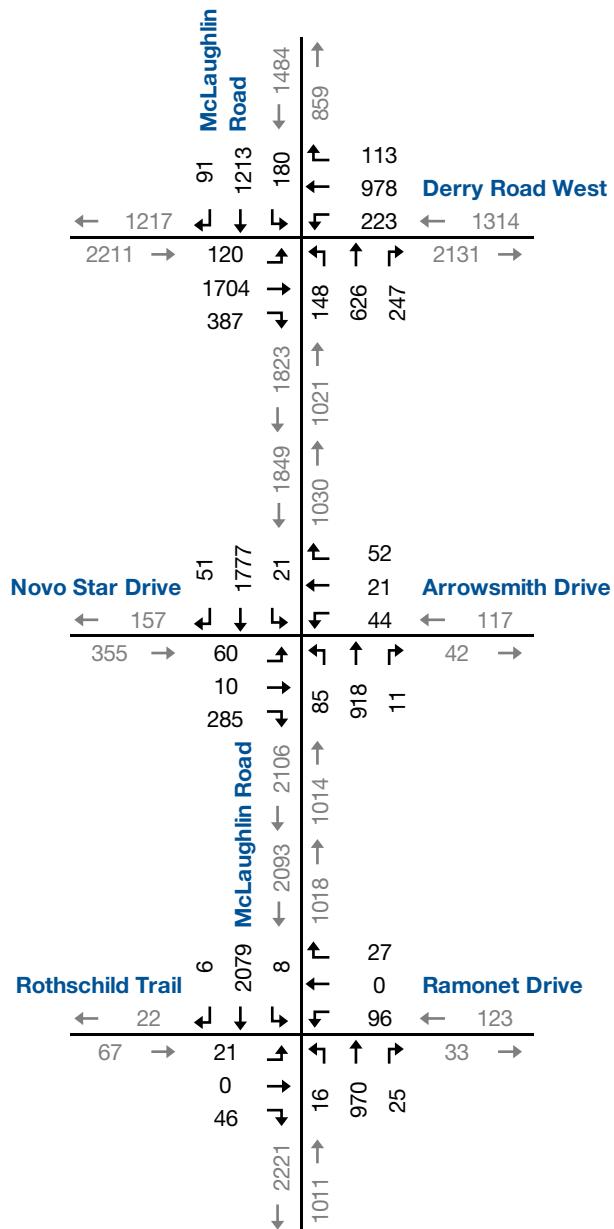
AM Peak Hour

- ▶ McLaughlin Road & Derry Road West
 - The overall intersection is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00;
 - Eastbound right-turn movement is forecast to operate with Synchro 95th percentile back of queue exceeding the available storage by 84 metres;
 - Westbound left-turn movement is forecast to operate with delays in the LOS F range, v/c ratios greater than 1.00 and Synchro 95th percentile back of queue is forecast to exceed available storage by 12 metres;
 - Northbound left-turn and right-turn movement Synchro 95th percentile back of queues are forecast to exceed available storage by 10 metres and 8 metres respectively; and
 - Eastbound and southbound through movements are forecast to operate with delays in the LOS F range and v/c ratios greater than 1.00.
- ▶ McLaughlin Road & Novo Star Drive/Arrowsmith Drive
 - The overall intersection is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00;
 - Eastbound shared through/right-turn movement is forecast to operate with delays in the LOS F range and a v/c ratio greater than 0.85;

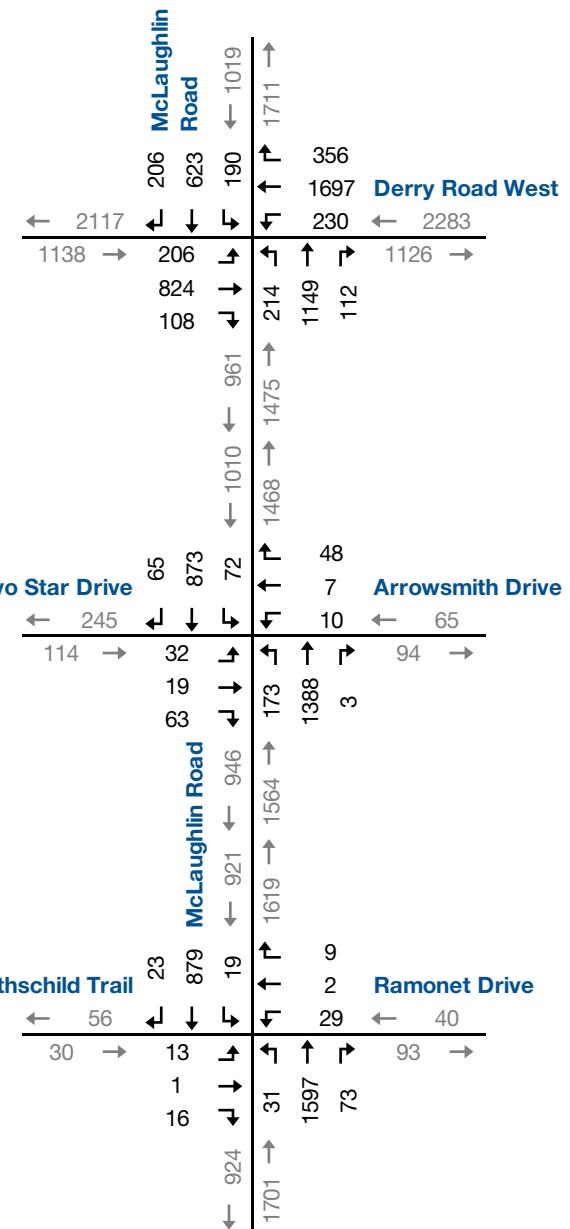




AM Peak Hour



PM Peak Hour



NTS



Forecast Total Traffic

Figure 4.5

- Westbound left-turn movement is forecast to operate with delays in the LOS F range, a v/c ratio greater than 1.00 and Synchro 95th percentile back of queue is forecast to exceed available storage by 28 metres;
 - Northbound and eastbound left-turn movements are forecast to operate with Synchro 95th percentile back of queues exceeding the available storage by 3 metres and 15 metres respectively; and
 - Southbound through shared through/right-turn movement is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00.
- McLaughlin Road & Rothschild Trail/Ramonet Drive
- The overall intersection is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00;
 - Westbound shared left-turn/through/right-turn movement is forecast to operate with delays in the LOS F range and a v/c ratio greater than 0.85; and
 - Southbound shared through/right-turn movement and is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00.

PM Peak Hour

- McLaughlin Road & Derry Road West
- The overall intersection is forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00;
 - Eastbound and northbound left-turn movements are forecast to operate with delays in the LOS F range, v/c ratios greater than 1.00 and Synchro 95th percentile back of queues forecast to exceed available storage by 65 metres and 37 metres respectively;
 - Westbound through and left-turn movements are forecast to operate with delays in the LOS F range and a v/c ratio greater than 1.00;
 - Westbound right-turn movement is forecast to operate with Synchro 95th percentile back of queue exceeding the available storage by 14 metres; and
 - Southbound left-turn movement is forecast to operate with delays in the LOS F range and a v/c ratio greater than 0.95.
- McLaughlin Road & Novo Star Drive/Arrowsmith Drive
- Eastbound left-turn movement is forecast to operate with Synchro 95th percentile back of queue exceeding the available storage by 7 metres.
- McLaughlin Road & Rothschild Trail/Ramonet Drive



- Northbound shared through/right-turn movement is forecast to operate with delays in the LOS A range and a v/c ratio equivalent to 0.85.

Inclusion of the site generated traffic increases overall intersection delay by one second or less during the AM and PM peak hours.

Appendix F contains the detailed Synchro 9.



TABLE 4.3: TOTAL TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																OVERALL	
				Eastbound				Westbound				Northbound				Southbound					
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach		
AM Peak Hour	McLaughlin Road & Derry Road West	TCS	LOS	D	F	E	F	F	D	D	F	F	D	E	E	E	C	E	F		
			Delay	49	150	57	128	324	48	37	94	107	50	59	60	77	79	30	75	96	1.27
			V/C	0.75	1.20	0.75		1.56	0.68	0.10		0.90	0.61	0.33		0.69	1.03	0.10			
			95th	41	293	134		152	129	13		50	115	53		47	277	17			
	McLaughlin Road & Novo Star Drive/Arrowsmith Drive	TCS	Storage	70	-	50		140	-	105		40	-	45		80	-	75			
			Avail.	29	-	-84		-12	-	92		-10	-	-8		33	-	59			
PM Peak Hour	McLaughlin Road & Rothschild Trail/Ramonet Drive	TCS	LOS	D	F	>	F	F	D	>	F	F	B	>	B	B	F	>	F	F	
			Delay	50	89	>	82	340	47	>	157	95	13	>	20	11	172	>	170	114	1.31
			V/C	0.30	0.94	>		1.43	0.15	>		0.84	0.60	>		0.19	1.32	>			
			95th	30	100	>		43	16	>		38	71	>		3	367	>			
	McLaughlin Road & Derry Road West	TCS	Storage	15	-	>		15	-	>		35	-	>		55	-	>			
			Avail.	-15	-	>		-28	-	>		-3	-	>		52	-	>			
PM Peak Hour	McLaughlin Road & Novo Star Drive/Arrowsmith Drive	TCS	LOS	E	E	>	E	<	F	>	F	E	B	>	B	A	F	>	F	F	
			Delay	56	57	>	57	<	91	>	91	68	13	>	14	3	196	>	195	133	1.30
			V/C	0.16	0.22	>		<	0.86	>		0.66	0.69	>		0.14	1.41	>			
			95th	13	16	>		<	50	>		11	85	>		1	253	>			
	McLaughlin Road & Rothschild Trail/Ramonet Drive	TCS	Storage	20	-	>		<	-	>		30	-	>		35	-	>			
			Avail.	7	-	>		<	-	>		19	-	>		34	-	>			
PM Peak Hour	McLaughlin Road & Derry Road West	TCS	LOS	F	D	D	E	F	F	D	F	F	D	C	E	F	D	C	D	F	
			Delay	161	45	38	65	110	134	54	119	167	52	25	67	129	38	33	54	84	1.07
			V/C	1.16	0.54	0.14		1.04	1.16	0.65		1.10	0.94	0.13		0.98	0.54	0.24			
			95th	135	106	24		121	300	119		77	239	15		65	111	37			
	McLaughlin Road & Novo Star Drive/Arrowsmith Drive	TCS	Storage	70	-	50		140	-	105		40	-	45		80	-	75			
			Avail.	-65	-	26		19	-	-14		-37	-	30		15	-	38			
PM Peak Hour	McLaughlin Road & Rothschild Trail/Ramonet Drive	TCS	LOS	E	E	>	E	E	E	>	E	C	A	>	A	C	A	>	A	B	
			Delay	75	71	>	72	72	75	>	75	21	3	>	5	35	6	>	8	10	0.70
			V/C	0.47	0.28	>		0.22	0.51	>		0.61	0.65	>		0.73	0.51	>			
			95th	22	17	>		10	27	>		8	30	>		37	53	>			
	McLaughlin Road & Rothschild Trail/Ramonet Drive	TCS	Storage	15	-	>		15	-	>		35	-	>		55	-	>			
			Avail.	-7	-	>		5	-	>		27	-	>		18	-	>			

MOE - Measure of Effectiveness

TCS - Traffic Control Signal

LOS - Level of Service

V/C - Volume to Capacity Ratio

95th - 95th Percentile Queue Length

Storage - Existing Storage (m)

> - Shared Right-Turn Lane

< - Shared Left-Turn Lane

Avail. - Available Storage (m)



5 Remedial Measures

5.1 Traffic Control Improvements

Under background and total traffic conditions, the analyses indicate capacity constraints at all study area intersections except for the intersection of McLaughlin Road and Rothschild Trail/Ramonet Drive. The addition of the traffic from the subject redevelopment has negligible impact on the operations of the intersections as shown in the operational analysis in Section 4.4. Therefore, the capacity issues at study area intersections is not as a result of the proposed redevelopment.

Potential remedial measures for the critical movements at the study area intersections include:

- ▶ McLaughlin Road & Derry Road West
 - An additional eastbound through lane, which would allow the high volume of through to clear the intersection; and
 - An additional southbound through lane, which would allow for the high volume of through movements to clear the intersection.
- ▶ McLaughlin Road & Novo Star Drive/Arrowsmith Drive
 - An additional southbound through lane; and
 - An eastbound right-turn lane, which would allow the high volume of right-turn movements to clear the intersection.
- ▶ McLaughlin Road & Rothschild Trail/Ramonet Drive
 - Westbound left-turn lane; and
 - An additional northbound through lane; however, the movement is still considered critical.

The remedial measures mentioned above are potential solutions to deal with total traffic operations and are not warranted by the subject development. Geometrically, there is available width to add lanes; however, this would require major road reconstruction.



6 Site Design & Layout

6.1 Vehicle Circulation

The site circulation has been assessed using the following design vehicles:

- ▶ Transportation Association of Canada⁷ (TAC) Heavy Single Unit (HSU);
 - Typical heavy truck used for delivery and refuse collection.
- ▶ TAC Medium Single Unit (MSU); and
- ▶ TAC Passenger Car (P) design vehicle

Appendix F contains reduced scale vehicle turning movement diagrams for the site driveway/entrance and underground parking. The diagrams were produced using the site plan and AutoTURN swept path analysis software.

The proposed geometry for the site driveways is sufficient to accommodate the intended design vehicles. The TAC P will require the full width of the circle road to turn right at the top of the underground parking ramp. The door swing illustrated for the garbage area will block one lane of traffic and the vehicle accessing the garbage area will block all lanes of traffic when being serviced.

Traffic control for the two-way circle located at the driveway should be considered as a yield entry due to circulation.

⁷ Canada, Transportation Association o. Geometric Design Guide for Canadian Roads (2017), Section 2.4 Design Vehicles



7 Transportation Demand Management

Transportation Demand Management (TDM) programs⁸ consider how people's choices of mode travel are affected by land use patterns, development design, parking availability, parking cost, and the relative cost, convenience, and availability of alternative modes of travel. Various TDM strategies are used to influence those factors so that alternatives to single occupant vehicle travel, such as transit or carpooling, are more competitive. TDM strategies that can be considered at a residential site development can be divided into two basic categories:

- ▶ **Pre-occupancy:** things that need to be done while a development is being designed and built; and
- ▶ **Post-development:** things that can be done once people have moved into the development.

The pre-occupancy actions are critical because they are most likely to determine how attractive, convenient and safe alternative travel will be once the site is occupied. Before a site is occupied, or during a remodel, it can be designed to be convenient and safe for pedestrians and cyclists. As well, vehicle parking can be provided to meet but not exceed demand.

After the development is built, incentives can be offered, but those incentives will not work as well if the site and its surroundings are already auto-oriented. The incentives generally include subsidies to use transit or rideshare and information about where and how to use alternative modes of transportation.

TDM is one of the tools that municipalities are using to create vibrant and sustainable communities. Using policies and programs to make active and sustainable transportation more convenient, a TDM approach to transportation can deliver long-term environmental sustainability, improve public health, create stronger communities, and build more prosperous and liveable cities.

7.1 Potential TDM Measures

To further promote sustainable modes of travel, some of the TDM measures that could be implemented are described below. Due to the subject site's location adjacent to existing transit routes and pedestrian facilities several initiatives could be considered.

7.1.1 Walking

The pedestrian accessibility of a development is essential in helping to ensure that those that can walk, have accessible pedestrian connections. Proper pedestrian connections from the surrounding community to the site

⁸ City of Mississauga Official Plan – Section 8 Create a Multi-Modal City 2015



should be available to ensure safety and to enhance the experience of those that choose to walk.

Sidewalks currently exist on both sides of Rothschild Trail north of Amarone Court, McLaughlin Road, Ramonet Drive, Novo Star Drive, Arrowsmith Drive and Derry Road West.

To further enhance the attractiveness of walking, proper lighting should be provided on site, and near all building entrances and exits. Weather protection at the proposed building's main entrance and adjacent sidewalk provided either by a building overhang, or a stand-alone structure is also recommended as an additional pedestrian enhancement. The future landscaping plan should consider enhancing the common areas to include pedestrian amenities such as benches or seating areas.

7.1.2 Cycling

In creating an environment that supports pedestrian and cycling activity, the public space must be accessible, safe and comfortable to encourage movement on the street and in the surrounding area(s). Providing safe and secure long-term bicycle storage in the underground parking level or within the development should be considered in the site design. Short-term bike storage along the frontage of the building within the public domain can be provided for visitors to the site. The City of Mississauga Cycling Master Plan⁹ recommends the following bicycle parking for a residential development:

- ▶ Long-term bicycle parking: 0.7 parking spaces/unit; and
- ▶ Short-term bicycle parking: 0.08 parking spaces/unit.

Based on this guideline, it is recommended that a total of 33 bike parking spaces would be provided. As zero spaces are being proposed there is a shortfall of 33 spaces. As a minimum, it is recommended at least three short-term bicycle parking spaces be provided near the main building entrance to accommodate those users who choose to bike to/from the site. Providing some long-term bicycle parking for residents who choose to access the site via bicycle should also be considered.

7.1.3 Transit

The availability of convenient and desirable transit options can reduce the number of personal automobile trips. As previously discussed, public transportation is provided via Miway Transit Route 66. This route provides good connectivity to the broader transit network and key destinations within the City, including recreational facilities and shopping. However, the existing amenities at the surrounding transit stops limit the attractiveness of public transportation.

⁹ City of Mississauga Cycling Master Plan 2010



Miway Transit in consultation with City staff should consider the installation of bus shelters at the bus stops near the subject site, specifically on McLaughlin Road and Rothschild Trail. These bus shelters should be installed as to not impede visibility for motorists entering either roadway from cross-streets, or other driveway connections. To further enhance these stops, it is recommended that seating (benches), illumination, and bus stop schedules/information be provided. Information about transit services could also be provided within the main lobby of the building on-site.

7.1.4 Parking Management

TDM measures aim to reduce auto ownership and private vehicle trips, thereby reducing the need for an oversupply of parking with the intent of encouraging the use of other forms of transportation. However, a parking supply should not be reduced to a point in which significant parking issues are created. Managing parking supply helps to reduce the undesirable impacts of parking demand on local and regional traffic levels and can result in positive impacts on community livability and design.

When reducing the number of parking spaces, adequate accessibility to other transportation modes should be provided. Additional provisions should be made, such as short-term and/or long-term bicycle parking, improved pedestrian and cycling connections, and improved access to transit to ensure alternate modes of transportation are attractive and readily accessible.

To further encourage residents to the building to utilize sustainable travel modes, the redevelopment should consider unbundling parking spaces from the cost to rent/purchase a unit. This is more equitable and efficient since occupants are not forced to pay for parking they do not need and allows consumers to adjust their parking supply to reflect their needs.

7.1.5 Carshare and Carpooling

Car sharing refers to automobile rental services intended to substitute for private vehicle ownership. It makes occasional use of a vehicle affordable, even for low-income households, while providing an incentive to minimize driving and increase reliance on alternative travel options as much as possible.

Where car sharing services are available, some households reduce their vehicle ownership, either shifting from two to one vehicle, or from one to zero vehicles. The use of car share benefits employees as well as nearby residents and businesses in suitable environments.

By providing this type of service onsite, lower automobile ownership rates and parking requirements can be further obtained. Residents of the building could choose to use walking, transit or cycling as their primary mode of travel and utilize the car share as a secondary mode of travel.

There are currently two car share providers in the City of Mississauga:



- ▶ **ZipCar**¹⁰ has nine locations in the City of Mississauga with the closest location to the subject site situated in close proximity to Square One Shopping Centre.
- ▶ **Enterprise Carshare**¹¹ has four locations in the City of Mississauga with the closest location at Square One Shopping Centre.

Ride-share/carpooling involves two or more people sharing a vehicle for a trip. The cost of the journey (fuel, tolls, parking, etc.) can be split between the driver and passengers, resulting in savings for all concerned. This also reduces the number of vehicle trips and parking demands.

There are several tools available such as Car Pool World¹² or Smart Commute¹³ Mississauga, which set up online ride sharing databases. These databases enable people to enter their daily journey so that the database can automatically search out coworkers whose journeys match. Notice boards could also be put up in the lobby of the building for residents who may want to organize informal carpools.

Ride sharing opportunities can also be used in combination with carpool parking stalls. These parking stalls are typically positioned in desirable locations (i.e. next to the building entrance) and are specifically reserved for vehicles with two (2) or more people. Providing a convenient parking location can be a good incentive for residents and visitors to carpool. One or more of the proposed surface parking spaces could be utilized as carpool parking.

7.1.6 Wayfinding and Travel Planning

Increasing awareness of sustainable transportation opportunities for residents of the redevelopment could be considered. New residents of the building should be provided with a welcome package that outlines the available transit and active transportation options such as the availability of bicycle parking, trails, car share/bike share facilities, etc. Signage and kiosks could also be considered to direct residents to nearby transit routes and schedules, bicycle routes and pedestrian walkways.

Providing awareness of commuting events such as, bike to work day and promotional materials that inform residents that all Miway buses are equipped with bike racks can be regularly distributed to residents through the condominium corporation.

The condominium corporation could also allow the City and Miway staff to hold regular events at or near the building to promote sustainable transportation. Some of these events could include how to properly load and unload a bicycle onto a Miway bus. Additionally, these events could also

¹⁰ <https://www.zipcar.ca/>

¹¹ <https://www.enterprise-carshare.ca/ca/en/home.html>

¹² <https://www.carpoolworld.com/>

¹³ <https://smartcommute.ca/>



include a workshop to problem solve issues the community is experiencing with incorporating sustainable travel.

A fully engaged travel plan will help to engage and educate residents and the community of available sustainable modes of travel and how to overcome obstacles that may be perceived.

7.1.7 Education/Promotion and Incentives

The following measures could be implemented to inform residents of existing transit and active transportation opportunities and encourage their usage:

- ▶ Travel planning resources for residents (individualized marketing, active transportation maps, community resources) be provided;
- ▶ Wayfinding signage be considered in the Lobby or near main entrances; and
- ▶ Provision of annual transit passes with purchase of apartment units.

The above TDM measures can assist in further mitigating the site's impact on the adjacent road network, promote a strong and vibrant economy, and create a livable community that has a balanced transportation network that accommodates all modes of transportation.



8 Conclusions and Recommendations

8.1 Conclusions

The main findings and conclusions of this study are as follows:

- ▶ **Study Area:** The intersections that form the study area include the McLaughlin Road intersections with Rothschild Trail/Ramonet Drive, Novo Star Drive/Arrowsmith Drive and Derry Road West.
- ▶ **Existing Traffic Conditions:** Intersection capacity issues are identified at the intersection of McLaughlin Road and Derry Road West, McLaughlin Road and Novo Star Drive and McLaughlin Road and Rothschild Trail/Ramonet Drive.
- ▶ **Development Generated Traffic:** The subject site is estimated to generate approximately 12 new AM peak hour trips and approximately 17 new PM peak hour trips after mode split reductions.
- ▶ **Forecast Traffic:** The forecast traffic volumes near the subject site have been assessed for five years (Year 2023) beyond the date of the study. The likely future traffic volumes near the subject site are estimated to consist of:
 - Generalized background traffic growth;
 - Build-out of one (1) adjacent development application; and
 - Traffic generated by the subject site.
- ▶ **Background Traffic Conditions:** The existing capacity constraints are expected to worsen with the growth in background traffic unrelated to the subject redevelopment.
- ▶ **Total Traffic Conditions:** The study area intersections are anticipated to continue to operate with levels of service similar to background traffic conditions.
- ▶ **Remedial Measures:** No remedial measures are necessary to accommodate the increase in traffic due to redevelopment of the subject site

8.2 Recommendations

Based on the findings of this study, the following is recommended:

- ▶ The development should be allowed to redevelop as planned;
- ▶ The applicant implements the recommendations outlined as part of the TDM review in Section 7. These include:
 - Providing safe, well-lit and attractive walkways for pedestrian throughout the site, including connections to the surrounding City sidewalk and multi-use path network;



- Providing a minimum of three short-term bicycle parking spaces near the main building entrance and consider providing some long-term bicycle parking for residents and visitors who choose to access the site via bicycle;
- Consultation with Miway to determine potential amenity improvements to the transit stops on McLaughlin Road at Rothschild Trail;
- Unbundling parking from the purchase and sale agreement so that the supply and demand is matched; and
- Provide general education of all travel mode options that identify benefits and how residents can best utilize these modes. New residents should be provided with a welcome package that outlines proximity to transit, cycling facilities and the proximity to local activity centres.



Appendix A

Pre-Study Consultation



10 September 2018

Project: 180231

By Email

**RE: TRANSPORTATION IMPACT STUDY
6620 ROTHSCHILD TRAIL, MISSISSAUGA, ON – SCOPE OF WORK**

Paradigm Transportation Solutions Limited has been retained to prepare a Transportation Impact Study (TRIS) for a proposed development in the City of Mississauga, Regional Municipality of Peel.

Project Understanding

The subject parcel is located on the south side of current terminus of Rothschild Trail, west of Amarone Court. The parcel is currently occupied by a single-family home with an individual driveway connection to Rothschild Trail. The existing building will be removed to permit the redevelopment to proceed.

The redevelopment is planned to include a four (4)-storey apartment building containing 43 residential units. A total of 105 parking spaces are proposed to service the site: 86 underground resident parking spaces and 19 surface visitor parking spaces. Access to the site will be provided via the existing all-turns private driveway connection to Rothschild Trail.

In assessing the transportation impacts, we intend to analyze the operation of the following three (3) intersections:

- ▶ McLaughlin Road and Rothschild Trail/Ramonet Drive (signalized);
- ▶ McLaughlin Road and Derry Road West (signalized); and
- ▶ McLaughlin Road and Novo Star Drive (signalized).

We will complete the TRIS in accordance with the *City of Mississauga Traffic Impact Study Guidelines* and any further direction provided by City staff.

Work Plan

Based on our understanding of the development proposal, we propose to carry out the following work plan:

- ▶ **Task 1 - Data Collection:** We will request available traffic counts, background growth rates, relevant background reports, and information about any other development applications in the vicinity. If acceptable (less than two years old) traffic data is not available, we will arrange for eight (8)-hour traffic counts to be conducted on a weekday at the subject intersections.

We will conduct a site visit to view and assess current road and transportation conditions in the study area during the typical peak periods for commuter traffic flow (weekday morning (AM) and afternoon (PM) peak hours).
- ▶ **Task 2 – Traffic Forecasting:** We will request confirmation of the opening year of the redevelopment and site plan statistics, including total number of units and parking provisions. According to the City of Mississauga TIS guidelines, we have assumed that we will be requested to develop traffic forecasts for the weekday AM and PM peak hours for one (1) future horizon five (5) years from the date of the study to satisfy City requirements. The components of the traffic forecasts will be as follows:
 - **Existing (Base Year)** – We will develop Existing (2018) vehicle traffic volumes for the AM and PM peak hours from available counts for the study area intersections.
 - **Future (Horizon Years) Background** – We will estimate Future Background (five years from date of the study) vehicle traffic volumes for the AM and PM peak hours by applying the approved growth rate to the Base Year volumes and adding anticipated trips from nearby approved. We will factor out any existing site-related trips that will be removed from the network when the existing land use is removed from the site.
 - **Future (Horizon Years) Total** – We will forecast the AM and PM peak hour vehicle traffic volumes generated by the proposed redevelopment based on rates contained in the Institute of Transportation Engineers (ITE) *Trip Generation* (10th Edition). The site vehicle trips will be distributed and assigned to the adjacent road network based on the distribution information contained in the 2016 Transportation Tomorrow Survey (TTS) for the subject site traffic analysis zone (TAZ). These trips will be added to the Future Background estimates to produce Future Total traffic volumes for the horizon year.
- ▶ **Task 3 – Operational Analyses:** We will evaluate the operations of the study area intersections for the Existing, Future Background and Future Total AM and PM peak hour traffic conditions for the horizon year. The operational analyses will be completed using Synchro 9 with HCM procedures. The analyses will assess volume-to-capacity (v/c) ratios, Level of Service (LOS) and queuing conditions. Based on the analysis results, we will identify any existing deficiencies, as well as the net impact of the proposed development on the study area road network. The need for road improvements (e.g., provision of auxiliary turn lanes) and/or modifications to traffic control devices (e.g., addition of traffic control signals) to address any deficiencies will be determined. An assessment of whether these measures are required due to non-site traffic (i.e. Existing or Future Background) or the increase in traffic resulting from the proposed development will be completed.



If you have any questions related to this work plan, please contact the undersigned at (905) 381-2229 x103 or (519) 896-3163 x103 or by email at selkins@ptsl.com.

Yours very truly,

PARADIGM TRANSPORTATION SOLUTIONS LIMITED



Stew Elkins
BES, MITE
Vice President and Chief Resource Officer



Appendix B

Existing Count Data



Ontario Traffic Inc.

Morning Peak Diagram

Specified Period

From: 6:00:00

To: 10:00:00

One Hour Peak

From: 7:45:00

To: 8:45:00

Municipality: Mississauga
Site #: 1833100001
Intersection: Derry Rd W & McLaughlin Rd
TFR File #: 1
Count date: 25-Sep-18

Weather conditions:

Person(s) who counted:

** Signalized Intersection **

Major Road: Derry Rd W runs N/S

North Leg Total: 2261

North Entering: 1437

North Peds: 25

Peds Cross: ☒

Cyclists	0	0	0	0
Trucks	4	10	2	16
Cars	85	1173	163	1421
Totals	89	1183	165	

Cyclists	0		
Trucks	16		
Cars	808		
Totals	824		

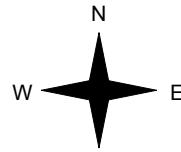
East Leg Total:	3225		
East Entering:	1219		
East Peds:	32		
Peds Cross:	☒		

Cyclists Trucks Cars Totals
0 98 1079 1177



Derry Rd W

McLaughlin Rd



Cyclists Trucks Cars Totals
0 1 116 117
0 66 1585 1651
0 1 376 377
0 68 2077

Derry Rd W

Cars	Trucks	Cyclists	Totals
96	1	0	97
854	91	0	945
175	2	0	177
1125	94	0	

McLaughlin Rd



Cars	Trucks	Cyclists	Totals
1936	70	0	2006

Peds Cross: ☒
West Peds: 62
West Entering: 2145
West Leg Total: 3322

Cars 1724
Trucks 13
Cyclists 0
Totals 1737

Cars 140 596 188 924
Trucks 3 14 2 19
Cyclists 0 0 0 0
Totals 143 610 190

Peds Cross: ☐
South Peds: 25
South Entering: 943
South Leg Total: 2680

Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 19:00:00

One Hour Peak

From: 17:00:00

To: 18:00:00

Municipality: Mississauga

Site #: 1833100001

Intersection: Derry Rd W & McLaughlin Rd

TFR File #: 1

Count date: 25-Sep-18

Weather conditions:

Person(s) who counted:

** Signalized Intersection **

Major Road: Derry Rd W runs N/S

North Leg Total: 2644

North Entering: 986

North Peds: 29

Peds Cross: ☒

Cyclists	0	0	0	0
Trucks	2	8	4	14
Cars	199	599	174	972
Totals	201	607	178	

Cyclists 0

Trucks 11

Cars 1647

Totals 1658

East Leg Total: 3223

East Entering: 2176

East Peds: 87

Peds Cross: ☒

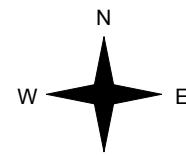
Cyclists Trucks Cars Totals

0 63 1995 2058



Derry Rd W

McLaughlin Rd



Cyclists Trucks Cars Totals

0 1 200 201

0 77 719 796

0 1 103 104

0 79 1022



Derry Rd W

Cars Trucks Cyclists Totals

337 0 0 337

1589 60 0 1649

190 0 0 190

2116 60 0

McLaughlin Rd



Cars Trucks Cyclists Totals

966 81 0 1047

Peds Cross: ☒

Cars 892

West Peds: 50

Trucks 9

West Entering: 1101

Cyclists 0

West Leg Total: 3159

Totals 901



Cars 207 1110 73 1390

Trucks 1 10 0 11

Cyclists 0 0 0 0

Totals 208 1120 73

Peds Cross: ☐

South Peds: 53

South Entering: 1401

South Leg Total: 2302

Comments

Ontario Traffic Inc.

Total Count Diagram

Municipality: Mississauga
Site #: 1833100001
Intersection: Derry Rd W & McLaughlin Rd
TFR File #: 1
Count date: 25-Sep-18

Weather conditions:

Person(s) who counted:

** Signalized Intersection **

Major Road: Derry Rd W runs N/S

North Leg Total: 17885

North Entering: 9139

North Peds: 232

Peds Cross: ☒

Cyclists	0	0	0	0
Trucks	20	99	22	141
Cars	1065	6332	1601	8998
Totals	1085	6431	1623	

Cyclists	0		
Trucks	109		
Cars	8637		
Totals	8746		

East Leg Total: 22987

East Entering: 11792

East Peds: 372

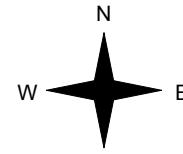
Peds Cross: ☒

Cyclists Trucks Cars Totals
0 608 10548 11156



Derry Rd W

McLaughlin Rd



Cyclists Trucks Cars Totals
0 10 1076 1086
0 491 8188 8679
0 8 1538 1546
0 509 10802



Derry Rd W

Cars Trucks Cyclists Totals
1712 12 0 1724
8306 571 0 8877
1174 17 0 1191
11192 600 0

McLaughlin Rd



Cars Trucks Cyclists Totals
10669 526 0 11195

Peds Cross: ☒
West Peds: 447
West Entering: 11311
West Leg Total: 22467

Cars 9044
Trucks 124
Cyclists 0
Totals 9168

Cars 1177 5849 880 7906
Trucks 17 87 13 117
Cyclists 0 0 0 0
Totals 1194 5936 893

Peds Cross: ☐
South Peds: 246
South Entering: 8023
South Leg Total: 17191

Comments

Ontario Traffic Inc.

Traffic Count Summary

Intersection: Derry Rd W & McLaughlin Rd

Count Date: 25-Sep-18

Municipality: Mississauga

North Approach Totals					North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists					Hour Ending	Includes Cars, Trucks, & Cyclists				
	Left	Thru	Right	Grand Total			Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	6:00:00	0	0	0	0	
7:00:00	316	897	92	1305	6	1571	7:00:00	28	147	91	
8:00:00	167	1128	80	1375	22	2067	8:00:00	89	466	137	
9:00:00	189	1226	91	1506	27	2444	9:00:00	131	603	204	
10:00:00	229	785	91	1105	23	1697	10:00:00	75	365	152	
15:00:00	0	0	0	0	0	15:00:00	0	0	0	0	
16:00:00	175	557	177	909	45	2202	16:00:00	215	996	82	
17:00:00	165	647	184	996	42	2454	17:00:00	233	1155	70	
18:00:00	178	607	201	986	29	2387	18:00:00	208	1120	73	
19:00:00	204	584	169	957	38	2340	19:00:00	215	1084	84	
Totals:	1623	6431	1085	9139	232	17162		1194	5936	893	
									8023	246	
East Approach Totals					West Approach Totals						
Hour Ending	Includes Cars, Trucks, & Cyclists				East/West Total Approaches	Hour Ending	Includes Cars, Trucks, & Cyclists				
	Left	Thru	Right	Grand Total			Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	6:00:00	0	0	0	0	
7:00:00	54	319	74	447	8	2201	7:00:00	55	1485	214	
8:00:00	120	770	103	993	37	3001	8:00:00	99	1574	335	
9:00:00	164	930	78	1172	28	3208	9:00:00	124	1554	358	
10:00:00	116	662	86	864	15	2365	10:00:00	108	1134	259	
15:00:00	0	0	0	0	0	15:00:00	0	0	0	0	
16:00:00	188	1501	290	1979	67	2921	16:00:00	152	697	93	
17:00:00	172	1492	386	2050	57	3072	17:00:00	166	753	103	
18:00:00	190	1649	337	2176	87	3277	18:00:00	201	796	104	
19:00:00	187	1554	370	2111	73	3058	19:00:00	181	686	80	
Totals:	1191	8877	1724	11792	372	23103		1086	8679	1546	
									11311	447	
Calculated Values for Traffic Crossing Major Street											
Hours Ending:	7:00	8:00	9:00	10:00		16:00	17:00	18:00	19:00		
Crossing Values:	1611	1840	1887	1396		1935	1909	2122	1998		

Ontario Traffic Inc.

Count Date: 25-Sep-18 Site #: 183310001

Ontario Traffic Inc.

Count Date: 25-Sep-18 **Site #:** 183310001

Ontario Traffic Inc.

Count Date: 25-Sep-18 Site #: 1833100001

Ontario Traffic Inc.

Count Date: 25-Sep-18 Site #: 1833100001

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period

From: 6:00:00

To: 10:00:00

One Hour Peak

From: 7:30:00

To: 8:30:00

Municipality: Mississauga

Site #: 1833100002

Intersection: McLaughlin Rd & Novo Star Dr-Arrowsmith Dr

TFR File #: 1

Count date: 25-Sep-18

Weather conditions:

Person(s) who counted:

**** Signalized Intersection ****

Major Road: McLaughlin Rd runs N/S

North Leg Total: 2715

North Entering: 1762

North Peds:

Peds Cross: ☒

Cyclists	0	0	0	0
Trucks	0	23	1	24
Cars	50	1669	19	1738
Totals	50	1692	20	

Cyclists 0

Trucks 23

Cars 930

Totals 953

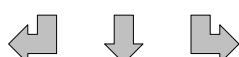
East Leg Total: 155

East Entering: 114

East Peds:

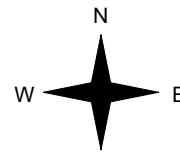
Peds Cross: ☒

Cyclists Trucks Cars Totals
0 4 149 153



McLaughlin Rd

Novo Star Dr



Cyclists Trucks Cars Totals
0 0 59 59
0 0 10 10
0 2 276 278
0 2 345

Cars	Trucks	Cyclists	Totals
51	0	0	51
18	2	0	20
43	0	0	43
112	2	0	

Arrowsmith Dr



Peds Cross: ☒	Cars 1988
West Peds: 9	Trucks 25
West Entering: 347	Cyclists 0
West Leg Total: 500	Totals 2013

McLaughlin Rd

Cars 81	820	11	912
Trucks 2	23	0	25
Cyclists 0	0	0	0
Totals 83	843	11	

Peds Cross: ☒	
South Peds: 2	
South Entering: 937	
South Leg Total: 2950	

Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 19:00:00

One Hour Peak

From: 16:45:00

To: 17:45:00

Municipality: Mississauga

Site #: 1833100002

Intersection: McLaughlin Rd & Novo Star Dr-Arrowsmith Dr

TFR File #: 1

Count date: 25-Sep-18

Weather conditions:

Person(s) who counted:

** Signalized Intersection **

Major Road: McLaughlin Rd runs N/S

North Leg Total: 2342

North Entering: 948

North Peds:

Peds Cross: ☒

Cyclists	0	0	0	0
Trucks	0	9	0	9
Cars	63	806	70	939
Totals	63	815	70	

Cyclists 0

Trucks 9

Cars 1385

Totals 1394

East Leg Total: 156

East Entering: 64

East Peds: 15

Peds Cross: ☒

Cyclists Trucks Cars Totals

0	0	239	239
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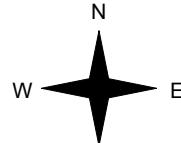


McLaughlin Rd

Novo Star Dr

Cyclists Trucks Cars Totals

0	0	31	31
---	---	----	----



McLaughlin Rd

Cars Trucks Cyclists Totals

47	0	0	47
----	---	---	----

Peds Cross: ☒

Cars 877

West Peds: 11

Trucks 9

West Entering: 111

Cyclists 0

West Leg Total: 350

Totals 886

Cars 169 1307 3 1479

Trucks 0 9 0 9

Cyclists 0 0 0 0

Totals 169 1316 3

Peds Cross: ☐

South Peds: 3

South Entering: 1488

South Leg Total: 2374

Comments

Ontario Traffic Inc.

Total Count Diagram

Municipality: Mississauga

Site #: 1833100002

Intersection: McLaughlin Rd & Novo Star Dr-Arrowsmith Dr

TFR File #: 1

Count date: 25-Sep-18

Weather conditions:

Person(s) who counted:

**** Signalized Intersection ****

Major Road: McLaughlin Rd runs N/S

North Leg Total: 17191

North Entering: 9164

North Peds: 55

Peds Cross: ☒

Cyclists	0	0	0	0
Trucks	8	110	6	124
Cars	308	8473	259	9040
Totals	316	8583	265	

Cyclists 0

Trucks 116

Cars 7911

Totals 8027

East Leg Total: 959

East Entering: 561

East Peds: 50

Peds Cross: ☒

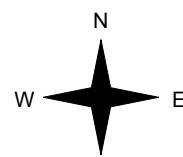
Cyclists Trucks Cars Totals

0 20 1033 1053



McLaughlin Rd

Novo Star Dr



Cars	Trucks	Cyclists	Totals
350	5	0	355
57	4	0	61
145	0	0	145
552	9	0	

Cyclists Trucks Cars Totals

0 7 292 299

0 6 68 74

0 9 855 864

0 22 1215

Peds Cross: ☒

West Peds: 63

West Entering: 1237

West Leg Total: 2290

Cars 9473

Trucks 119

Cyclists 0

Totals 9592



Arrowsmith Dr

Cars	Trucks	Cyclists	Totals
386	12	0	398

Cars 668

Trucks 8

Cyclists 0

Totals 676

Cars 7269

Trucks 104

Cyclists 0

Totals 7373

Cars 59

Trucks 0

Cyclists 0

Totals 59

Peds Cross: ☐

South Peds: 36

South Entering: 8108

South Leg Total: 17700

Comments

Ontario Traffic Inc.

Traffic Count Summary

Intersection: McLaughlin Rd & Novo Star Dr-Ar

Count Date: 25-Sep-18

Municipality: Mississauga

North Approach Totals					North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists					Hour Ending	Includes Cars, Trucks, & Cyclists				
	Left	Thru	Right	Grand Total			Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	6:00:00	0	0	0	0	
7:00:00	7	1146	9	1162	4	1391	7:00:00	8	220	1	229
8:00:00	14	1544	24	1582	7	2231	8:00:00	35	612	2	649
9:00:00	25	1664	52	1741	5	2650	9:00:00	78	815	16	909
10:00:00	27	1107	27	1161	8	1693	10:00:00	21	505	6	532
15:00:00	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	32	767	41	840	12	2178	16:00:00	103	1217	18	1338
17:00:00	46	834	46	926	1	2430	17:00:00	134	1366	4	1504
18:00:00	69	770	64	903	7	2409	18:00:00	175	1330	1	1506
19:00:00	45	751	53	849	11	2290	19:00:00	122	1308	11	1441
Totals:	265	8583	316	9164	55	17272		676	7373	59	8108
											36
East Approach Totals					West Approach Totals						
Hour Ending	Includes Cars, Trucks, & Cyclists				East/West Total Approaches	Hour Ending	Includes Cars, Trucks, & Cyclists				
	Left	Thru	Right	Grand Total			Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	6:00:00	0	0	0	0	0
7:00:00	15	1	35	51	6	145	7:00:00	12	3	79	94
8:00:00	33	5	58	96	4	327	8:00:00	28	6	197	231
9:00:00	34	21	50	105	4	440	9:00:00	73	13	249	335
10:00:00	21	4	42	67	3	205	10:00:00	45	6	87	138
15:00:00	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	7	5	37	49	10	178	16:00:00	42	18	69	129
17:00:00	11	11	36	58	6	168	17:00:00	43	9	58	110
18:00:00	10	10	53	73	13	175	18:00:00	26	14	62	102
19:00:00	14	4	44	62	4	160	19:00:00	30	5	63	98
Totals:	145	61	355	561	50	1798		299	74	864	1237
											63
Calculated Values for Traffic Crossing Major Street											
Hours Ending:	7:00	8:00	9:00	10:00		16:00	17:00	18:00	19:00		
Crossing Values:	35	76	134	81		93	72	64	64		

Ontario Traffic Inc.

Count Date: 25-Sep-18 Site #: 183310002

Ontario Traffic Inc.

Count Date: 25-Sep-18 Site #: 183310002

Ontario Traffic Inc.

Count Date: 25-Sep-18 Site #: 1833100002

Ontario Traffic Inc.

Count Date: 25-Sep-18 Site #: 183310002

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period

From: 6:00:00

To: 10:00:00

One Hour Peak

From: 7:30:00

To: 8:30:00

Municipality: Mississauga

Site #: 1833100003

Intersection: McLaughlin Rd & Rothschild Trail-R

TFR File #: 1

Count date: 25-Sep-18

Weather conditions:

Person(s) who counted:

** Signalized Intersection **

Major Road: McLaughlin Rd runs N/S

North Leg Total: 2941

North Entering: 2001

North Peds:

Peds Cross: ☒

Cyclists	0	0	0	0
Trucks	0	22	2	24
Cars	5	1966	6	1977
Totals	5	1988	8	

Cyclists	0	0	0	0
Trucks	25			
Cars	915			
Totals	940			

East Leg Total: 152

East Entering: 120

East Peds: 6

Peds Cross: ☒

Cyclists Trucks Cars Totals

0	1	18	19
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McLaughlin Rd

Cyclists Trucks Cars Totals

0	0	16	16
---	---	----	----

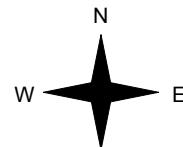
0	0	0	0
---	---	---	---

0	1	40	41
---	---	----	----

0	1	56	56
---	---	----	----



Rothschild Trail



Cars	Trucks	Cyclists	Totals
24	2	0	26
0	0	0	0
94	0	0	94

Ramonet Dr



Cars	Trucks	Cyclists	Totals
29	3	0	32

Peds Cross: ☒

Cars 2100

West Peds: 12

Trucks 23

West Entering: 57

Cyclists 0

West Leg Total: 76

Totals 2123



Comments

Peds Cross: ☐

South Peds: 2

South Entering: 936

South Leg Total: 3059

Cars	13	875	23	911
Trucks	1	23	1	25
Cyclists	0	0	0	0

Totals	14	898	24	
--------	----	-----	----	--

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 19:00:00

One Hour Peak

From: 15:45:00

To: 16:45:00

Municipality: Mississauga

Site #: 1833100003

Intersection: McLaughlin Rd & Rothschild Trail-R

TFR File #: 1

Count date: 25-Sep-18

Weather conditions:

Person(s) who counted:

** Signalized Intersection **

Major Road: McLaughlin Rd runs N/S

North Leg Total: 2405

North Entering: 863

North Peds:

Peds Cross: ☒

Cyclists	0	0	0	0
Trucks	1	13	0	14
Cars	16	814	19	849
Totals	17	827	19	

Cyclists 0

Trucks 14

Cars 1528

Totals 1542

East Leg Total: 130

East Entering: 39

East Peds: 4

Peds Cross: ☒

Cyclists Trucks Cars Totals

0 1 43 44



McLaughlin Rd

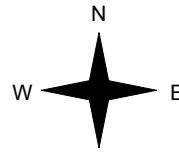
Cyclists Trucks Cars Totals

0 0 9 9

0 0 1 1

0 1 12 13

0 1 22



Cars	Trucks	Cyclists	Totals
9	0	0	9
2	0	0	2
27	1	0	28
38	1	0	

Ramonet Dr



Cars	Trucks	Cyclists	Totals
91	0	0	91

Peds Cross: ☒

Cars 853

West Peds: 8

Trucks 15

West Entering: 23

Cyclists 0

West Leg Total: 67

Totals 868



Cars	25	1510	71	1606
Trucks	0	14	0	14
Cyclists	0	0	0	0
Totals	25	1524	71	

Peds Cross: ☐

South Peds: 2

South Entering: 1620

South Leg Total: 2488

Comments

Ontario Traffic Inc.

Total Count Diagram

Municipality: Mississauga

Site #: 1833100003

Intersection: McLaughlin Rd & Rothschild Trail-R

TFR File #: 1

Count date: 25-Sep-18

Weather conditions:

Person(s) who counted:

**** Signalized Intersection ****

Major Road: McLaughlin Rd runs N/S

North Leg Total: 17669

North Entering: 9539

North Peds:

Peds Cross:

Cyclists	0	0	0	0
Trucks	3	108	4	115
Cars	93	9209	122	9424
Totals	96	9317	126	

Cyclists	0	0	0	0
Trucks	113			
Cars	8017			
Totals	8130			

East Leg Total:	970
East Entering:	462
East Peds:	26
Peds Cross:	0

Cyclists	0	0	0	0
Trucks	4			
Cars	218			
Totals	222			



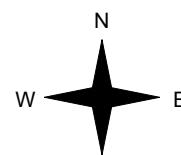
McLaughlin Rd

Cyclists	0	0	0	0
Trucks	1			
Cars	84			
Totals	85			

Cyclists	0	0	0	0
Trucks	0			
Cars	5			
Totals	5			

Cyclists	0	0	0	0
Trucks	2			
Cars	137			
Totals	139			

Cyclists	0	0	0	0
Trucks	3			
Cars	226			
Totals	226			



Cars	114	3	0	117
Trucks	5	0	0	5
Cyclists	336	4	0	340
Totals	455	7	0	

Ramonet Dr



Cars	501	7	0	508
------	-----	---	---	-----

Peds Cross:	0
West Peds:	47
West Entering:	229
West Leg Total:	451

Cars	9682
Trucks	114
Cyclists	0
Totals	9796



Comments

Peds Cross:	0
South Peds:	11
South Entering:	8426
South Leg Total:	18222

Ontario Traffic Inc.

Traffic Count Summary

Intersection: McLaughlin Rd & Rothschild Trail-F Count Date: 25-Sep-18 Municipality: Mississauga

North Approach Totals					North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists					Hour Ending	Includes Cars, Trucks, & Cyclists				
	Left	Thru	Right	Grand Total			Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	6:00:00	0	0	0	0	
7:00:00	2	1220	0	1222	0	7:00:00	1	217	2	220	
8:00:00	10	1725	6	1741	2	8:00:00	6	624	14	644	
9:00:00	10	1950	4	1964	2	9:00:00	21	859	24	904	
10:00:00	6	1183	13	1202	3	10:00:00	10	510	17	537	
15:00:00	0	0	0	0	0	15:00:00	0	0	0	0	
16:00:00	29	796	18	843	5	16:00:00	22	1331	63	1416	
17:00:00	19	865	15	899	4	17:00:00	24	1496	65	1585	
18:00:00	22	799	20	841	4	18:00:00	20	1483	88	1591	
19:00:00	28	779	20	827	0	19:00:00	17	1408	104	1529	
Totals:	126	9317	96	9539	20	17965	121	7928	377	8426	
										11	

East Approach Totals					East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists					Hour Ending	Includes Cars, Trucks, & Cyclists				
	Left	Thru	Right	Grand Total			Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	6:00:00	0	0	0	0	
7:00:00	31	0	12	43	1	58	7:00:00	2	0	13	
8:00:00	76	1	19	96	4	125	8:00:00	9	2	18	
9:00:00	63	0	26	89	2	147	9:00:00	20	0	38	
10:00:00	36	1	14	51	1	82	10:00:00	10	0	21	
15:00:00	0	0	0	0	0	15:00:00	0	0	0	0	
16:00:00	32	0	10	42	9	57	16:00:00	7	0	8	
17:00:00	25	2	9	36	4	59	17:00:00	10	1	12	
18:00:00	34	0	12	46	4	76	18:00:00	16	1	13	
19:00:00	43	1	15	59	1	87	19:00:00	11	1	16	
Totals:	340	5	117	462	26	691	85	5	139	229	
										47	

Calculated Values for Traffic Crossing Major Street

Hours Ending:	7:00	8:00	9:00	10:00	16:00	17:00	18:00	19:00
Crossing Values:	33	90	86	51	45	43	60	55

Ontario Traffic Inc.

Count Date: 25-Sep-18 Site #: 1833100003

Ontario Traffic Inc.

Count Date: 25-Sep-18 Site #: 183310003

Ontario Traffic Inc.

Count Date: 25-Sep-18 Site #: 1833100003

Ontario Traffic Inc.

Count Date: 25-Sep-18 Site #: 1833100003

Signal Timing Report

Runtime: 11/02/2018 14:40:21

Device: 4401

Signal Timing Report

Runtime: 11/02/2018 14:42:41

Device: 4412

Region:	Mississauga	Signal ID:	4412	Location: MCLAUGHLIN ROAD N at Nova Star Drive/Arrowsmith Drive					
Phase	Units	1	2	3	4	5	7	8	
Walk	Sec	0	8	0	10	0	8	0	
Ped Clear	Sec	0	15	0	20	0	15	0	
Min Green	Sec	5	8	0	8	0	8	0	
Passage	Sec	2.0	3.0	0.0	3.0	0.0	3.0	0.0	
Maximum 1	Sec	10	32	0	30	0	32	0	
Maximum 2	Sec	10	32	0	30	0	32	0	
Yellow Change	Sec	3.0	5.0	3.0	4.0	3.0	5.0	3.0	
Red Clearance	Sec	0.0	2.0	0.0	2.5	0.0	2.0	0.0	
Red Revert	Sec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Added Initial	Sec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Max Initial	Sec	0	0	0	0	0	0	0	
Time Before	Sec	0	0	0	0	0	0	0	
Cars Before	Veh	0	0	0	0	0	0	0	
Time To Reduce	Sec	0	0	0	0	0	0	0	
Reduce By	Sec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Min Gap	Sec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Dynamic Max Limit	Sec	0	0	0	0	0	0	0	
Dynamic Max Step	Sec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
[P2] Start Up	Enum	phaseNotOn	redClear	other	phaseNotOn	other	redClear	other	
[P2] Options	Bit	Enabled	Enabled	0	Enabled	0	Enabled	0	
		Non Lock Det	Non-Actuated 1		Non Lock Det	Dual Entry	Non-Actuated 1		
			Max Veh Recall				Max Veh Recall		
			Ped Recall				Ped Recall		
			Dual Entry				Dual Entry		
			Act Rest In Walk				Act Rest In Walk		
[P2] Ring	Ring	1	1	0	1	0	2	0	
[P2] Concurrency	Phase (.)	(6)	(6)	(0)	(8)	(0)	(1.2)	(0)	
Coord Pattern	Units	1	2	3	4	5	7	8	
Cycle Time	Sec	160	0	160	0	0	0	0	
Offset	Sec	109	0	94	0	0	0	0	
Split	Split	1	2	3	4	5	6	7	
Sequence	Sequence	1	1	1	1	1	1	1	
Coord Split	Units	1	2	3	4	5	7	8	
Split 1 - Mode	Enum	none	none	none	none	none	none	none	
Split 1 - Time	Sec	13	101	0	46	0	114	0	
Split 1 - Coord	Enum	false	true	false	false	false	true	false	
Split 2 - Mode	Enum	none	none	none	none	none	none	none	
Split 2 - Time	Sec	0	0	0	0	0	0	0	
Split 2 - Coord	Enum	false	true	false	false	false	true	false	
Split 3 - Mode	Enum	none	none	none	none	none	none	none	
Split 3 - Time	Sec	13	101	0	46	0	114	0	
Split 3 - Coord	Enum	false	true	false	false	false	true	false	
TB Schedule	Units	1	2	3	4	5	7	8	
Month	Bit	JFMAMJJASOND	JFMAMJJASOND	JFMAMJJASOND	J-----	-F-----	--M-----	--M-----	
Day of Week	Bit	-MTWTF-	S-----	-----S	SMTWTFS	SMTWTFS	SMTWTFS	SMTWTFS	
Day of Month	Bit	123456789012345	123456789012345	123456789012345	1-----	-----9-----	-----1-----	-----2-----	
		678901234567890	678901234567890	678901234567890	---	---0-	---	---	
Day Plan	Number	1	3	2	3	3	3	3	
TB Schedule	Units	9	10	11	12	13	15	16	
Month	Bit	-----A---	-----S--	-----O--	-----D	-----D	-----D	0	
Day of Week	Bit	SMTWTFS	SMTWTFS	SMTWTFS	SMTWTFS	SMTWTFS	SMTWTFS	SMTWTFS	
Day of Month	Bit	-----6-----	-----3-----	-----8-----	-----5-----	-----6-----	-----4-----	0	
Day Plan	Number	3	3	3	3	3	0	0	
TB Dayplan	Units	1	2	3	4	5	7	8	
Plan 1 Hour	Hour	0	6	9	15	19	0	0	
Plan 1 Minute	Min	0	0	30	0	30	0	0	
Plan 1 Action	Number	8	1	8	3	8	0	0	
Plan 2 Hour	Hour	0	0	0	0	0	0	0	
Plan 2 Minute	Min	0	0	0	0	0	0	0	
Plan 2 Action	Number	8	0	0	0	0	0	0	
Plan 3 Hour	Hour	0	0	0	0	0	0	0	
Plan 3 Minute	Min	0	0	0	0	0	0	0	
Plan 3 Action	Number	8	0	0	0	0	0	0	
TB Action	Units	1	2	3	4	5	7	8	
Pattern	Enum	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5	Pattern 6	Pattern 7	
Aux. Functions	Bit	0	0	0	0	0	0	0	
Spec. Functions	Bit	0	0	0	0	0	0	0	

Appendix C

Existing Traffic Operational Conditions



Lanes, Volumes, Timings

1: McLaughlin Road & Derry Road West

Existing AM

180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑		↑	↑↑↑		↑	↑↑↑		↑↑↑	↑↑↑	↑
Traffic Volume (vph)	117	1651	377	177	945	97	143	610	190	165	1183	89
Future Volume (vph)	117	1651	377	177	945	97	143	610	190	165	1183	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0		50.0	140.0		105.0	40.0		45.0	80.0		75.0
Storage Lanes	1		1	1		1	2		1	2		1
Taper Length (m)	30.0		30.0		30.0		30.0		30.0			
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor			0.94			0.89	1.00		0.95	0.99		0.95
Frt			0.850		0.850		0.850		0.850		0.850	
Flt Protected	0.950		0.950		0.950		0.950		0.950		0.950	
Satd. Flow (prot)	1770	5085	1599	1787	5136	1553	3467	3282	1599	3467	3471	1615
Flt Permitted	0.129		0.075		0.950		0.950		0.950		0.950	
Satd. Flow (perm)	240	5085	1500	141	5136	1383	3459	3282	1523	3421	3471	1538
Right Turn on Red	Yes											
Satd. Flow (RTOR)		137			117		133		80			
Link Speed (k/h)	70		70		70		70		70		70	
Link Distance (m)	323.0		328.3		299.3		289.2					
Travel Time (s)	16.6		16.9		15.4		14.9					
Conf. Peds. (#/hr)	62	32	32	62	25	25	25	25	25	25	25	25
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	2%	2%	1%	1%	1%	4%	1%	10%	1%	1%	4%	0%
Adj. Flow (vph)	139	1965	449	211	1125	115	170	726	226	196	1408	106
Shared Lane Traffic (%)												
Lane Group Flow (vph)	139	1965	449	211	1125	115	170	726	226	196	1408	106
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Right	Left	Right
Median Width(m)	3.6		3.6		7.2		7.2					
Link Offset(m)	0.0		0.0		0.0		0.0		0.0			
Crosswalk Width(m)	4.8		4.8		4.8		4.8					
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25	15	25	15	25	15	25	15	25
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right									
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex											
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)	0.6		0.6		0.6		0.6		0.6		0.6	
Detector 2 Type	Cl+Ex											
Detector 2 Channel												
Detector 2 Extend (s)	0.0		0.0		0.0		0.0		0.0		0.0	

Lanes, Volumes, Timings

1: McLaughlin Road & Derry Road West

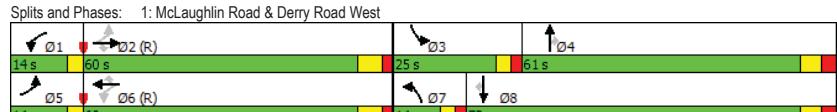
Existing AM

180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		6			4		8
Permitted Phases	2		2	2	1	6	6	7	4	4	3	8
Detector Phase	5	2		1	6		6	7	4	4	3	8
Switch Phase												
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	5.0	12.0	12.0	5.0	12.0	12.0
Minimum Split (s)	14.0	60.0	60.0	14.0	60.0	60.0	14.0	61.0	61.0	15.0	72.0	72.0
Total Split (s)	14.0	60.0	60.0	14.0	60.0	60.0	14.0	61.0	61.0	25.0	72.0	72.0
Total Split (%)	8.8%	37.5%	37.5%	8.8%	37.5%	37.5%	8.8%	38.1%	38.1%	15.6%	45.0%	45.0%
Maximum Green (s)	11.0	53.2	53.2	11.0	53.2	53.2	9.0	53.9	53.9	20.0	64.9	64.9
Yellow Time (s)	3.0	4.6	4.6	3.0	4.6	4.6	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	0.0	2.2	2.2	0.0	2.2	2.2	2.0	3.1	3.1	2.0	3.1	3.1
Lost Time Adjust (s)	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 Lost Time (s)	3.0	6.8	6.8	3.0	6.8	6.8	5.0	7.1	7.1	5.0	7.1	7.1
Lead/Lag	Lead	Lag	Lag									
Lead-Lag Optimize?	Yes											
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
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)	12.0		12.0		12.0		12.0		13.0		13.0	
Flash Dont Walk (s)	18.0		18.0		18.0		18.0		20.0		20.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Act Efect Green (s)	67.8	53.2	53.2	68.2	53.4	53.4	9.0	59.6	59.6	14.3	64.9	64.9
Actuated g/C Ratio	0.42	0.33	0.33	0.43	0.33	0.33	0.06	0.37	0.37	0.09	0.41	0.41
v/c Ratio	0.68	1.16	1.22	0.66	0.21	0.87	0.59	0.35	0.63	1.00	0.16	
Control Delay	44.5	126.9	42.1	174.3	47.7	6.6	106.6	52.1	26.6	79.3	71.1	9.8
Queue Delay	0.0	0.0	1.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0	38.2	0.0
Total Delay	44.5	126.9	43.1	177.2	47.7	6.6	106.6	52.1	26.6	79.3	109.3	9.8
LOS	D	F	D	F	D	A	F	D	C	E	F	A
Approach Delay		107.6			63.3			55.3		99.7		
Approach LOS		F			E			E		F		

Splits and Phases:

1: McLaughlin Road & Derry Road West



Queues
1: McLaughlin Road & Derry Road West

Existing AM
180231

Lane Group	EBL	EBT	EBC	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	139	1965	449	211	1125	115	170	726	226	196	1408	106	
v/c Ratio	0.68	1.16	0.76	1.22	0.66	0.21	0.87	0.59	0.35	0.63	1.00	0.16	
Control Delay	44.5	126.9	42.1	174.3	47.7	6.6	106.6	52.1	26.6	79.3	71.1	9.8	
Queue Delay	0.0	0.0	1.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0	38.2	0.0	
Total Delay	44.5	126.9	43.1	177.2	47.7	6.6	106.6	52.1	26.6	79.3	109.3	9.8	
Queue Length 50th (m)	27.8	-284.4	97.3	-68.8	118.1	0.0	31.0	90.8	27.9	33.2	-247.1	5.2	
Queue Length 95th (m)	40.2	#278.3	126.7	#111.6	123.6	11.6	#47.6	124.7	44.0	42.9	#264.6	15.8	
Internal Link Dist (m)	299.0				304.3			275.3			265.2		
Turn Bay Length (m)	70.0		50.0	140.0		105.0	40.0		45.0	80.0		75.0	
Base Capacity (vph)	207	1690	590	173	1713	539	195	1221	650	433	1407	671	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	32	26	0	0	0	0	0	0	616	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.67	1.16	0.80	1.44	0.66	0.21	0.87	0.59	0.35	0.45	1.78	0.16	

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: McLaughlin Road & Derry Road West

Existing AM
180231

Movement	EBL	EBT	EBC	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑	↑↑↑	↑	↑	↑↑↑	↑	↑↑↑	↑	↑↑↑	↑
Traffic Volume (vph)	117	1651	377	177	945	97	143	610	190	165	1183	89	
Future Volume (vph)	117	1651	377	177	945	97	143	610	190	165	1183	89	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	3.0	6.8	6.8	3.0	6.8	6.8	5.0	7.1	7.1	5.0	7.1	7.1	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	0.95	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.89	1.00	1.00	0.95	1.00	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	1.00
Fr	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	1.00	0.85
Fit Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1768	5085	1500	1787	5136	1383	3467	3282	1523	3467	3471	1538	
Fit Permitted	0.13	1.00	1.00	0.07	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	240	5085	1500	141	5136	1383	3467	3282	1523	3467	3471	1538	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	139	1965	449	211	1125	115	170	726	226	196	1408	106	
RTOR Reduction (vph)	0	0	91	0	0	77	0	0	83	0	0	48	
Lane Group Flow (vph)	139	1965	358	211	1125	38	170	726	143	196	1408	58	
Confl. Peds. (#/hr)	62		32	32		62	25		25	25		25	
Heavy Vehicles (%)	2%	2%	1%	1%	1%	4%	1%	10%	1%	1%	4%	0%	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	
Protected Phases	5	2		1	6		7	4		3	8		
Permitted Phases	2		2	6		6				4		8	
Actuated Green, G (s)	64.0	53.2	53.2	64.4	53.4	53.4	9.0	59.6	59.6	14.3	64.9	64.9	
Effective Green, g (s)	64.0	53.2	53.2	64.4	53.4	53.4	9.0	59.6	59.6	14.3	64.9	64.9	
Actuated g/C Ratio	0.40	0.33	0.33	0.40	0.33	0.33	0.06	0.37	0.37	0.09	0.41	0.41	
Clearance Time (s)	3.0	6.8	6.8	3.0	6.8	6.8	5.0	7.1	7.1	5.0	7.1	7.1	
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)	199	1690	498	169	1714	461	195	1222	567	309	1407	623	
v/s Ratio Prot	0.05	0.39		c0.09	0.22		c0.05	0.22		0.06	c0.41		
v/s Ratio Perm	0.23		0.24	c0.41		0.03			0.09			0.04	
v/c Ratio	0.70	1.16	0.72	1.25	0.66	0.08	0.87	0.59	0.25	0.63	1.00	0.09	
Uniform Delay, d1	34.0	53.4	46.8	45.8	45.5	36.5	74.9	40.5	34.8	70.3	47.5	29.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.22	1.70	1.00	1.00	1.00	
Incremental Delay, d2	10.2	80.2	8.6	151.4	2.0	0.4	28.7	0.7	0.2	4.2	24.2	0.1	
Delay (s)	44.2	133.6	55.4	197.1	47.5	36.9	102.3	50.0	59.3	74.5	71.7	29.4	
Level of Service	D	F	E	F	D	D	F	D	E	E	E	C	
Approach Delay (s)		115.0				68.4			59.8			69.4	
Approach LOS		F			E			E			E		
Intersection Summary													
HCM 2000 Control Delay							84.6					F	
HCM 2000 Volume to Capacity ratio							1.11						
Actuated Cycle Length (s)							160.0					21.9	
Intersection Capacity Utilization							97.7%					F	
Analysis Period (min)							15						
c Critical Lane Group													

Lanes, Volumes, Timings
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Existing AM
180231

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↓	↑	↓	↑	↓	↑	↑↓	↑↓	↑	↑↓	↑↓
Traffic Volume (vph)	59	10	278	43	20	51	83	843	11	20	1692	50
Future Volume (vph)	59	10	278	43	20	51	83	843	11	20	1692	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	15.0	0.0	15.0	0.0	35.0	0.0	55.0	0.0	55.0	0.0	55.0	0.0
Storage Lanes	1	0	1	0	1	0	1	0	1	0	1	0
Taper Length (m)	20.0		20.0		30.0		30.0		30.0		30.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95	0.95
Ped Bike Factor	0.99	0.99			0.98		1.00		1.00	1.00		
Frt		0.855			0.892		0.998		0.996			
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1585	0	1805	1623	0	1770	3497	0	1719	3556	0
Flt Permitted	0.669			0.101			0.041			0.185		
Satd. Flow (perm)	1261	1585	0	192	1623	0	76	3497	0	334	3556	0
Right Turn on Red		Yes			Yes		Yes		Yes		Yes	
Satd. Flow (RTOR)	107			77			2			3		
Link Speed (k/h)	50			50			70			70		
Link Distance (m)	133.1			152.5			363.0			299.3		
Travel Time (s)	9.6			11.0			18.7			15.4		
Confl. Peds. (#/hr)	6	2	2	6	9		6	6		6		9
Peak Hour Factor	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Heavy Vehicles (%)	0%	0%	1%	0%	10%	0%	2%	3%	0%	5%	1%	0%
Adj. Flow (vph)	89	15	421	65	30	77	126	1277	17	30	2564	76
Shared Lane Traffic (%)												
Lane Group Flow (vph)	89	436	0	65	107	0	126	1294	0	30	2640	0
Enter Blocked Intersection	No	No										
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Left	Right	
Median Width(m)	3.6			3.6			7.2			7.2		
Link Offset(m)	0.0			0.0			0.0			0.0		
Crosswalk Width(m)	4.8			4.8			4.8			4.8		
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)	0.6			0.6			0.6			0.6		
Detector 2 Type	Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		

Paradigm Transportation Solutions Limited

Synchro 9 Report
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Lanes, Volumes, Timings
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Existing AM
180231

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	8			4			1	6		2		
Permitted Phases	8		8		4	4	1	6	2	2	2	
Detector Phase												
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	5.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	46.0	46.0	46.0	46.0	46.0	46.0	13.0	114.0	101.0	101.0	101.0	101.0
Total Split (s)	46.0	46.0	46.0	46.0	46.0	46.0	13.0	114.0	101.0	101.0	101.0	101.0
Total Split (%)	28.8%	28.8%	28.8%	28.8%	28.8%	28.8%	8.1%	71.3%	63.1%	63.1%	63.1%	63.1%
Maximum Green (s)	39.5	39.5	39.5	39.5	39.5	39.5	10.0	107.0	94.0	94.0	94.0	94.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.5	2.5	2.5	2.5	2.5	2.5	0.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	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 Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	3.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag							Lead	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
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
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	10.0	10.0	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0	20.0	15.0	15.0	15.0	15.0	15.0	15.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Act Efcct Green (s)	39.5	39.5	39.5	39.5	39.5	39.5	111.0	107.0	94.4	94.4	94.4	94.4
Actuated g/C Ratio	0.25	0.25	0.25	0.25	0.25	0.25	0.69	0.67	0.59	0.59	0.59	0.59
v/c Ratio	0.29	0.93	1.38	0.23	0.82	0.55	0.15	1.26				
Control Delay	51.9	70.4	305.9	17.5	77.4	12.2	11.0	144.6				
Queue Delay	0.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	
Total Delay	51.9	76.9	305.9	17.5	77.4	12.2	11.0	146.0				
LOS	D	E	F	B	E	B	B	F	B	F		
Approach Delay		72.7			126.5			18.0			144.4	
Approach LOS		E			F			B			F	
Intersection Summary												
Area Type:												
Cycle Length:	160											
Actuated Cycle Length:	160											
Offset: 109 (68%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green												
Natural Cycle: 160												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.38												
Intersection Signal Delay: 98.4												
Intersection LOS: F												
ICU Level of Service F												
Analysis Period (min) 15												
Splits and Phases: 2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive												

Paradigm Transportation Solutions Limited

Synchro 9 Report
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Queues
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Existing AM
180231

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	89	436	65	107	126	1294	30	2640
v/c Ratio	0.29	0.93	1.38	0.23	0.82	0.55	0.15	1.26
Control Delay	51.9	70.4	305.9	17.5	77.4	12.2	11.0	144.6
Queue Delay	0.0	6.5	0.0	0.0	0.0	0.0	0.0	1.4
Total Delay	51.9	76.9	305.9	17.5	77.4	12.2	11.0	146.0
Queue Length 50th (m)	24.4	113.6	~28.7	7.8	30.7	79.4	2.5	~586.9
Queue Length 95th (m)	30.1	95.7	#41.8	12.3	36.7	61.7	m3.2	351.2
Internal Link Dist (m)	109.1		128.5		339.0		275.3	
Turn Bay Length (m)	15.0		15.0		35.0		55.0	
Base Capacity (vph)	311	471	47	458	158	2339	197	2098
Starvation Cap Reductn	0	0	0	0	0	0	0	233
Spillback Cap Reductn	0	22	0	0	0	0	0	750
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.97	1.38	0.23	0.80	0.55	0.15	1.96
Intersection Summary								
~ Volume exceeds capacity, queue is theoretically infinite.								
Queue shown is maximum after two cycles.								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								
m Volume for 95th percentile queue is metered by upstream signal.								

HCM Signalized Intersection Capacity Analysis
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Existing AM
180231

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↑	↑	↑	↑	↑	↑↑	↑↑	↑	↑↑	
Traffic Volume (vph)	59	10	278	43	20	51	83	843	11	20	1692	50
Future Volume (vph)	59	10	278	43	20	51	83	843	11	20	1692	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5		3.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.86		1.00	0.89		1.00	1.00		1.00	1.00	
Fit Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1790	1586		1805	1623		1770	3497		1715	3555	
Fit Permitted	0.67	1.00		0.10	1.00		0.04	1.00		0.18	1.00	
Satd. Flow (perm)	1260	1586		192	1623		76	3497		334	3555	
Peak-hour factor, PHF	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Adj. Flow (vph)	89	15	421	65	30	77	126	1277	17	30	2564	76
RTOR Reduction (vph)	0	81	0	0	58	0	0	1	0	0	1	0
Lane Group Flow (vph)	89	355	0	65	49	0	126	1293	0	30	2639	0
Confl. Peds. (#/hr)	6		2	2		6	9		6	6	9	
Heavy Vehicles (%)	0%	0%	1%	0%	10%	0%	2%	3%	0%	5%	1%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		8			4			1	6		2	
Permitted Phases		8			4			6		2		
Actuated Green, G (s)	39.5	39.5		39.5	39.5		107.0	107.0		94.4	94.4	
Effective Green, g (s)	39.5	39.5		39.5	39.5		107.0	107.0		94.4	94.4	
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.67	0.67		0.59	0.59	
Clearance Time (s)	6.5	6.5		6.5	6.5		3.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	311	391		47	400		152	2338		197	2097	
v/s Ratio Prot	0.22			0.03	c0.05	0.37				c0.74		
v/s Ratio Perm	0.07		c0.34		0.50					0.09		
v/c Ratio	0.29	0.91		1.38	0.12		0.83	0.55		0.15	1.26	
Uniform Delay, d1	48.8	58.5		60.2	46.8		52.4	13.9		14.8	32.8	
Progression Factor	1.00	1.00		1.00	1.00		1.37	0.82		0.63	0.78	
Incremental Delay, d2	0.5	24.3		263.0	0.1		24.1	0.7		1.0	118.9	
Delay (s)	49.3	82.8		323.2	46.9		95.7	12.1		10.3	144.3	
Level of Service	D	F		F	D		F	B		B	F	
Approach Delay (s)		77.1			151.3			19.5			142.8	
Approach LOS		E			F			B			F	
Intersection Summary												
HCM 2000 Control Delay					99.3							
HCM 2000 Volume to Capacity ratio					1.26							
Actuated Cycle Length (s)					160.0							
Intersection Capacity Utilization					98.0%							
Analysis Period (min)							15					
c Critical Lane Group												

Lanes, Volumes, Timings
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Existing AM
180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↓	↑	↓	↑	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	16	0	41	94	0	26	14	898	24	8	1988	5
Future Volume (vph)	16	0	41	94	0	26	14	898	24	8	1988	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0	0.0	0.0	0.0	30.0	0.0	35.0	0.0	0.0	0.0	0.0	0.0
Storage Lanes	1	0	0	0	1	0	1	0	1	0	0	0
Taper Length (m)	10.0			7.5			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95	0.95
Ped Bike Factor	1.00	0.98			0.99			1.00			1.00	
Frt		0.850			0.971			0.996				
Flt Protected	0.950				0.962			0.950				
Satd. Flow (prot)	1805	1558	0	0	1738	0	1687	3486	0	1444	3574	0
Flt Permitted	0.717				0.724			0.034			0.110	
Satd. Flow (perm)	1358	1558	0	0	1304	0	60	3486	0	167	3574	0
Right Turn on Red	Yes				Yes			Yes			Yes	
Satd. Flow (RTOR)	27				27			4				
Link Speed (k/h)	50				50			70			70	
Link Distance (m)	120.7				123.6			410.1			363.0	
Travel Time (s)	8.7				8.9			21.1			18.7	
Conf. Peds. (#/hr)	3	2	2		3	12		6	6		12	
Peak Hour Factor	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Heavy Vehicles (%)	0%	0%	2%	0%	0%	8%	7%	3%	4%	25%	1%	0%
Adj. Flow (vph)	29	0	73	168	0	46	25	1604	43	14	3550	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	29	73	0	0	214	0	25	1647	0	14	3559	0
Enter Blocked Intersection	No	No	No	No	No							
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Right	Left	Right
Median Width(m)	3.6				3.6			3.6			3.6	
Link Offset(m)	0.0				0.0			0.0			0.0	
Crosswalk Width(m)	4.8				4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)	0.6			0.6			0.6			0.6		
Detector 2 Type	Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		

Paradigm Transportation Solutions Limited

Synchro 9 Report
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Lanes, Volumes, Timings
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Existing AM
180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA										
Protected Phases		4					8			2		6
Permitted Phases		4					8			2		6
Detector Phase		4					8			2		6
Switch Phase												
Minimum Initial (s)	1.0	1.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	40.0	40.0		40.0	40.0		120.0	120.0		120.0	120.0	
Total Split (s)	40.0	40.0		40.0	40.0		120.0	120.0		120.0	120.0	
Total Split (%)	25.0%	25.0%		25.0%	25.0%		75.0%	75.0%		75.0%	75.0%	
Maximum Green (s)	33.5	33.5		33.5	33.5		113.0	113.0		113.0	113.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	2.5	2.5		2.5	2.5		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.5	6.5		6.5	6.5		7.0	7.0		7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	10.0	10.0		10.0	10.0		8.0	8.0		8.0	8.0	
Flash Dont Walk (s)	14.0	14.0		14.0	14.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Efect Green (s)	27.6	27.6		27.6	27.6		118.9	118.9		118.9	118.9	
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.74	0.74		0.74	0.74	
v/c Ratio	0.12	0.25		0.87			0.57	0.64		0.11	1.34	
Control Delay	54.4	37.0		86.8			64.3	12.1		4.4	171.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.2	
Total Delay	54.4	37.0		86.8			64.3	12.1		4.4	171.1	
LOS	D	D		F			E	B		A	F	
Approach Delay				42.0			86.8			12.8		170.5
Approach LOS				D			F			B		F
Intersection Summary												
Area Type:	Other											
Cycle Length:	160											
Actuated Cycle Length:	160											
Offset: 122 (76%), Referenced to phase 2:NBT and 6:SBTL, Start of Green												
Natural Cycle: 160												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.34												
Intersection Signal Delay: 117.5												
Intersection LOS: F												
ICU Level of Service D												
Analysis Period (min) 15												
Splits and Phases: 3: McLaughlin Road & Rothschild Trail/Ramonet Drive												

Paradigm Transportation Solutions Limited

Synchro 9 Report
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Queues
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Existing AM
180231

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	29	73	214	25	1647	14	3559
v/c Ratio	0.12	0.25	0.87	0.57	0.64	0.11	1.34
Control Delay	54.4	37.0	86.8	64.3	12.1	4.4	171.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Total Delay	54.4	37.0	86.8	64.3	12.1	4.4	171.1
Queue Length 50th (m)	8.2	13.2	61.8	3.5	132.6	0.6	~830.6
Queue Length 95th (m)	11.0	14.1	48.5	8.2	76.7	m0.7	169.1
Internal Link Dist (m)	96.7	99.6		386.1		339.0	
Turn Bay Length (m)	20.0		30.0		35.0		
Base Capacity (vph)	284	347	294	44	2591	124	2655
Starvation Cap Reductn	0	0	0	0	0	0	184
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.21	0.73	0.57	0.64	0.11	1.44
Intersection Summary							
~ Volume exceeds capacity, queue is theoretically infinite.							
Queue shown is maximum after two cycles.							
m Volume for 95th percentile queue is metered by upstream signal.							

HCM Signalized Intersection Capacity Analysis
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Existing AM
180231

Movement	EBL	EBT	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↑	↓	↓	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	16	0	41	94	0	26	14	898	24	8	1988
Future Volume (vph)	16	0	41	94	0	26	14	898	24	8	1988
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	0.95	
Frpb, ped/bikes	1.00	0.98			1.00		1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00	1.00	1.00	
Fr	1.00	0.85			0.97		1.00	1.00	1.00	1.00	
Flt Protected	0.95	1.00			0.96		0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1800	1558			1734		1687	3486	1444	3572	
Flt Permitted	0.72	1.00			0.72		0.03	1.00	0.11	1.00	
Satd. Flow (perm)	1359	1558			1304		60	3486	167	3572	
Peak-hour factor, PHF	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Adj. Flow (vph)	29	0	73	168	0	46	25	1604	43	14	3550
RTOR Reduction (vph)	0	22	0	0	22	0	0	1	0	0	0
Lane Group Flow (vph)	29	51	0	0	192	0	25	1646	0	14	3559
Confli. Peds. (#/hr)	3		2	2		3	12		6	6	12
Heavy Vehicles (%)	0%	0%	2%	0%	0%	8%	7%	3%	4%	25%	1% 0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA
Protected Phases		4			8				2		6
Permitted Phases		4			8			2		6	
Actuated Green, G (s)	27.6	27.6			27.6		118.9	118.9		118.9	118.9
Effective Green, g (s)	27.6	27.6			27.6		118.9	118.9		118.9	118.9
Actuated g/C Ratio	0.17	0.17			0.17		0.74	0.74		0.74	0.74
Clearance Time (s)	6.5	6.5			6.5		7.0	7.0		7.0	7.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	234	268			224		44	2590		124	2654
v/s Ratio Prot		0.03					0.47			c1.00	
v/s Ratio Perm		0.02			c0.15		0.42			0.08	
v/c Ratio	0.12	0.19			0.86		0.57	0.64		0.11	1.34
Uniform Delay, d1	56.0	56.6			64.3		9.1	10.0		5.8	20.5
Progression Factor	1.00	1.00			1.00		1.00	1.00		0.54	0.55
Incremental Delay, d2	0.2	0.3			25.9		43.9	1.2		0.2	153.7
Delay (s)	56.2	57.0			90.1		53.0	11.2		3.3	165.0
Level of Service	E	E			F		D	B		A	F
Approach Delay (s)		56.8			90.1			11.8			164.4
Approach LOS	E			F			B				F
Intersection Summary											
HCM 2000 Control Delay					113.7					F	
HCM 2000 Volume to Capacity ratio					1.25						
Actuated Cycle Length (s)					160.0					13.5	
Intersection Capacity Utilization					80.5%					D	
Analysis Period (min)							15				
c Critical Lane Group											

Lanes, Volumes, Timings

1: McLaughlin Road & Derry Road West

Existing PM

180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑	↑↑↑	↑	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑
Traffic Volume (vph)	201	796	104	190	1649	337	208	1120	73	178	607	201
Future Volume (vph)	201	796	104	190	1649	337	208	1120	73	178	607	201
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0		50.0	140.0		105.0	40.0		45.0	80.0		75.0
Storage Lanes	1		1	1		1	2		1	2		1
Taper Length (m)	30.0		30.0		30.0		30.0		30.0		30.0	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	0.98		0.85	0.97		0.91	0.98		0.95	0.99		0.91
Frt			0.850		0.850		0.850		0.850		0.850	
Flt Protected	0.950		0.950		0.950		0.950		0.950		0.950	
Satd. Flow (prot)	1805	5136	1615	1770	5136	1599	3502	3471	1615	3502	3282	1599
Flt Permitted	0.074		0.217		0.950		0.950		0.950		0.950	
Satd. Flow (perm)	137	5136	1375	392	5136	1454	3424	3471	1529	3476	3282	1459
Right Turn on Red	Yes											
Satd. Flow (RTOR)		87			145			80			154	
Link Speed (k/h)	70		70		70		70		70		70	
Link Distance (m)	323.0		328.3		299.3		289.2					
Travel Time (s)	16.6		16.9		15.4			14.9				
Conf. Peds. (#/hr)	50	87	87		50	53		29	29		53	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	
Heavy Vehicles (%)	0%	1%	0%	2%	1%	1%	0%	4%	0%	0%	10%	1%
Adj. Flow (vph)	226	894	117	213	1853	379	234	1258	82	200	682	226
Shared Lane Traffic (%)												
Lane Group Flow (vph)	226	894	117	213	1853	379	234	1258	82	200	682	226
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Right	Left	Right
Median Width(m)	3.6		3.6		7.2		7.2					
Link Offset(m)	0.0		0.0		0.0		0.0		0.0			
Crosswalk Width(m)	4.8		4.8		4.8		4.8					
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right									
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex											
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)	0.6		0.6		0.6		0.6		0.6		0.6	
Detector 2 Type	Cl+Ex											
Detector 2 Channel												
Detector 2 Extend (s)	0.0		0.0		0.0		0.0		0.0		0.0	

Lanes, Volumes, Timings

1: McLaughlin Road & Derry Road West

Existing PM

180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		6		4		3	8
Permitted Phases	2			2			6		4		3	8
Detector Phase	5	2	2	1	6		7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	5.0	12.0	12.0	5.0	12.0	12.0
Minimum Split (s)	15.0	60.0	60.0	13.0	58.0	58.0	15.0	72.0	72.0	15.0	72.0	72.0
Total Split (s)	15.0	60.0	60.0	13.0	58.0	58.0	15.0	72.0	72.0	15.0	72.0	72.0
Total Split (%)	9.4%	37.5%	37.5%	8.1%	36.3%	36.3%	9.4%	45.0%	45.0%	9.4%	45.0%	45.0%
Maximum Green (s)	12.0	53.2	53.2	10.0	51.2	51.2	10.0	64.9	64.9	10.0	64.9	64.9
Yellow Time (s)	3.0	4.6	4.6	3.0	4.6	4.6	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	0.0	2.2	2.2	0.0	2.2	2.2	0.0	3.1	3.1	2.0	3.1	3.1
Lost Time Adjust (s)	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 Lost Time (s)	3.0	6.8	6.8	3.0	6.8	6.8	5.0	7.1	7.1	5.0	7.1	7.1
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
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
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)	12.0		12.0		12.0		12.0		13.0		13.0	
Flash Dont Walk (s)	18.0		18.0		18.0		18.0		20.0		20.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Act Efect Green (s)	70.5	54.1	54.1	67.9	52.8	52.8	10.0	62.7	62.7	10.0	62.7	62.7
Actuated g/C Ratio	0.44	0.34	0.34	0.42	0.33	0.33	0.06	0.39	0.39	0.06	0.39	0.39
v/c Ratio	1.18	0.51	0.22	0.81	1.09	0.66	1.07	0.93	0.13	0.92	0.53	0.34
Control Delay	159.3	43.9	13.0	55.9	100.9	34.1	150.6	51.6	4.9	115.8	38.9	11.9
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	159.3	43.9	13.0	55.9	100.9	34.1	150.6	51.6	4.9	115.8	38.9	11.9
LOS	F	D	B	E	F	C	F	D	A	F	D	B
Approach Delay		62.1			86.6			63.8		47.2		
Approach LOS		E			F			E		D		
Intersection Summary												
Area Type:	Other											
Cycle Length:	160											
Actuated Cycle Length:	160											
Offset: 18 (11%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green												
Natural Cycle: 160												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.18												
Intersection Signal Delay: 69.3												
Intersection LOS: E												
ICU Level of Service F												
Analysis Period (min) 15												
Splits and Phases: 1: McLaughlin Road & Derry Road West												
	Ø1	Ø2 (R)	Ø3	Ø4	Ø5	Ø6 (R)	Ø7	Ø8	Ø9	Ø10	Ø11	Ø12
13 s	60 s	15 s	72 s									
15 s	58 s	15 s	72 s									

Queues

1: McLaughlin Road & Derry Road West

Existing PM

180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	226	894	117	213	1853	379	234	1258	82	200	682	226
v/c Ratio	1.18	0.51	0.22	0.81	1.09	0.66	1.07	0.93	0.13	0.92	0.53	0.34
Control Delay	159.3	43.9	13.0	55.9	100.9	34.1	150.6	51.6	4.9	115.8	38.9	11.9
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	159.3	43.9	13.0	55.9	100.9	34.1	150.6	51.6	4.9	115.8	38.9	11.9
Queue Length 50th (m)	~75.9	88.9	6.9	45.2	~261.9	69.7	~44.3	208.1	0.3	34.9	89.6	15.0
Queue Length 95th (m)	#131.4	102.3	22.4	#83.1	#286.1	108.2	#75.1	226.9	m7.4	#59.5	108.2	35.2
Internal Link Dist (m)	299.0			304.3			275.3			265.2		
Turn Bay Length (m)	70.0		50.0	140.0		105.0	40.0		45.0	80.0		75.0
Base Capacity (vph)	191	1737	523	263	1696	576	218	1407	667	218	1331	683
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	1.18	0.51	0.22	0.81	1.09	0.66	1.07	0.89	0.12	0.92	0.51	0.33
Intersection Summary												
~ Volume exceeds capacity, queue is theoretically infinite.												
Queue shown is maximum after two cycles.												
# 95th percentile volume exceeds capacity, queue may be longer.												
Queue shown is maximum after two cycles.												
m Volume for 95th percentile queue is metered by upstream signal.												

HCM Signalized Intersection Capacity Analysis

1: McLaughlin Road & Derry Road West

Existing PM

180231

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑	↑↑↑	↑	↑↑	↑↑	↑	↑↑	↑↑	↑↑
Traffic Volume (vph)	201	796	104	190	1649	337	208	1120	73	178	607	201
Future Volume (vph)	201	796	104	190	1649	337	208	1120	73	178	607	201
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.8	6.8	3.0	6.8	6.8	5.0	7.1	7.1	5.0	7.1	7.1
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr	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)	1805	5136	1375	1760	5136	1454	3502	3471	1529	3502	3282	1459
Flt Permitted	0.07	1.00	1.00	0.22	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	140	5136	1375	401	5136	1454	3502	3471	1529	3502	3282	1459
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	226	894	117	213	1853	379	234	1258	82	200	682	226
RTOR Reduction (vph)	0	0	58	0	0	97	0	0	49	0	0	94
Lane Group Flow (vph)	226	894	59	213	1853	282	234	1258	33	200	682	132
Confl. Peds. (#/hr)	50		87	87		50	53		29	29		53
Heavy Vehicles (%)	0%	1%	0%	2%	1%	1%	0%	4%	0%	0%	10%	1%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6		6			4			8
Actuated Green, G (s)	66.7	54.1	54.1	64.1	52.8	52.8	10.0	62.7	10.0	62.7	10.0	62.7
Effective Green, g (s)	66.7	54.1	54.1	64.1	52.8	52.8	10.0	62.7	62.7	10.0	62.7	62.7
Actuated g/C Ratio	0.42	0.34	0.34	0.40	0.33	0.33	0.06	0.39	0.39	0.06	0.39	0.39
Clearance Time (s)	3.0	6.8	6.8	3.0	6.8	6.8	5.0	7.1	7.1	5.0	7.1	7.1
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)	189	1736	464	256	1694	479	218	1360	599	218	1286	571
v/s Ratio Prot	c0.09	0.17		0.06	0.36		c0.07	c0.36		0.06	0.21	
v/s Ratio Perm	c0.40		0.04	0.27		0.19			0.02			0.09
v/c Ratio	1.20	0.51	0.13	0.83	1.09	0.59	1.07	0.93	0.06	0.92	0.53	0.23
Uniform Delay, d1	48.1	42.4	36.6	36.3	53.6	44.6	75.0	46.4	30.2	74.6	37.3	32.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.13	0.89	0.76	1.00	1.00	1.00
Incremental Delay, d2	128.1	1.1	0.6	20.0	52.2	5.2	75.8	9.1	0.0	38.5	0.4	0.2
Delay (s)	176.2	43.5	37.2	56.3	105.8	49.8	160.2	50.4	23.1	113.1	37.8	32.8
Level of Service	F	D	D	E	F	D	F	D	C	F	D	C
Approach Delay (s)		67.2			92.8			65.3			50.3	
Approach LOS		E			F			E			D	
Intersection Summary												
HCM 2000 Control Delay					73.6							E
HCM 2000 Volume to Capacity ratio					1.07							
Actuated Cycle Length (s)					160.0							
Intersection Capacity Utilization					98.1%							F
Analysis Period (min)								15				
c Critical Lane Group												

Lanes, Volumes, Timings
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Existing PM
180231

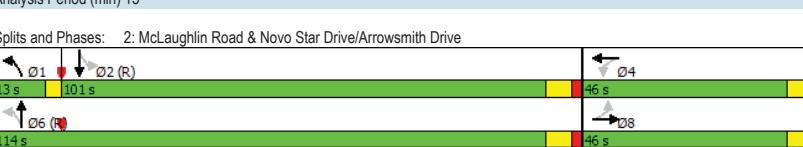
Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↓	↑	↑	↓	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	31	19	61	10	7	47	169	1316	3	70	815	63
Future Volume (vph)	31	19	61	10	7	47	169	1316	3	70	815	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	15.0	0.0	15.0	0.0	35.0	0.0	55.0	0.0	0.0	0.0	0.0	0.0
Storage Lanes	1	0	1	0	1	0	1	0	1	0	1	0
Taper Length (m)	20.0		20.0		30.0		30.0					
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95	
Ped Bike Factor	0.99	0.99		1.00	0.98		1.00			1.00		
Frt		0.886		0.870						0.989		
Flt Protected	0.950		0.950		0.950		0.950					
Satd. Flow (prot)	1805	1662	0	1805	1620	0	1787	3574	0	1805	3523	0
Flt Permitted	0.704		0.472		0.193		0.112					
Satd. Flow (perm)	1324	1662	0	893	1620	0	363	3574	0	213	3523	0
Right Turn on Red	Yes		Yes		Yes		Yes			Yes		
Satd. Flow (RTOR)	86		24							9		
Link Speed (k/h)	50		50		70		70					
Link Distance (m)	133.1		152.5		363.0		299.3					
Travel Time (s)	9.6		11.0		18.7		15.4					
Conf. Ped. (#/hr)	7	3	3	7	11	15	15	15	15	11		
Peak Hour Factor	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71		
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	1%	0%	0%	1%	0%	
Adj. Flow (vph)	44	27	86	14	10	66	238	1854	4	99	1148	89
Shared Lane Traffic (%)												
Lane Group Flow (vph)	44	113	0	14	76	0	238	1858	0	99	1237	0
Enter Blocked Intersection	No	No										
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Left	Right	
Median Width(m)	3.6		3.6		7.2		7.2					
Link Offset(m)	0.0		0.0		0.0		0.0					
Crosswalk Width(m)	4.8		4.8		4.8		4.8					
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)	25		15	25	15	25	15	25	15	25	15	
Number of Detectors	1	2	1	2	1	2	1	2	1	2		
Detector Template	Left	Thru										
Leading Detector (m)	2.0	10.0	2.0	10.0	2.0	10.0	2.0	10.0	2.0	10.0		
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Detector 1 Size(m)	2.0	0.6	2.0	0.6	2.0	0.6	2.0	0.6	2.0	0.6		
Detector 1 Type	Cl+Ex											
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(m)		9.4		9.4		9.4		9.4		9.4		
Detector 2 Size(m)	0.6		0.6		0.6		0.6		0.6			
Detector 2 Type	Cl+Ex											
Detector 2 Channel												
Detector 2 Extend (s)	0.0		0.0		0.0		0.0		0.0			

Paradigm Transportation Solutions Limited

Synchro 9 Report
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Lanes, Volumes, Timings
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Existing PM
180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		8			4			1	6		2	
Permitted Phases		8		8	4	4		1	6	2	2	
Detector Phase												
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	5.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	46.0	46.0	46.0	46.0	46.0	46.0	13.0	114.0	101.0	101.0	101.0	101.0
Total Split (s)	46.0	46.0	46.0	46.0	46.0	46.0	13.0	114.0	101.0	101.0	101.0	101.0
Total Split (%)	28.8%	28.8%	28.8%	28.8%	28.8%	28.8%	8.1%	71.3%	63.1%	63.1%	63.1%	63.1%
Maximum Green (s)	39.5	39.5	39.5	39.5	39.5	39.5	10.0	107.0	94.0	94.0	94.0	94.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.5	2.5	2.5	2.5	2.5	2.5	0.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	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 Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	3.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag							Lead		Lag		Lag	
Lead-Lag Optimize?							Yes		Yes		Yes	
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
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	10.0	10.0	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0	20.0	15.0	15.0	15.0	15.0	15.0	15.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Act Efect Green (s)	11.2	11.2	11.2	11.2	11.2	11.2	139.3	135.3	120.8	120.8	120.8	120.8
Actuated g/C Ratio	0.07	0.07	0.07	0.07	0.07	0.07	0.87	0.85	0.76	0.76	0.76	0.76
v/c Ratio	0.48	0.58	0.23	0.56	0.57	0.61	0.62	0.61	0.62	0.62	0.62	0.62
Control Delay	87.5	33.1	77.3	64.5	7.7	2.5	25.9	4.7				
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	87.5	33.1	77.3	64.5	7.7	2.6	25.9	4.7				
LOS	F	C	E	E	A	A	C	A	A	A	A	
Approach Delay		48.4			66.5		3.2		6.3			
Approach LOS		D			E		A		A			
Intersection Summary												
Area Type:	Other											
Cycle Length:	160											
Actuated Cycle Length:	160											
Offset: 94 (59%)	Referenced to phase 2:SBTL and 6:NBTL, Start of Green											
Natural Cycle:	160											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	0.62											
Intersection Signal Delay: 7.8												
Intersection LOS: A												
ICU Level of Service C												
Analysis Period (min) 15												
Splits and Phases:	2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive											
												

Paradigm Transportation Solutions Limited

Synchro 9 Report
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Queues
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Existing PM
180231

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	44	113	14	76	238	1858	99	1237
v/c Ratio	0.48	0.58	0.23	0.56	0.57	0.61	0.62	0.46
Control Delay	87.5	33.1	77.3	64.5	7.7	2.5	25.9	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay	87.5	33.1	77.3	64.5	7.7	2.6	25.9	4.7
Queue Length 50th (m)	14.5	8.8	4.5	17.1	4.7	28.0	6.0	35.9
Queue Length 95th (m)	22.0	16.8	9.9	25.2	5.0	23.5	m11.5	44.2
Internal Link Dist (m)	109.1		128.5		339.0		275.3	
Turn Bay Length (m)	15.0		15.0		35.0		55.0	
Base Capacity (vph)	326	475	220	418	423	3022	160	2662
Starvation Cap Reductn	0	0	0	0	0	273	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.24	0.06	0.18	0.56	0.68	0.62	0.46

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Existing PM
180231

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↑	↑	↑	↑	↑	↑↑	↑	↑	↑↑	↑↑
Traffic Volume (vph)	31	19	61	10	7	47	169	1316	3	70	815	63
Future Volume (vph)	31	19	61	10	7	47	169	1316	3	70	815	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5		3.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frbp, ped/bikes	1.00	0.99		1.00	0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Fr1	1.00	0.89		1.00	0.87		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1662		1798	1620		1786	3573		1799	3524	
Flt Permitted	0.70	1.00		0.47	1.00		0.19	1.00		0.11	1.00	
Satd. Flow (perm)	1324	1662		894	1620		363	3573		213	3524	
Peak-hour factor, PHF	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Adj. Flow (vph)	44	27	86	14	10	66	238	1854	4	99	1148	89
RTOR Reduction (vph)	0	80	0	0	22	0	0	0	0	0	2	0
Lane Group Flow (vph)	44	33	0	14	54	0	238	1858	0	99	1235	0
Confl. Peds. (#/hr)	7		3	3		7	11		15	15	11	
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%	1%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases	8			4			6			1	6	2
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	11.2	11.2		11.2	11.2		135.3	135.3		120.8	120.8	
Effective Green, g (s)	11.2	11.2		11.2	11.2		135.3	135.3		120.8	120.8	
Actuated g/C Ratio	0.07	0.07		0.07	0.07		0.85	0.85		0.75	0.75	
Clearance Time (s)	6.5	6.5		6.5	6.5		3.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	92	116		62	113		409	3021		160	2660	
v/s Ratio Prot	0.02			0.03			0.04	c0.52			0.35	
v/s Ratio Perm	c0.03			0.02			0.45			0.47		
v/c Ratio	0.48	0.28		0.23	0.48		0.58	0.62		0.62	0.46	
Uniform Delay, d1	71.6	70.6		70.3	71.6		4.6	4.0		9.0	7.4	
Progression Factor	1.00	1.00		1.00	1.00		2.52	0.46		0.66	0.52	
Incremental Delay, d2	3.9	1.4		1.9	3.1		1.3	0.6		15.6	0.5	
Delay (s)	75.5	72.0		72.2	74.7		12.7	2.4		21.5	4.4	
Level of Service	E	E		E	E		B	A		C	A	
Approach Delay (s)		72.9			74.3			3.5			5.7	
Approach LOS		E			E			A			A	
Intersection Summary												
HCM 2000 Control Delay					9.0							
HCM 2000 Volume to Capacity ratio					0.62							
Actuated Cycle Length (s)					160.0							
Sum of lost time (s)							16.5					
Intersection Capacity Utilization					71.1%							
ICU Level of Service							C					
Analysis Period (min)							15					
c = Critical Lane Group												

Lanes, Volumes, Timings
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Existing PM
180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↓	↑	↓	↑	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	9	1	13	28	2	9	25	1524	71	19	827	17
Future Volume (vph)	9	1	13	28	2	9	25	1524	71	19	827	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0	0.0	0.0		0.0	30.0		0.0	35.0		0.0	
Storage Lanes	1	0	0		0	1		0	1		0	
Taper Length (m)	10.0			7.5			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95	
Ped Bike Factor	0.99	0.99			0.99			1.00			1.00	
Frt		0.864			0.968			0.993			0.997	
Flt Protected	0.950				0.965			0.950			0.950	
Satd. Flow (prot)	1805	1508	0	0	1717	0	1805	3545	0	1805	3522	0
Flt Permitted	0.752				0.774			0.201			0.040	
Satd. Flow (perm)	1419	1508	0	0	1374	0	382	3545	0	76	3522	0
Right Turn on Red		Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)	20				9			7			3	
Link Speed (k/h)	50				50			70			70	
Link Distance (m)	120.7				123.6			410.1			363.0	
Travel Time (s)	8.7				8.9			21.1			18.7	
Conf. Peds. (#/hr)	4	2	2		4	8		4	4		8	
Peak Hour Factor	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	
Heavy Vehicles (%)	0%	0%	8%	4%	0%	0%	0%	1%	0%	0%	2%	6%
Adj. Flow (vph)	14	2	20	43	3	14	38	2345	109	29	1272	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	14	22	0	0	60	0	38	2454	0	29	1298	0
Enter Blocked Intersection	No	No	No	No	No							
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Left	Right	
Median Width(m)	3.6				3.6			3.6			3.6	
Link Offset(m)	0.0				0.0			0.0			0.0	
Crosswalk Width(m)	4.8				4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)	0.6			0.6			0.6			0.6		
Detector 2 Type	Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		

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Synchro 9 Report
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Lanes, Volumes, Timings
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Existing PM
180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4				8			2		6	
Permitted Phases		4		4		8	8		2	2	6	6
Detector Phase												
Switch Phase												
Minimum Initial (s)	1.0	1.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	40.0	40.0		40.0	40.0		120.0	120.0		120.0	120.0	
Total Split (s)	40.0	40.0		40.0	40.0		120.0	120.0		120.0	120.0	
Total Split (%)	25.0%	25.0%		25.0%	25.0%		75.0%	75.0%		75.0%	75.0%	
Maximum Green (s)	33.5	33.5		33.5	33.5		113.0	113.0		113.0	113.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	2.5	2.5		2.5	2.5		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.5	6.5				6.5	7.0	7.0		7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	10.0	10.0		10.0	10.0		8.0	8.0		8.0	8.0	
Flash Dont Walk (s)	14.0	14.0		14.0	14.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Efect Green (s)	11.2	11.2			11.2		139.1	139.1		139.1	139.1	
Actuated g/C Ratio	0.07	0.07			0.07		0.87	0.87		0.87	0.87	
v/c Ratio	0.14	0.18			0.58		0.11	0.80		0.44	0.42	
Control Delay	70.7	29.9			81.1		3.4	8.9		30.1	2.5	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	70.7	29.9			81.1		3.4	8.9		30.1	2.5	
LOS	E	C				F	A	A		C	A	
Approach Delay		45.7				81.1				8.8	3.1	
Approach LOS		D				F				A		
Intersection Summary												
Area Type:	Other											
Cycle Length:	160											
Actuated Cycle Length:	160											
Offset: 69 (43%), Referenced to phase 2:NBT and 6:SBTL, Start of Green												
Natural Cycle: 160												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 0.80												
Intersection Signal Delay: 8.3												
Intersection LOS: A												
Intersection Capacity Utilization 66.0%												
Analysis Period (min) 15												
Splits and Phases: 3: McLaughlin Road & Rothschild Trail/Ramonet Drive												

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Synchro 9 Report
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Queues
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Existing PM
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Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	14	22	60	38	2454	29	1298
v/c Ratio	0.14	0.18	0.58	0.11	0.80	0.44	0.42
Control Delay	70.7	29.9	81.1	3.4	8.9	30.1	2.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	70.7	29.9	81.1	3.4	8.9	30.1	2.5
Queue Length 50th (m)	4.5	0.6	16.8	1.8	173.8	1.6	36.6
Queue Length 95th (m)	8.7	5.6	22.2	3.5	108.5	3.0	26.3
Internal Link Dist (m)	96.7	99.6		386.1		339.0	
Turn Bay Length (m)	20.0		30.0		35.0		
Base Capacity (vph)	297	331	294	332	3083	66	3063
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.07	0.20	0.11	0.80	0.44	0.42

Intersection Summary

HCM Signalized Intersection Capacity Analysis
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Existing PM
180231

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↓		↔	↑	↓	↑	↓	↑	↑	↓	↑
Traffic Volume (vph)	9	1	13	28	2	9	25	1524	71	19	827	17
Future Volume (vph)	9	1	13	28	2	9	25	1524	71	19	827	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	0.95	1.00	0.95
Frpb, ped/bikes	1.00	0.99			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	0.99	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Fr	1.00	0.86			0.97		1.00	0.99	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00			0.97		0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1793	1508			1714		1797	3546	1805	3522		
Flt Permitted	0.75	1.00			0.77		0.20	1.00	0.04	1.00		
Satd. Flow (perm)	1419	1508			1374		380	3546	75	3522		
Peak-hour factor, PHF	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Adj. Flow (vph)	14	2	20	43	3	14	38	2345	109	29	1272	26
RTOR Reduction (vph)	0	19	0	0	8	0	0	1	0	0	0	0
Lane Group Flow (vph)	14	3	0	0	52	0	38	2453	0	29	1298	0
Confli. Peds. (#/hr)	4		2	2		4	8		4	4	4	8
Heavy Vehicles (%)	0%	0%	8%	4%	0%	0%	0%	1%	0%	0%	2%	6%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8				2		6	
Permitted Phases		4			8			2		6		
Actuated Green, G (s)	10.1	10.1			10.1		136.4	136.4		136.4	136.4	
Effective Green, g (s)	10.1	10.1			10.1		136.4	136.4		136.4	136.4	
Actuated g/C Ratio	0.06	0.06			0.06		0.85	0.85		0.85	0.85	
Clearance Time (s)	6.5	6.5			6.5		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	89	95			86		323	3022		63	3002	
v/s Ratio Prot	0.00						c0.69			0.37		
v/s Ratio Perm	0.01				c0.04		0.10			0.39		
v/c Ratio	0.16	0.03			0.60		0.12	0.81		0.46	0.43	
Uniform Delay, d1	70.9	70.4			73.0		1.9	5.7		2.9	2.8	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.36	0.69	
Incremental Delay, d2	0.8	0.1			10.8		0.7	2.5		20.8	0.4	
Delay (s)	71.8	70.5			83.7		2.7	8.1		24.7	2.3	
Level of Service	E	E			F		A	A		C	A	
Approach Delay (s)			71.0			83.7			8.1		2.8	
Approach LOS			E		F		A			A		
Intersection Summary												
HCM 2000 Control Delay							8.0					
HCM 2000 Volume to Capacity ratio							0.80					
Actuated Cycle Length (s)							160.0					
Intersection Capacity Utilization							66.0%					
Analysis Period (min)							15					
c Critical Lane Group												

Appendix D

Background Traffic Operational Conditions



Lanes, Volumes, Timings

1: McLaughlin Road & Derry Road West

Background AM

180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑	↑↑↑	↑	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑
Traffic Volume (vph)	120	1704	387	222	978	113	147	625	244	180	1213	91
Future Volume (vph)	120	1704	387	222	978	113	147	625	244	180	1213	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0		50.0	140.0		105.0	40.0		45.0	80.0		75.0
Storage Lanes	1		1	1		1	2		1	2		1
Taper Length (m)	30.0		30.0		30.0		30.0		30.0		30.0	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	0.99		0.94		0.89	1.00		0.95	0.99		0.95	
Frt			0.850		0.850		0.850		0.850		0.850	
Flt Protected	0.950		0.950		0.950		0.950		0.950		0.950	
Satd. Flow (prot)	1770	5085	1599	1787	5136	1553	3467	3282	1599	3467	3471	1615
Flt Permitted	0.118		0.075		0.950		0.950		0.950		0.950	
Satd. Flow (perm)	217	5085	1500	141	5136	1383	3450	3282	1523	3422	3471	1538
Right Turn on Red	Yes											
Satd. Flow (RTOR)	126		135		135		165		165		80	
Link Speed (k/h)	70		70		70		70		70		70	
Link Distance (m)	323.0		328.3		299.3		289.2					
Travel Time (s)	16.6		16.9		15.4		14.9					
Confli. Peds. (#/hr)	62	32	32	62	25	25	25	25	25	25	25	25
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	2%	2%	1%	1%	1%	4%	1%	10%	1%	1%	4%	0%
Adj. Flow (vph)	143	2029	461	264	1164	135	175	744	290	214	1444	108
Shared Lane Traffic (%)												
Lane Group Flow (vph)	143	2029	461	264	1164	135	175	744	290	214	1444	108
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Right	Left	Right
Median Width(m)	3.6		3.6		7.2		7.2					
Link Offset(m)	0.0		0.0		0.0		0.0		0.0		0.0	
Crosswalk Width(m)	4.8		4.8		4.8		4.8					
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25	15	25	15	25	15	25	15	25
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right									
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex											
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)	0.6		0.6		0.6		0.6		0.6		0.6	
Detector 2 Type	Cl+Ex											
Detector 2 Channel												
Detector 2 Extend (s)	0.0		0.0		0.0		0.0		0.0		0.0	

Lanes, Volumes, Timings

1: McLaughlin Road & Derry Road West

Background AM

180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR												
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm												
Protected Phases	5	2		1	6		6		4		3	8												
Permitted Phases	2			2			6		4		3	8												
Detector Phase	5	2	2	1	6		6	7	4	4	3	8												
Switch Phase																								
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	5.0	12.0	12.0	5.0	12.0	12.0												
Minimum Split (s)	14.0	60.0	60.0	14.0	60.0	60.0	14.0	61.0	61.0	15.0	72.0	72.0												
Total Split (s)	14.0	60.0	60.0	14.0	60.0	60.0	14.0	71.0	71.0	15.0	72.0	72.0												
Total Split (%)	8.8%	37.5%	37.5%	8.8%	37.5%	37.5%	8.8%	44.4%	44.4%	9.4%	45.0%	45.0%												
Maximum Green (s)	11.0	53.2	53.2	11.0	53.2	53.2	9.0	63.9	63.9	10.0	64.9	64.9												
Yellow Time (s)	3.0	4.6	4.6	3.0	4.6	4.6	3.0	4.0	4.0	3.0	4.0	4.0												
All-Red Time (s)	0.0	2.2	2.2	0.0	2.2	2.2	2.0	3.1	3.1	2.0	3.1	3.1												
Lost Time Adjust (s)	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 Lost Time (s)	3.0	6.8	6.8	3.0	6.8	6.8	5.0	7.1	7.1	5.0	7.1	7.1												
Lead/Lag	Lead	Lag	Lag																					
Lead-Lag Optimize?	Yes																							
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												
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None												
Walk Time (s)	12.0		12.0		12.0		12.0		13.0		13.0													
Flash Dont Walk (s)	18.0		18.0		18.0		18.0		20.0		20.0													
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0												
Act Efect Green (s)	67.7	53.2	53.2	68.3	53.5	53.5	9.0	63.9	63.9	10.0	64.9	64.9												
Actuated g/C Ratio	0.42	0.33	0.33	0.43	0.33	0.33	0.06	0.40	0.40	0.06	0.41	0.41												
v/c Ratio	0.73	1.20	0.79	1.53	0.68	0.25	0.90	0.57	0.41	0.99	1.03	0.16												
Control Delay	49.8	141.6	45.8	293.1	48.3	6.6	108.8	47.7	25.7	131.8	77.1	10.1												
Queue Delay	0.0	0.0	1.3	2.9	0.0	0.0	0.0	0.0	0.0	0.0	31.5	0.0												
Total Delay	49.8	141.6	47.1	296.0	48.3	6.6	108.8	47.7	25.7	131.8	108.5	10.1												
LOS	D	F	D	F	D	A	F	D	C	F	F	B												
Approach Delay	120.1				86.5			51.3			105.3													
Approach LOS	F				F			D			F													
Intersection Summary																								
Area Type:	Other																							
Cycle Length:	160																							
Actuated Cycle Length:	160																							
Offset: 14 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green																								
Natural Cycle: 160																								
Control Type: Actuated-Coordinated																								
Maximum v/c Ratio: 1.53																								
Intersection Signal Delay: 97.5																								
Intersection LOS: F																								
Intersection Capacity Utilization 102.0%																								
Analysis Period (min) 15																								
Splits and Phases: 1: McLaughlin Road & Derry Road West																								

Queues
1: McLaughlin Road & Derry Road West

Background AM
180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	143	2029	461	264	1164	135	175	744	290	214	1444	108
v/c Ratio	0.73	1.20	0.79	1.53	0.68	0.25	0.90	0.57	0.41	0.99	1.03	0.16
Control Delay	49.8	141.6	45.8	293.1	48.3	6.6	108.8	47.7	25.7	131.8	77.1	10.1
Queue Delay	0.0	0.0	1.3	2.9	0.0	0.0	0.0	0.0	0.0	31.5	0.0	
Total Delay	49.8	141.6	47.1	296.0	48.3	6.6	108.8	47.7	25.7	131.8	108.5	10.1
Queue Length 50th (m)	28.7	-300.6	106.0	-106.0	123.5	0.0	31.8	94.4	38.1	37.6	-270.1	5.7
Queue Length 95th (m)	41.2	#293.0	136.4	#151.0	128.6	12.9	#49.6	101.7	52.6	#59.9	#276.7	16.5
Internal Link Dist (m)		299.0			304.3			275.3			265.2	
Turn Bay Length (m)	70.0		50.0	140.0		105.0	40.0		45.0	80.0		75.0
Base Capacity (vph)	198	1690	582	173	1717	551	195	1310	707	216	1407	671
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	31	26	0	0	0	0	0	0	668	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.72	1.20	0.84	1.80	0.68	0.25	0.90	0.57	0.41	0.99	1.95	0.16

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: McLaughlin Road & Derry Road West

Background AM
180231

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑	↑↑↑	↑	↑↑	↑↑	↑	↑↑	↑↑	↑↑
Traffic Volume (vph)	120	1704	387	222	978	113	147	625	244	180	1213	91
Future Volume (vph)	120	1704	387	222	978	113	147	625	244	180	1213	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.8	6.8	3.0	6.8	6.8	5.0	7.1	7.1	5.0	7.1	7.1
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	0.95	0.95	0.97	0.95	1.00
Frbp, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.89	1.00	1.00	0.95	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
Fr	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Fit 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)	1768	5085	1500	1787	5136	1383	3467	3282	1523	3467	3471	1538
Fit Permitted	0.12	1.00	1.00	0.07	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	220	5085	1500	141	5136	1383	3467	3282	1523	3467	3471	1538
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	143	2029	461	264	1164	135	175	744	290	214	1444	108
RTOR Reduction (vph)	0	0	84	0	0	90	0	0	99	0	0	48
Lane Group Flow (vph)	143	2029	377	264	1164	45	175	744	191	214	1444	60
Confli. Peds. (#/hr)	62		32	32		62	25		25	25		25
Heavy Vehicles (%)	2%	2%	1%	1%	1%	4%	1%	10%	1%	1%	4%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6		6				4		8
Actuated Green, G (s)	63.9	53.2	53.2	64.5	53.5	53.5	9.0	63.9	63.9	10.0	64.9	64.9
Effective Green, g (s)	63.9	53.2	53.2	64.5	53.5	53.5	9.0	63.9	63.9	10.0	64.9	64.9
Actuated g/C Ratio	0.40	0.33	0.33	0.40	0.33	0.33	0.06	0.40	0.40	0.06	0.41	0.41
Clearance Time (s)	3.0	6.8	6.8	3.0	6.8	6.8	5.0	7.1	7.1	5.0	7.1	7.1
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)	191	1690	498	170	1717	462	195	1310	608	216	1407	623
v/s Ratio Prot	0.05	0.40	c0.11	0.23		0.05	0.23		c0.06	c0.42		
v/s Ratio Perm	0.25		0.25	c0.52		0.03			0.13		0.04	
v/c Ratio	0.75	1.20	0.76	1.55	0.68	0.10	0.90	0.57	0.31	0.99	1.03	0.10
Uniform Delay, d1	34.6	53.4	47.6	46.0	45.8	36.6	75.0	37.3	33.0	75.0	47.5	29.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	1.23	1.71	1.00	1.00	1.00
Incremental Delay, d2	14.8	96.2	10.3	275.7	2.2	0.4	32.5	0.5	0.2	58.4	30.9	0.1
Delay (s)	49.4	149.6	57.9	321.7	48.0	37.1	105.3	46.3	56.5	133.4	78.5	29.5
Level of Service	D	F	E	F	D	D	F	D	E	F	E	C
Approach Delay (s)		128.1			93.3			57.3			82.1	
Approach LOS		F		F			E			F		
Intersection Summary												
HCM 2000 Control Delay			97.3									
HCM 2000 Volume to Capacity ratio			1.28									
Actuated Cycle Length (s)			160.0									
Sum of lost time (s)												
Intersection Capacity Utilization			102.0%									
ICU Level of Service												
Analysis Period (min)							15					
c Critical Lane Group												

Lanes, Volumes, Timings
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Background AM
180231

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	→	↑	↑	→	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	60	10	285	44	21	52	85	913	11	21	1776	51
Future Volume (vph)	60	10	285	44	21	52	85	913	11	21	1776	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	15.0		0.0	15.0		0.0	35.0		0.0	55.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	20.0		20.0		30.0		30.0					
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95	
Ped Bike Factor	0.99	0.99			0.98		1.00		1.00	1.00		
Frt		0.855			0.893		0.998			0.996		
Flt Protected	0.950			0.950		0.950			0.950			
Satd. Flow (prot)	1805	1585	0	1805	1624	0	1770	3497	0	1719	3556	0
Flt Permitted	0.661			0.101			0.041			0.157		
Satd. Flow (perm)	1246	1585	0	192	1624	0	76	3497	0	284	3556	0
Right Turn on Red		Yes			Yes		Yes			Yes		
Satd. Flow (RTOR)	106			67		2				3		
Link Speed (k/h)	50			50		70				70		
Link Distance (m)	133.1			152.5			363.0			299.3		
Travel Time (s)	9.6			11.0		18.7				15.4		
Confl. Peds. (#/hr)	6	2	2	6	9		6	6		6		9
Peak Hour Factor	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66		
Heavy Vehicles (%)	0%	0%	1%	0%	10%	0%	2%	3%	0%	5%	1%	0%
Adj. Flow (vph)	91	15	432	67	32	79	129	1383	17	32	2691	77
Shared Lane Traffic (%)												
Lane Group Flow (vph)	91	447	0	67	111	0	129	1400	0	32	2768	0
Enter Blocked Intersection	No	No										
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Left	Right	
Median Width(m)	3.6			3.6			7.2			7.2		
Link Offset(m)	0.0			0.0			0.0			0.0		
Crosswalk Width(m)	4.8			4.8			4.8			4.8		
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)	0.6			0.6			0.6			0.6		
Detector 2 Type	Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		

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Synchro 9 Report
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Lanes, Volumes, Timings
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Background AM
180231

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR												
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA												
Protected Phases		8			4			1	6		2													
Permitted Phases		8		8	4			1	6	2	2													
Detector Phase																								
Switch Phase																								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	5.0	8.0	8.0	8.0	8.0	8.0												
Minimum Split (s)	46.0	46.0	46.0	46.0	46.0	46.0	13.0	114.0	101.0	101.0	101.0	101.0												
Total Split (s)	46.0	46.0	46.0	46.0	46.0	46.0	13.0	114.0	101.0	101.0	101.0	101.0												
Total Split (%)	28.8%	28.8%	28.8%	28.8%	28.8%	28.8%	8.1%	71.3%	63.1%	63.1%	63.1%	63.1%												
Maximum Green (s)	39.5	39.5	39.5	39.5	39.5	39.5	10.0	107.0	94.0	94.0	94.0	94.0												
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	5.0	5.0	5.0	5.0	5.0												
All-Red Time (s)	2.5	2.5	2.5	2.5	2.5	2.5	0.0	2.0	2.0	2.0	2.0	2.0												
Lost Time Adjust (s)	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 Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	3.0	7.0	7.0	7.0	7.0	7.0												
Lead/Lag							Lead		Lag		Lag													
Lead-Lag Optimize?							Yes		Yes		Yes													
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												
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max												
Walk Time (s)	10.0	10.0	10.0	10.0	10.0	10.0		8.0		8.0		8.0												
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0	20.0		15.0		15.0		15.0												
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0												
Act Efect Green (s)	39.5	39.5	39.5	39.5	39.5	39.5	111.0	107.0	94.3	94.3	94.3	94.3												
Actuated g/C Ratio	0.25	0.25	0.25	0.25	0.25	0.25	0.69	0.67	0.59	0.59	0.59	0.59												
v/c Ratio	0.30	0.95	1.43	0.25	0.83	0.60	0.19	0.19	0.19	0.19	0.19	0.19												
Control Delay	52.2	75.1	321.2	22.0	77.8	12.8	11.8	171.5																
Queue Delay	0.0	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6												
Total Delay	52.2	84.9	321.2	22.0	77.8	12.8	11.8	173.1																
LOS	D	F	C	E	B	B	B	F																
Approach Delay		79.4			134.6		18.3		171.2															
Approach LOS		E			F		B		F															
Intersection Summary																								
Area Type:	Other																							
Cycle Length:	160																							
Actuated Cycle Length:	160																							
Offset: 109 (68%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green																								
Natural Cycle: 160																								
Control Type: Actuated-Coordinated																								
Maximum v/c Ratio: 1.43																								
Intersection Signal Delay: 113.8																								
Intersection LOS: F																								
Intersection Capacity Utilization 100.9%																								
Analysis Period (min) 15																								
Splits and Phases: 2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive																								

Paradigm Transportation Solutions Limited

Synchro 9 Report
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Queues
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Background AM
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Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	91	447	67	111	129	1400	32	2768
v/c Ratio	0.30	0.95	1.43	0.25	0.83	0.60	0.19	1.32
Control Delay	52.2	75.1	321.2	22.0	77.8	12.8	11.8	171.5
Queue Delay	0.0	9.9	0.0	0.0	0.0	0.0	0.0	1.6
Total Delay	52.2	84.9	321.2	22.0	77.8	12.8	11.8	173.1
Queue Length 50th (m)	25.0	119.0	~30.0	11.5	32.1	86.2	2.6	~634.5
Queue Length 95th (m)	30.4	99.9	#43.2	15.9	37.9	70.2	m3.3	m367.1
Internal Link Dist (m)	109.1		128.5		339.0		275.3	
Turn Bay Length (m)	15.0		15.0		35.0		55.0	
Base Capacity (vph)	307	471	47	451	158	2339	167	2097
Starvation Cap Reductn	0	0	0	0	0	0	0	229
Spillback Cap Reductn	0	24	0	0	0	0	0	819
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	1.00	1.43	0.25	0.82	0.60	0.19	2.17
Intersection Summary								
~ Volume exceeds capacity, queue is theoretically infinite.								
Queue shown is maximum after two cycles.								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								
m Volume for 95th percentile queue is metered by upstream signal.								

HCM Signalized Intersection Capacity Analysis
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Background AM
180231

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↑	↓	↑	↑	↓	↑	↑	↑↓	↑	↑	↑	↑↓	
Traffic Volume (vph)	60	10	285	44	21	52	85	913	11	21	1776	51	
Future Volume (vph)	60	10	285	44	21	52	85	913	11	21	1776	51	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.5	6.5		6.5	6.5		3.0	7.0		7.0	7.0		
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95		
Frpb, ped/bikes	1.00	0.99		1.00	0.98		1.00	1.00		1.00	1.00		
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00		
Fr	1.00	0.86		1.00	0.89		1.00	1.00		1.00	1.00		
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00		
Satd. Flow (prot)	1790	1585		1805	1624		1770	3498		1716	3555		
Flt Permitted	0.66	1.00		0.10	1.00		0.04	1.00		0.16	1.00		
Satd. Flow (perm)	1245	1585		192	1624		77	3498		284	3555		
Peak-hour factor, PHF	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	
Adj. Flow (vph)	91	15	432	67	32	79	129	1383	17	32	2691	77	
RTOR Reduction (vph)	0	80	0	0	50	0	0	1	0	0	1	0	
Lane Group Flow (vph)	91	367	0	67	61	0	129	1399	0	32	2767	0	
Confl. Peds. (#/hr)	6		2	2		6	9		6	6	9		
Heavy Vehicles (%)	0%	0%	1%	0%	10%	0%	2%	3%	0%	5%	1%	0%	
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA		
Protected Phases		8			4			1	6		2		
Permitted Phases		8			4			6		2			
Actuated Green, G (s)	39.5	39.5		39.5	39.5		107.0	107.0		94.3	94.3		
Effective Green, g (s)	39.5	39.5		39.5	39.5		107.0	107.0		94.3	94.3		
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.67	0.67		0.59	0.59		
Clearance Time (s)	6.5	6.5		6.5	6.5		3.0	7.0		7.0	7.0		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)	307	391		47	400		154	2339		167	2095		
v/s Ratio Prot	0.23			0.04		c0.05	0.40			c0.78			
v/s Ratio Perm	0.07		c0.35			0.51			0.11				
v/c Ratio	0.30	0.94		1.43	0.15		0.84	0.60		0.19	1.32		
Uniform Delay, d1	49.0	59.1		60.2	47.1		52.8	14.6		15.2	32.9		
Progression Factor	1.00	1.00		1.00	1.00		1.35	0.81		0.63	0.77		
Incremental Delay, d2	0.5	30.1		279.4	0.2		23.9	0.8		1.4	146.3		
Delay (s)	49.5	89.1		339.7	47.3		95.0	12.7		11.0	171.6		
Level of Service	D	F		F	D		F	B		B	F		
Approach Delay (s)		82.4			157.4			19.6			169.7		
Approach LOS		F			F			B			F		
Intersection Summary													
HCM 2000 Control Delay			114.5	HCM 2000 Level of Service			F						
HCM 2000 Volume to Capacity ratio			1.31										
Actuated Cycle Length (s)			160.0	Sum of lost time (s)			16.5						
Intersection Capacity Utilization			100.9%	ICU Level of Service			G						
Analysis Period (min)			15										
c Critical Lane Group													

Lanes, Volumes, Timings
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Background AM
180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↓	↑	↓	↑	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	16	0	42	96	0	27	14	970	25	8	2079	5
Future Volume (vph)	16	0	42	96	0	27	14	970	25	8	2079	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0	0.0	0.0	0.0	30.0	0.0	35.0	0.0	0.0	0.0	0.0	0.0
Storage Lanes	1	0	0	0	1	0	1	0	1	0	0	0
Taper Length (m)	10.0			7.5			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95	0.95
Ped Bike Factor	1.00	0.98			0.99			1.00			1.00	
Frt	0.850			0.970			0.962			0.996		
Flt Protected	0.950			0.970			0.962			0.950		
Satd. Flow (prot)	1805	1558	0	0	1736	0	1687	3486	0	1444	3574	0
Flt Permitted	0.714			0.723			0.034			0.089		
Satd. Flow (perm)	1353	1558	0	0	1301	0	60	3486	0	135	3574	0
Right Turn on Red	Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)	27			27			4					
Link Speed (k/h)	50			50			70			70		
Link Distance (m)	120.7			123.6			410.1			363.0		
Travel Time (s)	8.7			8.9			21.1			18.7		
Conf. Peds. (#/hr)	3	2	2	3	12		6	6		12		
Peak Hour Factor	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Heavy Vehicles (%)	0%	0%	2%	0%	0%	8%	7%	3%	4%	25%	1%	0%
Adj. Flow (vph)	29	0	75	171	0	48	25	1732	45	14	3713	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	29	75	0	0	219	0	25	1777	0	14	3722	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Right	Left	Right
Median Width(m)	3.6			3.6			3.6			3.6		
Link Offset(m)	0.0			0.0			0.0			0.0		
Crosswalk Width(m)	4.8			4.8			4.8			4.8		
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	2		1	2		1	2		
Detector Template	Left	Thru	Left	Thru		Left	Thru		Left	Thru		
Leading Detector (m)	2.0	10.0	2.0	10.0		2.0	10.0		2.0	10.0		
Trailing Detector (m)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Detector 1 Position(m)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Detector 1 Size(m)	2.0	0.6	2.0	0.6		2.0	0.6		2.0	0.6		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Detector 2 Position(m)	9.4			9.4			9.4			9.4		
Detector 2 Size(m)	0.6			0.6			0.6			0.6		
Detector 2 Type	Cl+Ex		Cl+Ex			Cl+Ex			Cl+Ex			
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		

Paradigm Transportation Solutions Limited

Synchro 9 Report
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Lanes, Volumes, Timings
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Background AM
180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8			2			6	
Permitted Phases		4			8			2			6	
Detector Phase		4			8			2			6	
Switch Phase												
Minimum Initial (s)	1.0	1.0			5.0	5.0		5.0	5.0		5.0	5.0
Minimum Split (s)	40.0	40.0			40.0	40.0		120.0	120.0		120.0	120.0
Total Split (s)	40.0	40.0			40.0	40.0		120.0	120.0		120.0	120.0
Total Split (%)	25.0%	25.0%			25.0%	25.0%		75.0%	75.0%		75.0%	75.0%
Maximum Green (s)	33.5	33.5			33.5	33.5		113.0	113.0		113.0	113.0
Yellow Time (s)	4.0	4.0			4.0	4.0		5.0	5.0		5.0	5.0
All-Red Time (s)	2.5	2.5			2.5	2.5		2.0	2.0		2.0	2.0
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0	0.0		0.0	0.0
Total Lost Time (s)	6.5	6.5			6.5	6.5		7.0	7.0		7.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0	3.0		3.0	3.0
Recall Mode	None	None			None	None		C-Max	C-Max		C-Max	C-Max
Walk Time (s)	10.0	10.0			10.0	10.0		8.0	8.0		8.0	8.0
Flash Dont Walk (s)	14.0	14.0			14.0	14.0		10.0	10.0		10.0	10.0
Pedestrian Calls (#/hr)	0	0			0	0		0	0		0	0
Act Efect Green (s)	28.1	28.1			28.1	28.1		118.4	118.4		118.4	118.4
Actuated g/C Ratio	0.18	0.18			0.18	0.18		0.74	0.74		0.74	0.74
v/c Ratio	0.12	0.25			0.88	0.57		0.69	0.14		0.14	1.41
Control Delay	54.1	37.3			87.5	65.5		13.5	4.5		201.6	
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0		0.0	0.2
Total Delay	54.1	37.3			87.5	65.5		13.5	4.5		201.8	
LOS	D	D			F	E		B	A		F	
Approach Delay					42.0	87.5		14.2	201.1			
Approach LOS					D	F		B	F			
Intersection Summary												
Area Type:	Other											
Cycle Length:	160											
Actuated Cycle Length:	160											
Offset: 122 (76%), Referenced to phase 2:NBT and 6:SBTL, Start of Green												
Natural Cycle: 160												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.41												
Intersection Signal Delay: 136.6												
Intersection LOS: F												
Intersection Capacity Utilization 83.2%												
Analysis Period (min) 15												
Splits and Phases: 3: McLaughlin Road & Rothschild Trail/Ramonet Drive												

Paradigm Transportation Solutions Limited

Synchro 9 Report
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Queues
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Background AM
180231

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	29	75	219	25	1777	14	3722
v/c Ratio	0.12	0.25	0.88	0.57	0.69	0.14	1.41
Control Delay	54.1	37.3	87.5	65.5	13.5	4.5	201.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Total Delay	54.1	37.3	87.5	65.5	13.5	4.5	201.8
Queue Length 50th (m)	8.2	13.7	63.4	3.6	157.4	0.7	~894.7
Queue Length 95th (m)	11.0	14.7	49.6	8.2	85.2	m0.6	250.3
Internal Link Dist (m)	96.7	99.6		386.1		339.0	
Turn Bay Length (m)	20.0		30.0		35.0		
Base Capacity (vph)	283	347	293	44	2580	99	2644
Starvation Cap Reductn	0	0	0	0	0	0	182
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.22	0.75	0.57	0.69	0.14	1.51
Intersection Summary							
~ Volume exceeds capacity, queue is theoretically infinite.							
Queue shown is maximum after two cycles.							
m Volume for 95th percentile queue is metered by upstream signal.							

HCM Signalized Intersection Capacity Analysis
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Background AM
180231

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑		↓	↓		↑	↑	↑	↑	↑	
Traffic Volume (vph)	16	0	42	96	0	27	14	970	25	8	2079	5
Future Volume (vph)	16	0	42	96	0	27	14	970	25	8	2079	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	0.95	1.00	0.95
Frpb, ped/bikes	1.00	0.98			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Fr	1.00	0.85			0.97		1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00			0.96		0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1800	1558			1732		1687	3487	1444	3572		
Flt Permitted	0.71	1.00			0.72		0.03	1.00	0.09	1.00		
Satd. Flow (perm)	1352	1558			1302		60	3487	135	3572		
Peak-hour factor, PHF	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Adj. Flow (vph)	29	0	75	171	0	48	25	1732	45	14	3712	9
RTOR Reduction (vph)	0	22	0	0	22	0	0	1	0	0	0	0
Lane Group Flow (vph)	29	53	0	0	197	0	25	1776	0	14	3722	0
Confli. Peds. (#/hr)	3		2	2		3	12		6	6	12	
Heavy Vehicles (%)	0%	0%	2%	0%	0%	8%	7%	3%	4%	25%	1%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8				2		6	
Permitted Phases		4			8			2		6		
Actuated Green, G (s)	28.1	28.1			28.1		118.4	118.4		118.4	118.4	
Effective Green, g (s)	28.1	28.1			28.1		118.4	118.4		118.4	118.4	
Actuated g/C Ratio	0.18	0.18			0.18		0.74	0.74		0.74	0.74	
Clearance Time (s)	6.5	6.5			6.5		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	237	273			228		44	2580	99	2643		
v/s Ratio Prot		0.03					0.51			c1.04		
v/s Ratio Perm		0.02			c0.15		0.42			0.10		
v/c Ratio	0.12	0.19			0.86		0.57	0.69		0.14	1.41	
Uniform Delay, d1	55.6	56.3			64.1		9.3	11.0		6.0	20.8	
Progression Factor	1.00	1.00			1.00		1.00	1.00		0.51	0.55	
Incremental Delay, d2	0.2	0.3			26.9		43.9	1.5		0.3	183.9	
Delay (s)	55.8	56.6			90.9		53.2	12.5		3.4	195.3	
Level of Service	E	E			F		D	B		A	F	
Approach Delay (s)		56.4			90.9			13.1			194.6	
Approach LOS	E			F			B			F		
Intersection Summary												
HCM 2000 Control Delay			132.5								F	
HCM 2000 Volume to Capacity ratio			1.30									
Actuated Cycle Length (s)			160.0								13.5	
Intersection Capacity Utilization			83.2%								E	
Analysis Period (min)					15							
c Critical Lane Group												

Lanes, Volumes, Timings

1: McLaughlin Road & Derry Road West

Background PM

180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑	↑↑↑	↑	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑
Traffic Volume (vph)	206	824	107	226	1697	356	213	1148	110	190	622	206
Future Volume (vph)	206	824	107	226	1697	356	213	1148	110	190	622	206
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0		50.0	140.0		105.0	40.0		45.0	80.0		75.0
Storage Lanes	1		1	1		1	2		1	2		1
Taper Length (m)	30.0		30.0		30.0		30.0		30.0		30.0	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	0.98		0.85	0.97		0.91	0.98		0.95	0.99		0.91
Frt			0.850		0.850		0.850		0.850		0.850	
Flt Protected	0.950		0.950		0.950		0.950		0.950		0.950	
Satd. Flow (prot)	1805	5136	1615	1770	5136	1599	3502	3471	1615	3502	3282	1599
Flt Permitted	0.075		0.199		0.950		0.950		0.950		0.950	
Satd. Flow (perm)	139	5136	1375	360	5136	1454	3426	3471	1529	3477	3282	1459
Right Turn on Red	Yes											
Satd. Flow (RTOR)		87			143			80			154	
Link Speed (k/h)	70		70		70		70		70		70	
Link Distance (m)	323.0		328.3		299.3		289.2					
Travel Time (s)	16.6		16.9		15.4			14.9				
Confli. Peds. (#/hr)	50	87	87	50	53	29	29	29	29	29	53	53
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	0%	1%	0%	2%	1%	1%	0%	4%	0%	0%	10%	1%
Adj. Flow (vph)	231	926	120	254	1907	400	239	1290	124	213	699	231
Shared Lane Traffic (%)												
Lane Group Flow (vph)	231	926	120	254	1907	400	239	1290	124	213	699	231
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Left	Right	Right
Median Width(m)	3.6		3.6		7.2		7.2					
Link Offset(m)	0.0		0.0		0.0		0.0		0.0			
Crosswalk Width(m)	4.8		4.8		4.8		4.8					
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25	15	25	15	25	15	25	15	25
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right									
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex											
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)	0.6		0.6		0.6		0.6		0.6		0.6	
Detector 2 Type	Cl+Ex											
Detector 2 Channel												
Detector 2 Extend (s)	0.0		0.0		0.0		0.0		0.0		0.0	

Lanes, Volumes, Timings

1: McLaughlin Road & Derry Road West

Background PM

180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR												
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm												
Protected Phases	5	2		1	6		6		4		3	8												
Permitted Phases	2			2			6		4		3	8												
Detector Phase	5	2	2	1	6		7	4	4	3	8	8												
Switch Phase																								
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	5.0	12.0	12.0	5.0	12.0	12.0												
Minimum Split (s)	15.0	60.0	60.0	13.0	58.0	58.0	15.0	72.0	72.0	15.0	72.0	72.0												
Total Split (s)	15.0	60.0	60.0	13.0	58.0	58.0	15.0	72.0	72.0	15.0	72.0	72.0												
Total Split (%)	9.4%	37.5%	37.5%	8.1%	36.3%	36.3%	9.4%	45.0%	45.0%	9.4%	45.0%	45.0%												
Maximum Green (s)	12.0	53.2	53.2	10.0	51.2	51.2	10.0	64.9	64.9	10.0	64.9	64.9												
Yellow Time (s)	3.0	4.6	4.6	3.0	4.6	4.6	3.0	4.0	4.0	3.0	4.0	4.0												
All-Red Time (s)	0.0	2.2	2.2	0.0	2.2	2.2	0.0	3.1	3.1	0.0	3.1	3.1												
Lost Time Adjust (s)	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 Lost Time (s)	3.0	6.8	6.8	3.0	6.8	6.8	5.0	7.1	7.1	5.0	7.1	7.1												
Lead/Lag	Lead	Lag	Lag																					
Lead-Lag Optimize?	Yes																							
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												
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None												
Walk Time (s)	12.0		12.0		12.0		12.0		13.0		13.0													
Flash Dont Walk (s)	18.0		18.0		18.0		18.0		20.0		20.0													
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0												
Act Efect Green (s)	69.4	53.2	53.2	67.6	52.4	52.4	10.0	63.3	63.3	10.0	63.3	63.3												
Actuated g/C Ratio	0.43	0.33	0.33	0.42	0.33	0.33	0.06	0.40	0.40	0.06	0.40	0.40												
v/c Ratio	1.23	0.54	0.23	1.00	1.13	0.70	1.10	0.94	0.19	0.98	0.54	0.34												
Control Delay	175.4	44.9	13.6	92.7	115.7	37.2	154.5	53.2	10.1	128.2	38.8	12.3												
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	175.4	44.9	13.6	92.7	115.7	37.2	154.5	53.2	10.1	128.2	38.8	12.3												
LOS	F	D	B	F	F	D	F	D	B	F	D	B												
Approach Delay		65.6			101.2			64.6		50.1														
Approach LOS		E			F			E		D														
Intersection Summary																								
Area Type:	Other																							
Cycle Length:	160																							
Actuated Cycle Length:	160																							
Offset: 18 (11%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green																								
Natural Cycle: 160																								
Control Type: Actuated-Coordinated																								
Maximum v/c Ratio: 1.23																								
Intersection Signal Delay: 76.4																								
Intersection LOS: E																								
Intersection Capacity Utilization 100.4%																								
Analysis Period (min) 15																								
Splits and Phases: 1: McLaughlin Road & Derry Road West																								

Lanes, Volumes, Timings

2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Background PM

180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	→	↑	↑	→	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	60	10	285	44	21	52	85	913	11	21	1776	51
Future Volume (vph)	60	10	285	44	21	52	85	913	11	21	1776	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	15.0		0.0	15.0		0.0	35.0		0.0	55.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	20.0		20.0		30.0		30.0					
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95	
Ped Bike Factor	0.99	0.99			0.98		1.00		1.00	1.00		
Frt		0.855			0.893		0.998			0.996		
Flt Protected	0.950			0.950		0.950			0.950			
Satd. Flow (prot)	1805	1585	0	1805	1624	0	1770	3497	0	1719	3556	0
Flt Permitted	0.661			0.101		0.041		0.157				
Satd. Flow (perm)	1246	1585	0	192	1624	0	76	3497	0	284	3556	0
Right Turn on Red		Yes			Yes		Yes			Yes		
Satd. Flow (RTOR)	106			67		2			3			
Link Speed (k/h)	50			50		70			70			
Link Distance (m)	133.1			152.5		363.0			299.3			
Travel Time (s)	9.6			11.0		18.7			15.4			
Confl. Peds. (#/hr)	6	2	2	6	9	6	6	6	9			
Peak Hour Factor	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66		
Heavy Vehicles (%)	0%	0%	1%	0%	10%	0%	2%	3%	0%	5%	1%	0%
Adj. Flow (vph)	91	15	432	67	32	79	129	1383	17	32	2691	77
Shared Lane Traffic (%)												
Lane Group Flow (vph)	91	447	0	67	111	0	129	1400	0	32	2768	0
Enter Blocked Intersection	No	No										
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Left	Right	
Median Width(m)	3.6			3.6			7.2			7.2		
Link Offset(m)	0.0			0.0			0.0			0.0		
Crosswalk Width(m)	4.8			4.8			4.8			4.8		
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)	0.6			0.6			0.6			0.6		
Detector 2 Type	Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		

Paradigm Transportation Solutions Limited

Synchro 9 Report

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Lanes, Volumes, Timings

2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Background PM

180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR												
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA												
Protected Phases		8			4			1	6		2													
Permitted Phases		8		8	4	4		1	6	2	2													
Detector Phase																								
Switch Phase																								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	5.0	8.0	8.0	8.0	8.0	8.0												
Minimum Split (s)	46.0	46.0	46.0	46.0	46.0	46.0	13.0	114.0	101.0	101.0	101.0	101.0												
Total Split (s)	46.0	46.0	46.0	46.0	46.0	46.0	13.0	114.0	101.0	101.0	101.0	101.0												
Total Split (%)	28.8%	28.8%	28.8%	28.8%	28.8%	28.8%	8.1%	71.3%	63.1%	63.1%	63.1%	63.1%												
Maximum Green (s)	39.5	39.5	39.5	39.5	39.5	39.5	10.0	107.0	94.0	94.0	94.0	94.0												
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	5.0	5.0	5.0	5.0	5.0												
All-Red Time (s)	2.5	2.5	2.5	2.5	2.5	2.5	0.0	2.0	2.0	2.0	2.0	2.0												
Lost Time Adjust (s)	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 Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	3.0	7.0	7.0	7.0	7.0	7.0												
Lead/Lag							Lead		Lag		Lag													
Lead-Lag Optimize?							Yes		Yes		Yes													
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												
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max												
Walk Time (s)	10.0	10.0	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0	8.0												
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0	20.0	15.0	15.0	15.0	15.0	15.0	15.0												
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0												
Act Efect Green (s)	39.5	39.5	39.5	39.5	39.5	39.5	111.0	107.0	94.3	94.3	94.3	94.3												
Actuated g/C Ratio	0.25	0.25	0.25	0.25	0.25	0.25	0.69	0.67	0.59	0.59	0.59	0.59												
v/c Ratio	0.30	0.95	1.43	0.25	0.83	0.60	0.19	0.19	0.19	0.19	0.19	0.19												
Control Delay	52.2	74.9	321.2	19.8	78.6	12.1	5.1	157.8																
Queue Delay	0.0	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5												
Total Delay	52.2	84.8	321.2	19.8	78.6	12.1	5.1	159.3																
LOS	D	F	F	B	E	B	A	F																
Approach Delay		79.3		133.2			17.7		157.5															
Approach LOS		E		F			B		F															
Intersection Summary																								
Area Type:	Other																							
Cycle Length:	160																							
Actuated Cycle Length:	160																							
Offset: 109 (68%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green																								
Natural Cycle: 160																								
Control Type: Actuated-Coordinated																								
Maximum v/c Ratio: 1.43																								
Intersection Signal Delay: 105.9																								
Intersection LOS: F																								
Intersection Capacity Utilization 100.9%																								
Analysis Period (min) 15																								
Splits and Phases: 2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive																								

Paradigm Transportation Solutions Limited

Synchro 9 Report

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Queues
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Background PM
180231

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	91	447	67	111	129	1400	32	2768
v/c Ratio	0.30	0.95	1.43	0.25	0.83	0.60	0.19	1.32
Control Delay	52.2	74.9	321.2	19.8	78.6	12.1	5.1	157.8
Queue Delay	0.0	9.9	0.0	0.0	0.0	0.0	0.0	1.5
Total Delay	52.2	84.8	321.2	19.8	78.6	12.1	5.1	159.3
Queue Length 50th (m)	25.0	119.0	~30.0	11.5	32.1	86.2	2.6	~634.5
Queue Length 95th (m)	30.4	99.9	#43.2	15.9	37.9	70.2	m3.3	m367.1
Internal Link Dist (m)	109.1		128.5		339.0		275.3	
Turn Bay Length (m)	15.0		15.0		35.0		55.0	
Base Capacity (vph)	307	471	47	451	158	2339	167	2097
Starvation Cap Reductn	0	0	0	0	0	0	0	229
Spillback Cap Reductn	0	24	0	0	0	0	0	819
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	1.00	1.43	0.25	0.82	0.60	0.19	2.17
Intersection Summary								
~ Volume exceeds capacity, queue is theoretically infinite.								
Queue shown is maximum after two cycles.								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								
m Volume for 95th percentile queue is metered by upstream signal.								

HCM Signalized Intersection Capacity Analysis
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Background PM
180231

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations	↑	↓	↑	↑	↓	↑	↑	↑↓	↑	↑	↑	↑↓				
Traffic Volume (vph)	60	10	285	44	21	52	85	913	11	21	1776	51				
Future Volume (vph)	60	10	285	44	21	52	85	913	11	21	1776	51				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Total Lost time (s)	6.5	6.5		6.5	6.5		3.0	7.0		7.0	7.0					
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95					
Frpb, ped/bikes	1.00	0.99		1.00	0.98		1.00	1.00		1.00	1.00					
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00					
Fr	1.00	0.86		1.00	0.89		1.00	1.00		1.00	1.00					
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00					
Satd. Flow (prot)	1790	1585		1805	1624		1770	3498		1716	3555					
Flt Permitted	0.66	1.00		0.10	1.00		0.04	1.00		0.16	1.00					
Satd. Flow (perm)	1245	1585		192	1624		77	3498		284	3555					
Peak-hour factor, PHF	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66				
Adj. Flow (vph)	91	15	432	67	32	79	129	1383	17	32	2691	77				
RTOR Reduction (vph)	0	80	0	0	50	0	0	1	0	0	1	0				
Lane Group Flow (vph)	91	367	0	67	61	0	129	1399	0	32	2767	0				
Confl. Peds. (#/hr)	6		2	2		6	9		6	6	9					
Heavy Vehicles (%)	0%	0%	1%	0%	10%	0%	2%	3%	0%	5%	1%	0%				
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA					
Protected Phases		8			4			1	6		2					
Permitted Phases		8			4			6		2						
Actuated Green, G (s)	39.5	39.5		39.5	39.5		107.0	107.0		94.3	94.3					
Effective Green, g (s)	39.5	39.5		39.5	39.5		107.0	107.0		94.3	94.3					
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.67	0.67		0.59	0.59					
Clearance Time (s)	6.5	6.5		6.5	6.5		3.0	7.0		7.0	7.0					
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0					
Lane Grp Cap (vph)	307	391		47	400		154	2339		167	2095					
v/s Ratio Prot	0.23			0.04		c0.05	0.40			c0.78						
v/s Ratio Perm	0.07		c0.35			0.51			0.11							
v/c Ratio	0.30	0.94		1.43	0.15		0.84	0.60		0.19	1.32					
Uniform Delay, d1	49.0	59.1		60.2	47.1		52.8	14.6		15.2	32.9					
Progression Factor	1.00	1.00		1.00	1.00		1.35	0.81		0.63	0.77					
Incremental Delay, d2	0.5	30.1		279.4	0.2		23.9	0.8		1.4	146.3					
Delay (s)	49.5	89.1		339.7	47.3		95.0	12.7		11.0	171.6					
Level of Service	D	F		F	D		F	B		B	F					
Approach Delay (s)		82.4			157.4			19.6			169.7					
Approach LOS		F			F			B			F					
Intersection Summary																
HCM 2000 Control Delay			114.5	HCM 2000 Level of Service			F									
HCM 2000 Volume to Capacity ratio			1.31													
Actuated Cycle Length (s)			160.0	Sum of lost time (s)			16.5									
Intersection Capacity Utilization			100.9%	ICU Level of Service			G									
Analysis Period (min)			15													
c Critical Lane Group																

Lanes, Volumes, Timings
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Background PM
180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↓	↑	↓	↑	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	16	0	42	96	0	27	14	970	25	8	2079	5
Future Volume (vph)	16	0	42	96	0	27	14	970	25	8	2079	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0	0.0	0.0	0.0	30.0	0.0	35.0	0.0	0.0	0.0	0.0	0.0
Storage Lanes	1	0	0	0	1	0	1	0	1	0	1	0
Taper Length (m)	10.0			7.5			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95	
Ped Bike Factor	1.00	0.98			0.99			1.00			1.00	
Frt	0.850			0.970			0.962			0.996		
Flt Protected	0.950			0.962			0.950			0.950		
Satd. Flow (prot)	1805	1558	0	0	1736	0	1687	3486	0	1444	3574	0
Flt Permitted	0.714			0.723			0.034			0.089		
Satd. Flow (perm)	1353	1558	0	0	1301	0	60	3486	0	135	3574	0
Right Turn on Red	Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)	27			27			4					
Link Speed (k/h)	50			50			70			70		
Link Distance (m)	120.7			123.6			410.1			363.0		
Travel Time (s)	8.7			8.9			21.1			18.7		
Conf. Peds. (#/hr)	3	2	2	3	12		6	6		12		
Peak Hour Factor	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	
Heavy Vehicles (%)	0%	0%	2%	0%	0%	8%	7%	3%	4%	25%	1%	0%
Adj. Flow (vph)	29	0	75	171	0	48	25	1732	45	14	3713	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	29	75	0	0	219	0	25	1777	0	14	3722	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Right	Left	Right
Median Width(m)	3.6			3.6			3.6			3.6		
Link Offset(m)	0.0			0.0			0.0			0.0		
Crosswalk Width(m)	4.8			4.8			4.8			4.8		
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	2		1	2		1	2		
Detector Template	Left	Thru	Left	Thru		Left	Thru		Left	Thru		
Leading Detector (m)	2.0	10.0	2.0	10.0		2.0	10.0		2.0	10.0		
Trailing Detector (m)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Detector 1 Position(m)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Detector 1 Size(m)	2.0	0.6	2.0	0.6		2.0	0.6		2.0	0.6		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Detector 2 Position(m)	9.4			9.4			9.4			9.4		
Detector 2 Size(m)	0.6			0.6			0.6			0.6		
Detector 2 Type	Cl+Ex		Cl+Ex			Cl+Ex			Cl+Ex			
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		

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Synchro 9 Report
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Lanes, Volumes, Timings
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Background PM
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Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8			2			6	
Permitted Phases		4		4	4		8	8	2	2	6	6
Detector Phase												
Switch Phase												
Minimum Initial (s)	1.0	1.0			5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	40.0	40.0			40.0	40.0	120.0	120.0	120.0	120.0	120.0	120.0
Total Split (s)	40.0	40.0			40.0	40.0	120.0	120.0	120.0	120.0	120.0	120.0
Total Split (%)	25.0%	25.0%			25.0%	25.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Maximum Green (s)	33.5	33.5			33.5	33.5	113.0	113.0	113.0	113.0	113.0	113.0
Yellow Time (s)	4.0	4.0			4.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.5	2.5			2.5	2.5	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5			6.5	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None			None	None	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	10.0	10.0			10.0	10.0	8.0	8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	14.0	14.0			14.0	14.0	10.0	10.0	10.0	10.0	10.0	10.0
Pedestrian Calls (#/hr)	0	0			0	0	0	0	0	0	0	0
Act Efect Green (s)	28.1	28.1			28.1	28.1	118.4	118.4	118.4	118.4	118.4	118.4
Actuated g/C Ratio	0.18	0.18			0.18	0.18	0.74	0.74	0.74	0.74	0.74	0.74
v/c Ratio	0.12	0.25			0.88	0.57	0.69	0.14	0.14	0.14	0.14	0.14
Control Delay	54.1	37.3			87.5	65.5	12.7	4.5	4.5	192.3		
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.1	
Total Delay	54.1	37.3			87.5	65.5	12.7	4.5	4.5	192.5		
LOS	D	D				F	E	B	A	F		
Approach Delay					42.0		87.5		13.4		191.8	
Approach LOS					D		F		B		F	
Intersection Summary												
Area Type:	Other											
Cycle Length:	160											
Actuated Cycle Length:	160											
Offset: 122 (76%), Referenced to phase 2:NBT and 6:SBTL, Start of Green												
Natural Cycle: 160												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.41												
Intersection Signal Delay: 130.4												
Intersection LOS: F												
Intersection Capacity Utilization 83.2%												
Analysis Period (min) 15												
Splits and Phases: 3: McLaughlin Road & Rothschild Trail/Ramonet Drive												

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Synchro 9 Report
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Queues
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Background PM
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Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	29	75	219	25	1777	14	3722
v/c Ratio	0.12	0.25	0.88	0.57	0.69	0.14	1.41
Control Delay	54.1	37.3	87.5	65.5	12.7	4.5	192.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay	54.1	37.3	87.5	65.5	12.7	4.5	192.5
Queue Length 50th (m)	8.2	13.7	63.4	3.6	157.4	0.7	~894.7
Queue Length 95th (m)	11.0	14.7	49.6	8.2	85.2	m0.6	250.3
Internal Link Dist (m)	96.7	99.6		386.1		339.0	
Turn Bay Length (m)	20.0		30.0		35.0		
Base Capacity (vph)	283	347	293	44	2580	99	2644
Starvation Cap Reductn	0	0	0	0	0	0	182
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.22	0.75	0.57	0.69	0.14	1.51
Intersection Summary							
~ Volume exceeds capacity, queue is theoretically infinite.							
Queue shown is maximum after two cycles.							
m Volume for 95th percentile queue is metered by upstream signal.							

HCM Signalized Intersection Capacity Analysis
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Background PM
180231

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑		↓	↓		↑	↑	↑	↑	↑	
Traffic Volume (vph)	16	0	42	96	0	27	14	970	25	8	2079	5
Future Volume (vph)	16	0	42	96	0	27	14	970	25	8	2079	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	0.95	1.00	0.95
Frpb, ped/bikes	1.00	0.98			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85			0.97		1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00			0.96		0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1800	1558			1732		1687	3487	1444	3572		
Flt Permitted	0.71	1.00			0.72		0.03	1.00	0.09	1.00		
Satd. Flow (perm)	1352	1558			1302		60	3487	135	3572		
Peak-hour factor, PHF	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Adj. Flow (vph)	29	0	75	171	0	48	25	1732	45	14	3712	9
RTOR Reduction (vph)	0	22	0	0	22	0	0	1	0	0	0	0
Lane Group Flow (vph)	29	53	0	0	197	0	25	1776	0	14	3722	0
Confli. Peds. (#/hr)	3		2	2		3	12		6	6	12	
Heavy Vehicles (%)	0%	0%	2%	0%	0%	8%	7%	3%	4%	25%	1%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8				2		6	
Permitted Phases		4			8			2		6		
Actuated Green, G (s)	28.1	28.1			28.1		118.4	118.4		118.4	118.4	
Effective Green, g (s)	28.1	28.1			28.1		118.4	118.4		118.4	118.4	
Actuated g/C Ratio	0.18	0.18			0.18		0.74	0.74		0.74	0.74	
Clearance Time (s)	6.5	6.5			6.5		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	237	273			228		44	2580	99	2643		
v/s Ratio Prot		0.03					0.51			c1.04		
v/s Ratio Perm		0.02			c0.15		0.42			0.10		
v/c Ratio	0.12	0.19			0.86		0.57	0.69		0.14	1.41	
Uniform Delay, d1	55.6	56.3			64.1		9.3	11.0		6.0	20.8	
Progression Factor	1.00	1.00			1.00		1.00	1.00		0.51	0.55	
Incremental Delay, d2	0.2	0.3			26.9		43.9	1.5		0.3	183.9	
Delay (s)	55.8	56.6			90.9		53.2	12.5		3.4	195.3	
Level of Service	E	E			F		D	B	A	F		
Approach Delay (s)		56.4			90.9			13.1			194.6	
Approach LOS	E			F			B			F		
Intersection Summary												
HCM 2000 Control Delay			132.5								F	
HCM 2000 Volume to Capacity ratio			1.30									
Actuated Cycle Length (s)			160.0								13.5	
Intersection Capacity Utilization			83.2%								E	
Analysis Period (min)					15							
c Critical Lane Group												

Appendix E

Total Traffic Operational Conditions



Lanes, Volumes, Timings

1: McLaughlin Road & Derry Road West

Total AM

180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑	↑↑↑	↑	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑
Traffic Volume (vph)	120	1704	387	223	978	113	148	626	247	180	1213	91
Future Volume (vph)	120	1704	387	223	978	113	148	626	247	180	1213	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0		50.0	140.0		105.0	40.0		45.0	80.0		75.0
Storage Lanes	1		1	1		1	2		1	2		1
Taper Length (m)	30.0		30.0		30.0		30.0		30.0		30.0	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	0.99		0.94		0.89	1.00		0.95	0.99		0.95	
Frt			0.850		0.850		0.850		0.850		0.850	
Flt Protected	0.950		0.950		0.950		0.950		0.950		0.950	
Satd. Flow (prot)	1770	5085	1599	1787	5136	1553	3467	3282	1599	3467	3471	1615
Flt Permitted	0.118		0.075		0.950		0.950		0.950		0.950	
Satd. Flow (perm)	217	5085	1500	141	5136	1383	3450	3282	1523	3422	3471	1538
Right Turn on Red	Yes											
Satd. Flow (RTOR)		132			135			169			80	
Link Speed (k/h)	70		70		70		70		70		70	
Link Distance (m)	323.0		328.3		299.3		289.2					
Travel Time (s)	16.6		16.9		15.4			14.9				
Confli. Peds. (#/hr)	62	32	32	62	25	25	25	25	25	25	25	25
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	2%	2%	1%	1%	1%	4%	1%	10%	1%	1%	4%	0%
Adj. Flow (vph)	143	2029	461	265	1164	135	176	745	294	214	1444	108
Shared Lane Traffic (%)												
Lane Group Flow (vph)	143	2029	461	265	1164	135	176	745	294	214	1444	108
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Right	Left	Right
Median Width(m)	3.6		3.6		7.2		7.2					
Link Offset(m)	0.0		0.0		0.0		0.0		0.0		0.0	
Crosswalk Width(m)	4.8		4.8		4.8		4.8					
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25	15	25	15	25	15	25	15	25
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right									
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex											
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)	0.6		0.6		0.6		0.6		0.6		0.6	
Detector 2 Type	Cl+Ex											
Detector 2 Channel												
Detector 2 Extend (s)	0.0		0.0		0.0		0.0		0.0		0.0	

Lanes, Volumes, Timings

1: McLaughlin Road & Derry Road West

Total AM

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Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		6		4		3	8
Permitted Phases	2			2			6		4		3	8
Detector Phase	5	2	2	1	6		7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	5.0	12.0	12.0	5.0	12.0	12.0
Minimum Split (s)	14.0	60.0	60.0	14.0	60.0	60.0	14.0	61.0	61.0	15.0	72.0	72.0
Total Split (s)	14.0	60.0	60.0	14.0	60.0	60.0	14.0	65.0	65.0	21.0	72.0	72.0
Total Split (%)	8.8%	37.5%	37.5%	8.8%	37.5%	37.5%	8.8%	40.6%	40.6%	13.1%	45.0%	45.0%
Maximum Green (s)	11.0	53.2	53.2	11.0	53.2	53.2	9.0	57.9	57.9	16.0	64.9	64.9
Yellow Time (s)	3.0	4.6	4.6	3.0	4.6	4.6	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	0.0	2.2	2.2	0.0	2.2	2.2	2.0	3.1	3.1	2.0	3.1	3.1
Lost Time Adjust (s)	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 Lost Time (s)	3.0	6.8	6.8	3.0	6.8	6.8	5.0	7.1	7.1	5.0	7.1	7.1
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
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
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)	12.0		12.0		12.0		12.0		13.0		13.0	
Flash Dont Walk (s)	18.0		18.0		18.0		18.0		20.0		20.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Act Efect Green (s)	67.7	53.2	53.2	68.3	53.5	53.5	9.0	59.6	59.6	14.3	64.9	64.9
Actuated g/C Ratio	0.42	0.33	0.33	0.43	0.33	0.33	0.06	0.37	0.37	0.09	0.41	0.41
v/c Ratio	0.73	1.20	0.79	1.53	0.68	0.25	0.90	0.61	0.44	0.69	1.03	0.16
Control Delay	49.8	141.6	44.7	295.4	48.3	6.6	109.6	51.9	27.1	82.4	77.1	10.1
Queue Delay	0.0	0.0	1.3	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.5
Total Delay	49.8	141.6	46.0	298.4	48.3	6.6	109.6	51.9	27.1	82.4	108.5	10.1
LOS	D	F	D	F	D	A	F	D	C	F	F	B
Approach Delay		119.9			87.1			54.2		99.3		
Approach LOS		F			F			D		F		
Intersection Summary												
Area Type:	Other											
Cycle Length:	160											
Actuated Cycle Length:	160											
Offset: 14 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green												
Natural Cycle: 160												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.53												
Intersection Signal Delay: 96.6												
Intersection LOS: F												
ICU Level of Service G												
Analysis Period (min) 15												
Splits and Phases: 1: McLaughlin Road & Derry Road West												
	01	02 (R)	03	04	05	06 (R)	07	08				
14 s	60 s	21 s	65 s									
14 s	60 s	14 s	72 s									

Queues
1: McLaughlin Road & Derry Road West

Total AM
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Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	143	2029	461	265	1164	135	176	745	294	214	1444	108
v/c Ratio	0.73	1.20	0.79	1.53	0.68	0.25	0.90	0.61	0.44	0.69	1.03	0.16
Control Delay	49.8	141.6	44.7	295.4	48.3	6.6	109.6	51.9	27.1	82.4	77.1	10.1
Queue Delay	0.0	0.0	1.3	2.9	0.0	0.0	0.0	0.0	0.0	31.5	0.0	
Total Delay	49.8	141.6	46.0	298.4	48.3	6.6	109.6	51.9	27.1	82.4	108.5	10.1
Queue Length 50th (m)	28.7	-300.6	104.0	-106.7	123.5	0.0	32.0	100.3	38.3	36.2	-270.1	5.7
Queue Length 95th (m)	41.2	#293.0	134.3	#151.7	128.6	12.9	#50.1	115.2	52.6	47.4	#276.7	16.5
Internal Link Dist (m)		299.0			304.3			275.3			265.2	
Turn Bay Length (m)	70.0		50.0	140.0		105.0	40.0		45.0	80.0		75.0
Base Capacity (vph)	198	1690	586	173	1717	551	195	1221	672	346	1407	671
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	33	26	0	0	0	0	0	0	666	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.72	1.20	0.83	1.80	0.68	0.25	0.90	0.61	0.44	0.62	1.95	0.16

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: McLaughlin Road & Derry Road West

Total AM
180231

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑	↑↑↑	↑	↑↑	↑↑	↑	↑↑	↑	↑↑
Traffic Volume (vph)	120	1704	387	223	978	113	148	626	247	180	1213	91
Future Volume (vph)	120	1704	387	223	978	113	148	626	247	180	1213	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.8	6.8	3.0	6.8	6.8	5.0	7.1	7.1	5.0	7.1	7.1
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	0.95	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.89	1.00	1.00	0.95	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
Fr	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)	1768	5085	1500	1787	5136	1383	3467	3282	1523	3467	3471	1538
Flt Permitted	0.12	1.00	1.00	0.07	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	220	5085	1500	141	5136	1383	3467	3282	1523	3467	3471	1538
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	143	2029	461	265	1164	135	176	745	294	214	1444	108
RTOR Reduction (vph)	0	0	88	0	0	90	0	0	106	0	0	48
Lane Group Flow (vph)	143	2029	373	265	1164	45	176	745	188	214	1444	60
Confli. Peds. (#/hr)	62		32	32		62	25		25	25		25
Heavy Vehicles (%)	2%	2%	1%	1%	1%	4%	1%	10%	1%	1%	4%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6		6			4			8
Actuated Green, G (s)	63.9	53.2	53.2	64.5	53.5	53.5	9.0	59.6	59.6	14.3	64.9	64.9
Effective Green, g (s)	63.9	53.2	53.2	64.5	53.5	53.5	9.0	59.6	59.6	14.3	64.9	64.9
Actuated g/C Ratio	0.40	0.33	0.33	0.40	0.33	0.33	0.06	0.37	0.37	0.09	0.41	0.41
Clearance Time (s)	3.0	6.8	6.8	3.0	6.8	6.8	5.0	7.1	7.1	5.0	7.1	7.1
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)	191	1690	498	170	1717	462	195	1222	567	309	1407	623
v/s Ratio Prot	0.05	0.40	c0.11	0.23		c0.05	0.23		0.06	c0.42		
v/s Ratio Perm	0.25		0.25	c0.52		0.03			0.12			0.04
v/c Ratio	0.75	1.20	0.75	1.56	0.68	0.10	0.90	0.61	0.33	0.69	1.03	0.10
Uniform Delay, d1	34.6	53.4	47.5	46.0	45.8	36.6	75.1	40.8	35.9	70.7	47.5	29.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	1.21	1.63	1.00	1.00	1.00
Incremental Delay, d2	14.8	96.2	9.9	278.2	2.2	0.4	33.7	0.7	0.3	6.6	30.9	0.1
Delay (s)	49.4	149.6	57.4	324.2	48.0	37.1	106.6	49.9	58.7	77.3	78.5	29.5
Level of Service	D	F	E	F	D	D	F	D	E	E	E	C
Approach Delay (s)					128.0		93.9		60.2		75.3	
Approach LOS					F		F		E		E	
Intersection Summary												
HCM 2000 Control Delay						96.1						F
HCM 2000 Volume to Capacity ratio						1.27						
Actuated Cycle Length (s)						160.0		Sum of lost time (s)			21.9	
Intersection Capacity Utilization						102.1%		ICU Level of Service			G	
Analysis Period (min)						15						
c Critical Lane Group												

Queues
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Total AM
180231

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	91	447	67	111	129	1408	32	2769
v/c Ratio	0.30	0.95	1.43	0.25	0.83	0.60	0.19	1.32
Control Delay	52.2	75.1	321.2	22.3	77.5	12.9	11.9	171.6
Queue Delay	0.0	9.9	0.0	0.0	0.0	0.0	0.0	1.6
Total Delay	52.2	84.9	321.2	22.3	77.5	12.9	11.9	173.2
Queue Length 50th (m)	25.0	119.0	~30.0	11.8	31.9	87.5	2.6	~635.0
Queue Length 95th (m)	30.4	99.9	#43.2	16.1	37.5	70.7	m3.4	m367.2
Internal Link Dist (m)	109.1		128.5		339.0		275.3	
Turn Bay Length (m)	15.0		15.0		35.0		55.0	
Base Capacity (vph)	307	471	47	450	158	2339	165	2097
Starvation Cap Reductn	0	0	0	0	0	0	0	228
Spillback Cap Reductn	0	24	0	0	0	0	0	821
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	1.00	1.43	0.25	0.82	0.60	0.19	2.17
Intersection Summary								
~ Volume exceeds capacity, queue is theoretically infinite.								
Queue shown is maximum after two cycles.								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								
m Volume for 95th percentile queue is metered by upstream signal.								

HCM Signalized Intersection Capacity Analysis
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Total AM
180231

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↓	↑	↑	↓	↑	↑	↑↓	↑	↑	↑	↑↓
Traffic Volume (vph)	60	10	285	44	21	52	85	918	11	21	1777	51
Future Volume (vph)	60	10	285	44	21	52	85	918	11	21	1777	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5		3.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Fr	1.00	0.86		1.00	0.89		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1790	1585		1805	1624		1770	3498		1716	3555	
Flt Permitted	0.66	1.00		0.10	1.00		0.04	1.00		0.16	1.00	
Satd. Flow (perm)	1245	1585		192	1624		77	3498		280	3555	
Peak-hour factor, PHF	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Adj. Flow (vph)	91	15	432	67	32	79	129	1391	17	32	2692	77
RTOR Reduction (vph)	0	80	0	0	50	0	0	1	0	0	1	0
Lane Group Flow (vph)	91	367	0	67	61	0	129	1407	0	32	2768	0
Confl. Peds. (#/hr)	6		2	2		6	9		6	6	9	
Heavy Vehicles (%)	0%	0%	1%	0%	10%	0%	2%	3%	0%	5%	1%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		8			4			1	6		2	
Permitted Phases		8			4			6		2		
Actuated Green, G (s)	39.5	39.5		39.5	39.5		107.0	107.0		94.3	94.3	
Effective Green, g (s)	39.5	39.5		39.5	39.5		107.0	107.0		94.3	94.3	
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.67	0.67		0.59	0.59	
Clearance Time (s)	6.5	6.5		6.5	6.5		3.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	307	391		47	400		154	2339		165	2095	
v/s Ratio Prot	0.23			0.04			c0.05	0.40			c0.78	
v/s Ratio Perm	0.07		c0.35				0.51			0.11		
v/c Ratio	0.30	0.94		1.43	0.15		0.84	0.60		0.19	1.32	
Uniform Delay, d1	49.0	59.1		60.2	47.2		52.8	14.7		15.2	32.9	
Progression Factor	1.00	1.00		1.00	1.00		1.34	0.81		0.63	0.77	
Incremental Delay, d2	0.5	30.1		279.4	0.2		24.0	0.8		1.5	146.5	
Delay (s)	49.5	89.1		339.7	47.3		94.6	12.7		11.1	171.7	
Level of Service	D	F		F	D		F	B		B	F	
Approach Delay (s)		82.4			157.4			19.6			169.8	
Approach LOS		F			F			B			F	
Intersection Summary												
HCM 2000 Control Delay					114.4							
HCM 2000 Volume to Capacity ratio					1.31							
Actuated Cycle Length (s)					160.0							
Sum of lost time (s)								16.5				
Intersection Capacity Utilization					100.9%							
ICU Level of Service								G				
Analysis Period (min)								15				
c Critical Lane Group												

Lanes, Volumes, Timings
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Total AM
180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↓	↑	↓	↑	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	21	0	46	96	0	27	16	970	25	8	2079	6
Future Volume (vph)	21	0	46	96	0	27	16	970	25	8	2079	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0	0.0	0.0	0.0	30.0	0.0	35.0	0.0	0.0	0.0	0.0	0.0
Storage Lanes	1	0	0	0	1	0	1	0	1	0	0	0
Taper Length (m)	10.0			7.5			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95	0.95
Ped Bike Factor	1.00	0.98			0.99			1.00			1.00	
Frt	0.850			0.970			0.962			0.996		
Frt Protected	0.950			0.962			0.950			0.950		
Satd. Flow (prot)	1805	1558	0	0	1736	0	1687	3486	0	1444	3574	0
Frt Permitted	0.713			0.719			0.034			0.089		
Satd. Flow (perm)	1351	1558	0	0	1294	0	60	3486	0	135	3574	0
Right Turn on Red	Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)	27			27			4					
Link Speed (k/h)	50			50			70			70		
Link Distance (m)	120.7			123.6			410.1			363.0		
Travel Time (s)	8.7			8.9			21.1			18.7		
Conf. Peds. (#/hr)	3	2	2	3	12		6	6		12		
Peak Hour Factor	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Heavy Vehicles (%)	0%	0%	2%	0%	0%	8%	7%	3%	4%	25%	1%	0%
Adj. Flow (vph)	38	0	82	171	0	48	29	1732	45	14	3713	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	38	82	0	0	219	0	29	1777	0	14	3724	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Left	Right	
Median Width(m)	3.6			3.6			3.6			3.6		
Link Offset(m)	0.0			0.0			0.0			0.0		
Crosswalk Width(m)	4.8			4.8			4.8			4.8		
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	2		1	2		1	2		
Detector Template	Left	Thru	Left	Thru		Left	Thru		Left	Thru		
Leading Detector (m)	2.0	10.0	2.0	10.0		2.0	10.0		2.0	10.0		
Trailing Detector (m)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Detector 1 Position(m)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Detector 1 Size(m)	2.0	0.6	2.0	0.6		2.0	0.6		2.0	0.6		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Detector 2 Position(m)	9.4		9.4			9.4			9.4			
Detector 2 Size(m)	0.6		0.6			0.6			0.6			
Detector 2 Type	Cl+Ex		Cl+Ex			Cl+Ex			Cl+Ex			
Detector 2 Channel												
Detector 2 Extend (s)	0.0		0.0			0.0			0.0			

Paradigm Transportation Solutions Limited

Synchro 9 Report
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Lanes, Volumes, Timings
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Total AM
180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8			2			6	
Permitted Phases		4			8			2			6	
Detector Phase		4			8			2			6	
Switch Phase												
Minimum Initial (s)	1.0	1.0			5.0	5.0		5.0	5.0		5.0	5.0
Minimum Split (s)	40.0	40.0			40.0	40.0		120.0	120.0		120.0	120.0
Total Split (s)	40.0	40.0			40.0	40.0		120.0	120.0		120.0	120.0
Total Split (%)	25.0%	25.0%			25.0%	25.0%		75.0%	75.0%		75.0%	75.0%
Maximum Green (s)	33.5	33.5			33.5	33.5		113.0	113.0		113.0	113.0
Yellow Time (s)	4.0	4.0			4.0	4.0		5.0	5.0		5.0	5.0
All-Red Time (s)	2.5	2.5			2.5	2.5		2.0	2.0		2.0	2.0
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0	0.0		0.0	0.0
Total Lost Time (s)	6.5	6.5			6.5	6.5		7.0	7.0		7.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0	3.0		3.0	3.0
Recall Mode	None	None			None	None		C-Max	C-Max		C-Max	C-Max
Walk Time (s)	10.0	10.0			10.0	10.0		8.0	8.0		8.0	8.0
Flash Dont Walk (s)	14.0	14.0			14.0	14.0		10.0	10.0		10.0	10.0
Pedestrian Calls (#/hr)	0	0			0	0		0	0		0	0
Act Efect Green (s)	28.2	28.2			28.2	28.2		118.3	118.3		118.3	118.3
Actuated g/C Ratio	0.18	0.18			0.18	0.18		0.74	0.74		0.74	0.74
v/c Ratio	0.16	0.28			0.88	0.66		0.69	0.14		1.41	
Control Delay	55.0	38.6			87.6	82.1		13.5	4.5		202.5	
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0		0.0	0.2
Total Delay	55.0	38.6			87.6	82.1		13.5	4.5		202.7	
LOS	D	D			F	F		B	A		F	
Approach Delay					43.8			87.6			14.6	201.9
Approach LOS					D			F			B	
Intersection Summary												
Area Type:	Other											
Cycle Length:	160											
Actuated Cycle Length:	160											
Offset: 122 (76%), Referenced to phase 2:NBT and 6:SBTL, Start of Green												
Natural Cycle: 160												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.41												
Intersection Signal Delay: 137.0												
Intersection LOS: F												
ICU Level of Service E												
Analysis Period (min) 15												
Splits and Phases: 3: McLaughlin Road & Rothschild Trail/Ramonet Drive												

Paradigm Transportation Solutions Limited

Synchro 9 Report
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Queues
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Total AM
180231

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	38	82	219	29	1777	14	3724
v/c Ratio	0.16	0.28	0.88	0.66	0.69	0.14	1.41
Control Delay	55.0	38.6	87.6	82.1	13.5	4.5	202.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Total Delay	55.0	38.6	87.6	82.1	13.5	4.5	202.7
Queue Length 50th (m)	10.8	15.7	63.3	4.7	158.2	0.7	~896.5
Queue Length 95th (m)	13.3	16.4	49.7	11.0	85.2	m0.6	253.2
Internal Link Dist (m)	96.7	99.6		386.1		339.0	
Turn Bay Length (m)	20.0		30.0		35.0		
Base Capacity (vph)	282	347	292	44	2578	99	2642
Starvation Cap Reductn	0	0	0	0	0	0	181
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.24	0.75	0.66	0.69	0.14	1.51
Intersection Summary							
~ Volume exceeds capacity, queue is theoretically infinite.							
Queue shown is maximum after two cycles.							
m Volume for 95th percentile queue is metered by upstream signal.							

HCM Signalized Intersection Capacity Analysis
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

Total AM
180231

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑		↓	↓		↑	↑	↑	↑	↑	
Traffic Volume (vph)	21	0	46	96	0	27	16	970	25	8	2079	6
Future Volume (vph)	21	0	46	96	0	27	16	970	25	8	2079	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	0.95	1.00	0.95
Frpb, ped/bikes	1.00	0.98			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85			0.97		1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00			0.96		0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1800	1558			1732		1687	3487	1444	3572		
Flt Permitted	0.71	1.00			0.72		0.03	1.00	0.09	1.00		
Satd. Flow (perm)	1352	1558			1294		60	3487	135	3572		
Peak-hour factor, PHF	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Adj. Flow (vph)	38	0	82	171	0	48	29	1732	45	14	3712	11
RTOR Reduction (vph)	0	22	0	0	22	0	0	1	0	0	0	0
Lane Group Flow (vph)	38	60	0	0	197	0	29	1776	0	14	3724	0
Confli. Peds. (#/hr)	3		2	2		3	12		6	6	12	
Heavy Vehicles (%)	0%	0%	2%	0%	0%	8%	7%	3%	4%	25%	1%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8				2		6	
Permitted Phases		4			8			2		6		
Actuated Green, G (s)	28.2	28.2			28.2		118.3	118.3		118.3	118.3	
Effective Green, g (s)	28.2	28.2			28.2		118.3	118.3		118.3	118.3	
Actuated g/C Ratio	0.18	0.18			0.18		0.74	0.74		0.74	0.74	
Clearance Time (s)	6.5	6.5			6.5		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	238	274			228		44	2578	99	2641		
v/s Ratio Prot		0.04					0.51			c1.04		
v/s Ratio Perm		0.03			c0.15		0.48			0.10		
v/c Ratio	0.16	0.22			0.86		0.66	0.69		0.14	1.41	
Uniform Delay, d1	55.9	56.5			64.0		10.6	11.1		6.1	20.9	
Progression Factor	1.00	1.00			1.00		1.00	1.00		0.51	0.55	
Incremental Delay, d2	0.3	0.4			26.9		57.5	1.5		0.3	184.7	
Delay (s)	56.2	56.9			90.9		68.1	12.6		3.4	196.2	
Level of Service	E	E			F		E	B		A	F	
Approach Delay (s)		56.6			90.9			13.5			195.4	
Approach LOS	E			F			B			F		
Intersection Summary												
HCM 2000 Control Delay					132.9		HCM 2000 Level of Service			F		
HCM 2000 Volume to Capacity ratio					1.30							
Actuated Cycle Length (s)					160.0		Sum of lost time (s)			13.5		
Intersection Capacity Utilization					83.2%		ICU Level of Service			E		
Analysis Period (min)					15							
c Critical Lane Group												

Lanes, Volumes, Timings

1: McLaughlin Road & Derry Road West

Total PM

180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑	↑↑↑	↑	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑
Traffic Volume (vph)	206	824	108	230	1697	356	214	1149	112	190	623	206
Future Volume (vph)	206	824	108	230	1697	356	214	1149	112	190	623	206
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	70.0	50.0	140.0	105.0	40.0		45.0	80.0		75.0		
Storage Lanes	1	1	1	1	2		1	2		1		
Taper Length (m)	30.0		30.0		30.0			30.0				
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor			0.85	0.97		0.91	0.97		0.95	0.99		0.91
Frt			0.850		0.850			0.850		0.850		
Flt Protected	0.950		0.950			0.950			0.950			
Satd. Flow (prot)	1805	5136	1615	1770	5136	1599	3502	3471	1615	3502	3282	1599
Flt Permitted	0.075		0.204			0.950			0.950			
Satd. Flow (perm)	142	5136	1375	369	5136	1454	3400	3471	1529	3477	3282	1459
Right Turn on Red	Yes		Yes			Yes			Yes			
Satd. Flow (RTOR)		87			143			80			154	
Link Speed (k/h)	70		70		70			70				
Link Distance (m)	323.0		328.3		299.3			289.2				
Travel Time (s)	16.6		16.9		15.4			14.9				
Confli. Peds. (#/hr)	50	87	87	50	53		29	29		53		
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89		
Heavy Vehicles (%)	0%	1%	0%	2%	1%	1%	0%	4%	0%	0%	10%	1%
Adj. Flow (vph)	231	926	121	258	1907	400	240	1291	126	213	700	231
Shared Lane Traffic (%)												
Lane Group Flow (vph)	231	926	121	258	1907	400	240	1291	126	213	700	231
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Left	Right	
Median Width(m)	3.6		3.6			7.2			7.2			
Link Offset(m)	0.0		0.0			0.0			0.0			
Crosswalk Width(m)	4.8		4.8		4.8			4.8				
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right									
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex											
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)	0.6		0.6			0.6			0.6			
Detector 2 Type	Cl+Ex											
Detector 2 Channel												
Detector 2 Extend (s)	0.0		0.0			0.0			0.0			

Lanes, Volumes, Timings

1: McLaughlin Road & Derry Road West

Total PM

180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		6			4		
Permitted Phases	2			2			6			4		
Detector Phase	5	2	2	1	6		7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	7.0	12.0	12.0	7.0	12.0	12.0	5.0	12.0	12.0	5.0	12.0	12.0
Minimum Split (s)	15.0	60.0	60.0	13.0	58.0	58.0	15.0	72.0	72.0	15.0	72.0	72.0
Total Split (s)	15.0	60.0	60.0	13.0	58.0	58.0	15.0	72.0	72.0	15.0	72.0	72.0
Total Split (%)	9.4%	37.5%	37.5%	8.1%	36.3%	36.3%	9.4%	45.0%	45.0%	9.4%	45.0%	45.0%
Maximum Green (s)	12.0	53.2	53.2	10.0	51.2	51.2	10.0	64.9	64.9	10.0	64.9	64.9
Yellow Time (s)	3.0	4.6	4.6	3.0	4.6	4.6	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	0.0	2.2	2.2	0.0	2.2	2.2	0.0	3.1	3.1	2.0	3.1	3.1
Lost Time Adjust (s)	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 Lost Time (s)	3.0	6.8	6.8	3.0	6.8	6.8	5.0	7.1	7.1	5.0	7.1	7.1
Lead/Lag	Lead	Lag	Lag									
Lead-Lag Optimize?	Yes											
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
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		12.0	12.0		12.0	12.0		13.0	13.0		13.0	13.0
Flash Dont Walk (s)		18.0	18.0		18.0	18.0		20.0	20.0		20.0	20.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Act Efect Green (s)	70.6	53.2	53.2	66.6	51.2	51.2	10.0	63.3	63.3	10.0	63.3	63.3
Actuated g/C Ratio	0.44	0.33	0.33	0.42	0.32	0.32	0.06	0.40	0.40	0.06	0.40	0.40
v/c Ratio	1.14	0.54	0.23	1.01	1.16	0.71	1.10	0.94	0.19	0.98	0.54	0.34
Control Delay	142.0	44.9	13.8	95.7	127.0	38.0	155.4	53.3	10.3	128.2	38.8	12.3
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	142.0	44.9	13.8	95.7	127.0	38.0	155.4	53.3	10.3	128.2	38.8	12.3
LOS	F	D	B	F	F	D	F	D	B	F	D	B
Approach Delay		59.5			110.0			64.8			50.1	
Approach LOS		E			F			E			D	
Intersection Summary												
Area Type:	Other											
Cycle Length:	160											
Actuated Cycle Length:	160											
Offset: 18 (11%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green												
Natural Cycle: 160												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.16												
Intersection Signal Delay: 78.7												
Intersection LOS: E												
ICU Level of Service G												
Analysis Period (min) 15												
Splits and Phases: 1: McLaughlin Road & Derry Road West												

Queues

1: McLaughlin Road & Derry Road West

Total PM

180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	231	926	121	258	1907	400	240	1291	126	213	700	231
v/c Ratio	1.14	0.54	0.23	1.01	1.16	0.71	1.10	0.94	0.19	0.98	0.54	0.34
Control Delay	142.0	44.9	13.8	95.7	127.0	38.0	155.4	53.3	10.3	128.2	38.8	12.3
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	142.0	44.9	13.8	95.7	127.0	38.0	155.4	53.3	10.3	128.2	38.8	12.3
Queue Length 50th (m)	~78.1	92.6	7.8	~64.4	~275.7	78.4	~46.4	207.5	3.8	37.4	92.7	16.1
Queue Length 95th (m)	#135.0	106.3	23.7	#121.4	#299.5	119.1	#76.8	238.7	15.0	#64.8	111.3	37.2
Internal Link Dist (m)	299.0			304.3			275.3			265.2		
Turn Bay Length (m)	70.0		50.0	140.0		105.0	40.0		45.0	80.0		75.0
Base Capacity (vph)	203	1707	515	255	1643	562	218	1407	667	218	1331	683
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	1.14	0.54	0.23	1.01	1.16	0.71	1.10	0.92	0.19	0.98	0.53	0.34

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: McLaughlin Road & Derry Road West

Total PM

180231

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑	↑↑↑	↑	↑↑	↑↑	↑	↑↑	↑↑	↑↑
Traffic Volume (vph)	206	824	108	230	1697	356	214	1149	112	190	623	206
Future Volume (vph)	206	824	108	230	1697	356	214	1149	112	190	623	206
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.8	6.8	3.0	6.8	6.8	5.0	7.1	7.1	5.0	7.1	7.1
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	0.95	0.95	1.00	0.97	1.00
Frpb, ped/bikes	1.00	1.00	0.85	1.00	1.00	0.91	1.00	1.00	0.95	1.00	1.00	0.91
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
Fr	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)	1805	5136	1375	1762	5136	1454	3502	3471	1529	3502	3282	1459
Flt Permitted	0.08	1.00	1.00	0.20	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	143	5136	1375	378	5136	1454	3502	3471	1529	3502	3282	1459
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	231	926	121	258	1907	400	240	1291	126	213	700	231
RTOR Reduction (vph)	0	0	58	0	0	97	0	0	48	0	0	93
Lane Group Flow (vph)	231	926	63	258	1907	303	240	1291	78	213	700	138
Confl. Peds. (#/hr)	50		87	87		50	53		29	29		53
Heavy Vehicles (%)	0%	1%	0%	2%	1%	1%	0%	4%	0%	0%	10%	1%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6		6				4		8
Actuated Green, G (s)	66.8	53.2	53.2	62.8	51.2	51.2	10.0	63.3	10.0	63.3	10.0	63.3
Effective Green, g (s)	66.8	53.2	53.2	62.8	51.2	51.2	10.0	63.3	10.0	63.3	10.0	63.3
Actuated g/C Ratio	0.42	0.33	0.33	0.39	0.32	0.32	0.06	0.40	0.40	0.06	0.40	0.40
Clearance Time (s)	3.0	6.8	6.8	3.0	6.8	6.8	5.0	7.1	7.1	5.0	7.1	7.1
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)	200	1707	457	248	1643	465	218	1373	604	218	1298	577
v/s Ratio Prot	c0.10	0.18		0.08	0.37		c0.07	c0.37		0.06	0.21	
v/s Ratio Perm	c0.38		0.05	0.33		0.21			0.05		0.09	
v/c Ratio	1.16	0.54	0.14	1.04	1.16	0.65	1.10	0.94	0.13	0.98	0.54	0.24
Uniform Delay, d1	48.9	43.5	37.4	42.1	54.4	46.7	75.0	46.5	30.8	74.9	37.1	32.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.11	0.90	0.81	1.00	1.00	1.00
Incremental Delay, d2	111.6	1.2	0.6	68.1	79.5	6.9	83.6	10.5	0.1	53.9	0.4	0.2
Delay (s)	160.6	44.7	38.0	110.1	133.9	53.6	166.9	52.4	25.0	128.7	37.6	32.5
Level of Service	F	D	D	F	F	D	F	D	C	F	D	C
Approach Delay (s)		65.0			119.0			66.9			53.5	
Approach LOS		E			F			E			D	
Intersection Summary												
HCM 2000 Control Delay					84.3							F
HCM 2000 Volume to Capacity ratio					1.07							
Actuated Cycle Length (s)					160.0							G
Intersection Capacity Utilization					100.5%							
Analysis Period (min)					15							
c Critical Lane Group												

Lanes, Volumes, Timings
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

Total PM
180231

Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↓	↑	↑	↓	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	32	19	63	10	7	48	173	1388	3	72	873	65
Future Volume (vph)	32	19	63	10	7	48	173	1388	3	72	873	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	15.0		0.0	15.0		0.0	35.0		0.0	55.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	20.0		20.0		30.0		30.0					
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	0.99	0.99		1.00	0.98			1.00			1.00	
Frt		0.885			0.869					0.990		
Flt Protected	0.950		0.950			0.950			0.950			
Satd. Flow (prot)	1805	1660	0	1805	1618	0	1787	3574	0	1805	3527	0
Flt Permitted	0.693		0.466			0.168		0.100				
Satd. Flow (perm)	1303	1660	0	882	1618	0	316	3574	0	190	3527	0
Right Turn on Red		Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)	89			19					8			
Link Speed (k/h)	50		50			70		70				
Link Distance (m)	133.1		152.5			363.0		299.3				
Travel Time (s)	9.6		11.0			18.7			15.4			
Conf. Peds. (#/hr)	7	3	3	7	11		15	15		11		
Peak Hour Factor	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71		
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	1%	0%
Adj. Flow (vph)	45	27	89	14	10	68	244	1955	4	101	1230	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	45	116	0	14	78	0	244	1959	0	101	1322	0
Enter Blocked Intersection	No	No										
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Left	Right	
Median Width(m)	3.6		3.6			7.2			7.2			
Link Offset(m)	0.0		0.0			0.0			0.0			
Crosswalk Width(m)	4.8		4.8			4.8			4.8			
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)	0.6		0.6			0.6			0.6			
Detector 2 Type	Cl+Ex		Cl+Ex			Cl+Ex			Cl+Ex			
Detector 2 Channel												
Detector 2 Extend (s)	0.0		0.0			0.0			0.0			

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Lanes, Volumes, Timings
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

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Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		8			4			1	6		2	
Permitted Phases		8		8	4	4		1	6	2	2	
Detector Phase												
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	5.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	46.0	46.0	46.0	46.0	46.0	46.0	13.0	114.0	101.0	101.0	101.0	101.0
Total Split (s)	46.0	46.0	46.0	46.0	46.0	46.0	13.0	114.0	101.0	101.0	101.0	101.0
Total Split (%)	28.8%	28.8%	28.8%	28.8%	28.8%	28.8%	8.1%	71.3%	63.1%	63.1%	63.1%	63.1%
Maximum Green (s)	39.5	39.5	39.5	39.5	39.5	39.5	10.0	107.0	94.0	94.0	94.0	94.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.5	2.5	2.5	2.5	2.5	2.5	0.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	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 Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	3.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag							Lead		Lag		Lag	
Lead-Lag Optimize?							Yes		Yes		Yes	
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
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	10.0	10.0	10.0	10.0	10.0	10.0		8.0		8.0	8.0	8.0
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0	20.0		15.0		15.0	15.0	15.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Act Efect Green (s)	11.7	11.7	11.7	11.7	11.7	11.7	138.8	134.8	116.9	116.9	116.9	116.9
Actuated g/C Ratio	0.07	0.07	0.07	0.07	0.07	0.07	0.87	0.84	0.73	0.73	0.73	0.73
v/c Ratio	0.47	0.57	0.22	0.58	0.59	0.65	0.59	0.65	0.73	0.51		
Control Delay	86.2	31.7	76.0	70.0	12.2	2.8	40.9	6.0				
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1		
Total Delay	86.2	31.7	76.0	70.0	12.2	2.9	40.9	6.1				
LOS	F	C	E	E	B	A	D	A				
Approach Delay		46.9			70.9		4.0		8.6			
Approach LOS		D			E		A		A			
Intersection Summary												
Area Type:	Other											
Cycle Length:	160											
Actuated Cycle Length:	160											
Offset: 94 (59%)												
Referenced to phase 2:SBTL and 6:NBT, Start of Green												
Natural Cycle: 160												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 0.73												
Intersection Signal Delay: 9.0												
Intersection LOS: A												
ICU Level of Service D												
Analysis Period (min) 15												
Splits and Phases:	2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive											
	01 (R)		02 (R)		04							
	13 s		101 s		46 s							
	06 (R)				08							
	114 s		46 s		46 s							

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Queues
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

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Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	45	116	14	78	244	1959	101	1322
v/c Ratio	0.47	0.57	0.22	0.58	0.59	0.65	0.73	0.51
Control Delay	86.2	31.7	76.0	70.0	12.2	2.8	40.9	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.2	0.0	0.1	
Total Delay	86.2	31.7	76.0	70.0	12.2	2.9	40.9	6.1
Queue Length 50th (m)	14.8	8.7	4.5	19.4	4.8	29.6	7.9	47.2
Queue Length 95th (m)	22.2	16.7	9.8	27.4	7.6	30.4	m36.8	53.0
Internal Link Dist (m)	109.1		128.5		339.0		275.3	
Turn Bay Length (m)	15.0		15.0		35.0		55.0	
Base Capacity (vph)	321	476	217	413	411	3010	138	2578
Starvation Cap Reductn	0	0	0	0	0	264	0	261
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.24	0.06	0.19	0.59	0.71	0.73	0.57

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
2: McLaughlin Road & Novo Star Drive/Arrowsmith Drive

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↑	↑	↑	↑	↑	↑↑	↑	↑	↑↑	↑↑
Traffic Volume (vph)	32	19	63	10	7	48	173	1388	3	72	873	65
Future Volume (vph)	32	19	63	10	7	48	173	1388	3	72	873	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5		3.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frbp, ped/bikes	1.00	0.99		1.00	0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Fr	1.00	0.88		1.00	0.87		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1660		1798	1618		1787	3573		1800	3525	
Flt Permitted	0.69	1.00		0.47	1.00		0.17	1.00		0.10	1.00	
Satd. Flow (perm)	1304	1660		881	1618		315	3573		190	3525	
Peak-hour factor, PHF	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Adj. Flow (vph)	45	27	89	14	10	68	244	1955	4	101	1230	92
RTOR Reduction (vph)	0	82	0	0	18	0	0	0	0	0	2	0
Lane Group Flow (vph)	45	34	0	14	60	0	244	1959	0	101	1320	0
Confl. Peds. (#/hr)	7		3	3		7	11		15	15	11	
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	1%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		8			4			1	6		2	
Permitted Phases		8			4			6			2	
Actuated Green, G (s)	11.7	11.7		11.7	11.7		134.8	134.8		116.9	116.9	
Effective Green, g (s)	11.7	11.7		11.7	11.7		134.8	134.8		116.9	116.9	
Actuated g/C Ratio	0.07	0.07		0.07	0.07		0.84	0.84		0.73	0.73	
Clearance Time (s)	6.5	6.5		6.5	6.5		3.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	95	121		64	118		402	3010		138	2575	
v/s Ratio Prot	0.02		c0.04		0.06	c0.55				0.37		
v/s Ratio Perm	0.03		0.02		0.45					c0.53		
v/c Ratio	0.47	0.28		0.22	0.51		0.61	0.65		0.73	0.51	
Uniform Delay, d1	71.2	70.1		69.8	71.4		6.8	4.4		12.5	9.3	
Progression Factor	1.00	1.00		1.00	1.00		2.89	0.45		0.69	0.53	
Incremental Delay, d2	3.7	1.2		1.7	3.7		1.4	0.6		26.4	0.7	
Delay (s)	74.9	71.4		71.6	75.1		21.0	2.6		34.9	5.6	
Level of Service	E	E		E	E		C	A		C	A	
Approach Delay (s)		72.4			74.6			4.6			7.7	
Approach LOS		E			E			A			A	
Intersection Summary												
HCM 2000 Control Delay					10.2					B		
HCM 2000 Volume to Capacity ratio					0.70							
Actuated Cycle Length (s)					160.0					D		
Intersection Capacity Utilization					73.1%							
Analysis Period (min)							15					
c Critical Lane Group												

Lanes, Volumes, Timings
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

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Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↓	↑	↓	↑	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	13	1	16	29	2	9	31	1597	73	19	879	23
Future Volume (vph)	13	1	16	29	2	9	31	1597	73	19	879	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0	0.0	0.0	0.0	30.0	0.0	35.0	0.0	0.0	0.0	0.0	0.0
Storage Lanes	1	0	0	0	1	0	1	0	1	0	0	0
Taper Length (m)	10.0			7.5			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95	0.95
Ped Bike Factor	0.99	0.99			0.99			1.00			1.00	
Frt	0.861			0.970			0.993			0.996		
Frt Protected	0.950			0.965			0.950			0.950		
Satd. Flow (prot)	1805	1501	0	0	1721	0	1805	3545	0	1805	3517	0
Frt Permitted	0.748			0.768			0.181			0.030		
Satd. Flow (perm)	1411	1501	0	0	1365	0	344	3545	0	57	3517	0
Right Turn on Red	Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)	25			8			7			4		
Link Speed (k/h)	50			50			70			70		
Link Distance (m)	120.7			123.6			410.1			363.0		
Travel Time (s)	8.7			8.9			21.1			18.7		
Conf. Peds. (#/hr)	4	2	2	4	8		4	4		4		8
Peak Hour Factor	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Heavy Vehicles (%)	0%	0%	8%	4%	0%	0%	0%	1%	0%	0%	2%	6%
Adj. Flow (vph)	20	2	25	45	3	14	48	2457	112	29	1352	35
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	27	0	0	62	0	48	2569	0	29	1387	0
Enter Blocked Intersection	No	No	No	No	No							
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Left	Right	
Median Width(m)	3.6			3.6			3.6			3.6		
Link Offset(m)	0.0			0.0			0.0			0.0		
Crosswalk Width(m)	4.8			4.8			4.8			4.8		
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)	0.6			0.6			0.6			0.6		
Detector 2 Type	Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		

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Lanes, Volumes, Timings
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

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Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA										
Protected Phases		4			8			2			6	
Permitted Phases		4		4	4		8	8		2	2	
Detector Phase											6	6
Switch Phase												
Minimum Initial (s)	1.0	1.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	40.0	40.0		40.0	40.0		120.0	120.0		120.0	120.0	
Total Split (s)	40.0	40.0		40.0	40.0		120.0	120.0		120.0	120.0	
Total Split (%)	25.0%	25.0%		25.0%	25.0%		75.0%	75.0%		75.0%	75.0%	
Maximum Green (s)	33.5	33.5		33.5	33.5		113.0	113.0		113.0	113.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		5.0	5.0		5.0	5.0	
All-Red Time (s)	2.5	2.5		2.5	2.5		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.5	6.5		6.5	6.5		7.0	7.0		7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	10.0	10.0		10.0	10.0		8.0	8.0		8.0	8.0	
Flash Dont Walk (s)	14.0	14.0		14.0	14.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Efect Green (s)	11.5	11.5		11.6			138.8	138.8		138.8	138.8	
Actuated g/C Ratio	0.07	0.07		0.07	0.07		0.87	0.87		0.87	0.87	
v/c Ratio	0.20	0.21		0.58			0.16	0.84		0.59	0.45	
Control Delay	72.2	27.6		83.0			4.1	10.8		58.5	2.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	72.2	27.6		83.0			4.1	10.8		58.5	2.7	
LOS	E	C		F			A	B		E	A	
Approach Delay		46.6			83.0			10.6			3.8	
Approach LOS		D			F			B			A	
Intersection Summary												
Area Type:	Other											
Cycle Length:	160											
Actuated Cycle Length:	160											
Offset: 69 (43%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green												
Natural Cycle: 160												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 0.84												
Intersection Signal Delay: 9.8												
Intersection LOS: A												
ICU Level of Service C												
Analysis Period (min) 15												
Splits and Phases: 3: McLaughlin Road & Rothschild Trail/Ramonet Drive												

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Queues
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

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Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	20	27	62	48	2569	29	1387
v/c Ratio	0.20	0.21	0.58	0.16	0.84	0.59	0.45
Control Delay	72.2	27.6	83.0	4.1	10.8	58.5	2.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.2	27.6	83.0	4.1	10.8	58.5	2.7
Queue Length 50th (m)	6.4	0.6	17.8	2.4	208.1	1.6	39.8
Queue Length 95th (m)	11.2	5.9	23.2	4.5	121.1	12.8	30.8
Internal Link Dist (m)	96.7	99.6		386.1		339.0	
Turn Bay Length (m)	20.0		30.0		35.0		
Base Capacity (vph)	295	334	292	298	3076	49	3052
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.08	0.21	0.16	0.84	0.59	0.45

Intersection Summary

HCM Signalized Intersection Capacity Analysis
3: McLaughlin Road & Rothschild Trail/Ramonet Drive

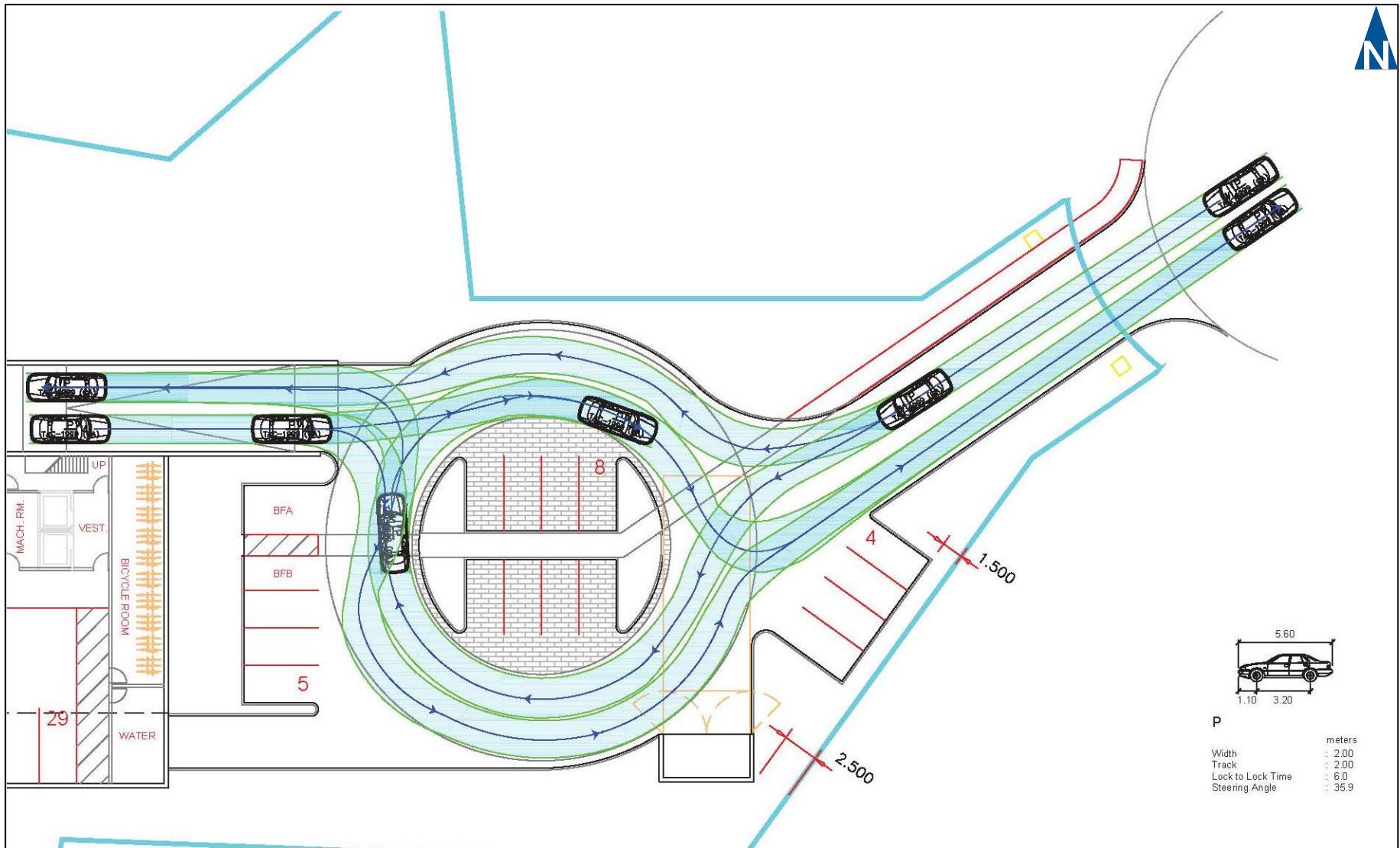
Total PM
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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑		↓	↓		↑	↑	↑	↑	↑	
Traffic Volume (vph)	13	1	16	29	2	9	31	1597	73	19	879	23
Future Volume (vph)	13	1	16	29	2	9	31	1597	73	19	879	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	0.95	1.00	0.95
Frpb, ped/bikes	1.00	0.99			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	0.99	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Fr	1.00	0.86			0.97		1.00	0.99	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00			0.96		0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1793	1501			1715		1798	3547	1805	3517		
Flt Permitted	0.75	1.00			0.77		0.18	1.00	0.03	1.00		
Satd. Flow (perm)	1412	1501			1365		343	3547	57	3517		
Peak-hour factor, PHF	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Adj. Flow (vph)	20	2	25	45	3	14	48	2457	112	29	1352	35
RTOR Reduction (vph)	0	23	0	0	7	0	0	1	0	0	1	0
Lane Group Flow (vph)	20	4	0	0	55	0	48	2568	0	29	1386	0
Confl. Peds. (#/hr)	4		2	2		4	8		4	4	4	8
Heavy Vehicles (%)	0%	0%	8%	4%	0%	0%	0%	1%	0%	0%	2%	6%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8				2		6	
Permitted Phases		4				2				6		
Actuated Green, G (s)	10.4	10.4			10.4		136.1	136.1		136.1	136.1	
Effective Green, g (s)	10.4	10.4			10.4		136.1	136.1		136.1	136.1	
Actuated g/C Ratio	0.07	0.07			0.07		0.85	0.85		0.85	0.85	
Clearance Time (s)	6.5	6.5			6.5		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	91	97			88		291	3017		48	2991	
v/s Ratio Prot		0.00				c0.72					0.39	
v/s Ratio Perm		0.01			c0.04		0.14			0.51		
v/c Ratio		0.22	0.04		0.62		0.16	0.85		0.60	0.46	
Uniform Delay, d1	71.0	70.1			72.9		2.1	6.5		3.7	2.9	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.61	0.70	
Incremental Delay, d2	1.2	0.2			12.3		1.2	3.3		41.8	0.5	
Delay (s)	72.2	70.3			85.2		3.3	9.7		47.7	2.5	
Level of Service	E	E			F		A	A		D	A	
Approach Delay (s)		71.1			85.2			9.6			3.4	
Approach LOS		E			F		A				A	
Intersection Summary												
HCM 2000 Control Delay					9.3		HCM 2000 Level of Service			A		
HCM 2000 Volume to Capacity ratio					0.83							
Actuated Cycle Length (s)					160.0		Sum of lost time (s)			13.5		
Intersection Capacity Utilization					68.1%		ICU Level of Service			C		
Analysis Period (min)							15					
c Critical Lane Group												

Appendix F

Reduced Scale AutoTURN Plots

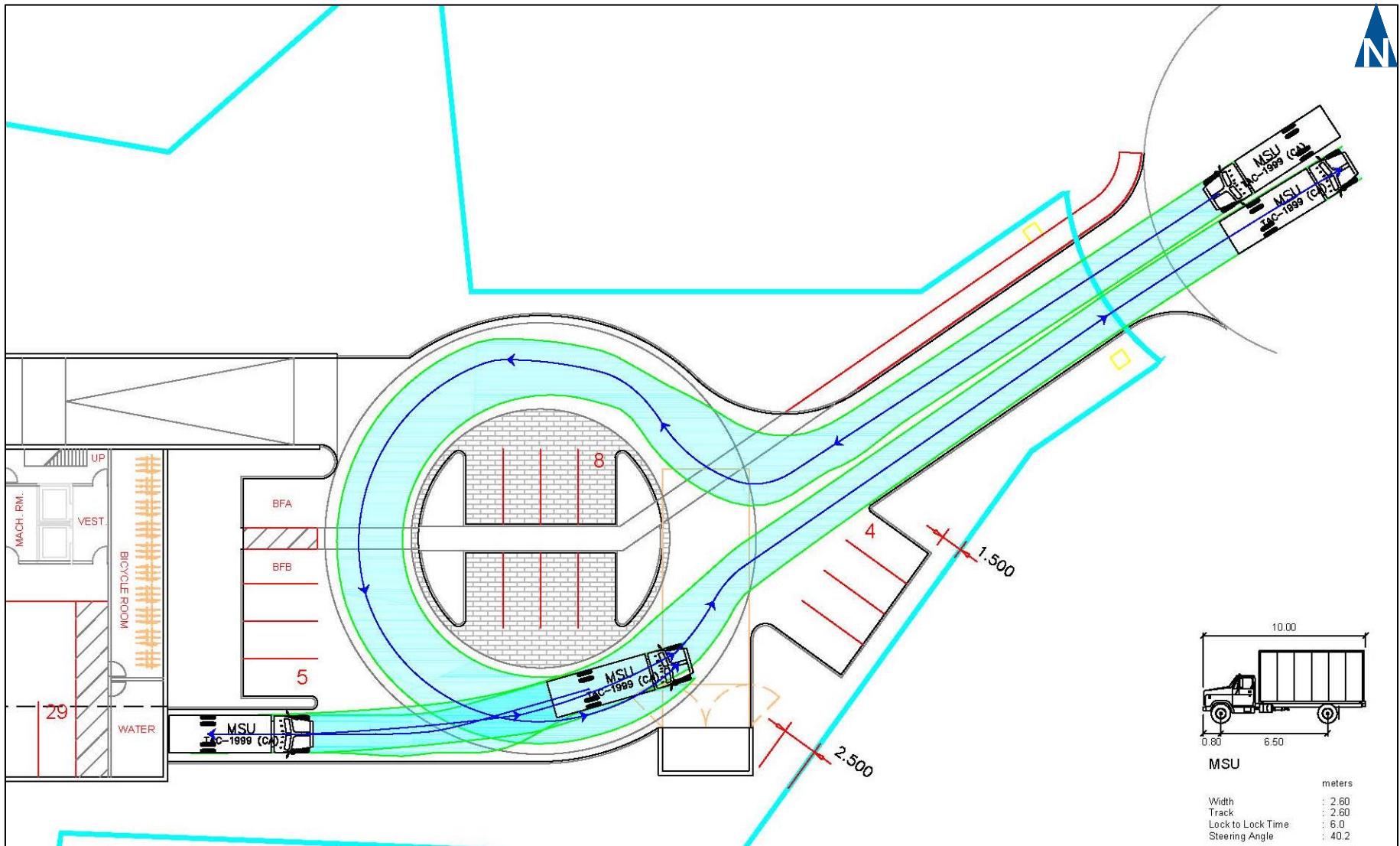




AutoTURN Analysis Passenger Car

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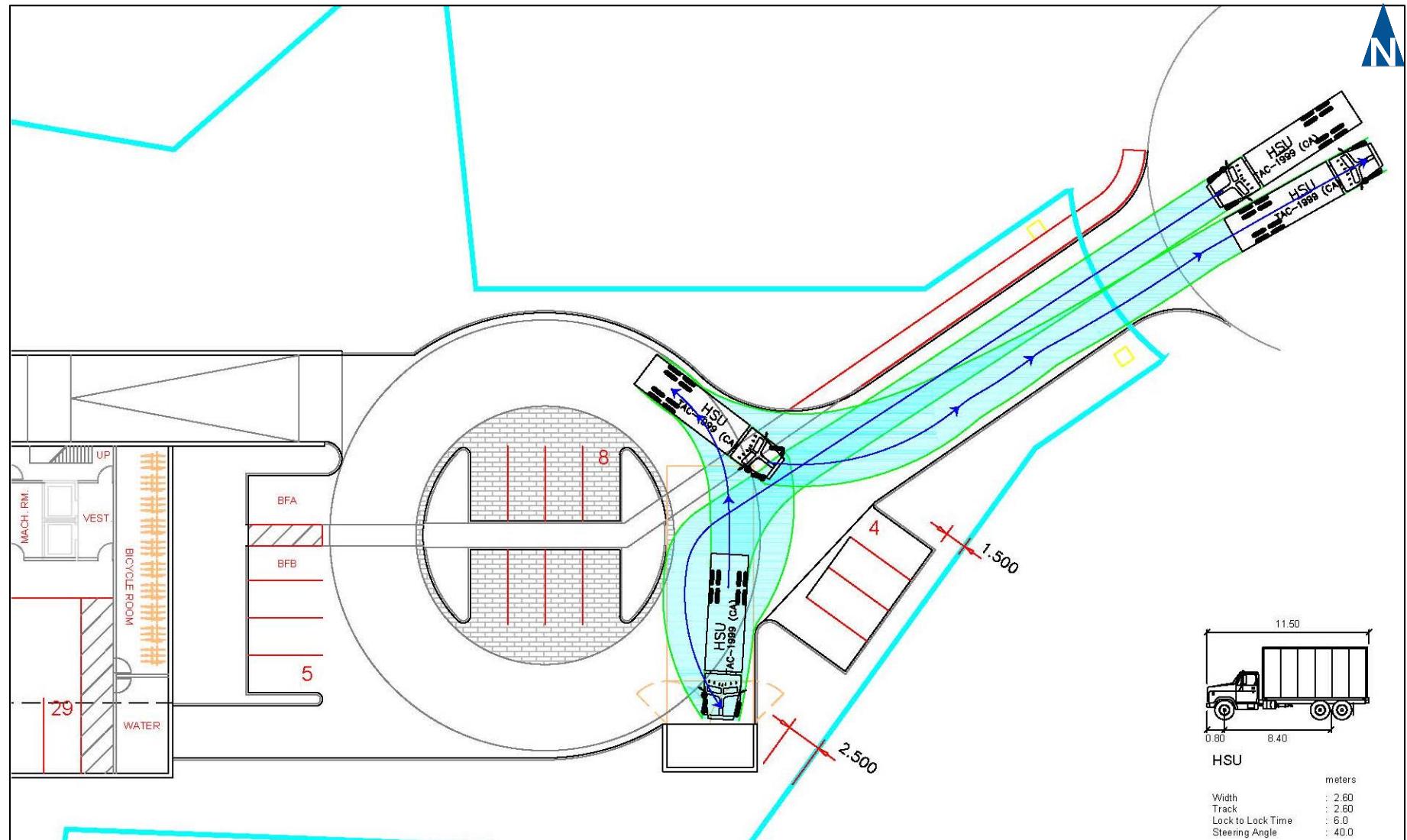
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AutoTURN Analysis Medium Single Unit

Appendix F



AutoTURN Analysis Heavy Single Unit

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