

642 Dunlop Street West

City of Barrie

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Executive Summary

This report summarizes the traffic study prepared for the proposed mixed-use development, municipally known as 642 Dunlop Street West, located in the northeast corner of the Miller Drive & Tiffin Street / Dunlop Street West intersection in the City of Barrie [City]. The report assesses the impact of traffic related to the development on the adjacent roadway and provides recommendations to accommodate this traffic in a safe and efficient manner.

The proposed development is anticipated to include a 71-unit residential building with 754 sq.m. GFA ground floor retail space.

The proposed development is anticipated to include a full-movement access driveway onto Miller Drive [FM Access] and a right-in-right-out [RIRO] access driveway onto Dunlop Street West [RIRO Access].

The scope of this analysis includes a review of the following intersections:

- Miller Drive & Tiffin Street / Dunlop Street West;
- Miller Drive / FM Access;
- Dunlop Street West / RIRO Access.

Conclusions

1. The proposed development is anticipated to generate a total of 40 AM and 53 PM peak hour primary trips and 16 PM peak hour pass-by trips
2. Detailed turning movement traffic and pedestrian counts for the Miller Drive & Tiffin Street / Dunlop Street West intersection were obtained from the City.
3. An intersection operational analysis was completed at the study area intersections, using the existing (2022) and background (2024, 2029 and 2034) traffic volumes, without the proposed development traffic. This enabled a review of existing and future traffic deficiencies that would be present without the influence of the proposed development. The following infrastructure improvements are recommended:

Miller Drive & Tiffin Street / Dunlop Street West; Background (2034) Traffic Volumes

- Signal timing optimization during the PM peak hour while maintaining the existing cycle length
4. An estimate of the amount of traffic that would be generated by the proposed development was prepared and assigned to the study area streets and intersections.
 5. An intersection operation analysis was completed under total (2024, 2029 and 2034) traffic volumes with the proposed development operational at the study area intersections. No additional geometric lane improvements or traffic signal improvements are recommended within the study area.
 6. The FM Access will operate efficiently as a full-movement access, with one-way stop control for the westbound movements. A single eastbound and westbound lane at the FM Access will provide the necessary capacity to service the proposed development.
 7. The RIRO Access will operate efficiently as a right-in-right-out access, with one-way stop control for the southbound movements. A single northbound and southbound lane at the RIRO Access will provide the necessary capacity to service the proposed development.

8. In order to restrict left turn movements at the RIRO Access, it is recommended that the median on Dunlop Street West is extended 29 metres to the east.
9. The sight distance available for the FM Access and RIRO Access meet the minimum stopping and intersection sight distance requirements.
10. It is recommended that the City consider accelerating the installation of the sidewalk on the east side of Miller Drive between Dunlop Street West and end of the existing sidewalk adjacent to the hydro corridor.
11. In summary, the proposed development will not cause any operational issues and will not add significant delay or congestion to the local roadway network.
12. The recommended parking supply for the proposed development is summarized below. The proposed parking supply is adequate to support the parking demand for the proposed development.
 - Resident parking – 71 spaces (one parking space per residential unit)
 - Residential visitor parking – 18 spaces (0.25 spaces per unit)
 - Retail – 21 spaces (one space per 36 square metres GFA)
 - Accessible parking – 5 spaces (per Zoning By-law requirement)
 - Bicycle parking – 7 indoor spaces

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1 Introduction

1.1 Background

2507517 Ontario Inc. [the Client] is proposing a mixed-use development, municipally known as 642 Dunlop Street West, located in the northeast corner of the Miller Drive & Tiffin Street / Dunlop Street West intersection in the City of Barrie [City].

The proposed development is anticipated to include a 71-unit residential building with 754 sq.m. GFA ground floor retail space.

The proposed development is anticipated to include a full-movement access driveway onto Miller Drive [FM Access] and a right-in-right-out [RIRO] access driveway onto Dunlop Street West [RIRO Access].

The Client has retained **JD Northcote Engineering Inc.** [JD Engineering] to prepare this traffic impact study in support of the proposed development.

1.2 Study Area

Figure 1 illustrates the location of the subject site and study area intersections in relation to the surrounding area. The Site Plan by n Architecture Inc. is provided in **Appendix A**.

The subject site is bound by the Miller Drive to the West, Dunlop Street West to the south, undeveloped lands to the north and existing commercial lands to the east.

The following intersections will be analysed as part of the study:

- Miller Drive & Tiffin Street / Dunlop Street West;
- Miller Drive / FM Access;
- Dunlop Street West / RIRO Access.

1.3 Study Scope and Objectives

The purpose of this study is to identify the potential impacts to traffic flow at the site access and on the surrounding roadway network. The study analysis includes the following tasks:

- Consult with the City to address any traffic-related issues or concerns they have with the proposed development;
- Determine existing traffic volumes and circulation patterns;
- Estimate future traffic volumes if the proposed development was not constructed, including the impact of additional proposed developments in the area;
- Complete level-of-service [LOS] analysis of horizon year (without the proposed development) traffic conditions and identify operational deficiencies;
- Estimate the amount of traffic that would be generated by the proposed development and assign to the roadway network;
- Complete LOS analysis of horizon year (with the proposed development) traffic conditions and
- Identify improvement options to address operational deficiencies;
- Review applicable Transportation Demand Management measures; and
- Document findings and recommendations in a final report.

Figure 1 – Proposed Site Location and Study Area



1.4 Analysis Periods

Traffic scenarios for the existing year (2022), the build-out year (2024), 5-year post-build-out horizon year (2029), and 10-year post-build-out horizon year (2034) were selected for analysis of traffic operations in the study area. The weekday morning [AM] and weekday afternoon [PM] peak hours have been selected as the analysis periods for this study.

2 Information Gathering

2.1 Street and Intersection Characteristics

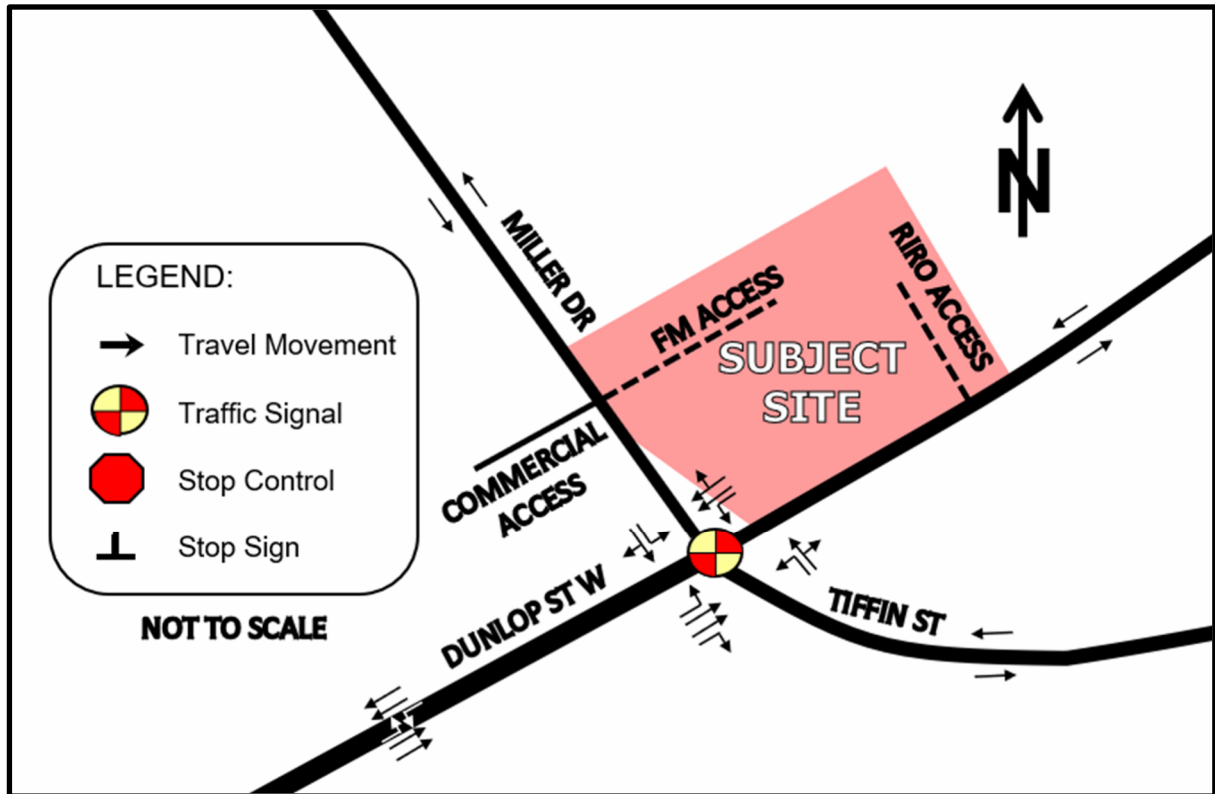
Dunlop Street West is a five-lane arterial road with an asphalt shoulder on both sides of the road and a posted speed limit of 80 km/h west of Miller Drive within the study area. Dunlop Street West is a two-lane arterial road with a gravel shoulder on both sides of the road and a posted speed limit of 60 km/h east of Miller Drive within the study area. Dunlop Street West has a rural cross-section with no sidewalks within the study area. Dunlop Street West is under the jurisdiction of the City within the City limits and under the jurisdiction of the County of Simcoe, west of the City limits.

Miller Drive is a two-lane minor collector road with a rural cross-section within the study area. Miller Drive has no sidewalks and a gravel shoulder on both sides of the road. Miller Drive has a posted speed limit of 50km/h and is under the jurisdiction of the City.

Tiffin Street is a two-lane arterial road with a rural cross-section within the study area. Tiffin Street has no sidewalks and an asphalt or gravel shoulder on both sides of the road within the study area. Tiffin Street has a posted speed limit of 60km/h and is under the jurisdiction of the City.

The existing intersection spacing and lane configuration within the study area is illustrated in **Figure 2**.

Figure 2 – Existing Lane Configuration within Study Area



*It is noted that there is a commercial access opposite of the FM Access; however, for the purpose of this study, we have analyzed the Miller Drive / FM Access intersection as a three-legged intersection as there is anticipated to be minimal interaction between the commercial access and the FM Access

2.2 Transit Access

There is no municipal transit service within the study area.

2.3 Local Road Improvements

Based on the City's Transportation Master Plan (April 2019) [TMP] and the City's 2022-2031 Capital Plan, the following improvements are anticipated to be completed within and near the study area after 2031, with the exact timing of improvements between 2031 and 2041 currently unknown:

- Miller Drive (within study area)
 - Construction of buffered bike lanes.
 - Install sidewalk on both sides of the road
- Dunlop Street West (east of Miller Drive within study area)
 - Road widening to five-lane cross-section (including a two-way-left-turn- lane [TWLTL]);
 - Install sidewalk on both sides of the road

- Tiffin Street (within study area)
 - Road widening to include a TWLTL;
 - Construction of an in-boulevard pathway; and
 - Install sidewalk on one side of the road.

The road widening noted above occurs just outside the study area intersections. Consequently, the above noted improvements are not anticipated to have a notable impact on traffic distribution within the study area.

There are no additional infrastructure improvements anticipated within the study area.

2.4 Other Developments within the Study Area

Based on our review of the City's active development webpage, there are three adjacent developments nearby the study area that will impact the traffic generation rates, specifically:

- 152 Miller Drive;
- 20, 30 & 40 Miller Drive; and
- 518, 520, 522 & 524 Tiffin Street.

For the purposes of this study, it has been assumed that all traffic generated by the adjacent developments within the study area will be new traffic and would not be in the study area if the developments were not constructed.

2.4.1 152 Miller Drive

The 152 Miller Drive development is located on the west side of Miller Drive, between Edgehill Drive and Ruffet Drive, and is anticipated to consist of 43 single-detached residential units. It has been assumed that the 152 Miller Drive development will be fully occupied by the 2024 horizon year.

Traffic generated by the 152 Miller Drive development has been estimated based on the April 2018 traffic brief and March 2019 traffic brief addendum titled 152 Miller Drive Development by JD Engineering [collectively, 152 Miller Drive TB] (excerpts provided in **Appendix B**). The traffic assignment for traffic volumes outside the 152 Miller Drive TB study area have been based on the traffic distribution methodology applied for the residential component of the proposed development outlined in Section 4.2.

Figure 3 illustrates the 152 Miller Drive development traffic within the study area.

2.4.2 20, 30 & 40 Miller Drive

The 20, 30 & 40 Miller Drive mixed-use development is located on the west side of Miller Drive, between Sproule Drive and Dunlop Street West, and is anticipated to consist of 185 residential units and a 283 sq.m. commercial building. It has been assumed that the 20, 30 & 40 Miller Drive development will be fully occupied by the 2024 horizon year.

Traffic generated by the 20, 30 & 40 Miller Drive development has been estimated based on the November 2015 traffic Impact Study titled 20/30/40 Miller Drive Development by JD Engineering (excerpts provided in **Appendix B**).

Figures 4 , 5 and 6 illustrate the commercial, residential and total traffic assignment for the 20, 30 & 40 Miller Drive development within the study area.

2.4.3 518, 520, 522 & 524 Tiffin Street

The 518, 520, 522 & 524 Tiffin Street development is located on the north side of Tiffin Street, east of Dunlop Street West and is anticipated to consist of indoor and outdoor storage space utilizing the existing 74.3 sq.m. building as office and storage space. It has been assumed that the 518, 520, 522 & 524 Tiffin Street development will be fully occupied by the 2024 horizon year.

The traffic generation for the 518, 520, 522 & 524 Tiffin Street development has been calculated based on the Institute of Transportation Engineers [ITE] *Trip Generation Manual* (11th Edition) [ITE Trip Generation Manual]. The following ITE land uses have been applied to estimate the traffic from the 518, 520, 522 & 524 Tiffin Street development:

- ITE land use 150 (Warehousing) – General Urban / Suburban Setting.

The estimated trip generation of the 518, 520, 522 & 524 Tiffin Street development is illustrated below in **Table 1**. The AM and PM peak traffic generation for the 518, 520, 522 & 524 Tiffin Street development is not expected to exactly align with the AM and PM peak hour in the traffic counts; consequently, we have applied the peak hour of adjacent street traffic values provided in the ITE Trip Generation Manual.

Table 1 – Estimated Traffic Generation – 518, 520, 522 & 524 Tiffin Street

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Warehousing ITE Land Use: 150	53,000 sq.ft.*	8	2	10	3	7	10

*The 518, 520, 522 & 524 Tiffin Street development consists of a 74.3 sq.m. building; however, in order to be conservative with the traffic generation calculation and in order to account for the outdoor storage area, we have utilized the lot area (53,000 sq.ft., based on aerial mapping)

No transportation modal split has been applied to the above-noted traffic generation calculation.

The traffic assignment for the 518, 520, 522 & 524 Tiffin Street development has been estimated based on the traffic distribution methodology applied for the commercial component of the proposed development outlined in Section 4.2.

Figure 7 illustrates the 518, 520, 522 & 524 Tiffin Street development traffic within the study area.

2.4.4 Total Adjacent Developments

Figure 8 illustrates the total adjacent development traffic within the study area.

Figure 3 – 152 Miller Drive Development Traffic Assignment

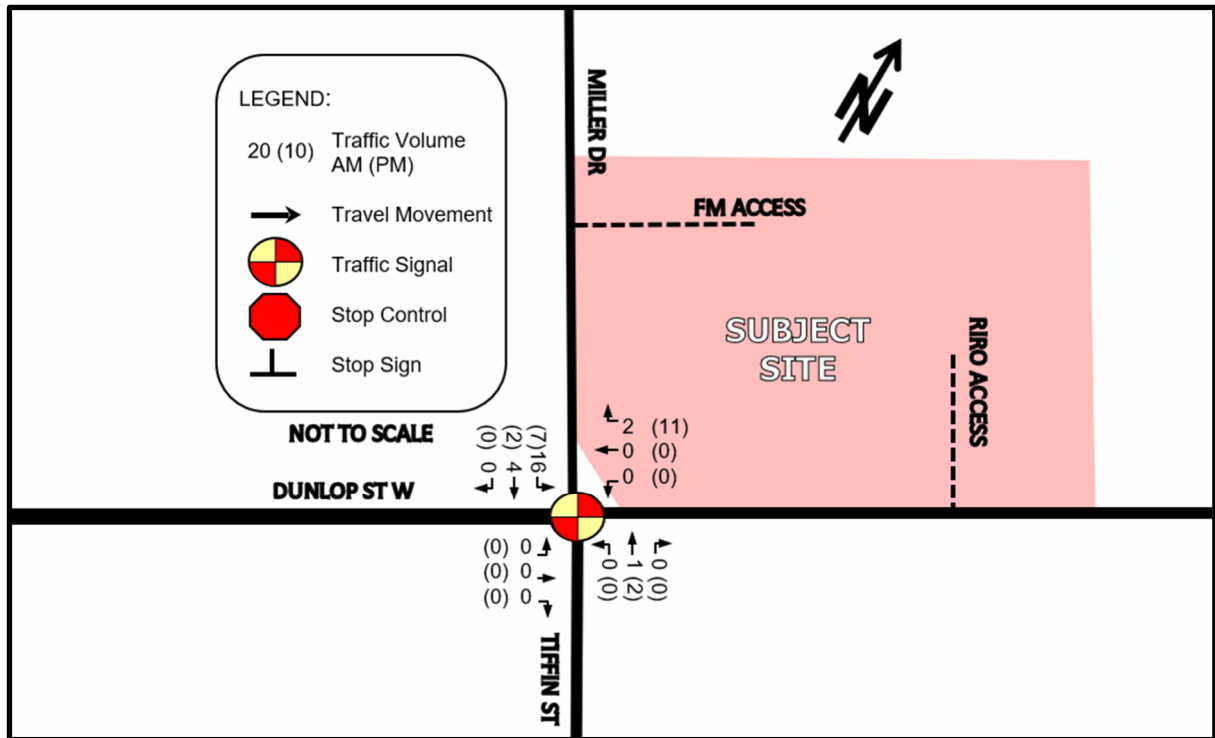


Figure 4 – 20/30/40 Miller Drive Development Traffic Assignment – Residential

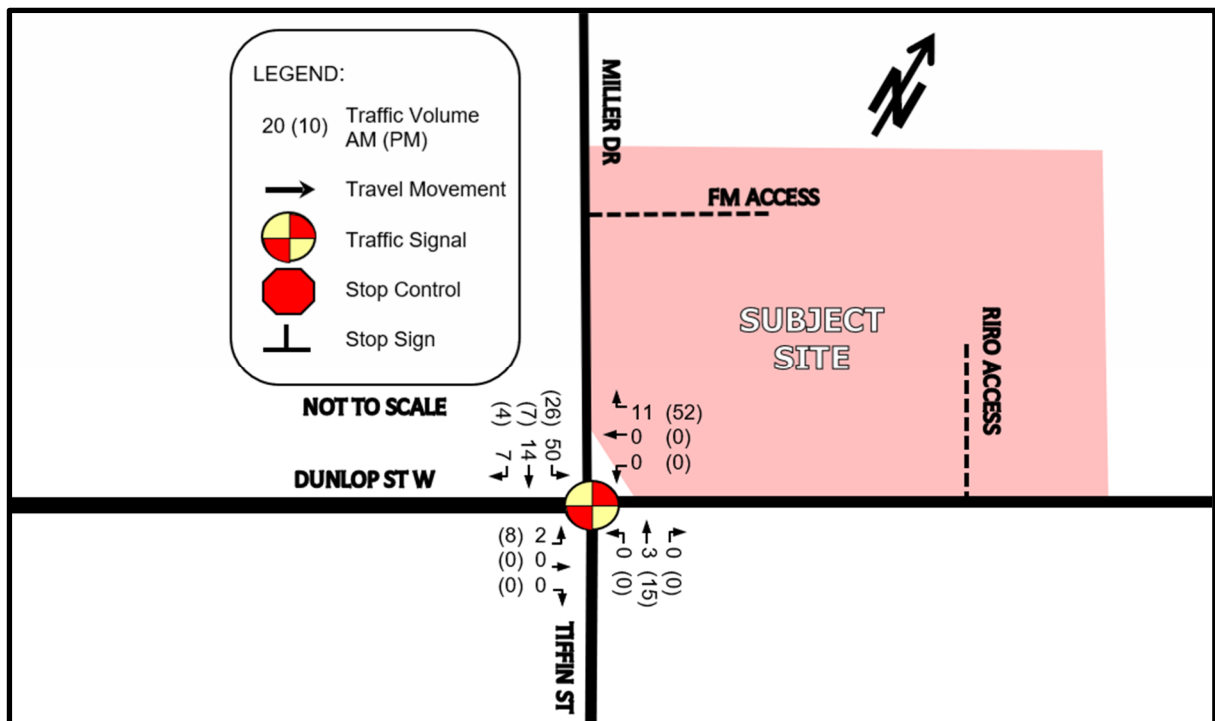


Figure 5 – 20/30/40 Miller Drive Development Traffic Assignment – Commercial

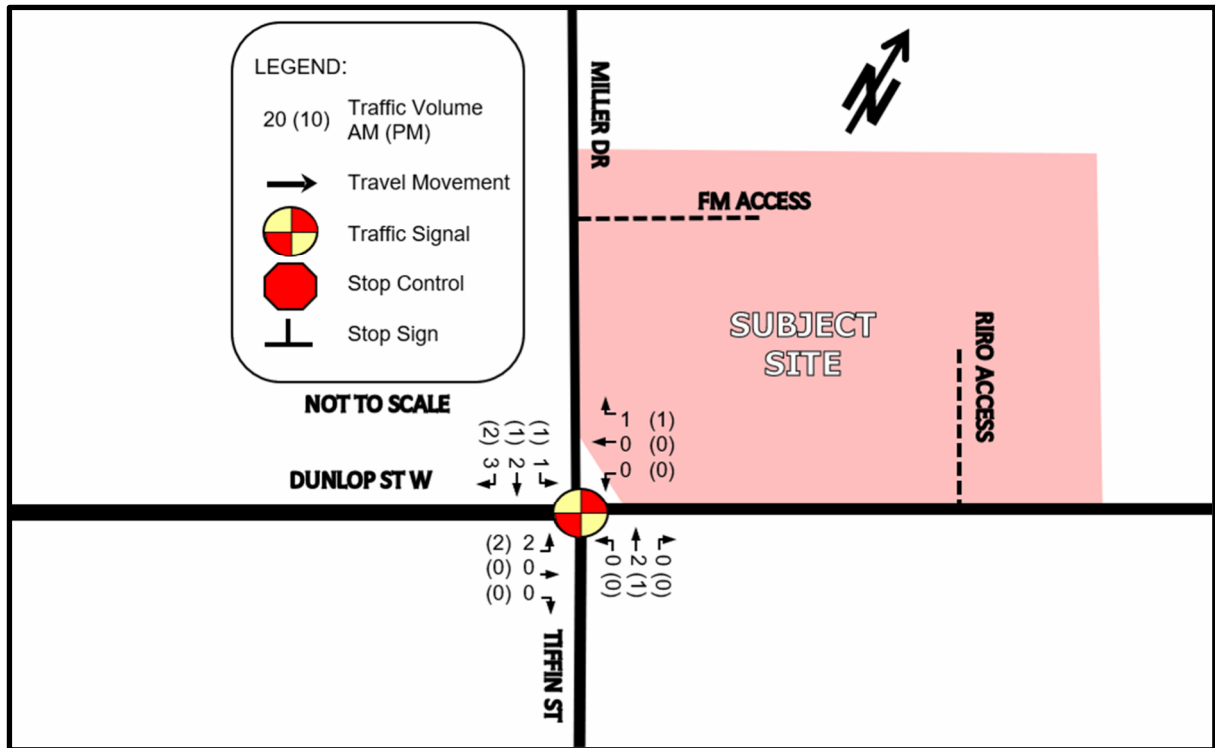


Figure 6 – 20/30/40 Miller Drive Development Traffic Assignment – Total

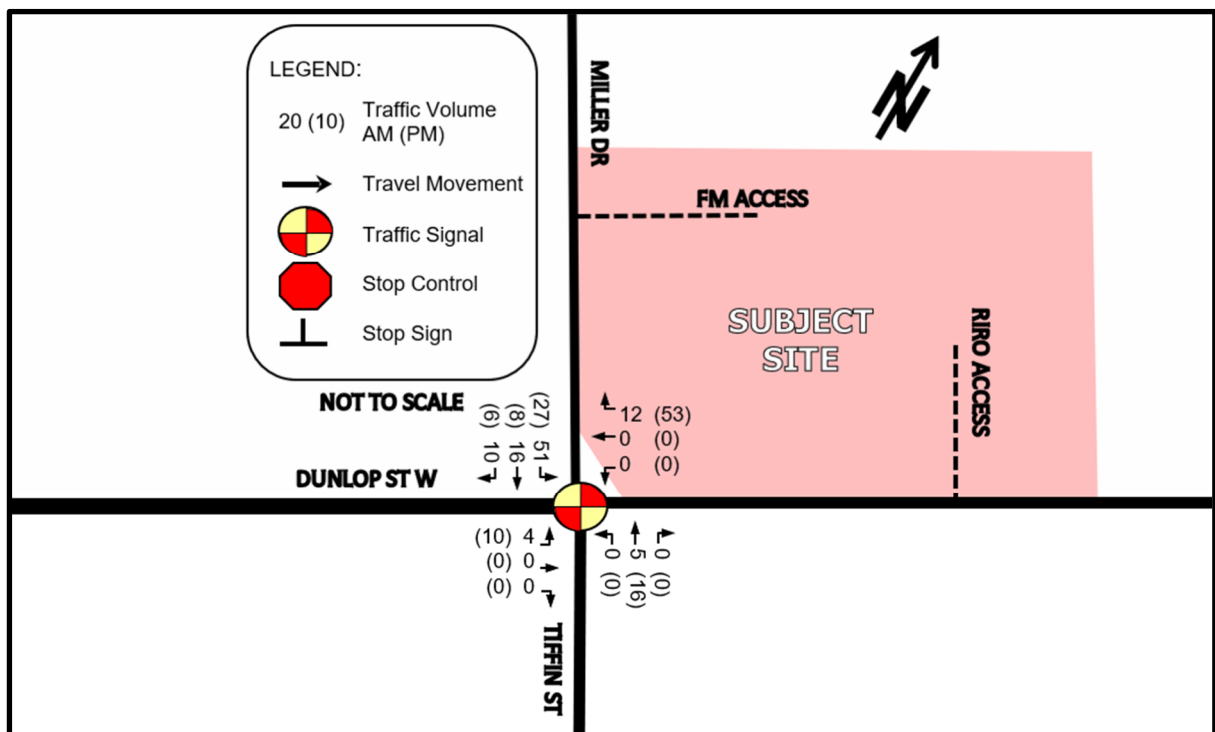


Figure 7 – 518/520/522 & 524 Tiffin Street Development Traffic Assignment

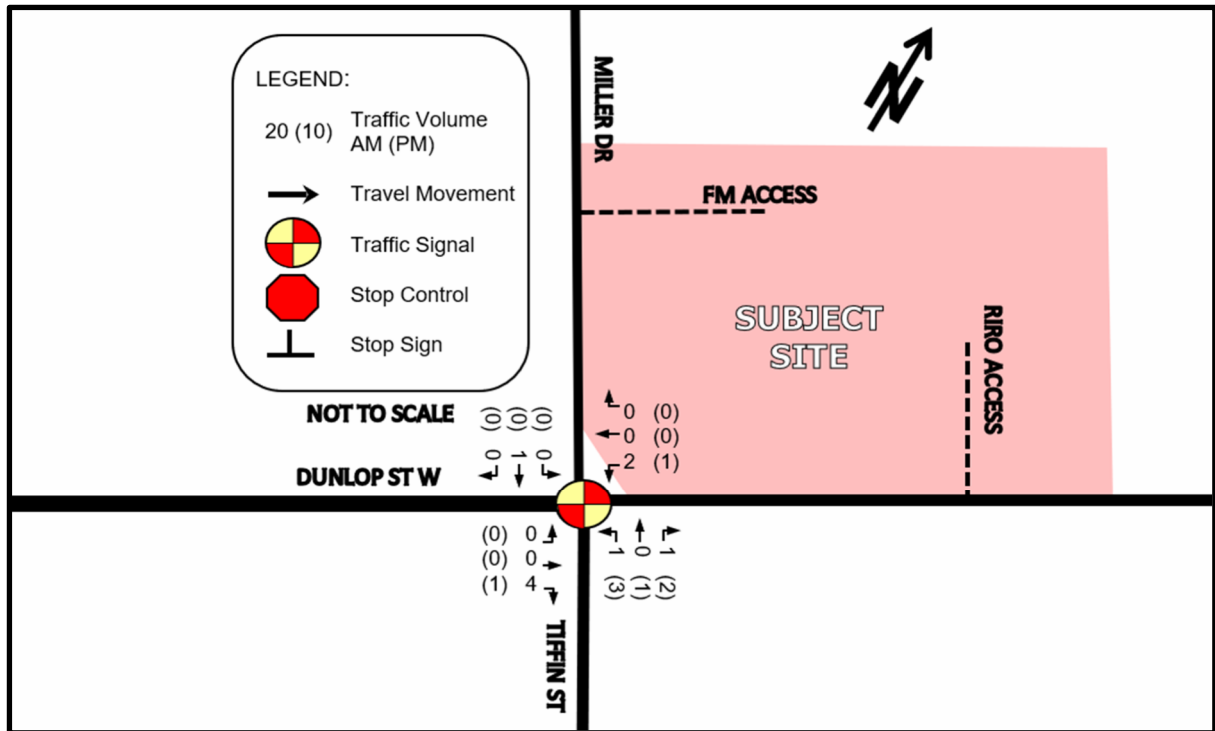
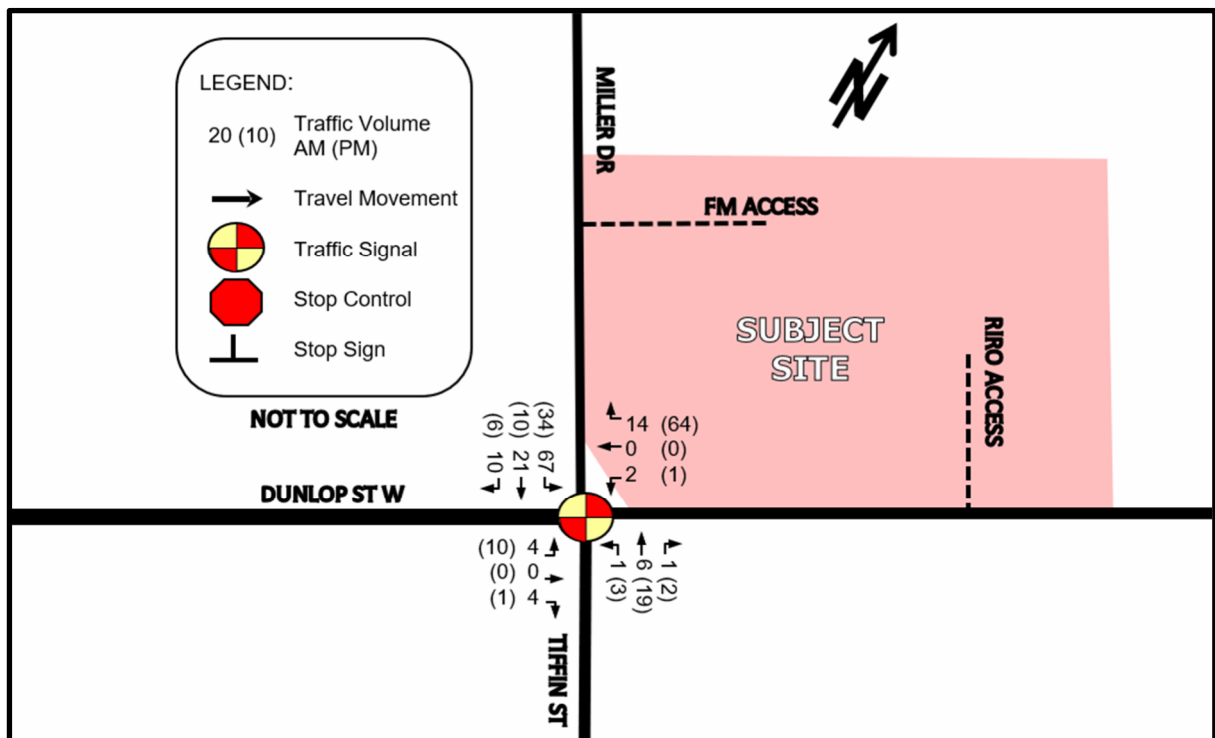


Figure 8 – Total Adjacent Development Traffic Assignment



2.5 Background Traffic Growth

Based on our review of the EMME travel demand model used in the City TMP, **Table 2** illustrates the background traffic growth rates selected for the study area roads for the AM and PM peak hours. Since there was no consistent identifiable background growth rate for all roads in the study area, different background growth rates were selected for each road and each peak hour.

Table 2 – Study Area Roads – Background Growth Rate

Street Name	2022 - 2031		2031-2041	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Dunlop Street West	4%	5%	2%	2%
Miller Drive	2%	2%	2%	2%
Tiffin Street	3%	3%	2%	2%

2.6 Traffic Counts

Detailed turning movement traffic and pedestrian counts were obtained from the City for the Miller Drive & Tiffin Street / Dunlop Street West intersection.

Table 3 summarizes the traffic count data collection information.

Table 3 – Traffic Count Data

Intersection (N-S Street / E-W Street)	Count Date	AM Peak Hour	PM Peak Hour	Source
Miller Drive & Tiffin Street / Dunlop Street West	Thursday, April 11, 2019	07:30 – 08:30	16:00 – 17:00	City

Detailed traffic count data can be found in **Appendix C**. The peak hours of traffic generation for the study area intersections generally aligned with the anticipated peak hour of traffic generation by the proposed development.

Heavy vehicle percentages from the traffic count data have also been included in the Synchro analysis.

The background traffic growth rate discussed in Section 2.5 has been applied to the traffic count data to estimate the existing (2022) horizon year traffic volumes within the study area.

Figure 9 illustrates the existing (2022) traffic volumes within the study area.

2.7 Horizon Year Traffic Volumes

In addition to the adjacent development traffic volumes discussed in Section 2.4, the background traffic growth rates discussed in Section 2.5 have been applied to the existing (2022) traffic volumes to estimate the background (2024, 2029 and 2034) horizon year traffic volumes within the study area.

Figures 10, 11 and 12 illustrate the background (2024, 2029 and 2034) horizon year AM and PM peak hour traffic volumes in the study area.

Figure 9 – Existing (2022) Traffic Volumes

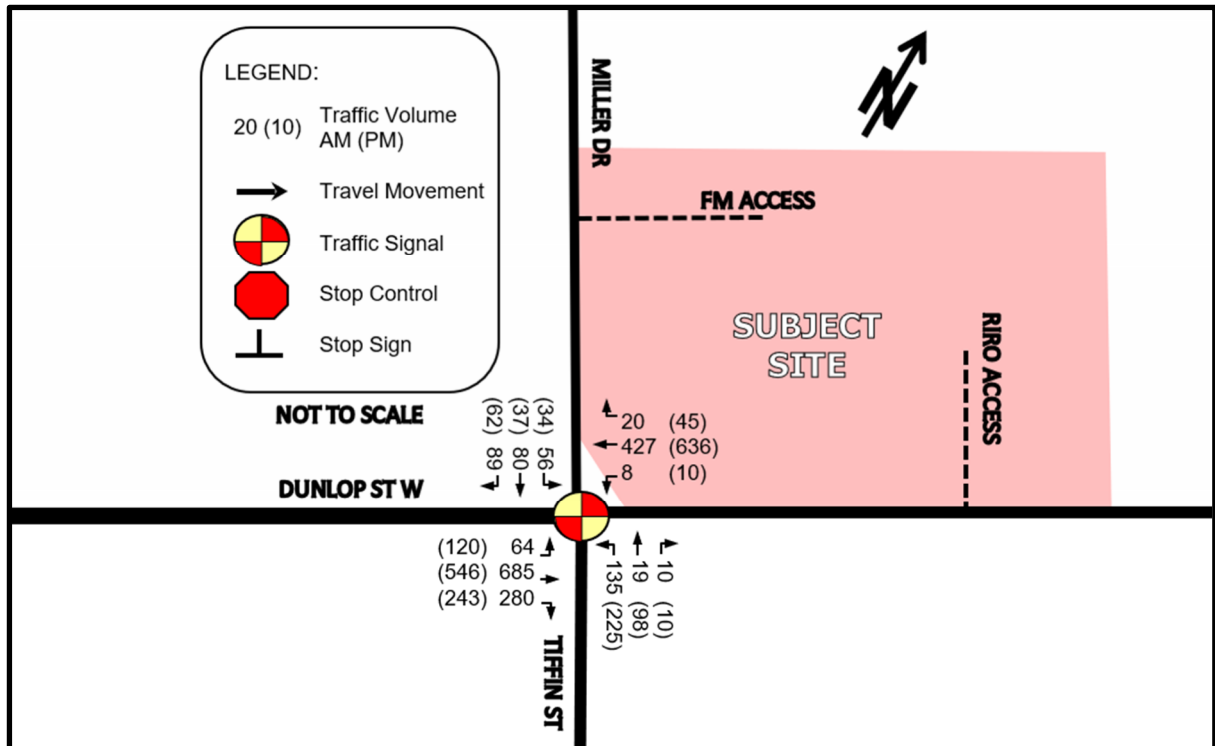


Figure 10 – Background (2024) Traffic Volumes

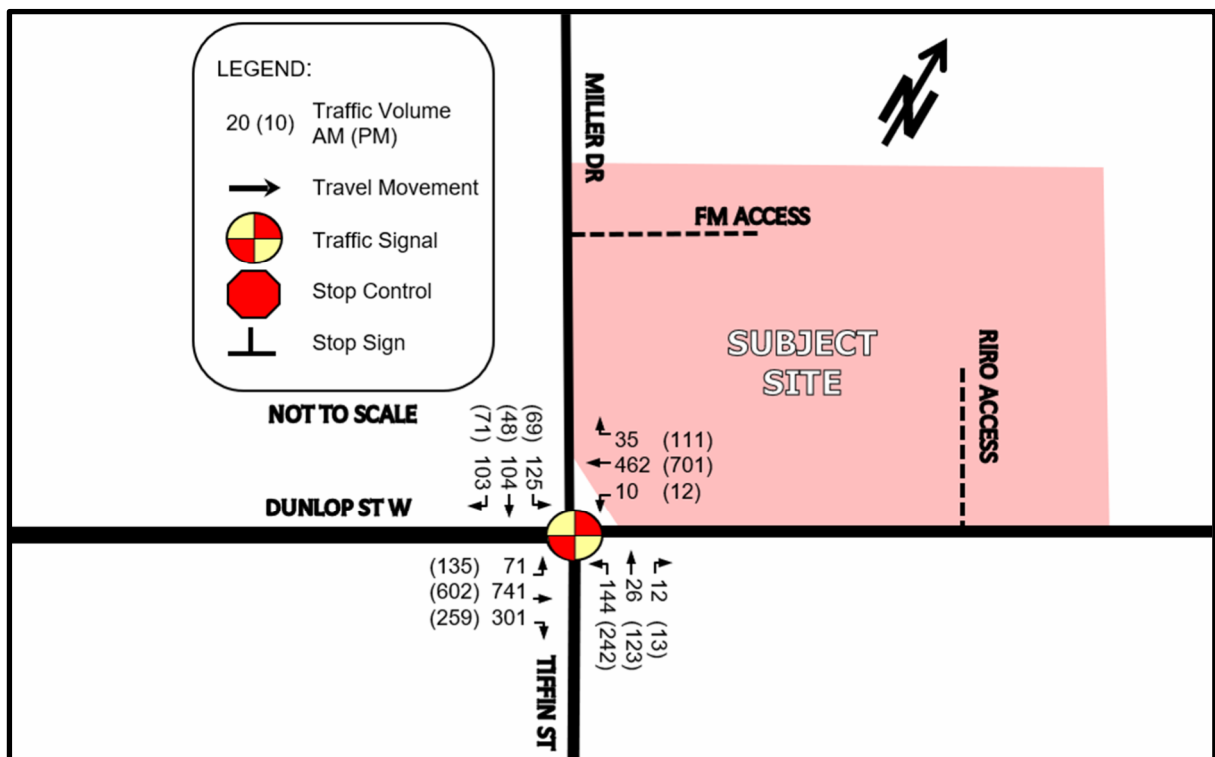


Figure 11 – Background (2029) Traffic Volumes

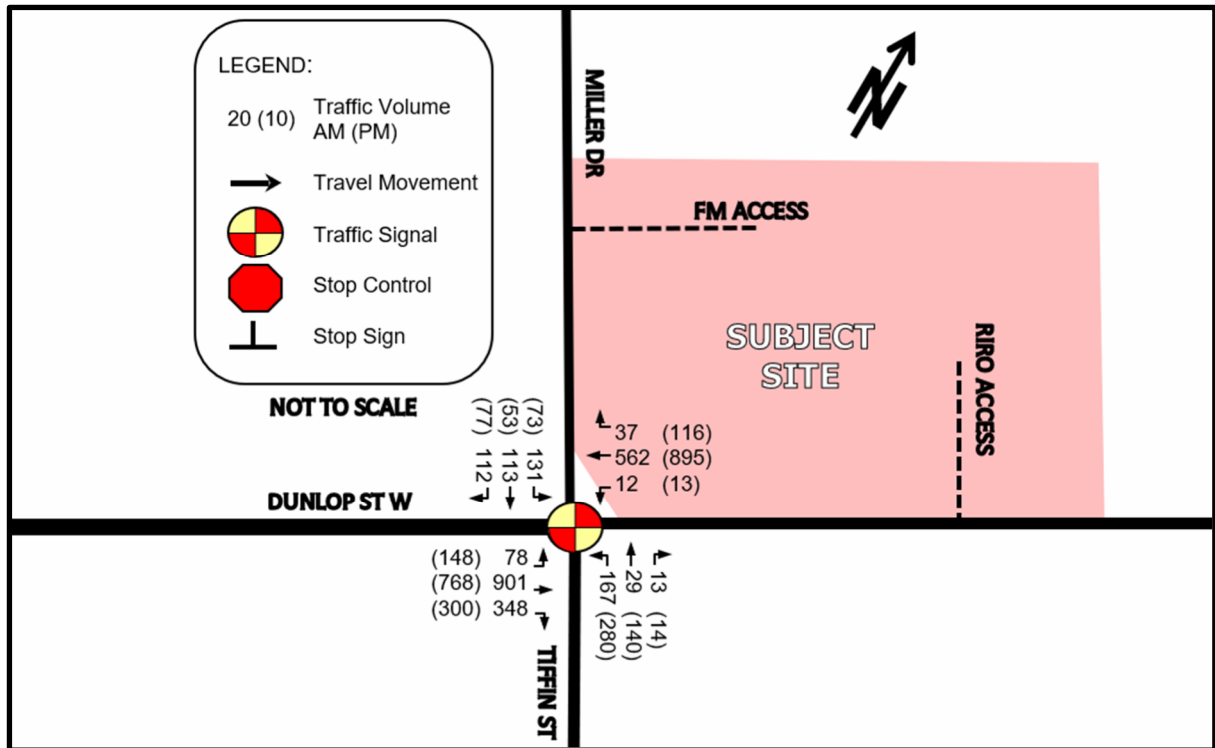
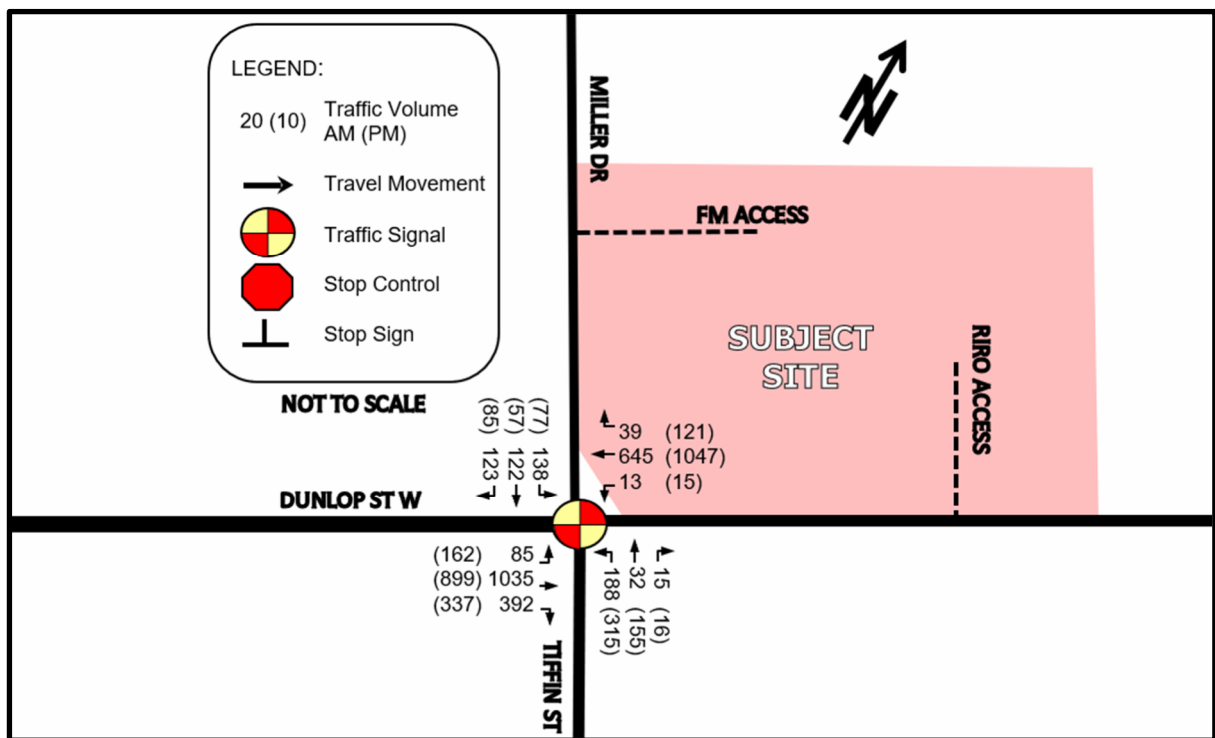


Figure 12 – Background (2034) Traffic Volumes



3 Intersection Operation without Proposed Development

3.1 Introduction

Existing year operational conditions were established to determine how the street network within the study area is currently functioning without the proposed development. This provides a base case scenario to compare with future development scenarios. Traffic operations within the study area were evaluated using the 2022 traffic volumes with the existing road configuration and traffic control. The intersection performance was measured using the traffic analysis software, Synchro 11, a deterministic model that employs Highway Capacity Manual and Intersection Capacity Utilization methodologies for analyzing intersection operations. These procedures are accepted by provincial and municipal agencies throughout North America.

Synchro 11 enables the study area to be graphically defined in terms of streets and intersections, along with their geometric and traffic control characteristics. The user is able to evaluate both signalized and unsignalized intersections in relation to each other, thus not only providing level of service for the individual intersections, but also enabling an assessment of the impact the various intersections in a network have on each other in terms of spacing, traffic congestion, delay, and queuing.

Individual turning movements with a volume-to-capacity [V/C] ratio of 0.85 or greater are considered to be critical movements and have been highlighted in the LOS tables.

The intersection operations were also evaluated in terms of the LOS. LOS is a common measure of the quality of performance at an intersection and is defined in terms of vehicular delay. This delay includes deceleration delay, queue move-up time, stopped delay, and acceleration delay. LOS is expressed on a scale of A through F, where LOS A represents very little delay (i.e. less than 10 seconds per vehicle) and LOS F represents very high delay (i.e. greater than 50 seconds per vehicle for a stop sign controlled intersection and greater than 80 seconds per vehicle for a signalized intersection).

The LOS criteria for signalized and stop sign-controlled intersections are shown in **Table 4**. A description of traffic performance characteristics is included for each LOS.

Table 4 – Level of Service Criteria for Intersections

LOS	LOS Description	Control Delay (seconds per vehicle)	
		Signalized Intersections	Stop Controlled Intersections
A	Very low delay; most vehicles do not stop (Excellent)	less than 10.0	less than 10.0
B	Higher delay; more vehicles stop (Very Good)	between 10.0 and 20.0	between 10.0 and 15.0
C	Higher level of congestion; number of vehicles stopping is significant, although many still pass through intersection without stopping (Good)	between 20.0 and 35.0	between 15.0 and 25.0
D	Congestion becomes noticeable; vehicles must sometimes wait through more than one red light; many vehicles stop (Satisfactory)	between 35.0 and 55.0	between 25.0 and 35.0
E	Vehicles must often wait through more than one red light; considered by many agencies to be the limit of acceptable delay	between 55.0 and 80.0	between 35.0 and 50.0
F	This level is considered to be unacceptable to most drivers; occurs when arrival flow rates exceed the capacity of the intersection (Unacceptable)	greater than 80.0	greater than 50.0

3.2 Existing (2022) Intersection Operation

The results of the LOS analysis under existing (2022) traffic volumes during the AM and PM peak hour can be found below in **Table 5**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix D**.

Table 5 – Existing (2022) LOS

Location (N-S Street / E-W Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Storage	Model				Storage	Model
Miller Drive & Tiffin Street / Dunlop Street West (signalized)	0.44	22.8	C	-	-	0.48	24.1	C	-	-
EBL	0.15	14.0	B	185	16	0.31	15.7	B	185	25
EBT	0.42	19.9	B	-	89	0.31	18.5	B	-	64
EBR	0.20	12.0	B	125	11	0.18	11.6	B	125	11
WBL	0.04	17.8	B	125	4	0.04	19.4	B	125	4
WBTR	0.32	21.5	C	-	59	0.44	25.1	C	-	88
NBL	0.43	31.8	C	200	47	0.52	35.3	D	200	72
NBTR	0.06	36.1	D	-	14	0.22	38.7	D	-	42
SBL	0.15	34.6	C	100	22	0.11	37.8	D	100	14
SBTR	0.41	45.8	D	-	60	0.16	42.9	D	-	27

The results of the LOS analysis indicate that the Miller Drive & Tiffin Street / Dunlop Street West intersection is operating within the typical design limits noted in Section 3.1.

The anticipated 95th percentile queue lengths for all movements at the Miller Drive & Tiffin Street / Dunlop Street West intersection can be accommodated by the existing auxiliary lane storage lengths.

No infrastructure improvements are recommended within the study area.

3.3 Background (2024) Intersection Operation

The results of the LOS analysis under background (2024) traffic volumes during the AM and PM peak hour can be found below in **Table 5**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix E**.

Table 6 – Background (2024) LOS

Location (N-S Street / E-W Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Storage	Model				Storage	Model
Miller Drive & Tiffin Street / Dunlop Street West (signalized)	0.48	24.3	C	-	-	0.56	25.7	C	-	-
EBL	0.17	13.8	B	185	17	0.41	16.9	B	185	28
EBT	0.45	19.7	B	-	98	0.35	19.5	B	-	72
EBR	0.22	11.6	B	125	12	0.19	12.1	B	125	11
WBL	0.05	18.1	B	125	4	0.06	18.6	B	125	5
WBTR	0.36	22.3	C	-	67	0.53	26.4	C	-	107
NBL	0.53	36.3	D	200	50	0.59	37.3	D	200	77
NBTR	0.08	40.3	D	-	17	0.31	42.5	D	-	54
SBL	0.31	34.6	C	100	44	0.21	36.6	D	100	25
SBTR	0.54	50.6	D	-	78	0.23	44.2	D	-	35

The results of the LOS analysis indicate that the Miller Drive & Tiffin Street / Dunlop Street West intersection is operating within the typical design limits noted in Section 3.1.

The anticipated 95th percentile queue lengths for all movements at the Miller Drive & Tiffin Street / Dunlop Street West intersection can be accommodated by the existing auxiliary lane storage lengths.

No infrastructure improvements are recommended within the study area.

3.4 Background (2029) Intersection Operation

The results of the LOS analysis under background (2029) traffic volumes during the AM and PM peak hour can be found below in **Table 5**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix E**.

Table 7 – Background (2029) LOS

Location (N-S Street / E-W Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Storage	Model				Storage	Model
Miller Drive & Tiffin Street / Dunlop Street West (signalized)	0.59	26.1	C	-	-	0.69	27.9	C	-	-
EBL	0.22	14.5	B	185	18	0.55	21.2	C	185	28
EBT	0.56	22.5	C	-	126	0.45	20.8	C	-	72
EBR	0.25	12.5	B	125	12	0.22	12.3	B	125	11
WBL	0.07	18.5	B	125	5	0.07	19.0	B	125	5
WBTR	0.44	23.9	C	-	82	0.66	29.6	C	-	107
NBL	0.64	39.9	D	200	58	0.70	42.9	D	200	77
NBTR	0.09	40.7	D	-	18	0.35	43.6	D	-	54
SBL	0.32	35.1	D	100	45	0.22	36.7	D	100	25
SBTR	0.60	53.3	D	-	85	0.26	44.9	D	-	35

The results of the LOS analysis indicate that the Miller Drive & Tiffin Street / Dunlop Street West intersection is operating within the typical design limits noted in Section 3.1.

The anticipated 95th percentile queue length for the eastbound through movement at the Miller Drive & Tiffin Street / Dunlop Street West intersection exceeds the existing storage length for the adjacent right turn movement; however, no improvements are recommended as the turning movements can access the auxiliary lane via the taper length. The anticipated 95th percentile queue lengths for all movements at the Miller Drive & Tiffin Street / Dunlop Street West intersection can be accommodated by the existing auxiliary lane storage lengths.

No infrastructure improvements are recommended within the study area.

3.5 Background (2034) Intersection Operation

The results of the LOS analysis under background (2034) traffic volumes during the AM and PM peak hour can be found below in **Table 5**. Existing intersection geometry and traffic control have been utilized for this scenario with signal timing optimization of the Miller Drive & Tiffin Street / Dunlop Street West intersection in PM peak hour, while maintaining the existing cycle length. Detailed output of the Synchro analysis can be found in **Appendix E**.

Table 8 – Background (2034) LOS

Location (N-S Street / E-W Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Storage	Model				Storage	Model
Miller Drive & Tiffin Street / Dunlop Street West (signalized)	0.68	27.8	C	-	-	0.82	30.0	C	-	-
EBL	0.26	15.1	B	185	19	0.76	36.2	D	185	52
EBT	0.64	24.3	C	-	152	0.52	21.3	C	-	114
EBR	0.28	12.8	B	125	13	0.25	12.9	B	125	12
WBL	0.10	19.6	B	125	5	0.10	18.0	B	125	5
WBTR	0.50	25.0	C	-	97	0.74	30.2	C	-	165
NBL	0.76	49.3	D	200	70	0.83	54.6	D	200	115
NBTR	0.11	41.1	D	-	20	0.39	43.6	D	-	63
SBL	0.34	35.4	D	100	47	0.25	35.4	D	100	27
SBTR	0.66	56.3	E	-	94	0.28	43.3	D	-	41

The results of the LOS analysis indicate that the Miller Drive & Tiffin Street / Dunlop Street West intersection is operating within the typical design limits noted in Section 3.1.

The anticipated 95th percentile queue length for the eastbound and westbound through movements at the Miller Drive & Tiffin Street / Dunlop Street West intersection exceed the existing storage length for the adjacent right and left turn movements; however, no improvements are recommended as the turning movements can access the auxiliary lanes via the taper lengths. The anticipated 95th percentile queues for all movements at the the study area intersections can be accommodated by the existing auxiliary lane storage lengths.

The anticipated 95th percentile queues for all other movements at the Miller Drive & Tiffin Street / Dunlop Street West intersection can be accommodated by the existing auxiliary lane storage lengths.

No infrastructure improvements are recommended within the study area.

4 Proposed Development

4.1 Traffic Generation

The traffic generation for the proposed development has been based on the ITE Trip Generation Manual. The following ITE land uses have been applied to estimate the traffic from the proposed development:

- ITE land use 221 (Multifamily Housing (Mid-Rise)) – General Urban/Suburban Setting;
- ITE land use 821 (Shopping Plaza (40-140K)) – General Urban / Suburban Setting; and
- ITE land use 822 (Strip Retail Plaza (<40K)) – General Urban / Suburban Setting.

The proposed development commercial space is less than 40,000 sq.ft.; consequently, ITE land use 822 is more applicable for the commercial space of the proposed development. However, ITE land use 821 has been used for the AM peak hour as the data set for ITE land use 822 is small for the AM peak hour.

The AM and PM peak hour traffic generation for the proposed development do not exactly align with the AM and PM peak hour in the traffic counts; consequently, we have applied the peak hour of adjacent street traffic values provided in the ITE Trip Generation Manual. The estimated trip generation of the proposed development is illustrated below in **Table 9**.

Table 9 – Estimated Traffic Generation of Proposed Development

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Shopping Plaza (40-140K) ITE land use 821	8,116 sq.ft.	9	6	15	-	-	-
Strip Retail Plaza (<40K) ITE land use 822		-	-	-	28	28	56
TOTAL COMMERCIAL		9	6	15	28	28	56
Multifamily Housing (Mid-Rise) ITE Land Use: 221	71 units*	6	19	25	20	13	33
TOTAL TRIP GENERATION		15	25	40	48	41	89
INTERNAL CAPTURE		-	-	-	-10	-10	-20
NET SITE GENERATION		15	25	40	38	31	69
PASS-BY TRIPS (ITE Land Use: 822)**		-	-	-	-8	-8	-16
PRIMARY TRIPS		15	25	40	30	23	53

*The traffic generation noted in the Table 9 is based on a previous iteration of the Site Plan which included 84 residential units and 8,384sq.ft. of retail space, which is more than the current version of the Site Plan. The variation will have a negligible impact on the modelling, analysis and recommendations

** Commercial pass-by trips for the AM and PM peak hour are 0% and 34% respectively, according to the ITE data for ITE land use 820 (Shopping Centre). The pass-by rate from ITE land use 820 was used as the data set is larger.

No transportation modal split has been applied to the above-noted traffic generation calculation.

4.2 Traffic Assignment

For the purposes of this study, it has been assumed that all traffic generated by the proposed development will be new traffic and would not be in the study area if the development was not constructed.

The ITE data provides the anticipated percentage of new traffic entering and exiting during the peak hour.

The distribution of the residential component of the proposed development traffic has been calculated based on the 2016 Transportation Tomorrow Survey [TTS] data for traffic zone 8520 retrieved using the TTS Internet Data Retrieval System [IDRS] (output attached as **Appendix G**). TTS data provides historical origin and destination work trip percentages for specific areas within the County and the Greater Toronto and Hamilton Area [GTHA].

Traffic distribution for the trips generated by the residential component of the subject site during the AM and PM peak hour is expected to generally follow commuter travel patterns. Our analysis is based on egress traffic during the AM peak hour. Logically, the distribution of ingress traffic will follow the inverse of the exiting traffic distribution. For each of the individual areas identified in the TTS data, we have selected the probable route of travel, assuming that people will select their route primarily based on travel time.

The distribution of traffic for the residential component of the proposed development is illustrated in **Table 10** using the methodology outlined above.

Table 10 – Proposed Development Traffic Distribution - Residential

Travel Direction (to / from)	Percent of Total Traffic Generation
West via Dunlop Street West	2%
East via Dunlop Street West	77%
North via Miller Drive	5%
South via Tiffin Street	16%
TOTAL	100%

The distribution of traffic for the commercial component of the proposed development is based on the distribution of the existing traffic volumes within the study area. **Table 11** summarizes the distribution of ingress and egress traffic for the commercial component of the proposed development.

Table 11 – Proposed Development Traffic Distribution - Commercial

Travel Direction (to / from)	AM Peak Hour		PM Peak Hour	
	Ingress	Egress	Ingress	Egress
West via Dunlop Street West	55%	35%	44%	44%
East via Dunlop Street West	24%	39%	33%	28%
North via Miller Drive	12%	6%	7%	13%
South via Tiffin Street	9%	20%	16%	15%
TOTAL	100%	100%	100%	100%

Using the traffic distributions pattern noted above, the residential, commercial primary and commercial pass-by traffic assignment for the proposed development was calculated for the AM and PM peak hour and is illustrated in **Figure 13, 14 and 15**. The total traffic assignment of the proposed development is illustrated in **Figure 16**.

4.3 Total Horizon Year Traffic Volumes with the Proposed Development

For the total (2024, 2029 and 2034) horizon year traffic volumes, the proposed development traffic was added to the background (2024, 2029 and 2034) traffic volumes. The resulting total (2024, 2029 and 2034) horizon year traffic volumes for the AM and PM peak hour are illustrated in **Figures 17, 18 and 19**.

Figure 13 – Proposed Development Traffic Assignment – Residential

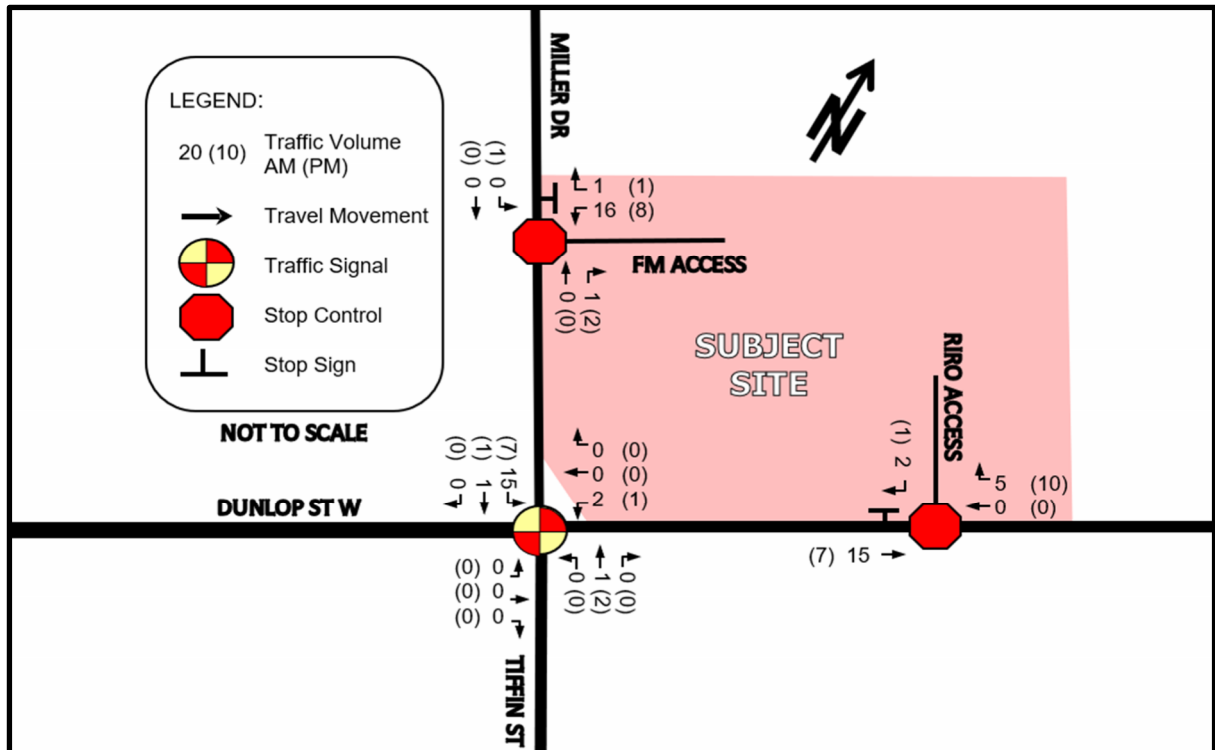


Figure 14 – Proposed Development Traffic Assignment – Commercial Primary

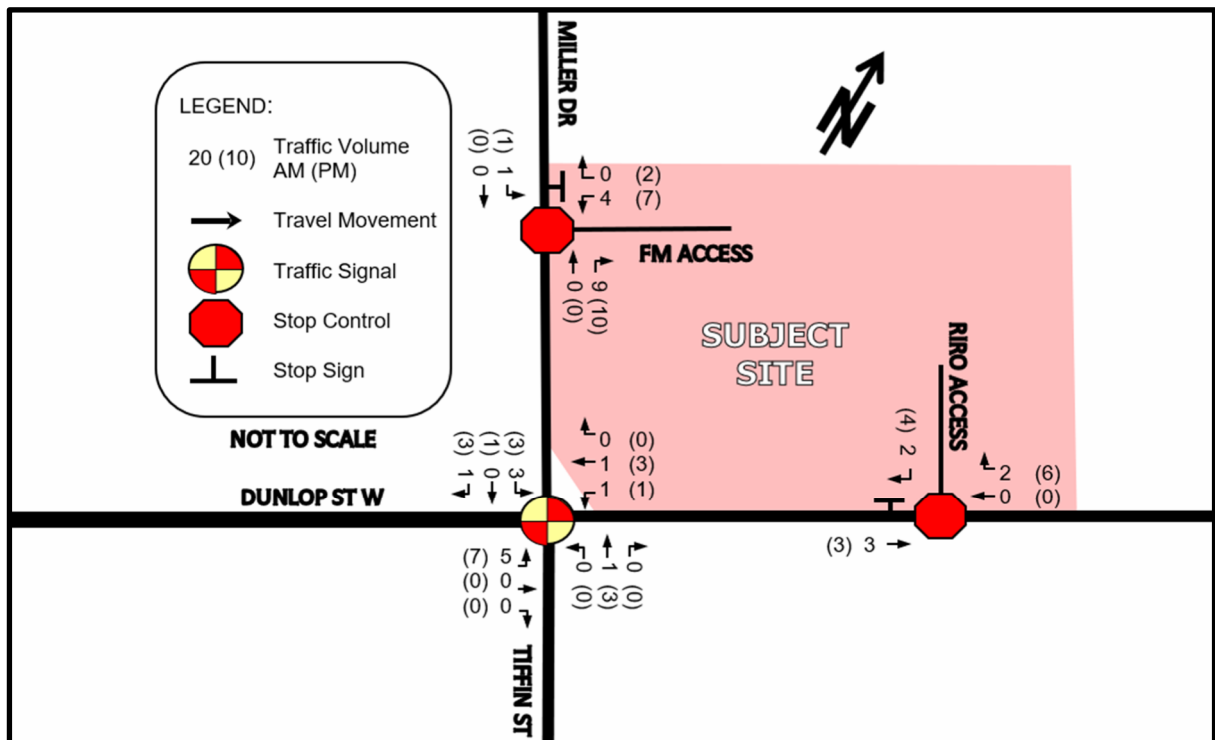


Figure 15 – Proposed Development Traffic Assignment – Commercial Pass-by

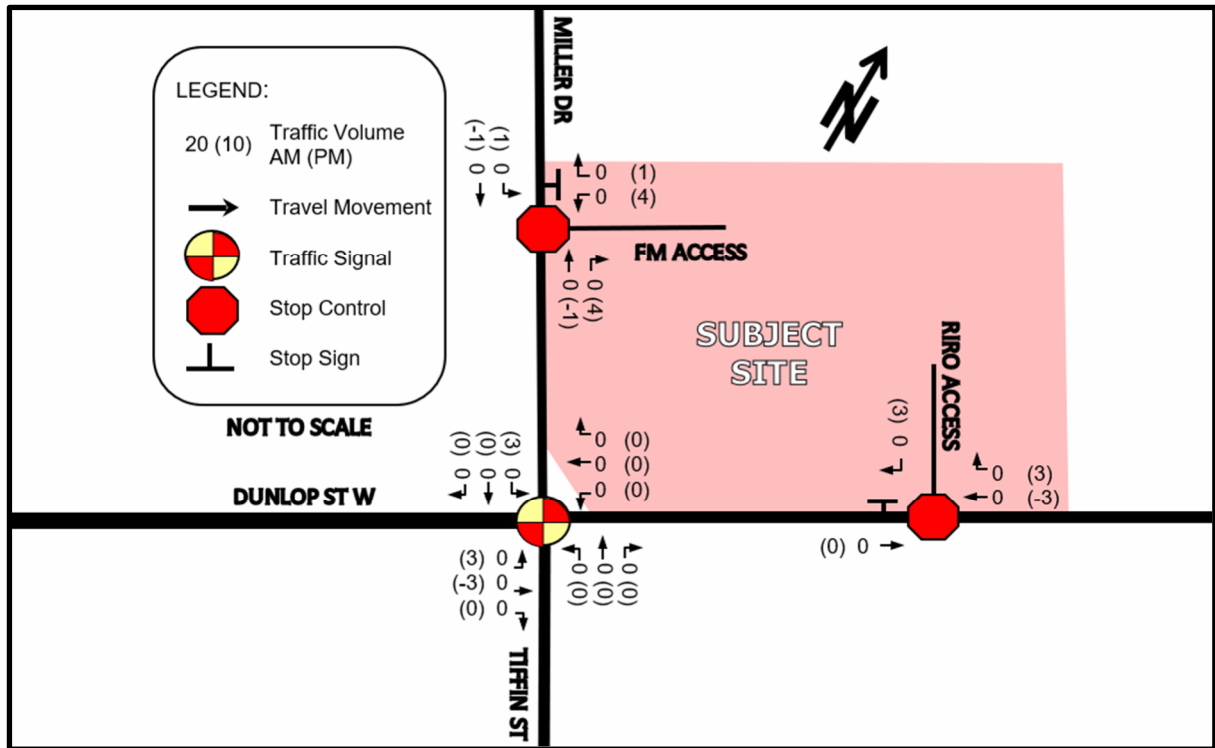


Figure 16 – Proposed Development Traffic Assignment – Total

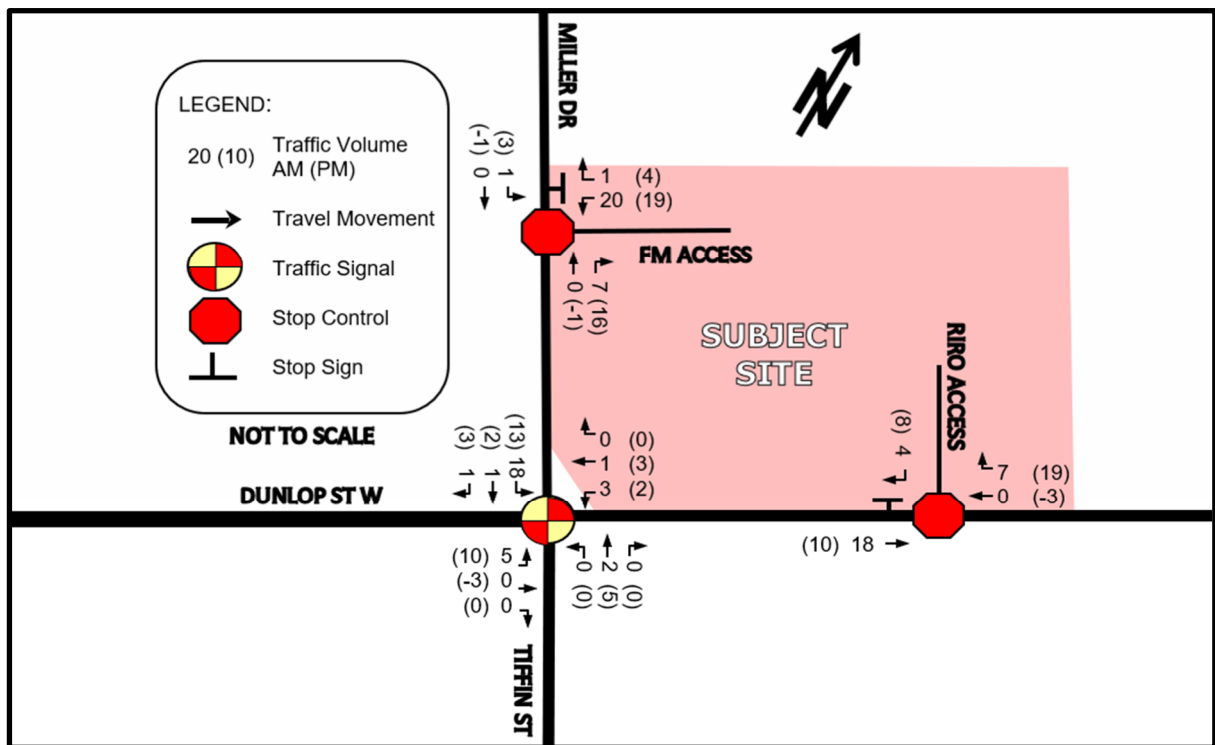


Figure 17 –Total (2024) Traffic Volumes

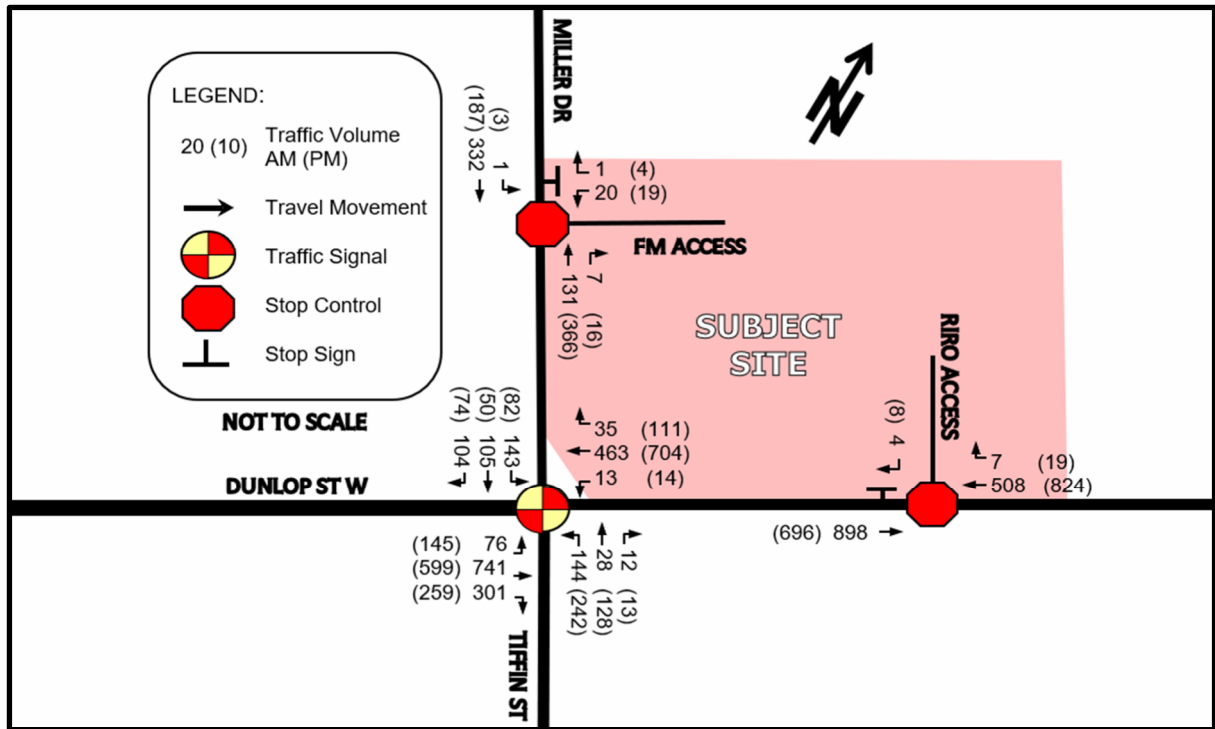


Figure 18 –Total (2029) Traffic Volumes

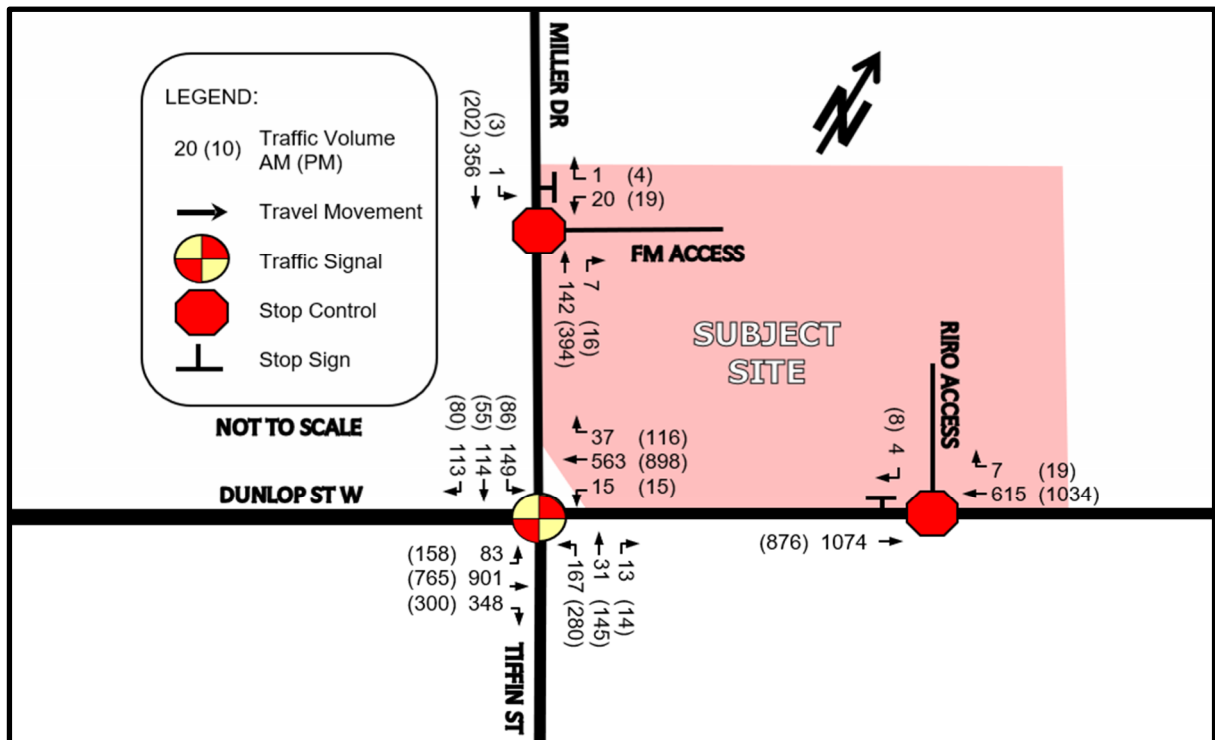
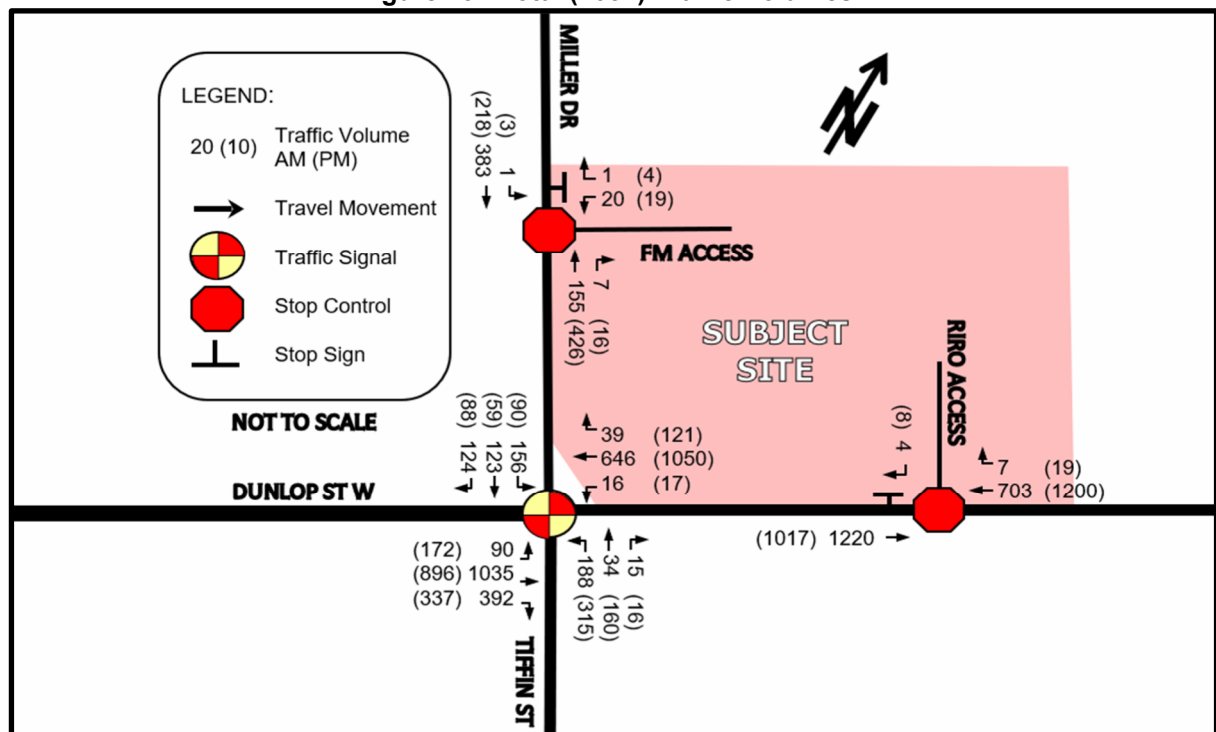


Figure 19 –Total (2034) Traffic Volumes



5 Intersection Operation with Proposed Development

5.1 Total (2024) Intersection Operation

The results of the LOS analysis under total (2024) traffic volumes during the AM and PM peak hour can be found below in **Table 12**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix F**.

In order to restrict left turn movements at the RIRO Access, it is recommended that the median on Dunlop Street West is extended 29 metres to the east.

Table 12 – Total (2024) LOS

Location (N-S Street / E-W Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Storage	Model				Storage	Model
Miller Drive / FM Access (unsignalized)	-	0.5	A	-	-	-	0.5	A	-	-
WB	0.04	12.0	B	-	1	0.05	12.7	B	-	1
Miller Drive & Tiffin Street / Dunlop Street West (signalized)	0.49	24.6	C	-	-	0.56	26.0	C	-	-
EBL	0.19	14.0	B	185	18	0.43	16.8	B	185	29
EBT	0.47	20.9	C	-	98	0.35	19.1	B	-	72
EBR	0.22	12.4	B	125	12	0.19	11.8	B	125	11
WBL	0.06	17.3	B	125	5	0.06	18.4	B	125	5
WBTR	0.36	21.9	C	-	66	0.53	26.2	C	-	108
NBL	0.52	35.4	D	200	50	0.61	39.2	D	200	77
NBTR	0.09	39.6	D	-	18	0.34	44.9	D	-	55
SBL	0.34	33.9	C	100	49	0.24	35.8	D	100	29
SBTR	0.54	49.5	D	-	78	0.24	44.9	D	-	37
RIRO Access / Dunlop Street West (unsignalized)	-	0.0	A	-	-	-	0.1	A	-	-
SB	0.01	10.0	B	-	-	0.02	11.7	B	-	-

The results of the LOS analysis indicate that all study area intersections are operating within the typical design limits noted in Section 3.1.

The anticipated 95th percentile queues for all movements at the the study area intersections can be accommodated by the existing auxiliary lane storage lengths.

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at the unsignalized study area intersections (results are provided in **Appendix H**).

A review of the need for auxiliary right lanes at the study area unsignalized intersections was completed as part of our analysis. The results of the Synchro analysis indicate that there is excess capacity for all movements; consequently, auxiliary turn lanes are not recommended.

No infrastructure improvements are recommended within the study area.

5.2 Total (2029) Intersection Operation

The results of the LOS analysis under total (2029) traffic volumes during the AM and PM peak hour can be found below in **Table 13**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix F**.

Table 13 – Total (2029) LOS

Location (N-S Street / E-W Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Storage	Model				Storage	Model
Miller Drive / FM Access (unsignalized)	-	0.5	A	-	-	-	0.5	A	-	-
WB	0.05	12.4	B	-	1	0.05	13.3	B	-	1
Miller Drive & Tiffin Street / Dunlop Street West (signalized)	0.59	26.3	C	-	-	0.69	28.1	C	-	-
EBL	0.23	14.5	B	185	19	0.59	21.8	C	185	32
EBT	0.56	22.5	C	-	126	0.44	20.4	C	-	95
EBR	0.25	12.5	B	125	12	0.22	12.1	B	125	12
WBL	0.09	18.7	B	125	5	0.08	18.7	B	125	5
WBTR	0.44	24.0	C	-	83	0.66	29.2	C	-	144
NBL	0.64	40.5	D	200	58	0.72	45.2	D	200	90
NBTR	0.10	41.1	D	-	19	0.39	46.2	D	-	62
SBL	0.36	35.5	D	100	51	0.26	36.0	D	100	30
SBTR	0.61	53.8	D	-	86	0.28	45.6	D	-	41
RIRO Access / Dunlop Street West (unsignalized)	-	0.0	A	-	-	-	0.1	A	-	-
SB	0.01	10.5	B	-	-	0.02	12.9	B	-	1

The results of the LOS analysis indicate that all study area intersections are operating within the typical design limits noted in Section 3.1.

The anticipated 95th percentile queue length for the eastbound and westbound through movements at the Miller Drive & Tiffin Street / Dunlop Street West intersection exceed the existing storage length for the adjacent right and left turn movements; however, no improvements are recommended as the turning movements can access the auxiliary lanes via the taper lengths. The anticipated 95th percentile queues for all movements at the the study area intersections can be accommodated by the existing auxiliary lane storage lengths.

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at the unsignalized study area intersections (results are provided in **Appendix H**).

A review of the need for auxiliary right lanes at the study area unsignalized intersections was completed as part of our analysis. The results of the Synchro analysis indicate that there is excess capacity for all movements; consequently, auxiliary turn lanes are not recommended.

No infrastructure improvements are recommended within the study area.

5.3 Total (2034) Intersection Operation

The results of the LOS analysis under total (2034) traffic volumes during the AM and PM peak hour can be found below in **Table 14**. Existing intersection geometry and traffic control have been utilized for this scenario with the signal timing optimization noted in Section 3.5. Detailed output of the Synchro analysis can be found in **Appendix F**.

Table 14 – Total (2034) LOS

Location (N-S Street / E-W Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Storage	Model				Storage	Model
Miller Drive / FM Access (unsignalized)	-	0.5	A	-	-	-	0.5	A	-	-
WB	0.05	12.8	B	-	1	0.06	13.9	B	-	2
Miller Drive & Tiffin Street / Dunlop Street West (signalized)	0.68	28.0	C	-	-	0.85	30.5	C	-	-
EBL	0.28	15.2	B	185	21	0.83	45.8	D	185	64
EBT	0.64	24.3	C	-	153	0.53	21.7	C	-	113
EBR	0.28	12.7	B	125	13	0.25	13.1	B	125	13
WBL	0.12	19.8	B	125	6	0.12	18.5	B	125	6
WBTR	0.50	25.1	C	-	98	0.77	31.4	C	-	166
NBL	0.77	50.1	D	200	72	0.82	50.4	D	200	111
NBTR	0.12	41.6	D	-	21	0.42	43.2	D	-	65
SBL	0.38	35.8	D	100	53	0.28	32.6	C	100	31
SBTR	0.67	56.8	E	-	95	0.28	41.3	D	-	42
RIRO Access / Dunlop Street West (unsignalized)	-	0.0	A	-	-	-	0.1	A	-	-
	0.01	10.9	B	-	-	0.02	14.1	B	-	1

The results of the LOS analysis indicate that all study area intersections are operating within the typical design limits noted in Section 3.1.

The anticipated 95th percentile queue length for the eastbound and westbound through movements at the Miller Drive & Tiffin Street / Dunlop Street West intersection exceed the existing storage length for the adjacent right and left turn movements; however, no improvements are recommended as the turning movements can access the auxiliary lanes via the taper lengths. The anticipated 95th percentile queues for all movements at the the study area intersections can be accommodated by the existing auxiliary lane storage lengths.

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at the unsignalized study area intersections (results are provided in **Appendix H**).

A review of the need for auxiliary right lanes at the study area unsignalized intersections was completed as part of our analysis. The results of the Synchro analysis indicate that there is excess capacity for all movements; consequently, auxiliary turn lanes are not recommended.

No infrastructure improvements are recommended within the study area.

5.4 Sight Distance Review

A review of the available sight distance for the proposed site access driveways was completed as part of this analysis.

The sight distance north (greater than 200 meters) and south (greater than 150 metres) of the FM Access at Miller Drive is greater than the minimum stopping and intersection sight distance requirements identified in the Transportation Association of Canada *Design Guide for Canadian Roads* (2017) [TAC Guidelines] for a design speed of 70km/h (105 and 150 metres).

The sight distance east (greater than 200 meters) and west (greater than 200 metres) of the RIRO Access at Dunlop Street West is greater than the minimum stopping and intersection sight distance requirements identified in the TAC Guidelines for a design speed of 80km/h (130 and 145 metres).

There are no issues with the sight distance available for the proposed Site Access driveways.

5.5 Site Access

The FM Access driveway will operate efficiently as a full-movement access, with one-way stop control for westbound movements. No lane improvements are recommended on Miller Drive at the FM Access. A single eastbound and westbound lane at the FM Access driveway will provide the necessary capacity to service the proposed development.

The RIRO Access driveway will operate efficiently as a RIRO access, with one-way stop control for southbound movements. No lane improvements are recommended on Dunlop Street West at the RIRO Access. A single northbound and southbound lane at the RIRO Access driveway will provide the necessary capacity to service the proposed development.

The proposed spacing (measured edge of driveway to edge of road) between the FM Access and Dunlop Street West (approximately 55 meters) meets the suggested minimum corner clearance requirements for a driveway as identified in the TAC Guidelines – Figure 8.8.2 (Suggested Minimum Corner Clearances to Accesses or Public Lanes at Major Intersections) – 55 metres for signalized condition.

The proposed spacing (measured edge of driveway to edge of road) between the RIRO Access and Dunlop Street West (approximately 100 meters) is in excess of the suggested minimum corner clearance requirements for a driveway as identified in the TAC Guidelines – Figure 8.8.2 (Suggested Minimum Corner Clearances to Accesses or Public Lanes at Major Intersections) – 70 metres for signalized condition.

The proposed spacing (measured edge of driveway radius to edge of driveway radius) between the RIRO Access and the existing driveway to the east (approximately 6 meters) is in excess of the suggested minimum corner clearance requirements for a driveway as identified in the TAC Guidelines – Figure 8.9.2 (Driveway Spacing Guidelines – Locals and Collectors) – 3 metres for industrial driveways.

The proposed throat length for the RIRO Access (approximately 14 metres) is less than the suggested minimum clear throat length (15 metres) for an apartment land use (< 100 units) onto an arterial road as identified in the TAC guidelines – Table 8.9.3 (Suggested Minimum Clear Throat Lengths for Major Driveways); however, per Table 8.9.3, for major developments it is desirable to determine throat lengths per a site specific traffic study. Based on the anticipated 95th percentile queue lengths in the critical total (2034) scenario for the southbound direction at the RIRO Access (1 vehicle), the 95th percentile queue can be accommodated by the proposed throat length. Furthermore, the north end of the throat

length is limited by a parking stall and not a high volume parking aisle or driveway. Consequently, the proposed throat length would have a negligible impact on traffic operations or traffic safety and is considered to be acceptable for the intended use.

The proposed throat length for the FM Access on the south end of the FM Access (approximately 12 metres) meets the suggested minimum clear throat length (8 metres) for an apartment land use (< 100 units) onto a collector road as identified in the TAC guidelines – Table 8.9.3 (Suggested Minimum Clear Throat Lengths for Major Driveways).

The proposed throat length for the FM Access on the north end of the FM Access (approximately 7 metres) is less than the suggested minimum clear throat length (8 metres) for an apartment land use (< 100 units) onto a collector road as identified in the TAC guidelines – Table 8.9.3 (Suggested Minimum Clear Throat Lengths for Major Driveways); however, per Table 8.9.3, for major developments it is desirable to determine throat lengths per a site specific traffic study. Based on the anticipated 95th percentile queue lengths in the critical total (2034) scenario for the westbound direction at the FM Access (1 vehicle), the 95th percentile queue can be accommodated by the proposed throat length. Furthermore, the east end of the throat length is limited by a parking stall and not a high volume parking aisle or driveway. Consequently, the proposed throat length would have a negligible impact on traffic operations or traffic safety and is considered to be acceptable for the intended use.

5.6 Construction Parking

Based on our correspondence with the design team for this project, the Developer is committed to the following arrangement for construction parking:

The parking of construction vehicles and vehicles owned by staff and subcontractors employed by the Developer will be formally directed (in writing where possible) to avoid parking on municipal streets surrounding the subject site and avoid parking within private parking lots surrounding the subject site, without consent from the owner of the parking lots.

5.7 Swept Path Analysis

A truck swept path analysis has been provided in **Appendix I** to illustrate that the following vehicles can access the site as intended without any operational issues:

- Front Load Garbage Truck;
- TAC Passenger Vehicle (TAC P); and
- TAC Light Single Unit Truck (TAC LSU).

6 Transportation Demand Management

The study area has and will continue to experience a significant transformation with respect to land-use and transportation. A number of infrastructure initiatives currently in the design, planning or concept phase, will help to address the transportation capacity challenges in the area. However, the construction of new roads will not be enough to accommodate the projected future travel demand. The following section provides additional existing and planned techniques incorporated in the design for the subject site which will help to address the transportation demand in the study area.

6.1 Transit Network

The subject site is not adjacent to any existing or planned Barrie Transit bus routes; however is within 750 metres of the No. 5 Barrie Transit bus route with the closest bus stop located in the southwest corner of the Sproule Drive / Kraus Road intersection. The above noted bus route connects into the

City's downtown bus terminal. It is recommended that the City consider adjusting existing transit routes to provide transit service adjacent to the subject site.

6.2 Pedestrian and Cycling Network

According to the City's TMP, the existing cycling network in the City includes approximately 145 kilometers of cycling infrastructure. While there is no direct cycling infrastructure adjacent to the subject site at this time, the proposed cycling network in the City's TMP includes buffered bike lanes along Miller Drive and an in-boulevard pathway on Tiffin Street, connecting into the City's cycling network.

There is also no sidewalk infrastructure within the study area; however, the proposed sidewalk network in the City's TMP includes a sidewalk on one side of the road on Tiffin Street within the study area and a sidewalk on both sides of the road on Miller Drive and Dunlop Street West, east of Miller Drive within the study area, connecting into the City's sidewalk network. It is recommended that the City consider accelerating the sidewalk installation on the east side of Miller Drive between Dunlop Street West and the existing end of sidewalk adjacent to the hydro corridor.

Furthermore, a variety of additional active transportation infrastructure is proposed within the City's TMP, including:

- Proposed additional 484 kilometers of active transportation infrastructure within the City;
- A direct, connected and continuous network of different active transportation options to be established that accommodates safe walking, cycling, hiking and other active modes of transportation;
- Provide and prioritize connections to key destinations within the City and to public transit;
- Enhance opportunities for people to walk and bike for short trips;
- Allocate an appropriate annual maintenance budget to monitoring and maintain pedestrian and cycling facilities once they have been constructed;
- Establish a winter maintained network consisting of spine routes in order for walking and cycling to be viable modes of transportation year-round; and
- Developing and implementing programs aimed at encouraging and promoting a culture of active transportation.

6.3 Local Development

The developer is not constructing the proposed development for their own use, consequently, operational decisions are beyond their control; however, the following is a list of transportation demand management techniques that are recommended for the proposed development:

- \$25 transit pass for the first owner of each residential unit, to encourage transit use among residents;
- Preparation and distribution of transit information packages to new residents, including bicycle maps, local transit map/schedule, information on transit incentives and any other relevant information related to active transportation, at time of distribution; and
- Provide an information display board in the amenity area to share updated transportation information. The information board shall display travel information such as bicycle maps, local transit map/schedule and other relevant information.

7 Parking Review

7.1 Scope

The purpose of this analysis is to estimate the parking supply required to adequately service the subject site.

7.2 City of Barrie By-Law Parking Requirement

The City's *Zoning By-law #2009-141* [City's ZBL] provides parking requirements for a variety of building types and land uses. **Table 15** summarizes the parking requirement for the proposed development uses, according to the City's ZBL.

Table 15 – City Zoning By-Law Requirement

Category	Parking Standard	Size	Parking Spaces		
			Required	Provided	Net
Residential building with more than 3 units	1.5 spaces / unit	71 units	107	90	-17
Multiple Uses in Commercial Zones	1 space / 24 sq.m.	754 sq.m.	25	21	-4
Total			132	111	-21
<i>Accessible Parking</i>	<i>1 space + 3% of total required parking</i>		5	5	-
<i>Bicycle Parking</i>	<i>No requirement</i>		-	7	+7

7.3 Study Area Parking Infrastructure

On-street parking is prohibited along all streets within the study area.

There are private parking lots located on the adjacent properties; however, access to these adjacent parking lots is not convenient, consequently we do not anticipate any issues related to illegal parking on adjacent parking lots. Notwithstanding, the proposed parking supply has been designed to ensure overflow parking is not an issue.

7.4 Parking Analysis

7.4.1 Retail Proxy Surveys

In order to estimate the retail parking demand for the proposed development, proxy parking surveys were conducted at four existing retail plazas, specifically:

- 494 Big Bay Point Road, City of Barrie;
- 409 Yonge Street, City of Barrie;
- 190 Minet's Point Road, City of Barrie; and
- 70 Essa Road, City of Barrie.

The building GFA for the proxy sites range from 610 to 1720 square metres, which is similar to the size of commercial space proposed for the subject site (769 square metres). Each of the proxy sites includes multiple retail units, which is similar to the proposed retail space. The type of retail use in each unit ranged, however, the mix of uses at the proxy sites were consistent with what is expected at the proposed development. Each proxy site was fully occupied at the time of the proxy survey. The local development and transportation characteristics for the area surrounding each proxy site is similar to

the local development and transportation characteristics for the proposed development. The proxy sites were reviewed with City staff prior to completing the proxy parking surveys and the parking demand at the proxy sites are generally considered provide a strong correlation with the parking demand for the retail component of the proposed development.

The parking surveys were conducted on Friday March 10th and Saturday March 11th, 2023 from 12:00 to 22:00 at 30-minute intervals. Detailed parking counts can be found in **Appendix C**.

The peak parking demand at 449 Big Bay Point Road, 409 Yonge Street and 190 Minet's Point Road occurred in the early afternoon on Friday and the peak parking demand for 70 Essa Road occurred in the early afternoon on Saturday.

A summary of the results of the proxy parking survey is provided in **Table 17**.

Table 16 – Proxy Parking Survey Summary

Proxy Location	Building Area (sq.m.)	Peak Parking Demand (spaces)	Peak Parking Demand Rate
494 Big Bay Point Road	924	24	1/38 sq.m.
409 Yonge Street	622	14	1/44 sq.m.
190 Minet's Point Road	1,720	37	1/49 sq.m.
70 Essa Road	610	13	1/46 sq.m.
TOTAL	3,876	88	1/44 sq.m.

As summarized in the table, the peak parking demand rate for all proxy sites was lower than the parking supply rate proposed for the subject site (1/36 sq.m.). Consequently, the proposed parking supply is sufficient for the intended use.

7.4.2 Residential - Visitor Parking

7.4.2.1 Proxy Municipalities

The Zoning By-law does not identify a specific parking requirement for residential visitors. Residential visitor parking requirements for other similar municipalities were reviewed as part of our analysis. **Table 16** summarizes similar municipalities parking requirement for residential visitors.

Table 17 – Similar Municipalities Visitor Parking Requirements

Municipality	Zoning By-law	Visitor Parking Requirements
Town of Newmarket	2010-40	0.15 spaces per unit
Town of Aurora	6000-17	0.30 spaces per unit
Town of Bradford West Gwillimbury	2010-050	0.25 spaces per unit
Town of Oakville	2009-189	0.20 spaces per unit
Town of Whitchurch-Stouffville	2010-001-ZO	0.25 spaces per unit

The visitor parking requirement identified in the above noted municipalities' Zoning By-Laws provide a reasonable reference for the Subject Site as the above noted municipalities have similar parking-related characteristics to the City of Barrie, including; population density, access to transit and access to active transportation infrastructure.

Consequently, a visitor parking supply of 0.25 spaces / unit is consistent with the parking supply required in similar municipalities.

7.4.2.2 Proxy Parking Counts – Residential Visitor

Proxy parking counts for residential visitor parking was also reviewed.

To estimate the residential visitor parking demand for the proposed development, two proxy parking surveys were reviewed. Both proxy sites are similar in scale to the proposed community. Both proxy sites are townhouse developments, which typically has similar or higher visitor parking demand when compared to the proposed mixed-use apartment building. One proxy site was constructed within the last 5 years and the other proxy site was constructed over 20 years ago. The surrounding transportation conditions at the proxy parking sites are generally consistent with the surrounding transportation conditions at the proposed development. The selected proxy survey locations are as follows:

- 1) 369 Essa Road, Barrie [369 Essa]; and
- 2) 28 Donald Street, Barrie [28 Donald].

The proxy surveys at 369 Essa and 28 Donald were completed at the following times:

- 1) Friday December 3rd, 2021 from 14:00 to 23:00; and
- 2) Saturday December 4th, 2021 from 10:00 to 23:00.

The proxy parking counts were completed at 30-minute intervals during the above-noted periods.

No on-street parking was observed on Essa Road, in the area, during the proxy surveys.

On-street parking is permitted on Donald Street, adjacent to 28 Donald; however, as illustrated in the proxy parking counts, the dedicated visitor parking areas maintain additional capacity throughout the survey. Consequently, there would be no incentive for residential visitors to park on Donald Street. As such, the parking data collected represents the full visitor parking demand.

Table 17 summarizes the survey data for the proxy sites. Detailed results are provided in **Appendix C**.

Table 18 – Residential Visitor Proxy Survey Data Summary

Proxy Site	Number of Units	Visitor Parking			
		Peak Period	Supply (spaces)	Demand (spaces)	Demand Rate (spaces/unit)
369 Essa	104	Friday, 21:00 Saturday, 19:30 Saturday, 20:30 Saturday, 21:00	14	12	0.15
28 Donald	82	Friday, 18:30	15	25	0.18
AVERAGE					0.17

The proxy survey at 369 Essa found that the standard visitor parking spaces were fully occupied for a three-hour period during the Friday survey and for a total of two and a half hours during the Saturday

survey. It is also noted that some vehicles were parked illegally, in areas along the driveways that were not designated as visitor parking. The survey data also shows that illegal parking occurred at times when there were visitor parking spaces available. This suggests that the illegal parking was not directly related to a shortage of visitor parking spaces. Consequently, we have assumed that the visitor parking demand was not constrained by the visitor parking supply.

Based on the parking data collected at the proxy sites, the proposed 18 visitor parking spaces (0.25 spaces per unit) will provide sufficient parking supply to accommodate the peak visitor parking demand from the proposed 71 residential units.

7.4.3 Residential - Resident Parking

In the case of residential visitor parking, when the visitor parking demand exceeds the visitor parking supply, the additional parking demand may result in unauthorized parking in nearby parking lots or undesignated areas. Consequently, providing an appropriate visitor parking supply as outlined in Section 7.4.1, will ensure overflow visitor parking issues do not occur. Allocation of resident parking is different than visitor parking. Lowering the resident parking supply, in conjunction with clear communication during sales / rental process and ongoing parking enforcement, can increase development efficiency and provide a form of transportation demand management.

Historically, the cost to buy or rent an apartment or condominium unit has included one or more parking spaces, which provides an incentive for private vehicle ownership.

The proposed development includes 71 residential units with one parking space available per unit. A number of municipalities in and around the GTA permit a minimum resident parking supply of 1.0 space per apartment unit, including the City of Guelph, City of Hamilton, Town of Oakville (North Oakville) and East Gwillimbury. As significant development continues to occur within the City, permitting these units provides an opportunity to fill a specific housing demand (individuals or families with one vehicle), without overwhelming the market. This reduced parking rate is also consistent with the City's Intensification Corridor planning and Transportation Demand Management objectives.

The Developer is committed to providing clear messaging in the sales agreement, which will inform buyers that additional parking is not available and regular enforcement by the property manager will occur to ensure there is no misuse of parking within the site.

7.4.4 Bicycle Parking Supply

In order to reduce the reliance on private vehicle travel, resident and visitor bicycle parking spaces will be provided within the Subject Site. A total of 7 indoor bicycle spaces will be provided.

7.5 Recommendations

Table 19 illustrates the recommended parking supply for the Subject Site.

Table 19 – Recommended Minimum Parking Summary

Category	Parking Standard	Size	Recommended Parking Supply	Justification Criteria
Resident	1.0 spaces / unit	71 units	71 spaces	Control of Parking Spaces at Sale of Units Alignment with the City's Intensification Planning and TDM objectives.
Visitor	0.25 space / unit		18 spaces	Proxy Municipalities
Retail	1 space / 36 sq.m.	754 sq.m.	21 spaces	Proxy Parking Survey Data
Recommended Minimum Parking Supply			110 spaces	
<i>Accessible Parking</i>	<i>1 space + 3% of total required parking</i>		<i>5 spaces</i>	
<i>Bicycle Parking</i>	<i>7 spaces</i>		<i>7 spaces</i>	

The above-noted parking supply is considered to be adequate to support the parking demand for the proposed development.

8 Summary

2507517 Ontario Inc. retained **JD Engineering** to prepare this traffic impact study in support of the proposed mixed-use development municipally known as 642 Dunlop Street West, located in the northeast corner of the Miller Drive & Tiffin Street / Dunlop Street West intersection in the City of Barrie [City]. The proposed Site Plan is shown in **Appendix A**. This chapter summarizes the conclusions and recommendations from the study.

The proposed development is anticipated to include a 71-unit residential building with 754 sq.m. GFA ground floor retail space.

1. The proposed development is anticipated to generate a total of 40 AM and 53 PM peak hour primary trips and 16 PM peak hour pass-by trips
2. Detailed turning movement traffic and pedestrian counts for the Miller Drive & Tiffin Street / Dunlop Street West intersection were obtained from the City.
3. An intersection operational analysis was completed at the study area intersections, using the existing (2022) and background (2024, 2029 and 2034) traffic volumes, without the proposed development traffic. This enabled a review of existing and future traffic deficiencies that would be present without the influence of the proposed development. The following infrastructure improvements are recommended:

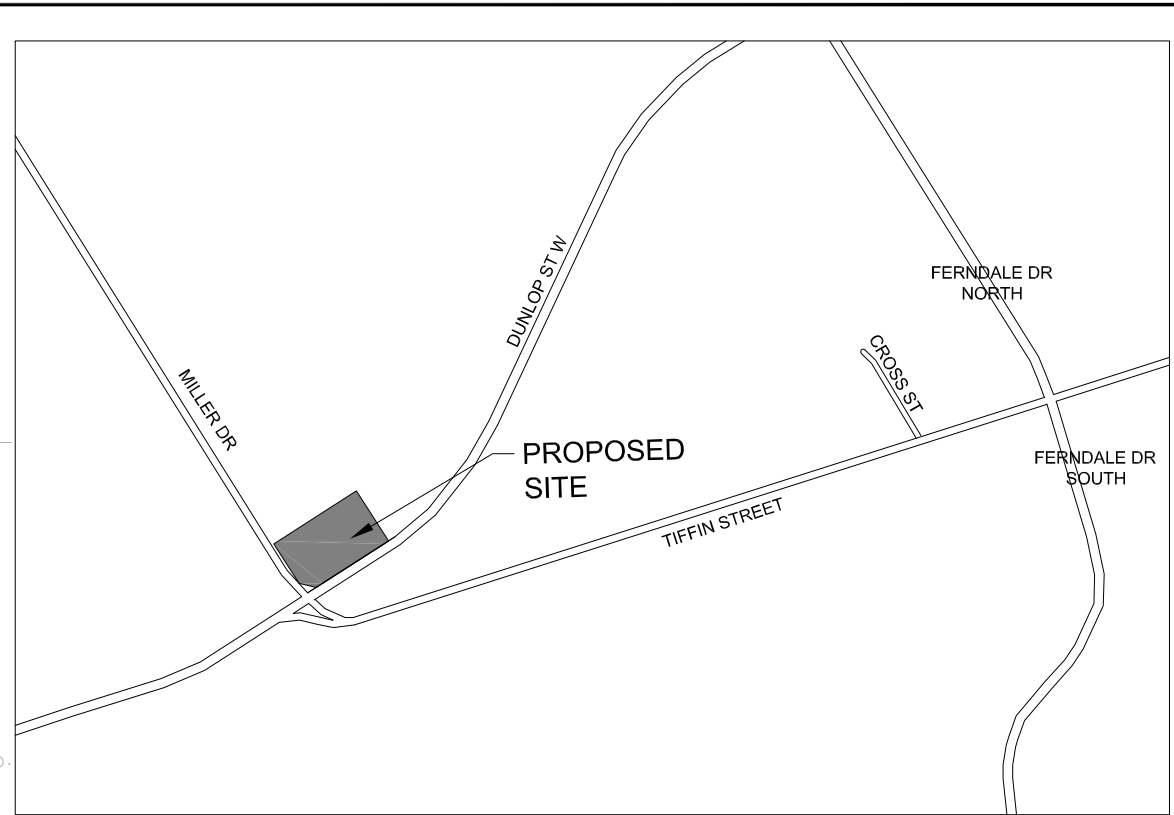
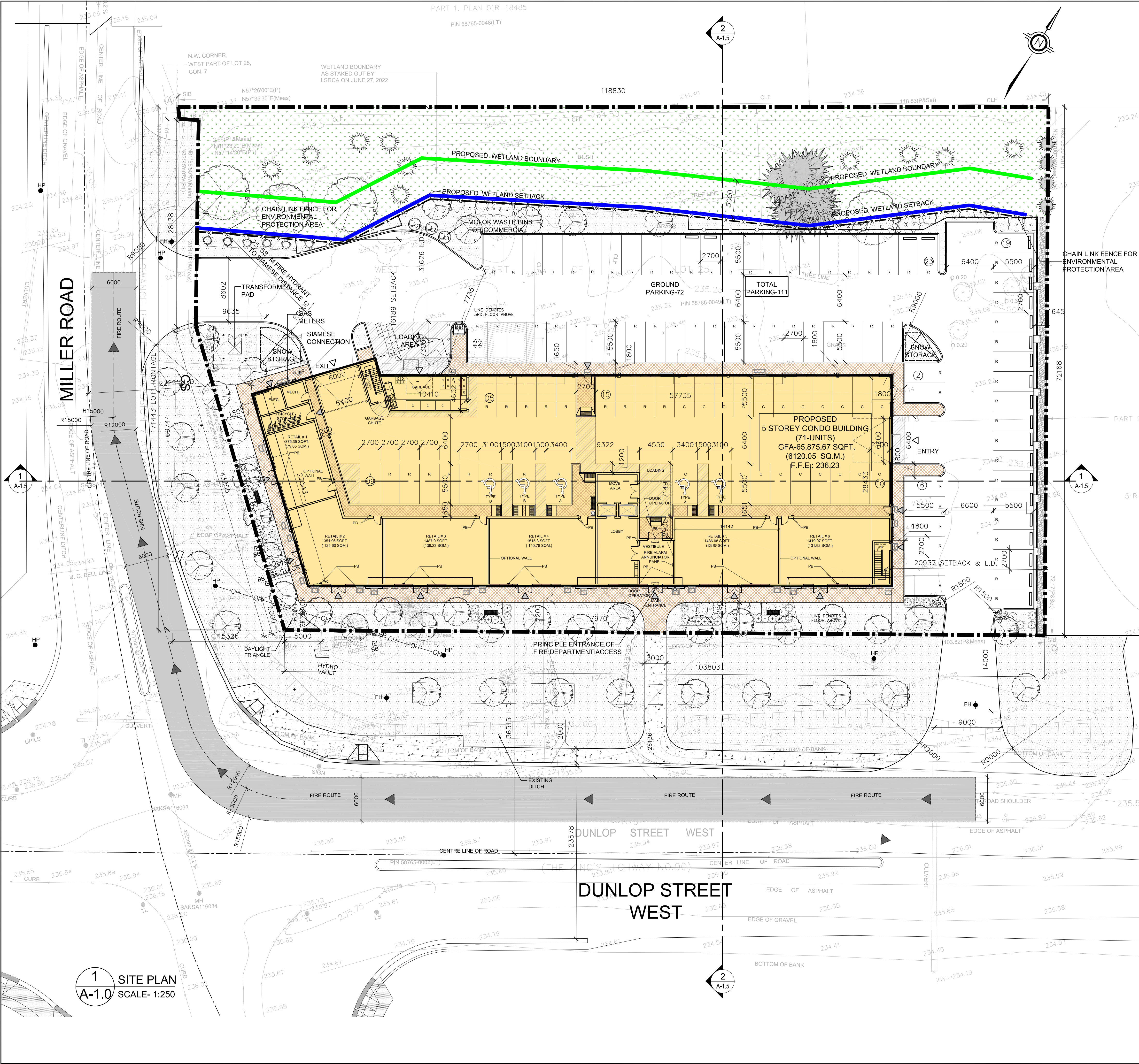
Miller Drive & Tiffin Street / Dunlop Street West;
Background (2034) Traffic Volumes

- Signal timing optimization during the PM peak hour while maintaining the existing cycle length
4. An estimate of the amount of traffic that would be generated by the proposed development was prepared and assigned to the study area streets and intersections.
 5. An intersection operation analysis was completed under total (2024, 2029 and 2034) traffic volumes with the proposed development operational at the study area intersections. No

additional geometric lane improvements or traffic signal improvements are recommended within the study area.

6. The FM Access will operate efficiently as a full-movement access, with one-way stop control for the westbound movements. A single eastbound and westbound lane at the FM Access will provide the necessary capacity to service the proposed development.
7. The RIRO Access will operate efficiently as a right-in-right-out access, with one-way stop control for the southbound movements. A single northbound and southbound lane at the RIRO Access will provide the necessary capacity to service the proposed development.
8. In order to restrict left turn movements at the RIRO Access, it is recommended that the median on Dunlop Street West is extended 29 metres to the east.
9. The sight distance available for the FM Access and RIRO Access meet the minimum stopping and intersection sight distance requirements.
10. It is recommended that the City consider accelerating the installation of the sidewalk on the east side of Miller Drive between Dunlop Street West and end of the existing sidewalk adjacent to the hydro corridor.
11. In summary, the proposed development will not cause any operational issues and will not add significant delay or congestion to the local roadway network.
12. The recommended parking supply for the proposed development is summarized below. The proposed parking supply is adequate to support the parking demand for the proposed development.
 - Resident parking – 71 spaces (one parking space per residential unit)
 - Residential visitor parking – 18 spaces (0.25 spaces per unit)
 - Retail – 21 spaces (one space per 36 square metres GFA)
 - Accessible parking – 5 spaces (per Zoning By-law requirement)
 - Bicycle parking – 7 indoor spaces

Appendix A – Site Plan



KEY PLAN

PROJECT STATISTICS		
ADDRESS 642 DUNLOP STREET WEST, BARRIE, ON.		
ZONING	REQUIRED	PROPOSED
LOT(SITE) AREA (m²)	450 SQ.M.	8084.59 SQ.M.
LOT FRONTAGE		71.44 M.
RETAIL		754.24 SQ.M.
RESIDENTIAL UNITS		6120.05 SQ.M.
OUTDOOR AMENITY AREA		966.52 SQ.M.
TOTAL AMENITY AREA		1362.14 SQ.M.
TOTAL GFA		6120.05 SQ.M.
COVERAGE	50% MAX	2417.06 SQ.M. (28.89%)
LANDSCAPE AREA		2725.20 SQ.M. (33.70%)
PAVED AREA		2942.33 SQ.M. (36.39%)
BUILDING HEIGHT (MAX.)	14.0 M.	13.95 M.
TOTAL PARKING (MIN.)	132 CARS	111 CARS
BARRIER FREE PARKING (MIN.)	5 CARS	5 CARS
BICYCLE PARKING (MIN.)	4	7
LOADING SPACE (MIN.)	1	1
LOT FRONTAGE (MIN.)	15 M.	69.7 M.
DUNLOP STREET WEST		

BUILDING SETBACKS	REQUIRED	PROPOSED
FRONT YARD (WEST)	6.0M	4.76 M.
EXTERIOR SIDE YARD (SOUTH)	5.0M	6.0 M.
INTERIOR SIDE YARD (NORTH)	3.0M	16.18 M.
REAR YARD (EAST)	7.0M	20.93 M.

PARKING CALCULATIONS				
ITEM	AREA(SQM.)	RATE	REQUIRED	PROVIDED
RETAIL	754.24	1 PER 30 SQ.M.	25	21
RESIDENTIAL PARKING (71 UNITS)	6120.05	1.5 PER DWELLING	107	90
TOTAL			132	111
B.F. PARKING (OVER 100 - 14-3% OF REQ. PARKING)			5	5
CAR SPACE SIZE			2.7X5.5M	2.7X5.5M
B.F. CAR SPACE SIZE (TYPE-A)			3.4X5.5M	3.4X5.5M
(TYPE-B)			3.1X5.5M	3.1X5.5M

LEGEND

- NEW BUILDING
- ASPHALT
- LANDSCAPE
- CONC. PAVEMENT, 150MM RAISED
- HANDICAP PARKING
- MAIN ENTRANCE
- OVERHEAD DOOR
- TREE
- BARRIER CURB
- BARRIER FREE CURB
- PB BARRIER FREE PUSH BUTTON

MUNICIPAL ADDRESS & LEGAL DESCRIPTION:

PART 3 OF LOT 25 REGISTERED PLAN F45 CITY OF BARRIE, COUNTY OF SIMCOE

APPLICANT:

IPS (INNOVATIVE PLANNING SOLUTIONS)
647 WELHAM RD, UNIT 9A
BARRIE, ON L4N 0B7

SURVEY INFORMATION TAKEN FROM:

OMARI MWINYI SURVEYING LTD.
1905 PINE GROVE AVENUE PICKERING
ONTARIO, L1V 6T1
Ph: (905) 728-8863
Fax: (905) 492-5485

OWNER:

2507517 ONTARIO INC.
12 CHAVATTI DR., MARKHAM,
ON L3R 1E2

TOTAL UNITS:	
TWO BED ROOM UNITS	31
ONE BED ROOM UNITS	28
ACCESSIBLE ONE BED ROOM UNITS	06
ACCESSIBLE TWO BED ROOM UNITS	06
TOTAL	71

n Architecture Inc

PRINCIPAL: NITIN MALHOTRA, ARCHITECT.
9120 Leslie Street, Suite-208
Richmond Hill, Ontario. L4B 3J9
T : 4 1 6 . 2 5 6 . 9 7 4 1
E : info@narchitecture.com
www.narchitecture.com

ONTARIO ASSOCIATION OF ARCHITECTS
NITIN MALHOTRA
LICENCE 6211
OCT. 21, 2024
PROJECT NORTH

21st OCTOBER 2024
ISSUED FOR SPA-3

5.	21-OCT-2024	ISSUED FOR SPA-3	EY
4.	28-MAR-2023	ISSUED FOR SPA-2	EY
3.	21-APR-2022	ISSUED FOR SPA-1	SB
2.	13-JUN-2018	ISSUED FOR PRE-CONSULTATION	SB
1.	04-APR-2016	ISSUED FOR PRE-CONSULTATION	FK
No.	Date	Version	Dwn.

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PROJECT:

**PROPOSED 5-STOREY CONDO BUILDING
642 DUNLOP STREET W
BARRIE, ON.**

DRAWING TITLE:

SITE PLAN

DRAWN BY: FK	DATE: DEC 02 2015
CHECKED BY: NM	SCALE: AS NOTED
PROJECT NO.: 15-48	DRAWING NO.: A-1.0

Appendix B – Adjacent Development Excerpts

152 Miller Drive Development

City of Barrie

Traffic Brief for Park City Inc.

Type of Document:
Final Report

Project Number:
JDE – 18027

Date Submitted:
April 20th, 2018



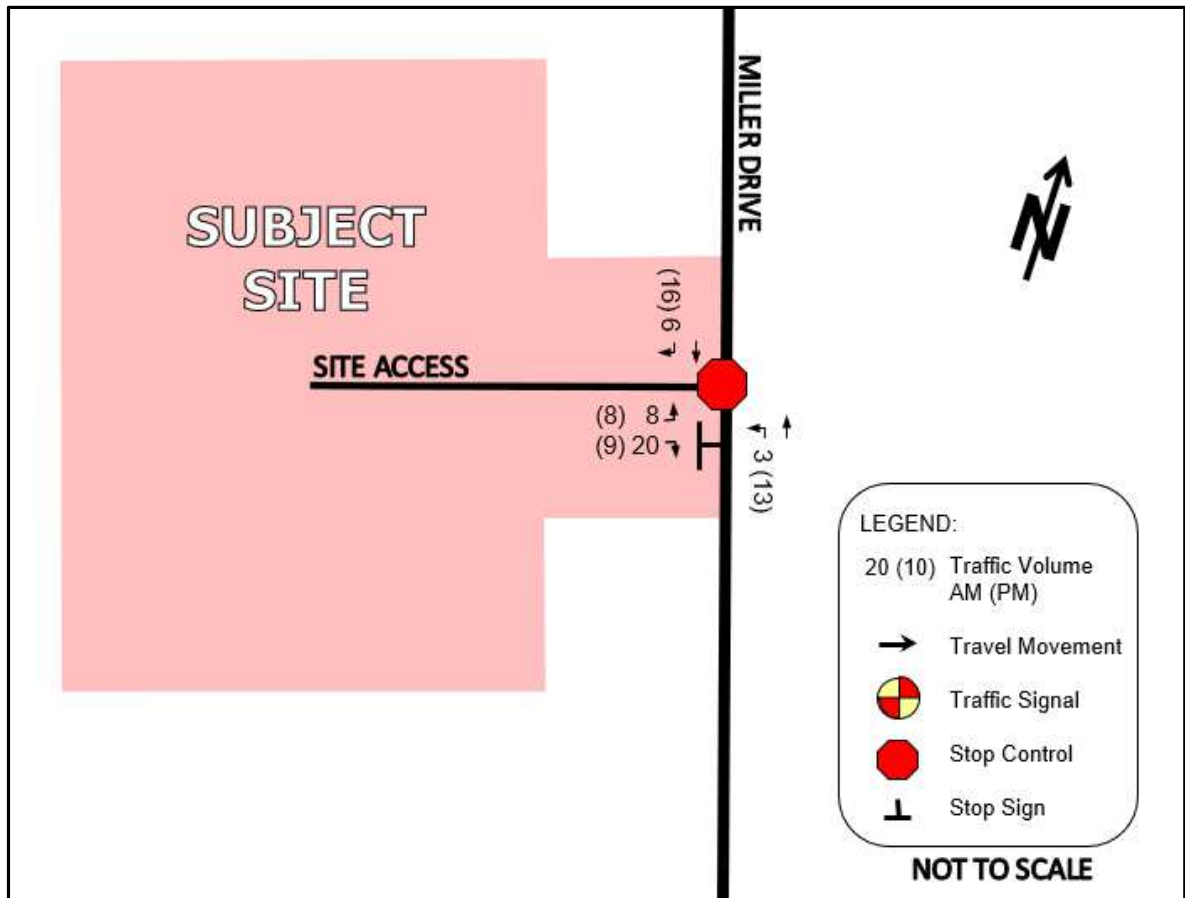
John Northcote, P.Eng.
Professional License #: 100124071



ENGINEERING

JD Northcote Engineering Inc.
86 Cumberland Street
Barrie, ON
(705) 725-4035
www.JDEngineering.ca

Figure 4 – Traffic Assignment for Proposed Development



20/30/40 Miller Drive Development

City of Barrie

Traffic Impact Study for The Hedbern Development Corp.

Type of Document:
Final Report

Project Number:
JDE – 1534

Date Submitted:
November 26th, 2015



John Northcote, P.Eng.
Professional License #:



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Figure 7 – Residential Traffic Assignment for Proposed Development

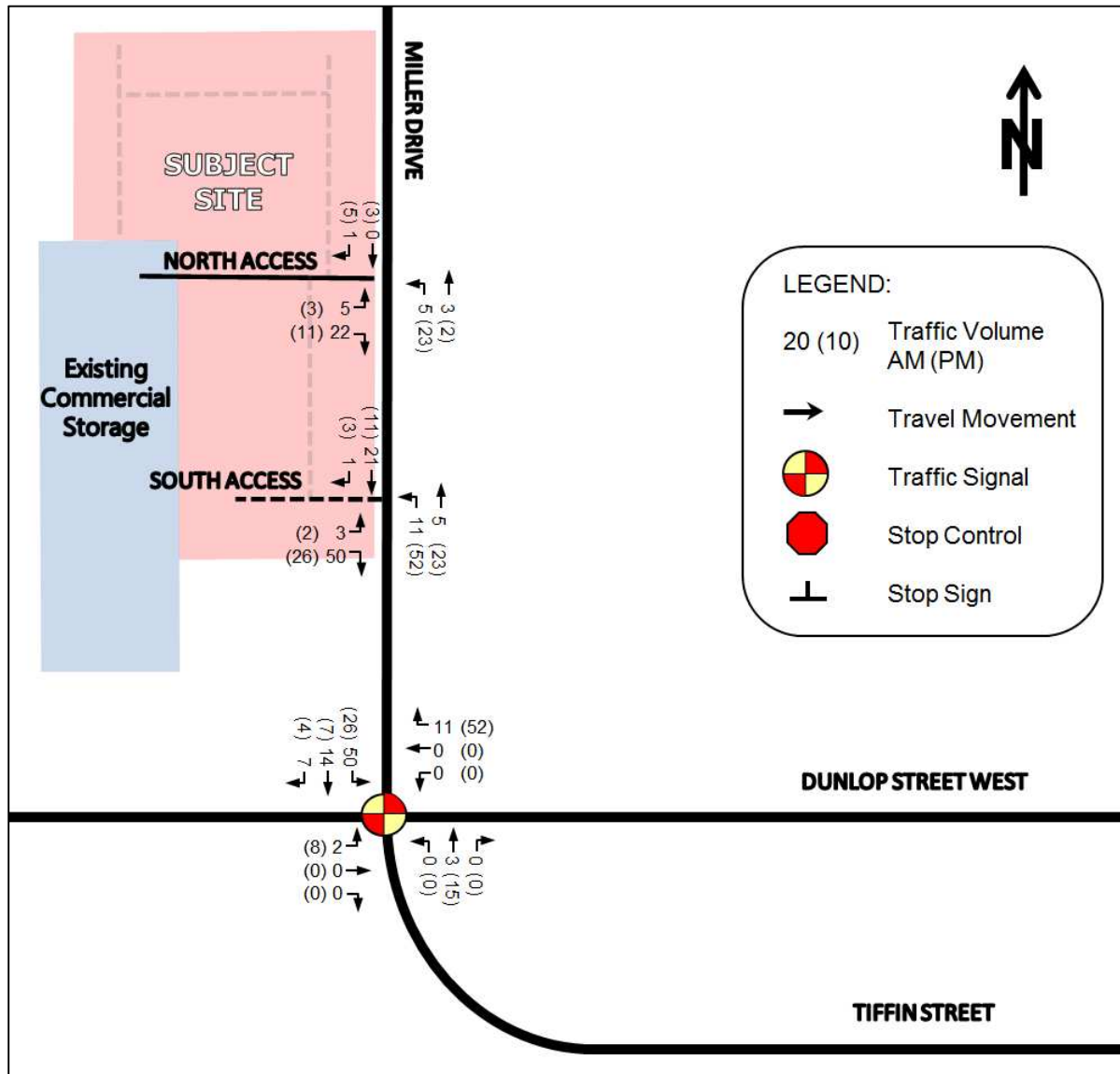
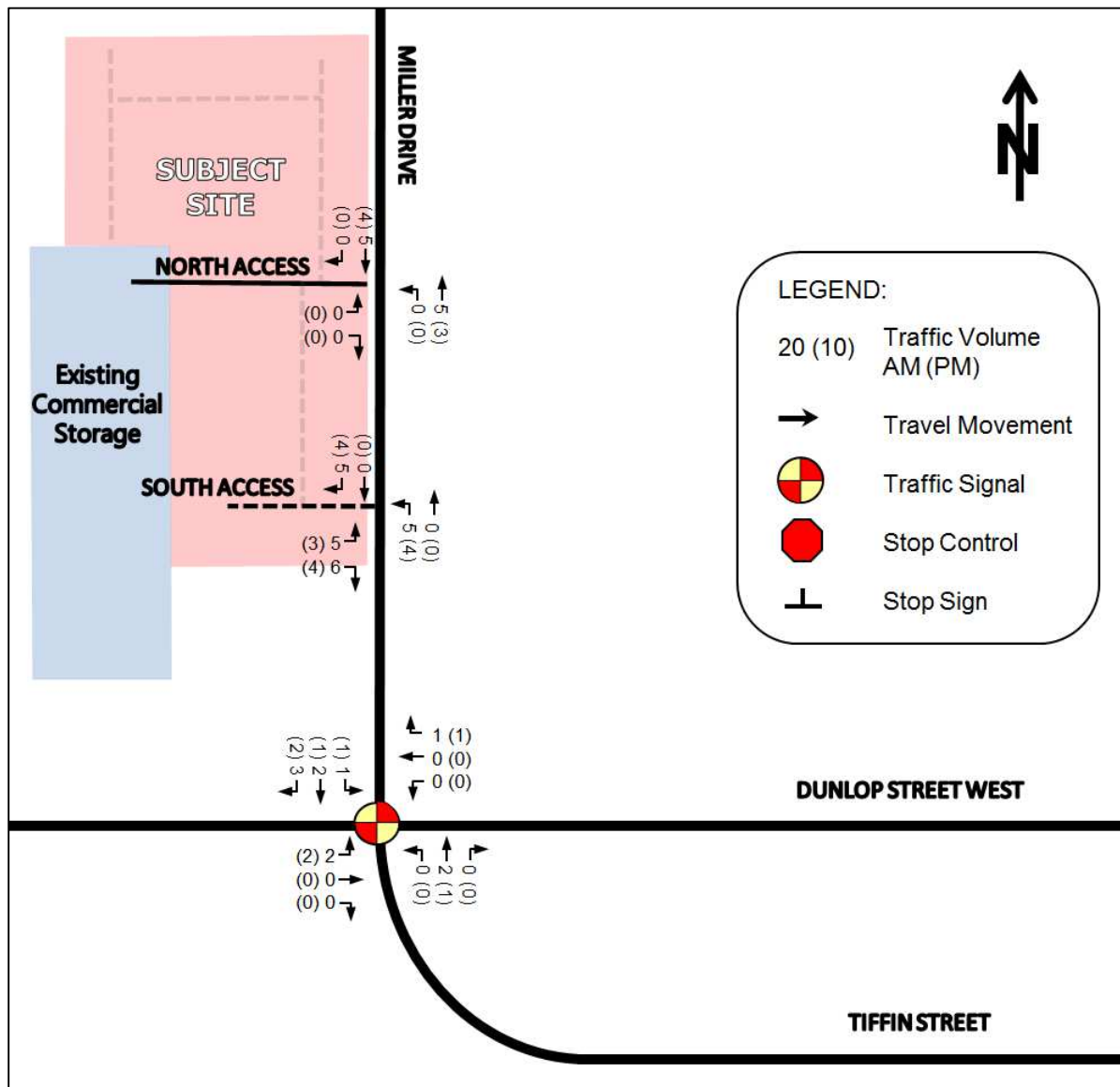


Figure 8 – Commercial Traffic Assignment for Proposed Development



4.3 Total Horizon Year Traffic Volumes with the Proposed Development

For the total (2025) horizon year traffic volumes, the proposed residential and commercial development traffic was added to the projected (2025) traffic volumes. The resulting total (2025) horizon year total traffic volume for the AM and PM peak hour can be found in **Figure 9**.

Appendix C – Traffic Count Data

Trans-Plan Transportation Inc.

Site ID Code:
 Intersection Location: Dunlop Street & Miller Drive / Tiffin Street
 Municipality: Barrie, Ontario
 Count Date: Thursday April 11, 2019
 Weather and Temperature: Cloudy, 0 Degrees
 Surveyor: TP

AM	NORTH APPROACH										Total	EAST APPROACH										Total	SOUTH APPROACH										Total	WEST APPROACH										Total	Grand Total
	CAR			TRUCKS			CYCLISTS			Peds		CAR			TRUCKS			CYCLISTS			Peds		CAR			TRUCKS			CYCLISTS			Peds													
	L	T	R	L	T	R	L	T	R			L	T	R	L	T	R	L	T	R			L	T	R	L	T	R	L	T	R														
7:00	16	7	15	0	0	0	0	0	0	0	38	3	60	2	0	11	1	0	0	0	0	77	35	4	1	8	0	3	0	0	0	0	51	3	114	50	0	1	1	0	0	0	0	169	335
7:15	12	10	15	0	0	0	0	0	0	0	37	2	93	2	0	9	1	0	1	0	1	109	26	4	1	4	2	1	0	0	0	0	38	8	104	47	1	3	3	0	0	0	0	166	350
7:30	17	22	30	0	3	2	0	0	0	0	74	0	107	3	0	5	0	0	0	0	0	115	34	5	0	6	0	1	0	0	0	0	46	14	154	61	1	4	3	0	0	0	0	237	472
7:45	11	18	30	0	2	0	0	0	0	0	61	0	96	5	0	10	3	0	0	0	0	114	27	7	1	1	0	0	0	0	0	0	36	15	143	81	1	10	6	0	0	0	0	256	467
8:00	11	15	14	1	2	1	0	0	0	0	44	3	83	4	1	15	0	0	0	0	0	106	26	2	4	4	0	0	0	0	0	0	36	21	141	40	0	6	1	0	0	0	0	209	395
8:15	13	13	7	0	0	0	0	0	0	0	33	2	56	3	1	8	1	0	0	0	0	71	22	2	2	4	1	1	0	0	0	0	32	8	146	62	0	5	2	0	0	0	0	223	359
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MD																																													
11:00	9	7	7	0	0	0	0	0	0	0	23	1	69	4	1	7	0	0	0	0	0	82	15	2	3	1	0	0	0	0	0	0	21	10	91	17	1	8	1	0	0	0	0	128	254
11:15	10	6	6	0	0	0	0	0	0	0	22	2	84	8	1	9	0	0	0	0	0	104	15	8	0	0	0	0	0	0	0	0	23	10	82	33	0	8	1	0	0	0	0	134	283
11:30	5	10	6	0	0	0	0	1	0	0	22	1	80	4	0	8	0	0	0	0	0	93	20	5	2	1	0	2	0	0	0	0	30	9	77	32	1	10	4	0	0	0	0	133	278
11:45	8	8	8	0	1	0	0	0	0	0	25	4	67	8	0	11	1	0	0	0	0	91	21	9	1	2	1	0	0	0	0	0	34	12	105	34	0	6	1	0	0	0	0	158	308
12:00	6	7	10	1	0	1	0	0	0	0	25	1	78	6	0	8	0	0	0	0	0	93	22	10	1	3	0	0	0	0	0	0	36	16	88	15	1	6	2	0	0	0	0	128	282
12:15	9	5	6	1	0	0	0	0	0	0	21	2	76	8	0	7	0	0	0	0	0	93	21	11	0	0	0	1	0	0	0	0	33	13	108	27	0	9	1	0	0	0	0	158	305
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PM																																													
15:00	3	8	15	0	1	0	0	0	0	0	27	3	119	6	0	3	0	0	0	0	0	131	37	11	1	3	0	0	0	0	0	0	52	13	111	30	0	8	3	0	0	0	0	165	375
15:15	6	7	14	0	0	0	0	0	0	0	27	1	122	10	0	13	0	0	0	0	0	146	36	17	1	2	1	0	0	0	0	0	57	14	91	33	0	8	3	0	0	0	0	149	379
15:30	7	7	12	0	0	1	0	0	0	1	28	1	128	5	2	4	0	0	0	0	1	141	38	15	1	1	0	0	0	0	0	1	56	23	115	49	0	5	5	0	0	0	0	197	422
15:45	8	7	15	0	1	0	0	0	0	0	31	0	120	10	2	4	0	0	0	0	0	136	28	20	0	0	1	0	0	0	0	0	49	29	108	47	0	5	6	0	0	0	0	195	411
16:00	9	12	13	1	0	1	0	0	0	0	36	1	121	12	1	3	0	0	0	0	0	138	52	18	2	1	0	2	0	0	0	0	75	29	120	45	0	4	6	0	0	0	0	204	453
16:15	2	4	12	0	3	0	0	0	0	0	21	0	134	11	3	5	0	0	0	0	0	153	55	15	0	0	1	0	0	0	0	0	71	27	106	49	0	5	7	0	0	0	0	194	439
16:30	8	6	19	1	0	0	0	0	0	0	34	0	134	6	1	2	0	0	0	0	0	143	54	22	1	0	0	2	0	0	0	0	79	20	113	60	0	7	9	0	0	0	0	209	465
16:45	9	10	13	2	0	0	0	0	0	0	34	2	143	13	1	7	0	0	0	0	1	167	40	34	2	4	0	0	0	0	0	0	80	37	115	39	0	2	7	0	1	0	0	201	482
17:00	5	3	14	0	0	0	0	0	0	0	22	0	125	12	0	4	0	0	0	0	1	142	64	25	1	0	0	0	0	0	0	0	90	25	104	35	1	3	2	0	0	0	0	170	424
17:15	14	9	10	0	0	0	0	0	0	0	33	1	141	17	1	2	0	0	0	0	0	162	50	22	0	0	0	0	0	0	0	0	72	25	110	34	0	1	5	0	0	0	0	175	442
17:30	7	13	16	0	0	0	0	0	0	0	36	0	115	15	0	1	0	0	0	0	0	131	39	19	0	0	0	0	0	0	0	0	58	24	96	29	0	3	3	0	0	0	0	155	380
17:45	9	12	13	0	0	0	0	0	0	0	34	0	101	18	0	2	0	0	0	0	0	121	30	10	2	1	0	0	0	0	0	0	43	26	106	25	0	3	3	0	0	0	0	163	361



Turning Movement Count Diagram

Intersection: Dunlop Street & Miller Drive / Tiffin Street

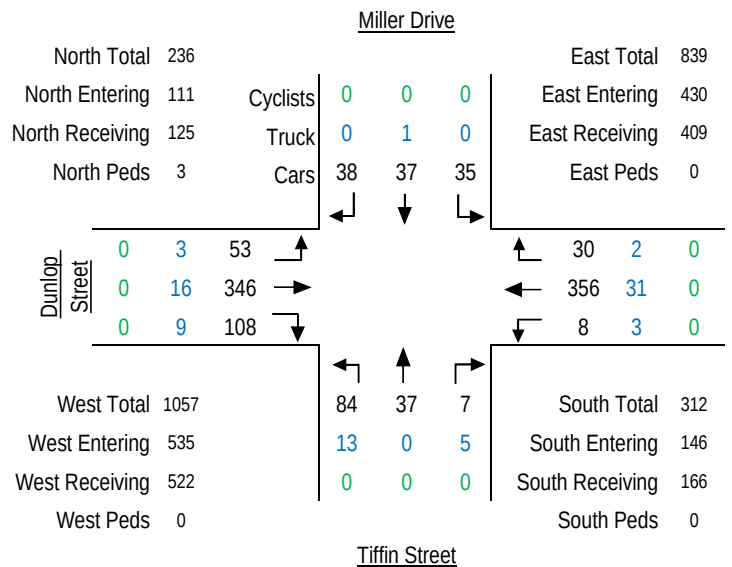
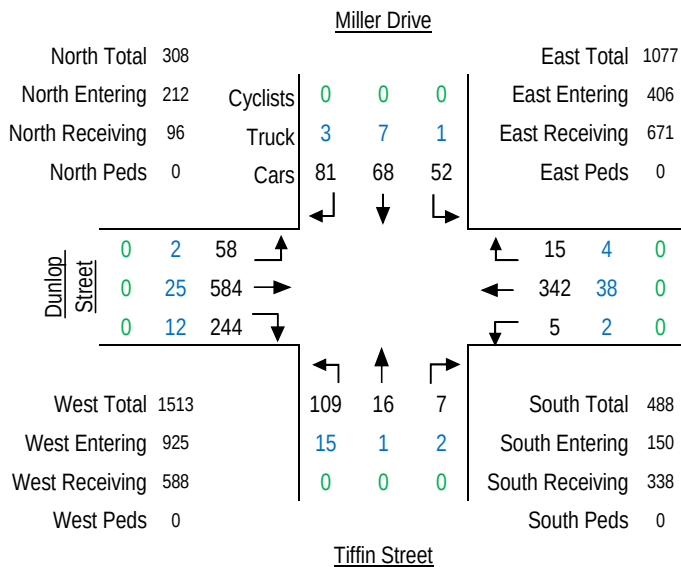
Municipality: Barrie, Ontario

Intersection ID:

Date: Thursday April 11, 2019

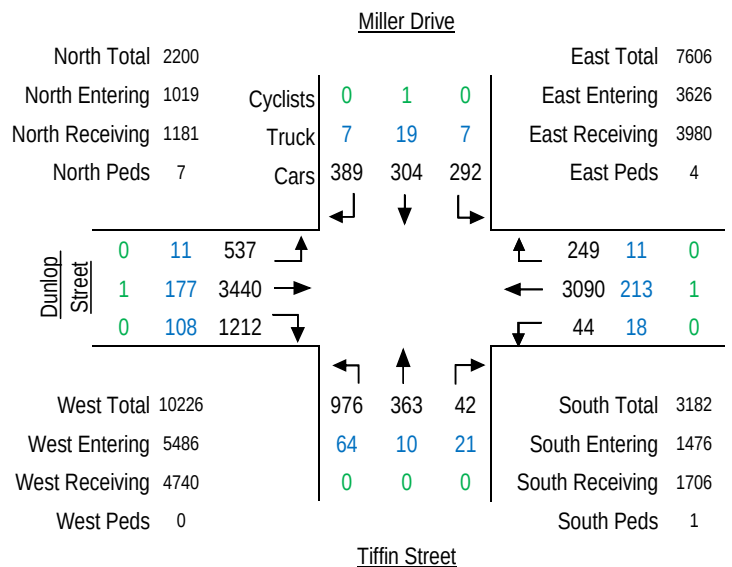
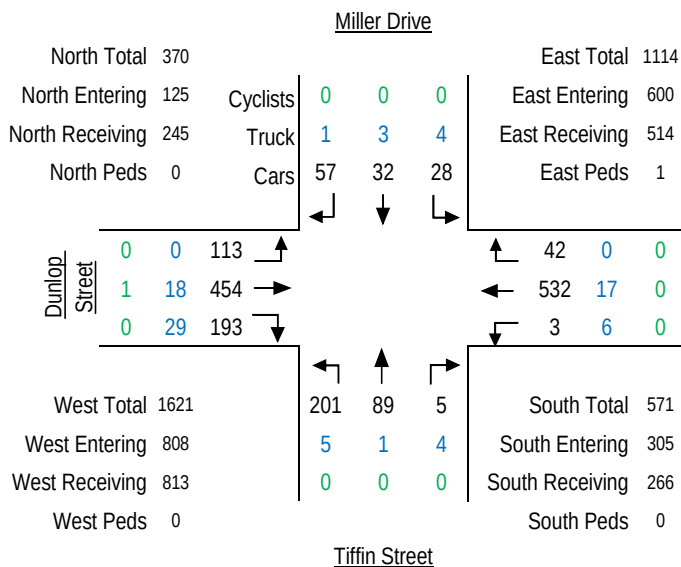
AM Peak Hour: 7:30 to 8:30

MD Peak Hour: 13:00 to 14:00



PM Peak Hour: 16:00 to 17:00

Total 8-Hour Count



Date: Friday March 10, 2023

494 Big Bay Point Road						
Time			Legal	BF	Visitor	Illegal
Supply			42	2		
12:00	to	12:30	23			23
12:30	to	13:00	26	1		28
13:00	to	13:30	18			18
13:30	to	14:00	21			21
14:00	to	14:30	23			23
14:30	to	15:00	24			24
15:00	to	15:30	19			19
15:30	to	16:00	19			19
16:00	to	16:30	22			22
16:30	to	17:00	23			23
17:00	to	17:30	20			20
17:30	to	18:00	16			16
18:00	to	18:30	12			12
18:30	to	19:00	15			15
19:00	to	19:30	14			14
19:30	to	20:00	12			12
20:00	to	20:30	8			8
20:30	to	21:00	7			7
21:00	to	21:30	6			6
21:30	to	22:00	4			4

Building GFA (sq.m.) 924

Peak Parking Demand 24

Peak Parking Demand Rate (1 space / X sq.m.) 38

409 Yonge Street						
Time			Legal	BF	Visitor	Illegal
Supply			58	N/A		
12:00	to	12:30	11			12
12:30	to	13:00	10			12
13:00	to	13:30	12			14
13:30	to	14:00	7			8
14:00	to	14:30	7			8
14:30	to	15:00	8			9
15:00	to	15:30	2			3
15:30	to	16:00	10			11
16:00	to	16:30	9			10
16:30	to	17:00	8			9
17:00	to	17:30	7			8
17:30	to	18:00	7			8
18:00	to	18:30	6			7
18:30	to	19:00	5			6
19:00	to	19:30	4			5
19:30	to	20:00	8			9
20:00	to	20:30	8			9
20:30	to	21:00	6			7
21:00	to	21:30	5			6
21:30	to	22:00	3			3

Building GFA (sq.m.) 622

Peak Parking Demand 14

Peak Parking Demand Rate (1 space / X sq.m.) 44

190 Minet's Point Road						
Time			Legal	BF	Visitor	Illegal
Supply			82	2		
12:00	to	12:30	35			35
12:30	to	13:00	33			34
13:00	to	13:30	27			27
13:30	to	14:00	26			27
14:00	to	14:30	33	1		34
14:30	to	15:00	30	2		32
15:00	to	15:30	23	1		24
15:30	to	16:00	36	1		37
16:00	to	16:30	34	1		35
16:30	to	17:00	31	0		31
17:00	to	17:30	23	1		24
17:30	to	18:00	19			19
18:00	to	18:30	17			17
18:30	to	19:00	16			16
19:00	to	19:30	14			14
19:30	to	20:00	11			11
20:00	to	20:30	4			4
20:30	to	21:00	5			5
21:00	to	21:30	6			6
21:30	to	22:00	3			3

Building GFA (sq.m.) 1720

Peak Parking Demand 35

Peak Parking Demand Rate (1 space / X sq.m.) 49

70 Essa Road						
Time			Legal	BF	Visitor	Illegal
Supply			24 *			
12:00	to	12:30	12			12
12:30	to	13:00	11			11
13:00	to	13:30	9			9
13:30	to	14:00	11			11
14:00	to	14:30	9			9
14:30	to	15:00	7			7
15:00	to	15:30	8			8
15:30	to	16:00	10			10
16:00	to	16:30	9			9
16:30	to	17:00	8			8
17:00	to	17:30	6			6
17:30	to	18:00	5			5
18:00	to	18:30	4			4
18:30	to	19:00	3			3
19:00	to	19:30	2			2
19:30	to	20:00	3			3
20:00	to	20:30	2			2
20:30	to	21:00	2			2
21:00	to	21:30	1			1
21:30	to	22:00	1			1

Building GFA (sq.m.) 610

Peak Parking Demand 12

Peak Parking Demand Rate (1 space / X sq.m.) 50

Date: Saturday, March 11, 2023

			494 Big Bay Point Road				
Time			Legal	BF	Visitor	Illegal	Total
Supply			42	2			
12:00	to	12:30	16				16
12:30	to	13:00	19				19
13:00	to	13:30	21				21
13:30	to	14:00	21				21
14:00	to	14:30	17				17
14:30	to	15:00	20				20
15:00	to	15:30	21				21
15:30	to	16:00	18			1	19
16:00	to	16:30	16				16
16:30	to	17:00	19				19
17:00	to	17:30	18				18
17:30	to	18:00	17				17
18:00	to	18:30	15				15
18:30	to	19:00	9				9
19:00	to	19:30	13				13
19:30	to	20:00	1				1
20:00	to	20:30	3				3
20:30	to	21:00	1				1
21:00	to	21:30	1				1
21:30	to	22:00	0				0

Building GFA (sq.m.) 924
Peak Parking Demand 21
Peak Parking Demand Rate (1 space / X sq.m.) 44

			409 Yonge Street				
Time			Legal	BF	Visitor	Illegal	Total
Supply			58	N/A			
12:00	to	12:30	2			2	4
12:30	to	13:00	3			2	5
13:00	to	13:30	7			2	9
13:30	to	14:00	6			2	8
14:00	to	14:30	5			2	7
14:30	to	15:00	7			2	9
15:00	to	15:30	8			2	10
15:30	to	16:00	4			2	6
16:00	to	16:30	1			2	3
16:30	to	17:00	4			1	5
17:00	to	17:30	7			1	8
17:30	to	18:00	8			2	10
18:00	to	18:30	7			2	9
18:30	to	19:00	3			2	5
19:00	to	19:30	2			2	4
19:30	to	20:00	3			2	5
20:00	to	20:30	2			2	4
20:30	to	21:00	1			2	3
21:00	to	21:30	2			1	3
21:30	to	22:00	1			1	2

Building GFA (sq.m.) 622
Peak Parking Demand 10
Peak Parking Demand Rate (1 space / X sq.m.) 62

			190 Minet's Point Road				
Time			Legal	BF	Visitor	Illegal	Total
Supply			82	2			
12:00	to	12:30	25				25
12:30	to	13:00	29				29
13:00	to	13:30	30				30
13:30	to	14:00	28				28
14:00	to	14:30	31				31
14:30	to	15:00	22				22
15:00	to	15:30	19				19
15:30	to	16:00	16				16
16:00	to	16:30	17				17
16:30	to	17:00	23				23
17:00	to	17:30	18				18
17:30	to	18:00	20				20
18:00	to	18:30	18				18
18:30	to	19:00	16				16
19:00	to	19:30	18				18
19:30	to	20:00	9				9
20:00	to	20:30	10				10
20:30	to	21:00	6				6
21:00	to	21:30	4				4
21:30	to	22:00	2				2

Building GFA (sq.m.) 1720
Peak Parking Demand 31
Peak Parking Demand Rate (1 space / X sq.m.) 55

			70 Essa Road				
Time			Legal	BF	Visitor	Illegal	Total
Supply			24				
12:00	to	12:30	8				8
12:30	to	13:00	11				11
13:00	to	13:30	10				10
13:30	to	14:00	13				13
14:00	to	14:30	12				12
14:30	to	15:00	11				11
15:00	to	15:30	5				5
15:30	to	16:00	6				6
16:00	to	16:30	5				5
16:30	to	17:00	4				4
17:00	to	17:30	6				6
17:30	to	18:00	4				4
18:00	to	18:30	3				3
18:30	to	19:00	4				4
19:00	to	19:30	3				3
19:30	to	20:00	3				3
20:00	to	20:30	3				3
20:30	to	21:00	2				2
21:00	to	21:30	1				1
21:30	to	22:00	1				1

Building GFA (sq.m.) 610
Peak Parking Demand 13
Peak Parking Demand Rate (1 space / X sq.m.) 46

Location: 369 Essa Road (104 townhouse units)

Date: Friday Dec 3rd from 4:00 PM to 11:00 PM

Time			Visitor	Accessible Vistor	Illegal	TOTAL
Supplay			10	4		
16:00	to	16:30	6	0	0	6
16:30	to	17:00	7	0	1	8
17:00	to	17:30	6	0	1	7
17:30	to	18:00	9	0	1	10
18:00	to	18:30	9	0	0	9
18:30	to	19:00	10	1	0	11
19:00	to	19:30	10	1	0	11
19:30	to	20:00	10	1	0	11
20:00	to	20:30	10	1	0	11
20:30	to	21:00	10	1	0	11
21:00	to	21:30	10	1	1	12
21:30	to	22:00	8	1	0	9
22:00	to	22:30	9	2	0	11
22:30	to	23:00	7	2	0	9

Date: Saturday Dec 4 from 10:00 AM to 11:00 PM

Time			Visitor	Accessible Vistor	Illegal	TOTAL
			10	4		
10:00	to	10:30	10	1	0	11
10:30	to	11:00	10	1	0	11
11:00	to	11:30	8	1	1	10
11:30	to	12:00	9	1	1	11
12:00	to	12:30	7	1	1	9
12:30	to	13:00	7	2	2	11
13:00	to	13:30	9	0	2	11
13:30	to	14:00	8	0	1	9
14:00	to	14:30	8	1	2	11
14:30	to	15:00	8	1	2	11
15:00	to	15:30	8	0	2	10
15:30	to	16:00	7	1	2	10
16:00	to	16:30	7	1	2	10
16:30	to	17:00	8	1	1	10
17:00	to	17:30	8	1	1	10
17:30	to	18:00	9	0	1	10
18:00	to	18:30	9	0	1	10
18:30	to	19:00	9	0	2	11
19:00	to	19:30	9	0	2	11
19:30	to	20:00	10	0	2	12
20:00	to	20:30	8	0	0	8
20:30	to	21:00	10	0	2	12
21:00	to	21:30	10	1	1	12
21:30	to	22:00	8	1	1	10
22:00	to	22:30	8	1	0	9
22:30	to	23:00	7	1	0	8

Location: 28 Donald Street (82 townhouse units)

Date: Friday Dec 3rd from 4:00 PM to 11:00 PM

Time			Visitor	Accessible Vistor	Illegal	TOTAL
Supplay			27	0		
16:00	to	16:30	10	0	0	10
16:30	to	17:00	12	0	1	13
17:00	to	17:30	12	0	1	13
17:30	to	18:00	11	0	1	12
18:00	to	18:30	12	0	2	14
18:30	to	19:00	13	0	2	15
19:00	to	19:30	10	0	2	12
19:30	to	20:00	8	0	2	10
20:00	to	20:30	7	0	2	9
20:30	to	21:00	6	0	2	8
21:00	to	21:30	6	0	2	8
21:30	to	22:00	7	0	2	9
22:00	to	22:30	5	0	2	7
22:30	to	23:00	5	0	2	7

Date: Saturday Dec 4 from 10:00 AM to 11:00 PM

Time			Visitor	Accessible Vistor	Illegal	TOTAL
			27	0		
10:00	to	10:30	8	0	0	8
10:30	to	11:00	10	0	0	10
11:00	to	11:30	9	0	1	10
11:30	to	12:00	10	0	1	11
12:00	to	12:30	10	0	0	10
12:30	to	13:00	11	0	0	11
13:00	to	13:30	11	0	0	11
13:30	to	14:00	12	0	0	12
14:00	to	14:30	11	0	0	11
14:30	to	15:00	11	0	1	12
15:00	to	15:30	12	0	0	12
15:30	to	16:00	12	0	0	12
16:00	to	16:30	11	0	0	11
16:30	to	17:00	11	0	1	12
17:00	to	17:30	10	0	1	11
17:30	to	18:00	10	0	0	10
18:00	to	18:30	10	0	0	10
18:30	to	19:00	10	0	0	10
19:00	to	19:30	10	0	0	10
19:30	to	20:00	11	0	0	11
20:00	to	20:30	12	0	1	13
20:30	to	21:00	13	0	1	14
21:00	to	21:30	11	0	0	11
21:30	to	22:00	9	0	0	9
22:00	to	22:30	9	0	0	9
22:30	to	23:00	7	0	0	7

Appendix D – Synchro Analysis Output – Existing Traffic Volumes

642 Dunlop Street West
6: Miller Drive/Tiffin Street & Dunlop Street West

Queues
Existing (2022) AM Peak Hour

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	64	685	280	8	427	135	19	56	80
Future Volume (vph)	64	685	280	8	427	135	19	56	80
Lane Group Flow (vph)	71	761	311	9	496	150	32	62	188
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	5	3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	5	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	7.0	60.0	7.0	7.0	60.0	7.0	10.0	7.0	10.0
Minimum Split (s)	11.0	66.0	11.0	11.0	66.0	11.0	36.0	11.0	36.0
Total Split (s)	16.0	66.0	16.0	16.0	66.0	16.0	26.0	16.0	26.0
Total Split (%)	12.9%	53.2%	12.9%	12.9%	53.2%	12.9%	21.0%	12.9%	21.0%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	None	Max
v/c Ratio	0.15	0.41	0.27	0.03	0.32	0.42	0.07	0.13	0.45
Control Delay	13.3	19.1	1.6	12.5	22.3	32.8	28.8	28.4	37.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.3	19.1	1.6	12.5	22.3	32.8	28.8	28.4	37.7
Queue Length 50th (m)	8.2	59.2	0.0	1.0	43.5	28.1	4.3	10.9	34.7
Queue Length 95th (m)	15.5	89.2	11.3	3.7	58.5	46.6	13.7	21.8	59.9
Internal Link Dist (m)		558.9			50.7		498.3		33.7
Turn Bay Length (m)	185.0		125.0	125.0		200.0		100.0	
Base Capacity (vph)	514	1849	1138	353	1532	362	453	511	417
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.41	0.27	0.03	0.32	0.41	0.07	0.12	0.45

Intersection Summary

Cycle Length: 124
Actuated Cycle Length: 127.6
Natural Cycle: 125
Control Type: Semi Act-Uncoord

Splits and Phases: 6: Miller Drive/Tiffin Street & Dunlop Street West

			
Ø1	Ø2	Ø3	Ø4
16 s	26 s	16 s	66 s
			
Ø5	Ø6	Ø7	Ø8
16 s	26 s	16 s	66 s

642 Dunlop Street West

HCM Signalized Intersection Capacity Analysis

6: Miller Drive/Tiffin Street & Dunlop Street West

Existing (2022) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	64	685	280	8	427	20	135	19	10	56	80	89
Future Volume (vph)	64	685	280	8	427	20	135	19	10	56	80	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.95		1.00	0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3471	1538	1399	3246		1612	1616		1770	1645	
Flt Permitted	0.40	1.00	1.00	0.32	1.00		0.46	1.00		0.74	1.00	
Satd. Flow (perm)	741	3471	1538	476	3246		782	1616		1372	1645	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	71	761	311	9	474	22	150	21	11	62	89	99
RTOR Reduction (vph)	0	0	124	0	3	0	0	8	0	0	30	0
Lane Group Flow (vph)	71	761	187	9	493	0	150	24	0	62	158	0
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	73.4	68.0	79.3	64.0	62.6		46.3	35.2		38.1	31.0	
Effective Green, g (s)	73.4	68.0	79.3	64.0	62.6		46.3	35.2		38.1	31.0	
Actuated g/C Ratio	0.56	0.52	0.60	0.49	0.48		0.35	0.27		0.29	0.24	
Clearance Time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	465	1792	926	241	1542		346	431		418	387	
v/s Ratio Prot	c0.01	c0.22	0.02	0.00	0.15		c0.04	0.01		0.01	0.10	
v/s Ratio Perm	0.08		0.10	0.02			c0.12			0.03		
v/c Ratio	0.15	0.42	0.20	0.04	0.32		0.43	0.06		0.15	0.41	
Uniform Delay, d1	13.8	19.7	11.9	17.7	21.4		30.9	35.9		34.5	42.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.2	0.1	0.1	0.1		0.9	0.2		0.2	3.2	
Delay (s)	14.0	19.9	12.0	17.8	21.5		31.8	36.1		34.6	45.8	
Level of Service	B	B	B	B	C		C	D		C	D	
Approach Delay (s)		17.4			21.4			32.6			43.0	
Approach LOS		B			C			C			D	
Intersection Summary												
HCM 2000 Control Delay			22.8			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.44									
Actuated Cycle Length (s)			131.7			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			83.7%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

642 Dunlop Street West
6: Miller Drive/Tiffin Street & Dunlop Street West

Queues
Existing (2022) PM Peak Hour

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	120	546	243	10	636	225	98	34	37
Future Volume (vph)	120	546	243	10	636	225	98	34	37
Lane Group Flow (vph)	125	569	253	10	710	234	112	35	104
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	5	3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	5	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	7.0	60.0	7.0	7.0	60.0	7.0	10.0	7.0	10.0
Minimum Split (s)	11.0	66.0	11.0	11.0	66.0	11.0	36.0	11.0	36.0
Total Split (s)	16.0	66.0	16.0	16.0	66.0	16.0	26.0	16.0	26.0
Total Split (%)	12.9%	53.2%	12.9%	12.9%	53.2%	12.9%	21.0%	12.9%	21.0%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	None	Max
v/c Ratio	0.31	0.30	0.24	0.03	0.45	0.51	0.21	0.09	0.25
Control Delay	14.8	17.4	1.7	12.5	25.8	36.1	38.2	29.0	22.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.8	17.4	1.7	12.5	25.8	36.1	38.2	29.0	22.0
Queue Length 50th (m)	14.9	41.3	0.0	1.1	68.7	47.2	23.7	6.3	10.2
Queue Length 95th (m)	24.7	64.2	10.5	3.8	87.6	71.6	42.4	14.4	26.9
Internal Link Dist (m)		558.9			50.7		498.3		33.7
Turn Bay Length (m)	185.0		125.0	125.0		200.0		100.0	
Base Capacity (vph)	425	1890	1053	331	1582	463	524	424	418
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.30	0.24	0.03	0.45	0.51	0.21	0.08	0.25

Intersection Summary

Cycle Length: 124
Actuated Cycle Length: 132.2
Natural Cycle: 125
Control Type: Semi Act-Uncoord

Splits and Phases: 6: Miller Drive/Tiffin Street & Dunlop Street West

			
Ø1	Ø2	Ø3	Ø4
16 s	26 s	16 s	66 s
			
Ø5	Ø6	Ø7	Ø8
16 s	26 s	16 s	66 s

642 Dunlop Street West

HCM Signalized Intersection Capacity Analysis

6: Miller Drive/Tiffin Street & Dunlop Street West

Existing (2022) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	120	546	243	10	636	45	225	98	10	34	37	62
Future Volume (vph)	120	546	243	10	636	45	225	98	10	34	37	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.99		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3471	1429	1081	3477		1770	1788		1597	1646	
Flt Permitted	0.28	1.00	1.00	0.44	1.00		0.60	1.00		0.68	1.00	
Satd. Flow (perm)	538	3471	1429	499	3477		1124	1788		1151	1646	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	125	569	253	10	662	47	234	102	10	35	39	65
RTOR Reduction (vph)	0	0	98	0	4	0	0	2	0	0	45	0
Lane Group Flow (vph)	125	569	155	10	706	0	234	110	0	35	59	0
Heavy Vehicles (%)	0%	4%	13%	67%	3%	0%	2%	1%	44%	13%	9%	2%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	77.4	72.0	84.0	64.6	63.2		47.6	38.6		36.6	31.6	
Effective Green, g (s)	77.4	72.0	84.0	64.6	63.2		47.6	38.6		36.6	31.6	
Actuated g/C Ratio	0.56	0.53	0.61	0.47	0.46		0.35	0.28		0.27	0.23	
Clearance Time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	398	1824	876	241	1603		447	503		323	379	
v/s Ratio Prot	c0.02	0.16	0.02	0.00	c0.20		c0.05	0.06		0.00	0.04	
v/s Ratio Perm	0.15		0.09	0.02			c0.14			0.02		
v/c Ratio	0.31	0.31	0.18	0.04	0.44		0.52	0.22		0.11	0.16	
Uniform Delay, d1	15.3	18.4	11.5	19.3	24.9		34.2	37.7		37.6	42.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.1	0.1	0.1	0.2		1.1	1.0		0.1	0.9	
Delay (s)	15.7	18.5	11.6	19.4	25.1		35.3	38.7		37.8	42.9	
Level of Service	B	B	B	B	C		D	D		D	D	
Approach Delay (s)		16.3			25.1			36.4			41.6	
Approach LOS		B			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			24.1			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			137.0			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			89.1%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

Appendix E – Synchro Analysis Output – Background Traffic Volumes

642 Dunlop Street West
6: Miller Drive/Tiffin Street & Dunlop Street West

Queues
BG (2024) AM Peak Hour

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	71	741	301	10	462	144	26	125	104
Future Volume (vph)	71	741	301	10	462	144	26	125	104
Lane Group Flow (vph)	79	823	334	11	552	160	42	139	230
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	5	3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	5	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	7.0	7.0	7.0	7.0	60.0	7.0	10.0	7.0	10.0
Minimum Split (s)	11.0	66.0	11.0	11.0	66.0	11.0	36.0	11.0	36.0
Total Split (s)	16.0	66.0	16.0	16.0	66.0	16.0	26.0	16.0	26.0
Total Split (%)	12.9%	53.2%	12.9%	12.9%	53.2%	12.9%	21.0%	12.9%	21.0%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	None	Max
v/c Ratio	0.17	0.44	0.29	0.04	0.37	0.50	0.11	0.29	0.56
Control Delay	13.3	19.4	1.6	12.5	23.5	35.9	31.7	31.0	44.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.3	19.4	1.6	12.5	23.5	35.9	31.7	31.0	44.1
Queue Length 50th (m)	9.2	65.6	0.0	1.2	50.7	30.9	6.3	26.3	48.2
Queue Length 95th (m)	16.9	97.9	11.5	4.0	67.2	50.4	16.9	43.8	77.7
Internal Link Dist (m)		558.9			50.7		498.3		33.7
Turn Bay Length (m)	185.0		120.0	125.0		200.0		100.0	
Base Capacity (vph)	488	1868	1150	336	1507	332	397	503	411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.44	0.29	0.03	0.37	0.48	0.11	0.28	0.56

Intersection Summary

Cycle Length: 124
Actuated Cycle Length: 129.2
Natural Cycle: 125
Control Type: Semi Act-Uncoord

Splits and Phases: 6: Miller Drive/Tiffin Street & Dunlop Street West

			
Ø1	Ø2	Ø3	Ø4
16 s	26 s	16 s	66 s
			
Ø5	Ø6	Ø7	Ø8
16 s	26 s	16 s	66 s

642 Dunlop Street West

HCM Signalized Intersection Capacity Analysis

6: Miller Drive/Tiffin Street & Dunlop Street West

BG (2024) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	71	741	301	10	462	35	144	26	12	125	104	103
Future Volume (vph)	71	741	301	10	462	35	144	26	12	125	104	103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.95		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3471	1538	1399	3224		1612	1633		1770	1651	
Flt Permitted	0.37	1.00	1.00	0.30	1.00		0.43	1.00		0.73	1.00	
Satd. Flow (perm)	681	3471	1538	448	3224		721	1633		1359	1651	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	79	823	334	11	513	39	160	29	13	139	116	114
RTOR Reduction (vph)	0	0	130	0	5	0	0	10	0	0	26	0
Lane Group Flow (vph)	79	823	204	11	547	0	160	32	0	139	204	0
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	74.8	69.5	80.8	63.8	62.5		41.9	30.6		40.9	30.1	
Effective Green, g (s)	74.8	69.5	80.8	63.8	62.5		41.9	30.6		40.9	30.1	
Actuated g/C Ratio	0.57	0.53	0.61	0.48	0.47		0.32	0.23		0.31	0.23	
Clearance Time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	452	1824	940	225	1524		304	377		454	375	
v/s Ratio Prot	c0.01	c0.24	0.02	0.00	0.17		c0.04	0.02		0.03	c0.12	
v/s Ratio Perm	0.09		0.11	0.02			0.12			0.07		
v/c Ratio	0.17	0.45	0.22	0.05	0.36		0.53	0.08		0.31	0.54	
Uniform Delay, d1	13.6	19.5	11.5	18.0	22.1		34.6	39.8		34.2	45.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.2	0.1	0.1	0.1		1.6	0.4		0.4	5.6	
Delay (s)	13.8	19.7	11.6	18.1	22.3		36.3	40.3		34.6	50.6	
Level of Service	B	B	B	B	C		D	D		C	D	
Approach Delay (s)		17.1			22.2			37.1			44.5	
Approach LOS		B			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			24.3			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			132.2			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			92.1%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

642 Dunlop Street West
6: Miller Drive/Tiffin Street & Dunlop Street West

Queues
BG (2024) PM Peak Hour

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	135	602	259	12	701	242	123	69	48
Future Volume (vph)	135	602	259	12	701	242	123	69	48
Lane Group Flow (vph)	141	627	270	13	846	252	142	72	124
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	5	3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	5	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	7.0	60.0	7.0	7.0	60.0	7.0	10.0	7.0	10.0
Minimum Split (s)	11.0	66.0	11.0	11.0	66.0	11.0	36.0	11.0	36.0
Total Split (s)	16.0	66.0	16.0	16.0	66.0	16.0	26.0	16.0	26.0
Total Split (%)	12.9%	53.2%	12.9%	12.9%	53.2%	12.9%	21.0%	12.9%	21.0%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	None	Max
v/c Ratio	0.40	0.34	0.26	0.05	0.54	0.58	0.30	0.19	0.30
Control Delay	16.3	19.3	1.8	12.6	27.3	39.1	42.3	30.2	27.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.3	19.3	1.8	12.6	27.3	39.1	42.3	30.2	27.3
Queue Length 50th (m)	17.0	46.5	0.0	1.5	86.2	51.9	31.6	13.3	16.5
Queue Length 95th (m)	27.5	71.8	10.8	4.6	107.3	77.1	53.7	25.2	35.4
Internal Link Dist (m)		558.9			50.7		498.3		33.7
Turn Bay Length (m)	185.0		125.0	125.0		200.0		100.0	
Base Capacity (vph)	369	1835	1040	313	1570	432	470	415	412
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.34	0.26	0.04	0.54	0.58	0.30	0.17	0.30

Intersection Summary

Cycle Length: 124
Actuated Cycle Length: 132.6
Natural Cycle: 125
Control Type: Semi Act-Uncoord

Splits and Phases: 6: Miller Drive/Tiffin Street & Dunlop Street West

 Ø1	 Ø2	 Ø3	 Ø4
16 s	26 s	16 s	66 s
 Ø5	 Ø6	 Ø7	 Ø8
16 s	26 s	16 s	66 s

642 Dunlop Street West

HCM Signalized Intersection Capacity Analysis

6: Miller Drive/Tiffin Street & Dunlop Street West

BG (2024) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	135	602	259	12	701	111	242	123	13	69	48	71
Future Volume (vph)	135	602	259	12	701	111	242	123	13	69	48	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.99		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3471	1429	1081	3447		1770	1779		1597	1650	
Flt Permitted	0.22	1.00	1.00	0.41	1.00		0.57	1.00		0.67	1.00	
Satd. Flow (perm)	424	3471	1429	462	3447		1053	1779		1121	1650	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	141	627	270	12	730	116	252	128	14	72	50	74
RTOR Reduction (vph)	0	0	107	0	11	0	0	3	0	0	39	0
Lane Group Flow (vph)	141	627	163	13	835	0	252	139	0	72	85	0
Heavy Vehicles (%)	0%	4%	13%	67%	3%	0%	2%	1%	44%	13%	9%	2%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	77.0	70.1	82.1	65.4	62.5		46.8	34.8		38.8	30.8	
Effective Green, g (s)	77.0	70.1	82.1	65.4	62.5		46.8	34.8		38.8	30.8	
Actuated g/C Ratio	0.57	0.52	0.60	0.48	0.46		0.34	0.26		0.29	0.23	
Clearance Time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	347	1791	863	235	1586		426	455		348	374	
v/s Ratio Prot	c0.03	0.18	0.02	0.00	c0.24		c0.05	0.08		0.01	0.05	
v/s Ratio Perm	0.20		0.10	0.03			c0.15			0.05		
v/c Ratio	0.41	0.35	0.19	0.06	0.53		0.59	0.31		0.21	0.23	
Uniform Delay, d1	16.1	19.4	12.0	18.5	26.1		35.1	40.7		36.3	42.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	0.1	0.1	0.1	0.3		2.2	1.7		0.3	1.4	
Delay (s)	16.9	19.5	12.1	18.6	26.4		37.3	42.5		36.6	44.2	
Level of Service	B	B	B	B	C		D	D		D	D	
Approach Delay (s)		17.2			26.3			39.2			41.4	
Approach LOS		B			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			25.7			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.56									
Actuated Cycle Length (s)			135.8			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			95.9%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

642 Dunlop Street West
6: Miller Drive/Tiffin Street & Dunlop Street West

Queues
BG (2029) AM Peak Hour

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	78	901	348	12	562	167	29	131	113
Future Volume (vph)	78	901	348	12	562	167	29	131	113
Lane Group Flow (vph)	87	1001	387	13	665	186	46	146	250
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	5	3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	5	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	7.0	60.0	7.0	7.0	60.0	7.0	10.0	7.0	10.0
Minimum Split (s)	11.0	66.0	11.0	11.0	66.0	11.0	36.0	11.0	36.0
Total Split (s)	16.0	66.0	16.0	16.0	66.0	16.0	26.0	16.0	26.0
Total Split (%)	12.9%	53.2%	12.9%	12.9%	53.2%	12.9%	21.0%	12.9%	21.0%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	None	Max
v/c Ratio	0.22	0.55	0.34	0.06	0.45	0.60	0.12	0.30	0.62
Control Delay	13.9	23.0	1.8	12.8	25.2	40.0	31.4	31.0	46.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.9	23.0	1.8	12.8	25.2	40.0	31.4	31.0	46.6
Queue Length 50th (m)	10.2	85.6	0.0	1.5	62.9	36.0	6.9	27.2	53.2
Queue Length 95th (m)	18.3	125.9	12.2	4.6	82.3	57.8	18.1	45.1	85.0
Internal Link Dist (m)		558.9			50.7		498.3		33.7
Turn Bay Length (m)	185.0		125.0	125.0		200.0		100.0	
Base Capacity (vph)	433	1819	1148	281	1486	309	395	493	405
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.55	0.34	0.05	0.45	0.60	0.12	0.30	0.62

Intersection Summary

Cycle Length: 124
Actuated Cycle Length: 130.8
Natural Cycle: 125
Control Type: Semi Act-Uncoord

Splits and Phases: 6: Miller Drive/Tiffin Street & Dunlop Street West

			
Ø1	Ø2	Ø3	Ø4
16 s	26 s	16 s	66 s
			
Ø5	Ø6	Ø7	Ø8
16 s	26 s	16 s	66 s

642 Dunlop Street West

HCM Signalized Intersection Capacity Analysis

6: Miller Drive/Tiffin Street & Dunlop Street West

BG (2029) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	78	901	348	12	562	37	167	29	13	131	113	112
Future Volume (vph)	78	901	348	12	562	37	167	29	13	131	113	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.95		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3471	1538	1399	3232		1612	1635		1770	1651	
Flt Permitted	0.31	1.00	1.00	0.22	1.00		0.38	1.00		0.73	1.00	
Satd. Flow (perm)	569	3471	1538	323	3232		644	1635		1354	1651	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	87	1001	387	13	624	41	186	32	14	146	126	124
RTOR Reduction (vph)	0	0	153	0	4	0	0	11	0	0	26	0
Lane Group Flow (vph)	87	1001	234	13	661	0	186	35	0	146	224	0
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	75.3	68.5	80.4	65.2	62.4		42.7	30.8		41.1	30.0	
Effective Green, g (s)	75.3	68.5	80.4	65.2	62.4		42.7	30.8		41.1	30.0	
Actuated g/C Ratio	0.57	0.51	0.60	0.49	0.47		0.32	0.23		0.31	0.23	
Clearance Time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	400	1785	928	180	1514		292	378		452	371	
v/s Ratio Prot	c0.01	c0.29	0.02	0.00	0.20		c0.06	0.02		0.03	0.14	
v/s Ratio Perm	0.11		0.13	0.03			c0.15			0.07		
v/c Ratio	0.22	0.56	0.25	0.07	0.44		0.64	0.09		0.32	0.60	
Uniform Delay, d1	14.2	22.1	12.3	18.4	23.7		35.4	40.2		34.7	46.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.4	0.1	0.2	0.2		4.5	0.5		0.4	7.1	
Delay (s)	14.5	22.5	12.5	18.5	23.9		39.9	40.7		35.1	53.3	
Level of Service	B	C	B	B	C		D	D		D	D	
Approach Delay (s)		19.4			23.8			40.0			46.6	
Approach LOS		B			C			D			D	

Intersection Summary

HCM 2000 Control Delay	26.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	133.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	94.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

642 Dunlop Street West
6: Miller Drive/Tiffin Street & Dunlop Street West

Queues
BG (2029) PM Peak Hour

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	148	768	300	13	895	280	140	73	53
Future Volume (vph)	148	768	300	13	895	280	140	73	53
Lane Group Flow (vph)	154	800	313	14	1053	292	161	76	135
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	5	3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	5	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	7.0	60.0	7.0	7.0	60.0	7.0	10.0	7.0	10.0
Minimum Split (s)	11.0	66.0	11.0	11.0	66.0	11.0	36.0	11.0	36.0
Total Split (s)	16.0	66.0	16.0	16.0	66.0	16.0	26.0	16.0	26.0
Total Split (%)	12.9%	53.2%	12.9%	12.9%	53.2%	12.9%	21.0%	12.9%	21.0%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	None	Max
v/c Ratio	0.54	0.44	0.30	0.06	0.67	0.69	0.34	0.20	0.33
Control Delay	20.2	20.8	1.9	12.8	31.0	44.5	43.4	30.5	29.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.2	20.8	1.9	12.8	31.0	44.5	43.4	30.5	29.5
Queue Length 50th (m)	18.7	63.2	0.0	1.6	118.5	62.2	36.7	14.2	19.5
Queue Length 95th (m)	29.9	95.5	11.5	4.7	143.5	90.1	59.9	26.2	39.4
Internal Link Dist (m)		558.9			50.7		498.3		33.7
Turn Bay Length (m)	185.0		125.0	125.0		200.0		100.0	
Base Capacity (vph)	298	1838	1055	264	1569	422	467	407	411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.44	0.30	0.05	0.67	0.69	0.34	0.19	0.33

Intersection Summary

Cycle Length: 124
Actuated Cycle Length: 132.9
Natural Cycle: 125
Control Type: Semi Act-Uncoord

Splits and Phases: 6: Miller Drive/Tiffin Street & Dunlop Street West

			
Ø1	Ø2	Ø3	Ø4
16 s	26 s	16 s	66 s
			
Ø5	Ø6	Ø7	Ø8
16 s	26 s	16 s	66 s

642 Dunlop Street West

HCM Signalized Intersection Capacity Analysis

6: Miller Drive/Tiffin Street & Dunlop Street West

BG (2029) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	148	768	300	13	895	116	280	140	14	73	53	77
Future Volume (vph)	148	768	300	13	895	116	280	140	14	73	53	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.99		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3471	1429	1081	3456		1770	1784		1597	1651	
Flt Permitted	0.15	1.00	1.00	0.32	1.00		0.55	1.00		0.65	1.00	
Satd. Flow (perm)	277	3471	1429	359	3456		1020	1784		1095	1651	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	154	800	312	14	932	121	292	146	15	76	55	80
RTOR Reduction (vph)	0	0	123	0	9	0	0	3	0	0	39	0
Lane Group Flow (vph)	154	800	190	14	1044	0	292	158	0	76	96	0
Heavy Vehicles (%)	0%	4%	13%	67%	3%	0%	2%	1%	44%	13%	9%	2%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	77.3	70.4	82.4	65.3	62.4		46.6	34.6		39.0	30.8	
Effective Green, g (s)	77.3	70.4	82.4	65.3	62.4		46.6	34.6		39.0	30.8	
Actuated g/C Ratio	0.57	0.52	0.61	0.48	0.46		0.34	0.25		0.29	0.23	
Clearance Time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	279	1795	865	187	1584		415	453		344	373	
v/s Ratio Prot	c0.04	0.23	0.02	0.00	c0.30		c0.06	0.09		0.01	0.06	
v/s Ratio Perm	0.27		0.11	0.03			c0.18			0.05		
v/c Ratio	0.55	0.45	0.22	0.07	0.66		0.70	0.35		0.22	0.26	
Uniform Delay, d1	18.8	20.6	12.2	18.8	28.6		37.5	41.5		36.4	43.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.4	0.2	0.1	0.2	1.0		5.3	2.1		0.3	1.7	
Delay (s)	21.2	20.8	12.3	19.0	29.6		42.9	43.6		36.7	44.9	
Level of Service	C	C	B	B	C		D	D		D	D	
Approach Delay (s)		18.8			29.5			43.1			42.0	
Approach LOS		B			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			27.9			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			136.1			Sum of lost time (s)				20.0		
Intersection Capacity Utilization			98.7%			ICU Level of Service				F		
Analysis Period (min)			15									
c Critical Lane Group												

642 Dunlop Street West
6: Miller Drive/Tiffin Street & Dunlop Street West

Queues
BG (2034) AM Peak Hour

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	85	1035	392	13	645	188	32	138	122
Future Volume (vph)	85	1035	392	13	645	188	32	138	122
Lane Group Flow (vph)	94	1150	436	14	760	209	53	153	273
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	5	3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	5	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	7.0	60.0	7.0	7.0	60.0	7.0	10.0	7.0	10.0
Minimum Split (s)	11.0	66.0	11.0	11.0	66.0	11.0	36.0	11.0	36.0
Total Split (s)	16.0	66.0	16.0	16.0	66.0	16.0	26.0	16.0	26.0
Total Split (%)	12.9%	53.2%	12.9%	12.9%	53.2%	12.9%	21.0%	12.9%	21.0%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	None	Max
v/c Ratio	0.26	0.63	0.37	0.07	0.51	0.72	0.13	0.32	0.68
Control Delay	14.4	24.9	1.9	13.1	26.6	47.6	31.2	31.5	49.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.4	24.9	1.9	13.1	26.6	47.6	31.2	31.5	49.7
Queue Length 50th (m)	11.1	104.7	0.0	1.6	75.1	41.3	8.0	28.7	59.9
Queue Length 95th (m)	19.4	152.7	12.7	4.7	97.0	#70.8	20.2	47.5	94.0
Internal Link Dist (m)		558.9			50.7		498.3		33.7
Turn Bay Length (m)	185.0		125.0	125.0		200.0		100.0	
Base Capacity (vph)	393	1819	1165	243	1485	290	394	490	404
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.63	0.37	0.06	0.51	0.72	0.13	0.31	0.68

Intersection Summary

Cycle Length: 124

Actuated Cycle Length: 131.1

Natural Cycle: 125

Control Type: Semi Act-Uncoord

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

Queue shown is maximum after two cycles.

Splits and Phases: 6: Miller Drive/Tiffin Street & Dunlop Street West

			
16 s	26 s	16 s	66 s
			
16 s	26 s	16 s	66 s

642 Dunlop Street West

HCM Signalized Intersection Capacity Analysis

6: Miller Drive/Tiffin Street & Dunlop Street West

BG (2034) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	85	1035	392	13	645	39	188	32	15	138	122	123
Future Volume (vph)	85	1035	392	13	645	39	188	32	15	138	122	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.95		1.00	0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3471	1538	1399	3236		1612	1627		1770	1650	
Flt Permitted	0.26	1.00	1.00	0.17	1.00		0.34	1.00		0.72	1.00	
Satd. Flow (perm)	486	3471	1538	244	3236		569	1627		1346	1650	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	94	1150	436	14	717	43	209	36	17	153	136	137
RTOR Reduction (vph)	0	0	172	0	4	0	0	12	0	0	27	0
Lane Group Flow (vph)	94	1150	264	14	756	0	209	41	0	153	246	0
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	75.6	68.8	80.8	65.3	62.5		42.8	30.8		41.2	30.0	
Effective Green, g (s)	75.6	68.8	80.8	65.3	62.5		42.8	30.8		41.2	30.0	
Actuated g/C Ratio	0.57	0.51	0.60	0.49	0.47		0.32	0.23		0.31	0.22	
Clearance Time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	361	1787	930	143	1513		275	375		450	370	
v/s Ratio Prot	c0.02	c0.33	0.03	0.00	0.23		c0.07	0.03		0.03	0.15	
v/s Ratio Perm	0.13		0.15	0.05			c0.17			0.08		
v/c Ratio	0.26	0.64	0.28	0.10	0.50		0.76	0.11		0.34	0.66	
Uniform Delay, d1	14.8	23.5	12.6	19.3	24.7		37.6	40.6		35.0	47.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.8	0.2	0.3	0.3		11.7	0.6		0.5	9.1	
Delay (s)	15.1	24.3	12.8	19.6	25.0		49.3	41.1		35.4	56.3	
Level of Service	B	C	B	B	C		D	D		D	E	
Approach Delay (s)		20.8			24.9			47.7			48.8	
Approach LOS		C			C			D			D	

Intersection Summary

HCM 2000 Control Delay	27.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	133.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	96.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

642 Dunlop Street West
6: Miller Drive/Tiffin Street & Dunlop Street West

Queues
BG (2034) PM Peak Hour

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	162	899	337	15	1047	315	155	77	57
Future Volume (vph)	162	899	337	15	1047	315	155	77	57
Lane Group Flow (vph)	169	936	351	16	1217	328	178	80	148
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	5	3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	5	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	7.0	60.0	7.0	7.0	60.0	7.0	10.0	7.0	10.0
Minimum Split (s)	11.0	66.0	11.0	11.0	66.0	11.0	36.0	11.0	36.0
Total Split (s)	16.0	66.0	16.0	16.0	66.0	16.0	26.0	16.0	26.0
Total Split (%)	12.9%	53.2%	12.9%	12.9%	53.2%	12.9%	21.0%	12.9%	21.0%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	None	Max
v/c Ratio	0.70	0.51	0.33	0.08	0.78	0.80	0.38	0.22	0.36
Control Delay	34.4	22.1	1.9	13.2	34.9	52.3	44.5	30.8	30.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.4	22.1	1.9	13.2	34.9	52.3	44.5	30.8	30.8
Queue Length 50th (m)	20.7	78.0	0.0	1.8	147.6	71.6	41.1	15.0	22.2
Queue Length 95th (m)	#44.8	116.5	12.0	5.2	176.9	#117.7	66.2	27.3	43.4
Internal Link Dist (m)		558.9			50.7		498.3		33.7
Turn Bay Length (m)	185.0		125.0	125.0		200.0		100.0	
Base Capacity (vph)	251	1840	1068	232	1566	409	464	392	412
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.51	0.33	0.07	0.78	0.80	0.38	0.20	0.36

Intersection Summary

Cycle Length: 124

Actuated Cycle Length: 133.1

Natural Cycle: 125

Control Type: Semi Act-Uncoord

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

Queue shown is maximum after two cycles.

Splits and Phases: 6: Miller Drive/Tiffin Street & Dunlop Street West

			
Ø1	Ø2	Ø3	Ø4
16 s	26 s	16 s	66 s
			
Ø5	Ø6	Ø7	Ø8
16 s	26 s	16 s	66 s

642 Dunlop Street West

HCM Signalized Intersection Capacity Analysis

6: Miller Drive/Tiffin Street & Dunlop Street West

BG (2034) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	162	899	337	15	1047	121	315	155	16	77	57	85
Future Volume (vph)	162	899	337	15	1047	121	315	155	16	77	57	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.99		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3471	1429	1081	3461		1770	1782		1597	1650	
Flt Permitted	0.10	1.00	1.00	0.25	1.00		0.53	1.00		0.61	1.00	
Satd. Flow (perm)	182	3471	1429	289	3461		979	1782		1033	1650	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	169	936	351	16	1091	126	328	161	17	80	59	89
RTOR Reduction (vph)	0	0	138	0	8	0	0	3	0	0	40	0
Lane Group Flow (vph)	169	936	213	16	1209	0	328	175	0	80	108	0
Heavy Vehicles (%)	0%	4%	13%	67%	3%	0%	2%	1%	44%	13%	9%	2%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	77.5	70.6	82.6	65.3	62.4		46.5	34.5		39.1	30.8	
Effective Green, g (s)	77.5	70.6	82.6	65.3	62.4		46.5	34.5		39.1	30.8	
Actuated g/C Ratio	0.57	0.52	0.61	0.48	0.46		0.34	0.25		0.29	0.23	
Clearance Time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	235	1797	865	155	1584		403	451		330	372	
v/s Ratio Prot	c0.06	0.27	0.02	0.00	c0.35		c0.07	0.10		0.01	0.07	
v/s Ratio Perm	0.35		0.13	0.05			c0.21			0.05		
v/c Ratio	0.72	0.52	0.25	0.10	0.76		0.81	0.39		0.24	0.29	
Uniform Delay, d1	23.0	21.7	12.4	19.2	30.8		39.9	42.2		36.5	43.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	10.1	0.3	0.1	0.3	2.2		11.9	2.5		0.4	2.0	
Delay (s)	33.1	22.0	12.6	19.5	33.0		51.8	44.7		36.9	45.7	
Level of Service	C	C	B	B	C		D	D		D	D	
Approach Delay (s)		21.0			32.9			49.3			42.6	
Approach LOS		C			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			30.9			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			136.3			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			101.4%			ICU Level of Service			G			
Analysis Period (min)			15									
c Critical Lane Group												

642 Dunlop Street West
6: Miller Drive/Tiffin Street & Dunlop Street West

Queues
BG (2034) PM Peak Hour with Improvements

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	162	899	337	15	1047	315	155	77	57
Future Volume (vph)	162	899	337	15	1047	315	155	77	57
Lane Group Flow (vph)	169	936	351	16	1217	328	178	80	148
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	5	3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	5	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	7.0	60.0	7.0	7.0	60.0	7.0	10.0	7.0	10.0
Minimum Split (s)	11.0	66.0	11.0	11.0	66.0	11.0	36.0	11.0	36.0
Total Split (s)	13.0	66.0	14.0	13.0	66.0	14.0	31.0	14.0	31.0
Total Split (%)	10.5%	53.2%	11.3%	10.5%	53.2%	11.3%	25.0%	11.3%	25.0%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	None	Max
v/c Ratio	0.75	0.51	0.33	0.08	0.75	0.82	0.39	0.22	0.35
Control Delay	37.8	21.5	2.0	12.6	31.7	53.7	43.0	30.0	28.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.8	21.5	2.0	12.6	31.7	53.7	43.0	30.0	28.2
Queue Length 50th (m)	19.9	74.9	0.0	1.7	136.7	68.9	39.8	14.4	20.4
Queue Length 95th (m)	#51.6	113.4	12.3	5.1	164.8	#114.7	63.3	26.7	40.9
Internal Link Dist (m)		558.9			50.7		498.3		33.7
Turn Bay Length (m)	185.0		125.0	125.0		200.0		100.0	
Base Capacity (vph)	226	1841	1056	210	1616	402	461	371	425
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.51	0.33	0.08	0.75	0.82	0.39	0.22	0.35

Intersection Summary

Cycle Length: 124

Actuated Cycle Length: 129

Natural Cycle: 125

Control Type: Semi Act-Uncoord

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

Queue shown is maximum after two cycles.

Splits and Phases: 6: Miller Drive/Tiffin Street & Dunlop Street West

			
Ø1	Ø2	Ø3	Ø4
14 s	31 s	13 s	66 s
			
Ø5	Ø6	Ø7	Ø8
14 s	31 s	13 s	66 s

642 Dunlop Street West

HCM Signalized Intersection Capacity Analysis

6: Miller Drive/Tiffin Street & Dunlop Street West

BG (2034) PM Peak Hour with Improvements

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	162	899	337	15	1047	121	315	155	16	77	57	85
Future Volume (vph)	162	899	337	15	1047	121	315	155	16	77	57	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.99		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3471	1429	1081	3461		1770	1782		1597	1650	
Flt Permitted	0.10	1.00	1.00	0.25	1.00		0.55	1.00		0.59	1.00	
Satd. Flow (perm)	197	3471	1429	281	3461		1031	1782		998	1650	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	169	936	351	16	1091	126	328	161	17	80	59	89
RTOR Reduction (vph)	0	0	143	0	7	0	0	3	0	0	42	0
Lane Group Flow (vph)	169	936	208	16	1210	0	328	175	0	80	106	0
Heavy Vehicles (%)	0%	4%	13%	67%	3%	0%	2%	1%	44%	13%	9%	2%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	75.3	68.4	78.4	65.2	62.3		43.2	33.2		38.4	30.8	
Effective Green, g (s)	75.3	68.4	78.4	65.2	62.3		43.2	33.2		38.4	30.8	
Actuated g/C Ratio	0.57	0.52	0.59	0.49	0.47		0.33	0.25		0.29	0.23	
Clearance Time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	221	1797	848	156	1632		393	447		324	384	
v/s Ratio Prot	c0.05	0.27	0.02	0.00	0.35		c0.06	0.10		0.01	0.06	
v/s Ratio Perm	c0.38		0.13	0.05			c0.21			0.06		
v/c Ratio	0.76	0.52	0.25	0.10	0.74		0.83	0.39		0.25	0.28	
Uniform Delay, d1	21.7	21.0	12.8	17.8	28.4		40.4	41.1		35.0	41.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	14.5	0.3	0.2	0.3	1.9		14.1	2.6		0.4	1.8	
Delay (s)	36.2	21.3	12.9	18.0	30.2		54.6	43.6		35.4	43.3	
Level of Service	D	C	B	B	C		D	D		D	D	
Approach Delay (s)		21.0			30.0			50.7			40.5	
Approach LOS		C			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			30.0			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			132.1			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			101.4%			ICU Level of Service			G			
Analysis Period (min)			15									
c Critical Lane Group												

Appendix F – Synchro Analysis Output – Total Traffic Volumes

642 Dunlop Street West
1: Miller Drive & FM Access

HCM Unsignalized Intersection Capacity Analysis

Total (2024) AM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	20	1	131	7	1	332
Future Volume (Veh/h)	20	1	131	7	1	332
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	1	142	8	1	361
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)			58			
pX, platoon unblocked	0.98	0.98			0.98	
vC, conflicting volume	509	146			150	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	490	120			124	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	100			100	
cM capacity (veh/h)	527	914			1435	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	23	150	1	361		
Volume Left	22	0	1	0		
Volume Right	1	8	0	0		
cSH	537	1700	1435	1700		
Volume to Capacity	0.04	0.09	0.00	0.21		
Queue Length 95th (m)	1.1	0.0	0.0	0.0		
Control Delay (s)	12.0	0.0	7.5	0.0		
Lane LOS	B		A			
Approach Delay (s)	12.0	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			27.5%		ICU Level of Service	A
Analysis Period (min)			15			

642 Dunlop Street West
6: Miller Drive & Dunlop Street West

Queues
Total (2024) AM Peak Hour

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	76	741	301	13	463	144	28	143	105
Future Volume (vph)	76	741	301	13	463	144	28	143	105
Lane Group Flow (vph)	84	823	334	14	553	160	44	159	233
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	5	3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	5	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	7.0	60.0	7.0	7.0	60.0	7.0	10.0	7.0	10.0
Minimum Split (s)	11.0	66.0	11.0	11.0	66.0	11.0	36.0	11.0	36.0
Total Split (s)	16.0	66.0	16.0	16.0	66.0	16.0	26.0	16.0	26.0
Total Split (%)	12.9%	53.2%	12.9%	12.9%	53.2%	12.9%	21.0%	12.9%	21.0%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	None	Max
v/c Ratio	0.18	0.46	0.30	0.05	0.36	0.49	0.11	0.32	0.56
Control Delay	13.6	21.3	1.8	12.7	22.9	35.1	31.6	31.0	43.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.6	21.3	1.8	12.7	22.9	35.1	31.6	31.0	43.7
Queue Length 50th (m)	9.8	65.6	0.0	1.6	49.7	30.4	6.7	29.8	48.3
Queue Length 95th (m)	17.7	98.1	11.5	4.7	66.3	49.7	17.6	48.7	78.4
Internal Link Dist (m)		558.9			50.7		498.3		33.7
Turn Bay Length (m)	185.0		125.0	125.0		200.0		100.0	
Base Capacity (vph)	486	1796	1127	328	1520	335	397	506	414
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.46	0.30	0.04	0.36	0.48	0.11	0.31	0.56

Intersection Summary

Cycle Length: 124
Actuated Cycle Length: 127.9
Natural Cycle: 125
Control Type: Semi Act-Uncoord

Splits and Phases: 6: Miller Drive & Dunlop Street West

			
Ø1	Ø2	Ø3	Ø4
16 s	26 s	16 s	66 s
			
Ø5	Ø6	Ø7	Ø8
16 s	26 s	16 s	66 s

642 Dunlop Street West
6: Miller Drive & Dunlop Street West

HCM Signalized Intersection Capacity Analysis

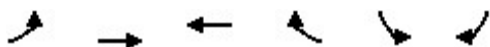
Total (2024) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	76	741	301	13	463	35	144	28	12	143	105	104
Future Volume (vph)	76	741	301	13	463	35	144	28	12	143	105	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.96		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3471	1538	1399	3224		1612	1640		1770	1651	
Flt Permitted	0.37	1.00	1.00	0.29	1.00		0.43	1.00		0.73	1.00	
Satd. Flow (perm)	681	3471	1538	423	3224		728	1640		1357	1651	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	84	823	334	14	514	39	160	31	13	159	117	116
RTOR Reduction (vph)	0	0	135	0	5	0	0	10	0	0	26	0
Lane Group Flow (vph)	84	823	199	14	548	0	160	34	0	159	207	0
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	72.9	66.2	77.5	64.4	61.7		41.6	30.3		41.2	30.1	
Effective Green, g (s)	72.9	66.2	77.5	64.4	61.7		41.6	30.3		41.2	30.1	
Actuated g/C Ratio	0.56	0.51	0.59	0.49	0.47		0.32	0.23		0.32	0.23	
Clearance Time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	440	1763	914	229	1526		309	381		464	381	
v/s Ratio Prot	c0.01	c0.24	0.02	0.00	0.17		c0.04	0.02		0.03	c0.13	
v/s Ratio Perm	0.10		0.11	0.03			0.12			0.08		
v/c Ratio	0.19	0.47	0.22	0.06	0.36		0.52	0.09		0.34	0.54	
Uniform Delay, d1	13.8	20.7	12.3	17.2	21.8		33.9	39.2		33.5	44.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.2	0.1	0.1	0.1		1.5	0.5		0.4	5.5	
Delay (s)	14.0	20.9	12.4	17.3	21.9		35.4	39.6		33.9	49.5	
Level of Service	B	C	B	B	C		D	D		C	D	
Approach Delay (s)		18.1			21.8			36.3			43.2	
Approach LOS		B			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			24.6			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.49									
Actuated Cycle Length (s)			130.3			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			92.4%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

642 Dunlop Street West
7: Dunlop Street West & RIRO Access

HCM Unsignalized Intersection Capacity Analysis

Total (2024) AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (veh/h)	0	898	508	7	0	4
Future Volume (Veh/h)	0	898	508	7	0	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	976	552	8	0	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		75				
pX, platoon unblocked					0.85	
vC, conflicting volume	560				1044	280
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	560				695	280
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	99
cM capacity (veh/h)	1007				319	717
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	488	488	368	192	4	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	8	4	
cSH	1700	1700	1700	1700	717	
Volume to Capacity	0.29	0.29	0.22	0.11	0.01	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.1	
Control Delay (s)	0.0	0.0	0.0	0.0	10.0	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		10.0	
Approach LOS					B	
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			28.2%		ICU Level of Service	A
Analysis Period (min)			15			

642 Dunlop Street West
1: Miller Drive & FM Access

HCM Unsignalized Intersection Capacity Analysis

Total (2024) PM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	19	4	366	16	3	187
Future Volume (Veh/h)	19	4	366	16	3	187
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	4	398	17	3	203
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)			58			
pX, platoon unblocked	0.90	0.90			0.90	
vC, conflicting volume	616	406			415	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	512	278			288	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	99			100	
cM capacity (veh/h)	466	681			1140	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	25	415	3	203		
Volume Left	21	0	3	0		
Volume Right	4	17	0	0		
cSH	491	1700	1140	1700		
Volume to Capacity	0.05	0.24	0.00	0.12		
Queue Length 95th (m)	1.3	0.0	0.1	0.0		
Control Delay (s)	12.7	0.0	8.2	0.0		
Lane LOS	B		A			
Approach Delay (s)	12.7	0.0	0.1			
Approach LOS	B					
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			30.2%		ICU Level of Service	A
Analysis Period (min)			15			

642 Dunlop Street West
6: Miller Drive & Dunlop Street West

Queues
Total (2024) PM Peak Hour

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	145	599	259	14	704	242	128	82	50
Future Volume (vph)	145	599	259	14	704	242	128	82	50
Lane Group Flow (vph)	151	624	270	15	849	252	147	85	129
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	5	3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	5	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	7.0	60.0	7.0	7.0	60.0	7.0	10.0	7.0	10.0
Minimum Split (s)	11.0	66.0	11.0	11.0	66.0	11.0	36.0	11.0	36.0
Total Split (s)	16.0	66.0	16.0	16.0	66.0	16.0	26.0	16.0	26.0
Total Split (%)	12.9%	53.2%	12.9%	12.9%	53.2%	12.9%	21.0%	12.9%	21.0%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	None	Max
v/c Ratio	0.42	0.34	0.26	0.05	0.54	0.58	0.34	0.22	0.31
Control Delay	16.7	19.3	1.8	12.7	27.5	39.0	44.0	30.8	28.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.7	19.3	1.8	12.7	27.5	39.0	44.0	30.8	28.1
Queue Length 50th (m)	18.3	46.3	0.0	1.7	87.2	52.2	33.3	16.0	17.8
Queue Length 95th (m)	29.3	71.7	10.8	5.0	107.5	77.1	55.1	29.0	37.0
Internal Link Dist (m)		558.9			50.7		498.3		33.7
Turn Bay Length (m)	185.0		125.0	125.0		200.0		100.0	
Base Capacity (vph)	368	1837	1040	316	1568	438	433	403	411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.41	0.34	0.26	0.05	0.54	0.58	0.34	0.21	0.31

Intersection Summary

Cycle Length: 124
Actuated Cycle Length: 132.8
Natural Cycle: 125
Control Type: Semi Act-Uncoord

Splits and Phases: 6: Miller Drive & Dunlop Street West

			
Ø1	Ø2	Ø3	Ø4
16 s	26 s	16 s	66 s
			
Ø5	Ø6	Ø7	Ø8
16 s	26 s	16 s	66 s

642 Dunlop Street West
6: Miller Drive & Dunlop Street West

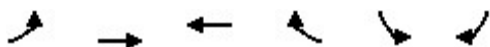
HCM Signalized Intersection Capacity Analysis

Total (2024) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	145	599	259	14	704	111	242	128	13	82	50	74
Future Volume (vph)	145	599	259	14	704	111	242	128	13	82	50	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.99		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3471	1429	1081	3447		1770	1782		1597	1650	
Flt Permitted	0.22	1.00	1.00	0.41	1.00		0.59	1.00		0.64	1.00	
Satd. Flow (perm)	423	3471	1429	468	3447		1091	1782		1076	1650	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	151	624	270	15	733	116	252	133	14	85	52	77
RTOR Reduction (vph)	0	0	106	0	11	0	0	3	0	0	40	0
Lane Group Flow (vph)	151	624	164	15	838	0	252	144	0	85	89	0
Heavy Vehicles (%)	0%	4%	13%	67%	3%	0%	2%	1%	44%	13%	9%	2%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	77.2	70.3	82.3	65.3	62.4		44.1	32.1		39.9	30.0	
Effective Green, g (s)	77.2	70.3	82.3	65.3	62.4		44.1	32.1		39.9	30.0	
Actuated g/C Ratio	0.57	0.52	0.61	0.48	0.46		0.33	0.24		0.30	0.22	
Clearance Time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	351	1804	869	239	1590		416	423		355	366	
v/s Ratio Prot	c0.03	0.18	0.02	0.00	c0.24		c0.05	0.08		0.02	0.05	
v/s Ratio Perm	0.21		0.10	0.03			c0.14			0.05		
v/c Ratio	0.43	0.35	0.19	0.06	0.53		0.61	0.34		0.24	0.24	
Uniform Delay, d1	15.9	19.0	11.7	18.3	25.9		36.7	42.8		35.5	43.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	0.1	0.1	0.1	0.3		2.5	2.2		0.4	1.6	
Delay (s)	16.8	19.1	11.8	18.4	26.2		39.2	44.9		35.8	44.9	
Level of Service	B	B	B	B	C		D	D		D	D	
Approach Delay (s)		16.9			26.1			41.3			41.3	
Approach LOS		B			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			26.0			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.56									
Actuated Cycle Length (s)			135.2			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			96.4%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

642 Dunlop Street West
7: Dunlop Street West & RIRO Access

HCM Unsignalized Intersection Capacity Analysis
Total (2024) PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (veh/h)	0	696	824	19	0	8
Future Volume (Veh/h)	0	696	824	19	0	8
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	757	896	21	0	9
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		75				
pX, platoon unblocked					0.90	
vC, conflicting volume	917				1285	458
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	917				1087	458
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	98
cM capacity (veh/h)	740				189	549
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	378	378	597	320	9	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	21	9	
cSH	1700	1700	1700	1700	549	
Volume to Capacity	0.22	0.22	0.35	0.19	0.02	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.4	
Control Delay (s)	0.0	0.0	0.0	0.0	11.7	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		11.7	
Approach LOS					B	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			33.4%		ICU Level of Service	A
Analysis Period (min)			15			

642 Dunlop Street West
1: Miller Drive & FM Access

HCM Unsignalized Intersection Capacity Analysis

Total (2029) AM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	20	1	142	7	1	356
Future Volume (Veh/h)	20	1	142	7	1	356
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	1	154	8	1	387
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)			58			
pX, platoon unblocked	0.98	0.98			0.98	
vC, conflicting volume	547	158			162	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	526	129			133	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	100			100	
cM capacity (veh/h)	501	902			1421	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	23	162	1	387		
Volume Left	22	0	1	0		
Volume Right	1	8	0	0		
cSH	511	1700	1421	1700		
Volume to Capacity	0.05	0.10	0.00	0.23		
Queue Length 95th (m)	1.1	0.0	0.0	0.0		
Control Delay (s)	12.4	0.0	7.5	0.0		
Lane LOS	B		A			
Approach Delay (s)	12.4	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			28.7%		ICU Level of Service	A
Analysis Period (min)			15			

642 Dunlop Street West
6: Miller Drive & Dunlop Street West

Queues
Total (2029) AM Peak Hour

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	83	901	348	15	563	167	31	149	114
Future Volume (vph)	83	901	348	15	563	167	31	149	114
Lane Group Flow (vph)	92	1001	387	17	667	186	48	166	253
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	5	3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	5	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	7.0	60.0	7.0	7.0	60.0	7.0	10.0	7.0	10.0
Minimum Split (s)	11.0	66.0	11.0	11.0	66.0	11.0	36.0	11.0	36.0
Total Split (s)	16.0	66.0	16.0	16.0	66.0	16.0	26.0	16.0	26.0
Total Split (%)	12.9%	53.2%	12.9%	12.9%	53.2%	12.9%	21.0%	12.9%	21.0%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	None	Max
v/c Ratio	0.23	0.55	0.34	0.07	0.45	0.61	0.12	0.34	0.63
Control Delay	14.0	23.0	1.8	13.0	25.3	40.5	31.8	31.9	47.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.0	23.0	1.8	13.0	25.3	40.5	31.8	31.9	47.2
Queue Length 50th (m)	10.8	85.6	0.0	1.9	63.5	36.1	7.4	31.5	54.2
Queue Length 95th (m)	19.2	126.3	12.3	5.4	82.8	58.0	18.7	50.9	86.3
Internal Link Dist (m)		558.9			50.7		498.3		33.7
Turn Bay Length (m)	185.0		125.0	125.0		200.0		100.0	
Base Capacity (vph)	433	1820	1148	281	1484	306	392	492	404
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.55	0.34	0.06	0.45	0.61	0.12	0.34	0.63

Intersection Summary

Cycle Length: 124

Actuated Cycle Length: 131

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Splits and Phases: 6: Miller Drive & Dunlop Street West

 Ø1	 Ø2	 Ø3	 Ø4
16 s	26 s	16 s	66 s
 Ø5	 Ø6	 Ø7	 Ø8
16 s	26 s	16 s	66 s

642 Dunlop Street West
6: Miller Drive & Dunlop Street West

HCM Signalized Intersection Capacity Analysis

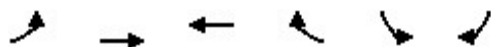
Total (2029) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	83	901	348	15	563	37	167	31	13	149	114	113
Future Volume (vph)	83	901	348	15	563	37	167	31	13	149	114	113
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.96		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3471	1538	1399	3232		1612	1642		1770	1651	
Flt Permitted	0.31	1.00	1.00	0.22	1.00		0.38	1.00		0.73	1.00	
Satd. Flow (perm)	566	3471	1538	324	3232		640	1642		1352	1651	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	92	1001	387	17	626	41	186	34	14	166	127	126
RTOR Reduction (vph)	0	0	153	0	4	0	0	11	0	0	26	0
Lane Group Flow (vph)	92	1001	234	17	663	0	186	37	0	166	227	0
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	75.5	68.7	80.6	65.2	62.4		42.4	30.5		41.4	30.0	
Effective Green, g (s)	75.5	68.7	80.6	65.2	62.4		42.4	30.5		41.4	30.0	
Actuated g/C Ratio	0.57	0.51	0.60	0.49	0.47		0.32	0.23		0.31	0.22	
Clearance Time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	401	1787	929	180	1511		290	375		455	371	
v/s Ratio Prot	c0.02	c0.29	0.02	0.00	0.21		c0.06	0.02		0.03	0.14	
v/s Ratio Perm	0.11		0.13	0.04			c0.15			0.08		
v/c Ratio	0.23	0.56	0.25	0.09	0.44		0.64	0.10		0.36	0.61	
Uniform Delay, d1	14.3	22.1	12.3	18.5	23.8		35.7	40.6		35.0	46.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.4	0.1	0.2	0.2		4.8	0.5		0.5	7.3	
Delay (s)	14.5	22.5	12.5	18.7	24.0		40.5	41.1		35.5	53.8	
Level of Service	B	C	B	B	C		D	D		D	D	
Approach Delay (s)		19.4			23.8			40.6			46.5	
Approach LOS		B			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			26.3			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			133.4			Sum of lost time (s)				20.0		
Intersection Capacity Utilization			94.7%			ICU Level of Service				F		
Analysis Period (min)			15									
c Critical Lane Group												

642 Dunlop Street West
7: Dunlop Street West & RIRO Access

HCM Unsignalized Intersection Capacity Analysis

Total (2029) AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (veh/h)	0	1074	615	7	0	4
Future Volume (Veh/h)	0	1074	615	7	0	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1167	668	8	0	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		75				
pX, platoon unblocked					0.80	
vC, conflicting volume	676				1256	338
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	676				828	338
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	99
cM capacity (veh/h)	911				248	658
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	584	584	445	231	4	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	8	4	
cSH	1700	1700	1700	1700	658	
Volume to Capacity	0.34	0.34	0.26	0.14	0.01	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.1	
Control Delay (s)	0.0	0.0	0.0	0.0	10.5	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		10.5	
Approach LOS					B	
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			33.0%		ICU Level of Service	A
Analysis Period (min)			15			

642 Dunlop Street West
1: Miller Drive & FM Access

HCM Unsignalized Intersection Capacity Analysis

Total (2029) PM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	19	4	394	16	3	202
Future Volume (Veh/h)	19	4	394	16	3	202
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	4	428	17	3	220
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)			58			
pX, platoon unblocked	0.88	0.88			0.88	
vC, conflicting volume	662	436			445	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	549	292			302	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	99			100	
cM capacity (veh/h)	436	658			1109	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	25	445	3	220		
Volume Left	21	0	3	0		
Volume Right	4	17	0	0		
cSH	461	1700	1109	1700		
Volume to Capacity	0.05	0.26	0.00	0.13		
Queue Length 95th (m)	1.4	0.0	0.1	0.0		
Control Delay (s)	13.3	0.0	8.3	0.0		
Lane LOS	B		A			
Approach Delay (s)	13.3	0.0	0.1			
Approach LOS	B					
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			31.7%		ICU Level of Service	A
Analysis Period (min)			15			

642 Dunlop Street West
6: Miller Drive & Dunlop Street West

Queues
Total (2029) PM Peak Hour

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	158	765	300	15	898	280	145	86	55
Future Volume (vph)	158	765	300	15	898	280	145	86	55
Lane Group Flow (vph)	165	797	313	16	1056	292	166	90	140
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	5	3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	5	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	7.0	60.0	7.0	7.0	60.0	7.0	10.0	7.0	10.0
Minimum Split (s)	11.0	66.0	11.0	11.0	66.0	11.0	36.0	11.0	36.0
Total Split (s)	16.0	66.0	16.0	16.0	66.0	16.0	26.0	16.0	26.0
Total Split (%)	12.9%	53.2%	12.9%	12.9%	53.2%	12.9%	21.0%	12.9%	21.0%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	None	Max
v/c Ratio	0.57	0.43	0.30	0.07	0.67	0.68	0.39	0.25	0.34
Control Delay	21.3	20.8	1.9	12.9	31.1	44.1	45.6	31.3	30.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.3	20.8	1.9	12.9	31.1	44.1	45.6	31.3	30.3
Queue Length 50th (m)	20.2	62.8	0.0	1.8	119.0	62.2	38.5	17.0	20.7
Queue Length 95th (m)	32.0	95.3	11.5	5.2	144.1	90.1	62.0	30.3	41.1
Internal Link Dist (m)		558.9			50.7		498.3		33.7
Turn Bay Length (m)	185.0		125.0	125.0		200.0		100.0	
Base Capacity (vph)	298	1839	1055	266	1567	427	431	384	411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.55	0.43	0.30	0.06	0.67	0.68	0.39	0.23	0.34

Intersection Summary

Cycle Length: 124
Actuated Cycle Length: 133
Natural Cycle: 125
Control Type: Semi Act-Uncoord

Splits and Phases: 6: Miller Drive & Dunlop Street West

			
Ø1	Ø2	Ø3	Ø4
16 s	26 s	16 s	66 s
			
Ø5	Ø6	Ø7	Ø8
16 s	26 s	16 s	66 s

642 Dunlop Street West
6: Miller Drive & Dunlop Street West

HCM Signalized Intersection Capacity Analysis

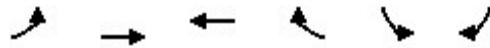
Total (2029) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	158	765	300	15	898	116	280	145	14	86	55	80
Future Volume (vph)	158	765	300	15	898	116	280	145	14	86	55	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.99		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3471	1429	1081	3456		1770	1787		1597	1651	
Flt Permitted	0.15	1.00	1.00	0.32	1.00		0.57	1.00		0.60	1.00	
Satd. Flow (perm)	278	3471	1429	363	3456		1057	1787		1001	1651	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	165	797	312	16	935	121	292	151	15	90	57	83
RTOR Reduction (vph)	0	0	122	0	9	0	0	2	0	0	39	0
Lane Group Flow (vph)	165	797	191	16	1047	0	292	164	0	90	101	0
Heavy Vehicles (%)	0%	4%	13%	67%	3%	0%	2%	1%	44%	13%	9%	2%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	77.4	70.5	82.5	65.3	62.4		43.9	31.9		40.1	30.0	
Effective Green, g (s)	77.4	70.5	82.5	65.3	62.4		43.9	31.9		40.1	30.0	
Actuated g/C Ratio	0.57	0.52	0.61	0.48	0.46		0.32	0.24		0.30	0.22	
Clearance Time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	282	1807	870	190	1592		405	421		340	365	
v/s Ratio Prot	c0.05	0.23	0.02	0.00	c0.30		c0.06	0.09		0.02	0.06	
v/s Ratio Perm	0.29		0.11	0.04			c0.17			0.06		
v/c Ratio	0.59	0.44	0.22	0.08	0.66		0.72	0.39		0.26	0.28	
Uniform Delay, d1	18.8	20.2	11.9	18.5	28.2		38.9	43.5		35.6	43.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.1	0.2	0.1	0.2	1.0		6.2	2.7		0.4	1.9	
Delay (s)	21.8	20.4	12.1	18.7	29.2		45.2	46.2		36.0	45.6	
Level of Service	C	C	B	B	C		D	D		D	D	
Approach Delay (s)		18.5			29.1			45.6			41.8	
Approach LOS		B			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			28.1			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			135.4			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			99.3%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

642 Dunlop Street West
7: Dunlop Street West & RIRO Access

HCM Unsignalized Intersection Capacity Analysis

Total (2029) PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (veh/h)	0	876	1034	19	0	8
Future Volume (Veh/h)	0	876	1034	19	0	8
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	952	1124	21	0	9
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		75				
pX, platoon unblocked					0.86	
vC, conflicting volume	1145				1610	572
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1145				1380	572
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	98
cM capacity (veh/h)	606				116	463
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	476	476	749	396	9	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	21	9	
cSH	1700	1700	1700	1700	463	
Volume to Capacity	0.28	0.28	0.44	0.23	0.02	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.5	
Control Delay (s)	0.0	0.0	0.0	0.0	12.9	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		12.9	
Approach LOS					B	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			39.2%		ICU Level of Service	A
Analysis Period (min)			15			

642 Dunlop Street West
1: Tiffin Street & FM Access

HCM Unsignalized Intersection Capacity Analysis

Total (2034) AM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	20	1	155	7	1	383
Future Volume (Veh/h)	20	1	155	7	1	383
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	1	168	8	1	416
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)			58			
pX, platoon unblocked	0.98	0.98			0.98	
vC, conflicting volume	590	172			176	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	567	139			143	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	100			100	
cM capacity (veh/h)	473	887			1405	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	23	176	1	416		
Volume Left	22	0	1	0		
Volume Right	1	8	0	0		
cSH	482	1700	1405	1700		
Volume to Capacity	0.05	0.10	0.00	0.24		
Queue Length 95th (m)	1.2	0.0	0.0	0.0		
Control Delay (s)	12.8	0.0	7.6	0.0		
Lane LOS	B		A			
Approach Delay (s)	12.8	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			30.2%		ICU Level of Service	A
Analysis Period (min)			15			

642 Dunlop Street West
6: Miller Drive/Tiffin Street & Dunlop Street West

Queues
Total (2034) AM Peak Hour

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	90	1035	392	16	646	188	34	156	123
Future Volume (vph)	90	1035	392	16	646	188	34	156	123
Lane Group Flow (vph)	100	1150	436	18	761	209	55	173	275
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	5	3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	5	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	7.0	60.0	7.0	7.0	60.0	7.0	10.0	7.0	10.0
Minimum Split (s)	11.0	66.0	11.0	11.0	66.0	11.0	36.0	11.0	36.0
Total Split (s)	16.0	66.0	16.0	16.0	66.0	16.0	26.0	16.0	26.0
Total Split (%)	12.9%	53.2%	12.9%	12.9%	53.2%	12.9%	21.0%	12.9%	21.0%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	None	Max
v/c Ratio	0.27	0.63	0.37	0.09	0.51	0.73	0.14	0.36	0.68
Control Delay	14.6	24.9	1.9	13.3	26.8	48.2	32.3	32.4	50.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.6	24.9	1.9	13.3	26.8	48.2	32.3	32.4	50.2
Queue Length 50th (m)	11.8	104.7	0.0	2.0	75.6	41.5	8.7	33.1	60.6
Queue Length 95th (m)	20.5	153.3	12.8	5.6	97.5	#71.6	21.0	53.4	94.9
Internal Link Dist (m)		558.9			50.7		498.3		33.7
Turn Bay Length (m)	185.0		125.0	125.0		200.0		100.0	
Base Capacity (vph)	393	1821	1165	243	1482	288	391	488	403
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.63	0.37	0.07	0.51	0.73	0.14	0.35	0.68

Intersection Summary

Cycle Length: 124

Actuated Cycle Length: 131.4

Natural Cycle: 125

Control Type: Semi Act-Uncoord

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

Queue shown is maximum after two cycles.

Splits and Phases: 6: Miller Drive/Tiffin Street & Dunlop Street West

			
Ø1	Ø2	Ø3	Ø4
16 s	26 s	16 s	66 s
			
Ø5	Ø6	Ø7	Ø8
16 s	26 s	16 s	66 s

642 Dunlop Street West

HCM Signalized Intersection Capacity Analysis

6: Miller Drive/Tiffin Street & Dunlop Street West

Total (2034) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	1035	392	16	646	39	188	34	15	156	123	124
Future Volume (vph)	90	1035	392	16	646	39	188	34	15	156	123	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.95		1.00	0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3471	1538	1399	3236		1612	1633		1770	1650	
Flt Permitted	0.26	1.00	1.00	0.17	1.00		0.33	1.00		0.72	1.00	
Satd. Flow (perm)	484	3471	1538	246	3236		567	1633		1343	1650	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	100	1150	436	18	718	43	209	38	17	173	137	138
RTOR Reduction (vph)	0	0	172	0	4	0	0	12	0	0	27	0
Lane Group Flow (vph)	100	1150	264	18	757	0	209	43	0	173	248	0
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	75.8	69.0	81.0	65.2	62.4		42.5	30.5		41.5	30.0	
Effective Green, g (s)	75.8	69.0	81.0	65.2	62.4		42.5	30.5		41.5	30.0	
Actuated g/C Ratio	0.57	0.52	0.61	0.49	0.47		0.32	0.23		0.31	0.22	
Clearance Time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	363	1789	931	144	1509		273	372		453	369	
v/s Ratio Prot	c0.02	c0.33	0.03	0.00	0.23		c0.07	0.03		0.03	0.15	
v/s Ratio Perm	0.14		0.15	0.06			c0.17			0.09		
v/c Ratio	0.28	0.64	0.28	0.12	0.50		0.77	0.12		0.38	0.67	
Uniform Delay, d1	14.8	23.5	12.6	19.4	24.9		38.0	41.0		35.3	47.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.8	0.2	0.4	0.3		12.1	0.6		0.5	9.4	
Delay (s)	15.2	24.3	12.7	19.8	25.1		50.1	41.6		35.8	56.8	
Level of Service	B	C	B	B	C		D	D		D	E	
Approach Delay (s)		20.8			25.0			48.3			48.7	
Approach LOS		C			C			D			D	

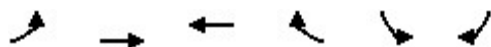
Intersection Summary

HCM 2000 Control Delay	28.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	133.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	97.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

642 Dunlop Street West
7: Dunlop Street West & RIRO Access

HCM Unsignalized Intersection Capacity Analysis

Total (2034) AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (veh/h)	0	1220	703	7	0	4
Future Volume (Veh/h)	0	1220	703	7	0	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1326	764	8	0	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		75				
pX, platoon unblocked					0.76	
vC, conflicting volume	772				1431	386
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	772				932	386
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	99
cM capacity (veh/h)	839				201	612
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	663	663	509	263	4	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	8	4	
cSH	1700	1700	1700	1700	612	
Volume to Capacity	0.39	0.39	0.30	0.15	0.01	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.2	
Control Delay (s)	0.0	0.0	0.0	0.0	10.9	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		10.9	
Approach LOS					B	
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			37.1%		ICU Level of Service	A
Analysis Period (min)			15			

642 Dunlop Street West
1: Miller Drive & FM Access

HCM Unsignalized Intersection Capacity Analysis

Total (2034) PM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	19	4	426	16	3	218
Future Volume (Veh/h)	19	4	426	16	3	218
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	4	463	17	3	237
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)			58			
pX, platoon unblocked	0.87	0.87			0.87	
vC, conflicting volume	714	472			480	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	592	312			321	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	99			100	
cM capacity (veh/h)	404	631			1072	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	25	480	3	237		
Volume Left	21	0	3	0		
Volume Right	4	17	0	0		
cSH	429	1700	1072	1700		
Volume to Capacity	0.06	0.28	0.00	0.14		
Queue Length 95th (m)	1.5	0.0	0.1	0.0		
Control Delay (s)	13.9	0.0	8.4	0.0		
Lane LOS	B		A			
Approach Delay (s)	13.9	0.0	0.1			
Approach LOS	B					
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			33.4%		ICU Level of Service	A
Analysis Period (min)			15			

642 Dunlop Street West
6: Miller Drive & Dunlop Street West

Queues
Total (2034) PM Peak Hour

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	172	896	337	17	1050	315	160	90	59
Future Volume (vph)	172	896	337	17	1050	315	160	90	59
Lane Group Flow (vph)	179	933	351	18	1220	328	184	94	153
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	5	3	8	5	2	1	6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	5	3	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	7.0	54.0	7.0	7.0	54.0	7.0	10.0	7.0	10.0
Minimum Split (s)	11.0	66.0	11.0	11.0	66.0	11.0	36.0	11.0	36.0
Total Split (s)	13.0	66.0	14.0	13.0	66.0	14.0	31.0	14.0	31.0
Total Split (%)	10.5%	53.2%	11.3%	10.5%	53.2%	11.3%	25.0%	11.3%	25.0%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	2.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	4.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None	None	Max	None	Max
v/c Ratio	0.82	0.52	0.34	0.09	0.79	0.77	0.41	0.26	0.35
Control Delay	49.3	22.3	2.1	13.1	33.6	46.8	42.3	28.9	27.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.3	22.3	2.1	13.1	33.6	46.8	42.3	28.9	27.5
Queue Length 50th (m)	21.2	74.5	0.0	2.0	137.0	63.5	38.7	15.8	20.1
Queue Length 95th (m)	#63.9	113.1	12.4	5.6	165.6	#110.7	65.3	30.4	42.3
Internal Link Dist (m)		558.9			50.7		498.3		33.7
Turn Bay Length (m)	185.0		122.0	125.0		200.0		100.0	
Base Capacity (vph)	217	1801	1042	207	1680	427	446	368	440
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.82	0.52	0.34	0.09	0.73	0.77	0.41	0.26	0.35

Intersection Summary

Cycle Length: 124

Actuated Cycle Length: 124.2

Natural Cycle: 125

Control Type: Semi Act-Uncoord

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

Queue shown is maximum after two cycles.

Splits and Phases: 6: Miller Drive & Dunlop Street West

			
Ø1	Ø2	Ø3	Ø4
14 s	31 s	13 s	66 s
			
Ø5	Ø6	Ø7	Ø8
14 s	31 s	13 s	66 s

642 Dunlop Street West
6: Miller Drive & Dunlop Street West

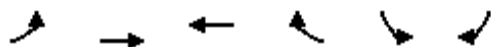
HCM Signalized Intersection Capacity Analysis

Total (2034) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	172	896	337	17	1050	121	315	160	16	90	59	88
Future Volume (vph)	172	896	337	17	1050	121	315	160	16	90	59	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.99		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3471	1429	1081	3461		1770	1785		1597	1650	
Flt Permitted	0.09	1.00	1.00	0.24	1.00		0.58	1.00		0.55	1.00	
Satd. Flow (perm)	179	3471	1429	279	3461		1079	1785		931	1650	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	179	933	351	18	1094	126	328	167	17	94	61	92
RTOR Reduction (vph)	0	0	147	0	8	0	0	3	0	0	42	0
Lane Group Flow (vph)	179	933	204	18	1212	0	328	181	0	94	111	0
Heavy Vehicles (%)	0%	4%	13%	67%	3%	0%	2%	1%	44%	13%	9%	2%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	70.6	63.7	73.7	60.5	57.6		40.9	30.9		39.3	30.1	
Effective Green, g (s)	70.6	63.7	73.7	60.5	57.6		40.9	30.9		39.3	30.1	
Actuated g/C Ratio	0.56	0.50	0.58	0.48	0.45		0.32	0.24		0.31	0.24	
Clearance Time (s)	4.0	6.0	4.0	4.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	215	1745	831	151	1573		402	435		337	391	
v/s Ratio Prot	c0.06	0.27	0.02	0.00	0.35		c0.06	0.10		0.02	0.07	
v/s Ratio Perm	c0.40		0.12	0.05			c0.20			0.07		
v/c Ratio	0.83	0.53	0.25	0.12	0.77		0.82	0.42		0.28	0.28	
Uniform Delay, d1	22.6	21.4	12.9	18.1	29.0		38.4	40.3		32.1	39.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	23.2	0.3	0.2	0.4	2.4		12.1	2.9		0.5	1.8	
Delay (s)	45.8	21.7	13.1	18.5	31.4		50.4	43.2		32.6	41.3	
Level of Service	D	C	B	B	C		D	D		C	D	
Approach Delay (s)		22.6			31.2			47.8			38.0	
Approach LOS		C			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			30.5			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.85									
Actuated Cycle Length (s)			126.7			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			97.1%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

642 Dunlop Street West
7: Dunlop Street West & RIRO Access

HCM Unsignalized Intersection Capacity Analysis
Total (2034) PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (veh/h)	0	1017	1200	19	0	8
Future Volume (Veh/h)	0	1017	1200	19	0	8
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1105	1304	21	0	9
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		75				
pX, platoon unblocked					0.82	
vC, conflicting volume	1325				1867	662
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1325				1613	662
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	98
cM capacity (veh/h)	517				77	404
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	552	552	869	456	9	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	21	9	
cSH	1700	1700	1700	1700	404	
Volume to Capacity	0.33	0.33	0.51	0.27	0.02	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.5	
Control Delay (s)	0.0	0.0	0.0	0.0	14.1	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		14.1	
Approach LOS					B	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			43.8%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix G – Transportation Tomorrow Survey – Excerpt



TTS Cross Tabulation

Cross Tabulation Query Form - Trip - 2016 v1.1

Filter Variables

2006 GTA zone of desti... x

2006 GTA zone of hous... x

(Optional) Table Attribute

Group Attributes

Row Grouping

Column Grouping

Table Grouping

Grouping file: Choose File No file chosen

Filter Selection +

☒ 2006 GTA zone of household In 8520

And

☒ Trip purpose of destination In W, R

And

☒ Start time of trip In 700 - 900

Output

☒ Comma-delimited table ☐ Column format Expansion Factor On Click to Select Load Load

Execute Query

Select All

Save As

Wed Feb 16 2022 14:30:09 GMT-0500 (Eastern Standard Time) - Run Time: 2518ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of destination - gta06_dest
Column: 2006 GTA zone of household - gta06_hhld

Filters:
(2006 GTA zone of household - gta06_hhld In 8520
and
Trip purpose of destination - purp_dest In W, R
and
Start time of trip - start_time In 700 - 900)

Trip 2016
Table:

,8520
358,9
2098,41
2557,103
2571,103
2671,37
2703,60
3706,21
8502,8
8508,50
8509,90
8510,26
8516,20
8521,25
8524,84
8527,39
8591,7

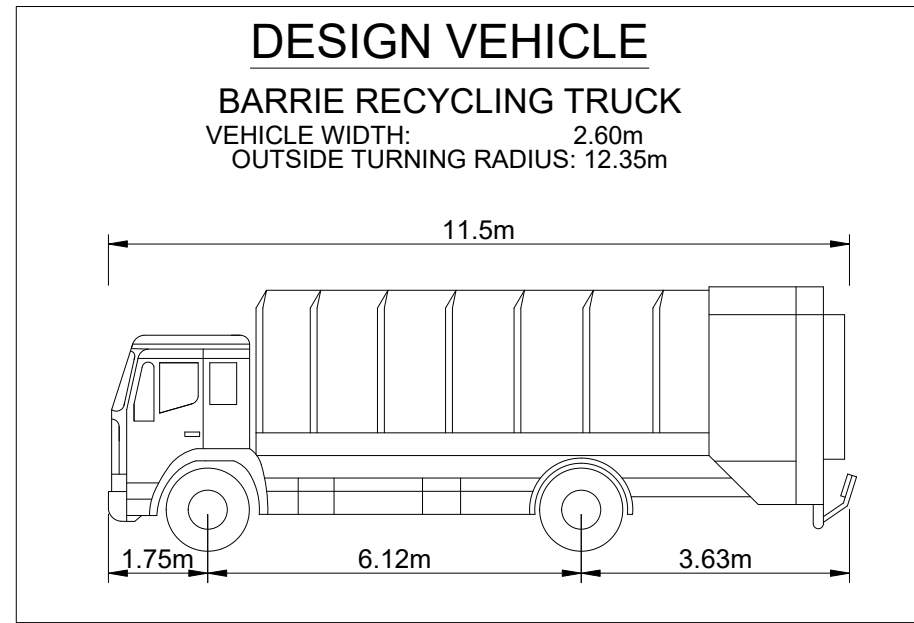
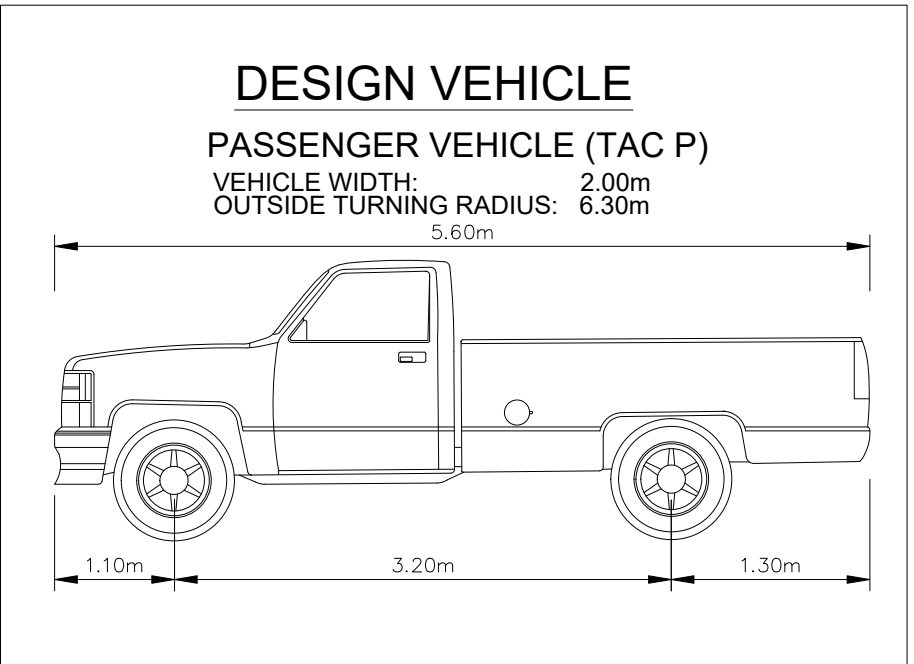
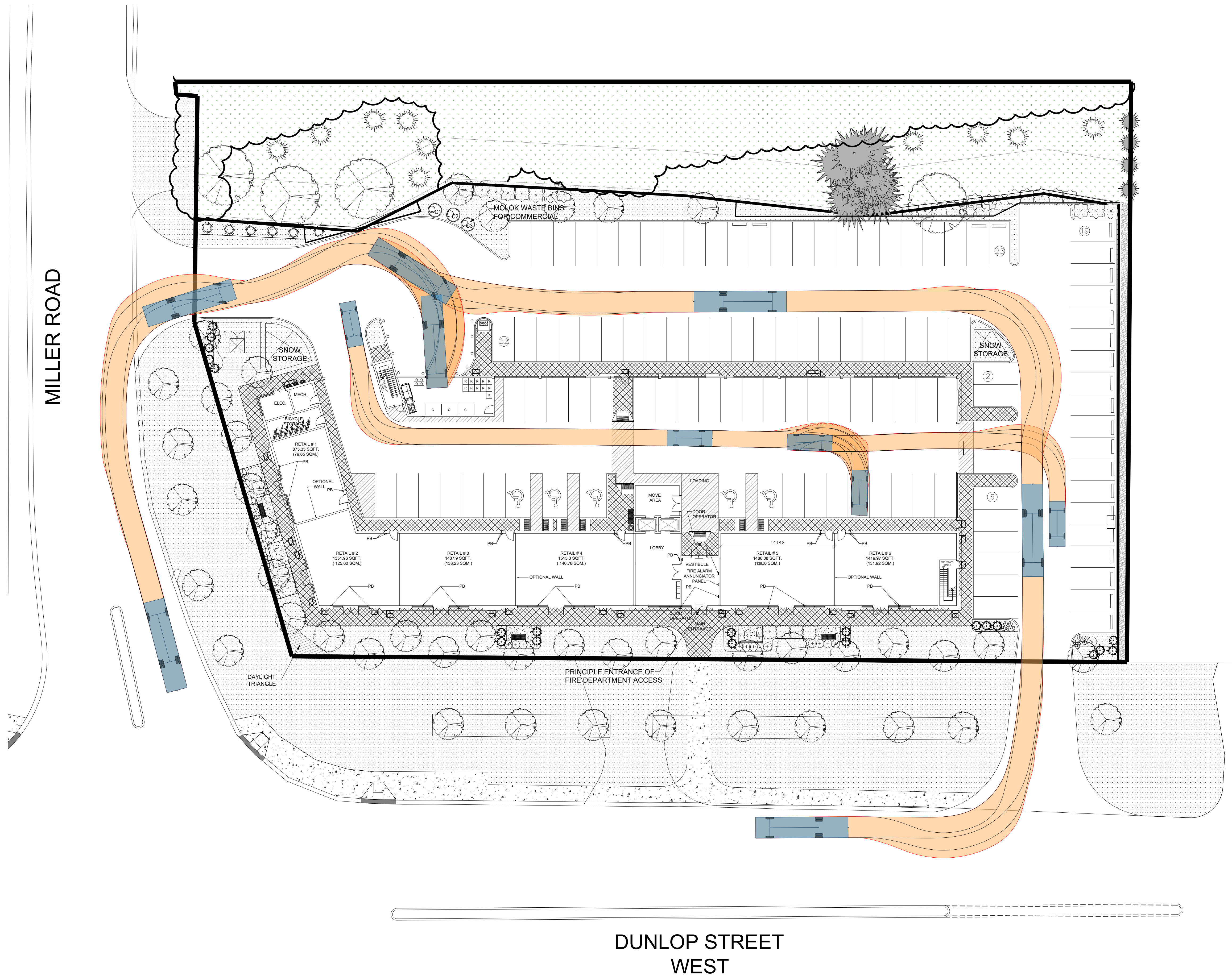
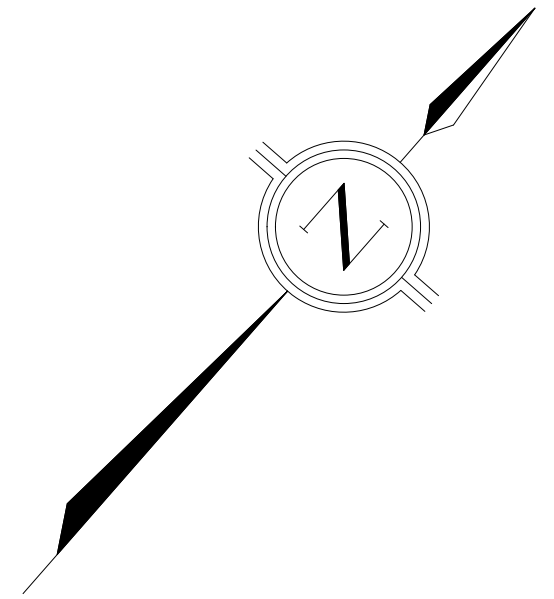
Appendix H – OTM Signal Justification Sheets

Justification No. 7 - 2034 Total Traffic (Critical Case)

Miller Road / North FM Access

Justification	Description		Compliance			Signal Warrant	Underground Provisions Warrant
			Sectional		Entire %		
			Rest. Flow	Numerical			
1. Minimum Vehicluar Volume	A. Vehicle volume, all aproaches (average hour)	720	313	43%	3%	NO	NO
	B. Vehicle volume, along minor streets (average hour)	255	11	4%		NO	NO
2. Delay to cross traffic	A. Vehicle volume, major street (average hour)	720	296	41%	9%	NO	NO
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	75	10	13%		NO	NO

Appendix I – Swept Path Analysis



GENERAL NOTES
1. THIS DRAWING IS NOT INTENDED FOR CONSTRUCTION.
2. DO NOT SCALE DRAWINGS.
3. THE DRAWINGS ARE THE PROPERTY OF JD ENGINEERING AND MUST BE RETURNED ON COMPLETION OF THE PROJECT.
4. BASE DRAWING PROVIDED BY N ARCHITECTURE INC. ON OCTOBER 25, 2024.

NO.	DATE	APPROVED	REVISIONS
3.	OCT 2024	JN	ZONING AND SPA
2.	APR 2023	JN	ZONING AND SPA
1.	APR 2022	JN	ZONING AND SPA

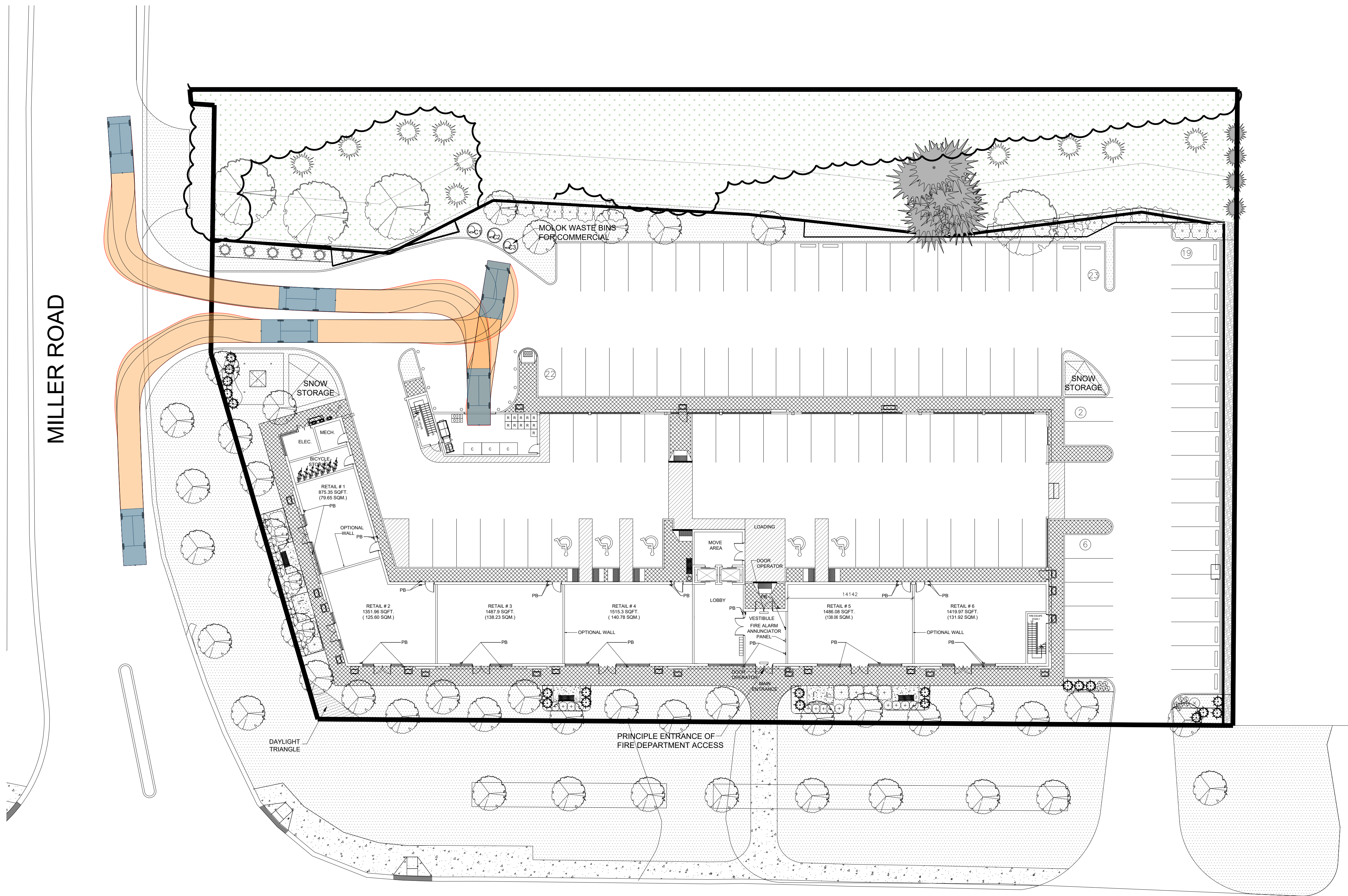
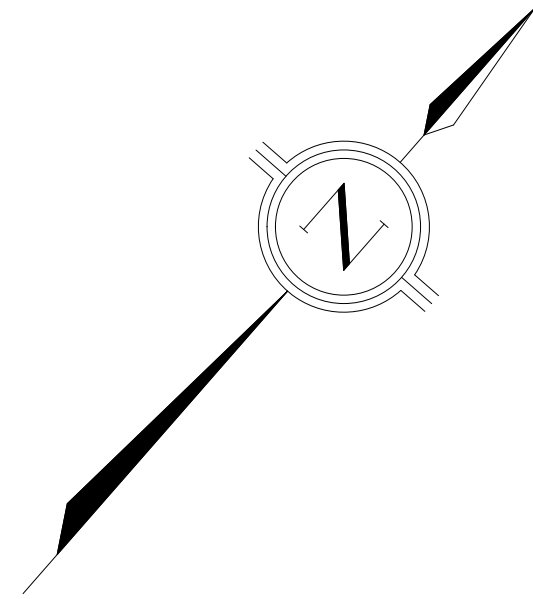
JD Northcote Engineering Inc.
Phone: 705.725.4035
86 Cumberland Street
Barrie, ON L4N 2P6
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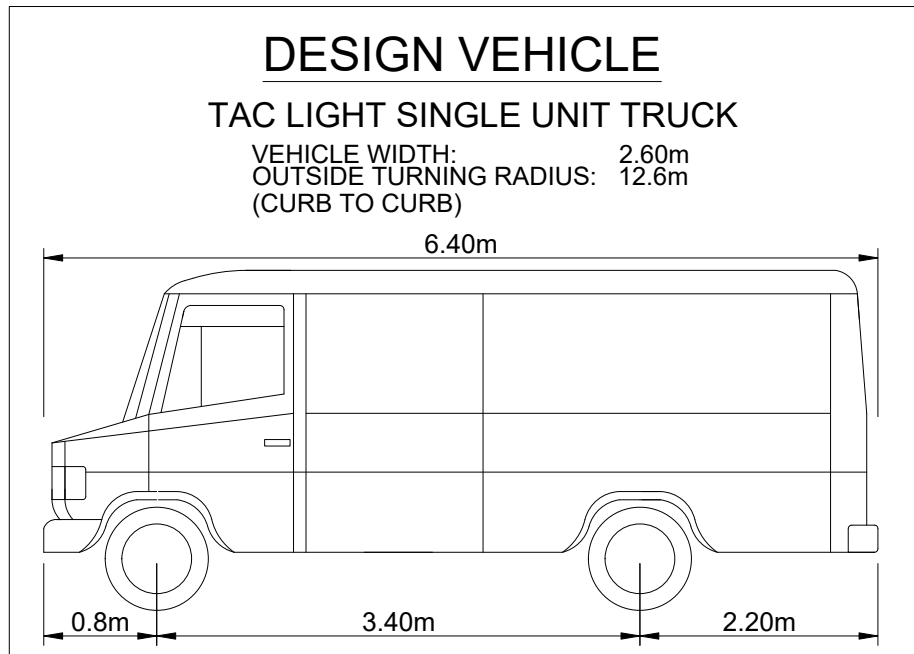
642 DUNLOP STREET WEST

VEHICLE TURNING MOVEMENT ANALYSIS

DESIGN: JN	DATE: 03/22
DRAWN: JN	DATE: 03/22
REVIEWED: JN	DATE: 03/22
SCALE HOR. 1:250	SCALE VERT. N/A
SHEET NO. 21173 - TURN A	



DUNLOP STREET
WEST



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NO.	DATE	APPROVED	REVISIONS
3.	OCT 2024	JN	ZONING AND SPA
2.	APR 2023	JN	ZONING AND SPA
1.	APR 2022	JN	ZONING AND SPA



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642 DUNLOP STREET WEST

VEHICLE TURNING MOVEMENT ANALYSIS

DESIGN: JN	DATE: 03/22
DRAWN: JN	DATE: 03/22
REVIEWED: JN	DATE: 03/22
SCALE HOR: 1:250	SCALE VERT: N/A
SHEET NO. 21173 - TURN B	