# Mansfield Residential Township of Mulmur

Traffic Impact Study for 2735528 Ontario Inc.

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Mansfield Residential 2735528 Ontario Inc. JDE-21035 Date: February 2<sup>nd</sup>, 2024

# **Legal Notification**

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# **Executive Summary**

This report summarizes the traffic impact study prepared for a proposed development located in the northeast quadrant of the Airport Road (County Road 18) / County Road 17 intersection in the Township of Mulmur [Township], County of Dufferin [County]. The report assesses the impact of traffic related to the proposed development on the adjacent roadway and provides recommendations to accommodate this traffic in a safe and efficient manner.

The proposed residential development is anticipated to consist of 43 single family detached units and 28 semi-detached units.

The proposed development is anticipated to include one full movement access onto County Road 18 [Street 'A'] and one full movement access onto County Road 17 opposite of Thomson Trail [Street 'C'].

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

- County Road 18 / County Road 17;
- County Road 18 / Street 'A'; and
- Street 'C' & Thompson Trail / County Road 17.

### Conclusions

- 1. The proposed development is expected to generate a total of 56 AM and 73 PM peak hour trips.
- 2. Detailed turning movement traffic and pedestrian counts for the County Road 18 / County Road 17 intersection were commissioned by JD Engineering.
- 3. An intersection operation analysis was completed at the study area intersections, using the existing (2024) and background (2026 and 2031) 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. No geometric lane improvements or traffic signal improvements are recommended within the study area.
- 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 (2026 and 2031) traffic volumes with the proposed development operational at the study area intersections. No geometric lane improvements or traffic signal improvements are recommended within the study area.
- 6. Street 'A' will operate efficiently as full-movement accesses, with one-way stop control for the westbound movements. A single eastbound and westbound lane at Street 'A' will provide the necessary capacity to service the proposed development.
- 7. Street 'C' will operate efficiently as full-movement access, with two-way stop control for the northbound and southbound movements. A single northbound and southbound lane at Street 'C' will provide the necessary capacity to service the proposed development.
- 8. County Road 18 will need to be reconstructed to improve the vertical curve and sight distance. Preliminary plan and profile drawings are provided in Appendix H.
- 9. With the above-noted road reconstruction, the sight distance available for Street 'A' and Street 'C' are suitable for their intended use.



10. In summary, the proposed development will not cause any operational issues and will not add a notable delay or congestion to the local roadway network.



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# 1 Introduction

## 1.1 Background

**2735528 Ontario Inc.** [The Developer] is proposing to develop a residential subdivision, located in the northeast quadrant of the Airport Road (County Road 18) / County Road 17 intersection in the Township of Mulmur [Township], County of Dufferin [County].

The proposed residential development is anticipated to consist of 43 single family detached units and 28 semi-detached units.

The proposed development is anticipated to include one full movement access onto County Road 18 [Street 'A'] and one full movement access onto County Road 17 opposite of Thomson Trail [Street 'C'].

The Developer 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** shows the location of the proposed development and study area intersections, in relation to the surrounding area. The Site Plan by IPS Consulting Inc. is provided in **Appendix A**.

The proposed development is bound by County Road 18 to the west, residential lands and County Road 17 to the south and agricultural/rural lands to the north and east.

Based on our correspondence with the Township and County, the following intersections will be analysed as part of this study:

- County Road 18 / County Road 17;
- County Road 18 / Street 'A'; and
- Street 'C' & Thompson Trail / County Road 17.





#### Figure 1 – Proposed Site Location and Study Area

### 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 Township and County 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 additional operational deficiencies;
- Identify improvement options to address operational deficiencies; and
- Document findings and recommendations in a final report.

## 1.4 Horizon Year and Analysis Periods

Traffic scenarios for the existing year (2024), build-out year (2026) and 5-year post build-out year (2031) 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

**County Road 18 (Airport Road)** is a two-lane arterial road with no sidewalks. County Road 18 generally has an urban cross-section and an asphalt 'killstrip' within 100 metres of County Road 17 and generally has a rural cross-section with asphalt shoulders elsewhere within the study area. County Road 18 has a posted speed of 50km/h south of the north end of the subject site and a posted speed limit of 70 km/h north of the north end of the subject site within the study area. County Road 18 is under the jurisdiction of the County within the study area.

**10**<sup>th</sup> **Sideroad** is a two-lane collector road. 10<sup>th</sup> Sideroad, west of County Road 18 within the study area has a rural cross-section, a gravel shoulder on both sides of the road, a speed limit of 50km/h and is under the jurisdiction of the Township. 10<sup>th</sup> Sideroad, east of County Road 18, is also known as **County Road 17** and is under the jurisdiction of the County. County Road 17 has an urban cross section, an asphalt 'killstrip' on both sides of the road and a posted speed limit of 50km/h between County Road 18 and Adrian Avenue. County Road 17 has a rural cross section, gravel shoulders on both sides of the road and a posted speed limit of 50km/h between County Road 18 and Adrian Avenue. County Road 17 has a rural cross section, gravel shoulders on both sides of the road and a posted speed limit of 70km/h east of Adrian Avenue within the study area.

**Thomson Trail** is a two-lane local road with a rural cross-section. Thomson Trail has gravel shoulders on both sides of the road, an assumed (unposted) speed limit of 50 km/h and is under jurisdiction of the Township.

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







# 2.2 Local Transportation Infrastructure Improvements

Based on a review of the County's 2024 Capital Budget Package, County Road 17 and County Road 18 are anticipated to be resurfaced in 2029. These improvements are not anticipated to significantly change traffic operations within the study area. There are no other infrastructure improvements anticipated within the study area.

## 2.3 Transit Access

There is no municipal transit service within the study area.

## 2.4 Other Developments within the Study Area

A gas station was recently constructed at the southwest corner of the County Road 18 / County Road 17 intersection [Mansfield Gas Station West].

The traffic counts used in this report were completed prior to the construction of the Mansfield Gas Station West development. Consequently, the traffic generated from the Mansfield Gas Station West development has been added to the existing (2024) traffic volumes (further discussed in Section 2.6.1.).



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

The Mansfield Gas Station West development includes 4 pumping stations that provide 8 fueling positions and a 280 sq.m. convenience store with drive-through. The Mansfield Gas Station West development is currently constructed and operating.

The traffic generation for the Mansfield Gas Station West development has been calculated based on the data provided in the Institute of Transportation Engineers [ITE] *Trip Generation Manual* (10<sup>th</sup> Edition) [ITE Trip Generation Manual]. The following ITE land uses have been applied to estimate the traffic:

- ITE land use 945 (Gasoline/ service station with convenience market) General Urban / Suburban Setting; and
- ITE land use 937 (Coffee/Donut shop with drive-through window) General Urban / Suburban Setting.

The AM and PM peak hour of traffic generation for the Mansfield Gas Station West development does 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. The estimated trip generation of the Mansfield Gas Station West development is illustrated below in **Table 1**.

It has been assumed that the convenience store drive-through will be for a coffee shop. In order to be conservative with our analysis, we have completed traffic generation calculations for ITE land use 937 in addition to ITE land use 945 assuming a quarter of the GFA of the convenience store will be for the coffee shop.

Land Llag	Sizo	A	M Peak H	lour	PM Peak Hour			
Lanu Ose	Size	IN	OUT	TOTAL	IN	OUT	TOTAL	
Gasoline/ service station with	8 Vehicle							
convenience market	fueling	51	49	100	57	55	112	
ITE Land Use:945	positions							
Coffee/Donut shop with drive-								
through window	754 sq.ft.*	34	33	67	17	16	33	
ITE Land Use:937								
TOTAL TRIP GENERA	TION	85	82	167	74	71	145	
INTERNAL CAPTUR	RE	-10	-10	-20	-12	-12	-24	
NET SITE GENERATION		75	72	147	62	59	121	
PASS-BY TRIPS (ITE #945)**		-28	-28	-56	-28	-28	-56	
PASS-BY TRIPS (ITE #937)***			-14	-28	-6	-5	-11	
PRIMARY TRIPS		33	30	73	28	26	54	

Table 1 – Estimated Traffic Generation – Mansfield Gas Station West

\*It has been assumed that a quarter of the convenience store GFA will be for a coffee shop

\*\*ITE Land Use 945 pass-by trips for the AM and PM peak hour are 62% and 56% respectively, according to the ITE data \*\*\*ITE Land Use 937 pass-by trips for the AM and PM peak hour are 49% and 50% respectively, according to the ITE data

The distribution of traffic for the Mansfield Gas Station West development is based on the distribution of the existing traffic volumes within the study area. **Table 2** illustrates the calculation of the distribution of ingress and egress traffic for the Mansfield Gas Station West development.



Travel Direction (to (from)	AM Pea	ak Hour	PM Peak Hour		
	Ingress	Egress	Ingress	Egress	
North via County Road 18	47%	37%	37%	45%	
East via County Road 17	12%	12%	9%	11%	
Outside of Study Area*	41%	51%	54%	44%	
TOTAL	100%	100%	100%	100%	

#### Table 2 – Mansfield Gas Station West Traffic Distribution

\*Trips to and from the west via 10<sup>th</sup> Sideroad and to and from the south via County Road 18 are considered to the be outside the study area as these trips are not anticipated to utilize the study area intersections.

Using the traffic distribution pattern noted above, the traffic assignment for the Mansfield Gas Station West development was calculated for the AM and PM peak hour and is illustrated in **Figure 3**.

Figure 3 – Mansfield Gas Station West development Traffic Assignment





# 2.5 **Background Growth Rate**

A background traffic growth rate of 4.7% per year has been selected for County Road 18 and 4.4% per year for County Road 17 and 10<sup>th</sup> Sideroad within the study area, based on historical traffic data provided by the County and historical 24-hour traffic count data on the County's traffic counts webpage.

## 2.6 Traffic Counts

Detailed turning movement traffic and pedestrian counts for the County Road 18 / County Road 17 intersection intersections were commissioned by JD Engineering.

**Table 3** summarizes the traffic count data collection information.

Intersection (N-S Street / E-W Street)	Count Date	AM Peak Hour	PM Peak Hour	Source
County Road 18 / County Road 17	Tuesday, July 13, 2021	08:00 – 9:00	16:00 – 17:00	JD Eng.*

#### Table 3 – Traffic Count Data

\*Traffic counts were completed by Accu-Traffic Inc. on behalf of JD Engineering.

Detailed traffic count data can be found in **Appendix B**. 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.

#### 2.6.1 Calculation of Existing (2024) Traffic Volumes

#### 2.6.1.1 Covid-19 Restrictions Adjustment

Although the traffic data was obtained in 2021 for the study area intersections, COVID-19 restrictions were implemented in Ontario at this time; consequently, these traffic counts do not reflect typical traffic conditions. To verify the 2021 counts, a comparison was completed for the 2021 traffic counts commissioned and the 2017 counts obtained from the County for County Road 18 at the north end of Mansfield and the 2019 counts obtained for County Road 17, 250 metres east of County Road 18.

To determine the equivalent 2021 traffic volumes from the 2017 and 2019 counts, for accurate comparison to the 2021 counts, the background traffic growth rate noted in Section 2.5 was applied to the 2017 and 2019 counts. Based on a comparison of the 2021 counts and the equivalent 2021 counts, the 2021 traffic volumes at the study area intersections were increased by 58% for County Road 18 and 14% for County Road 17 and 10<sup>th</sup> Sideroad to account for COVID-19 restrictions.

#### 2.6.1.2 County Road 17 / Thomson Trail

The eastbound and westbound through traffic volumes on County Road 17 at this intersection were estimated based on the traffic volumes calculated in Section 2.6.1.1.

The traffic volumes entering and exiting Thomson Trail intersection have been calculated based on the ITE Trip Generation Manual. The following ITE land uses have been applied to estimate the traffic from the existing Thomson Trail residential area:



• ITE land use 210 (Single-Family Detached Housing) – General Urban / Suburban Setting.

The estimated trip generation of the existing Thomson Trail residential area is illustrated below in **Table 4**. The AM and PM peak traffic generation for the existing Thomson Trail residential area 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.

Land Line	Cine	A	/I Peak I	Hour	PM Peak Hour		
Land Use	Size	IN	OUT	TOTAL	IN	OUT	TOTAL
Single-Family Detached Housing	60 units*	12	35	47	39	23	62

Table 4 – Estimated Traffic Generation – Thomson Trail Residential Area

\*There are 60 residential units on Thomson Trail and Sommerville Crescent which only have access to the Township and County road network via Thomson Trail

The distribution of traffic for the existing Thomson Trail residential area has been calculated based on the 2016 Transportation Tomorrow Survey [TTS] data for traffic zone 8411 retrieved using the TTS Internet Data Retrieval System [IDRS] (output attached as **Appendix F**). 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 Thompson Trail residential area 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 existing Thomson Trail residential area is illustrated in **Table 5** using the methodology outlined above.

Travel Direction (to/from)	Percentage of Total Traffic Generation
West via 10 <sup>th</sup> Sideroad	11%
East via County Road 17	23%
South via County Road 18	59%
North via County Road 18	7%
Total	100%

Table 5 – Thomson Trail Residential Area Traffic Distribution

#### 2.6.1.3 Existing (2024) Traffic Volumes

The 2024 existing AM and PM peak hour traffic volumes in the study area are established based on the conducted traffic counts, adjusted to reflect the annual background growth rate noted in Section 2.5, COVID-19 adjustment noted in Section 2.6.1.1., in addition to the adjacent development traffic noted in Section 2.4.

Figure 4 illustrates the existing (2024) AM and PM peak hour traffic volumes within the study area.



# 2.7 Horizon Year Traffic Volumes

The background traffic growth rate discussed in Section 2.5 has been applied to the existing traffic volumes to estimate the background (2026 and 2031) horizon year traffic volumes.

**Figures 5** and **6** illustrate the background (2026 and 2031) horizon year AM and PM peak hour traffic volumes in the study area.









Figure 5 – Background (2026) Traffic Volumes





Figure 6 – Background (2031) 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 2024 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.

# 3.2 Intersection Capacity Analysis Criteria

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 6**. A description of traffic performance characteristics is included for each LOS.

		Control Delay (s	econds per vehicle)
LOS	LOS Description	Signalized Intersections	Stop Controlled Intersections
А	Very low delay; most vehicles do not stop (Excellent)	less than 10.0	less than 10.0
В	Higher delay; more vehicles stop (Very Good)	between 10.0 and 20.0	between 10.0 and 15.0
с	Higher level of congestion; number of vehicles stopping is significant, although many still pass through intersection without stopping <b>(Good</b> )	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 ( <b>Satisfactory</b> )	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 <b>acceptable</b> 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 ( <b>Unacceptable</b> )	greater than 80.0	greater than 50.0

#### Table 6 – Level of Service Criteria for Intersections

# 3.3 Existing (2024) Intersection Operation

The results of the LOS analysis under existing (2024) traffic volumes during the AM and PM peak hour can be found below in **Table 7**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix C**.



Location		M Peak Hou	ır	PM Peak Hour			
(N-S Street / E-W Street)	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS	
County Road 18 / County Road 17 (signalized)	0.34	8.6	А	0.51	9.9	А	
EB	0.43	23.5	С	0.38	21.2	С	
WB	0.41	23.2	С	0.40	21.2	С	
NB	0.24	4.3	А	0.54	7.8	А	
SB	0.33	4.8	А	0.48	7.2	А	
County Road 17 / Thomson Trail (unsignalized)	-	2.0	A	-	1.42	А	
NB	0.04	9.3	А	0.03	9.8	А	

#### Table 7 – Existing (2024) LOS

The results of the LOS analysis indicate that all intersections are operating within the typical design limits noted in Section 3.2.

An analysis was completed for left turn movements at the unsignalized study area intersections, based on the criteria outlined in Appendix 9A of the Ontario Ministry of Transportation Design Supplement for TAC Geometric Design Guide for Canadian Roads June 2017 [MTO DS]. Based on the MTO criteria, auxiliary left turn lanes are not warranted (results are provided in **Appendix D**).

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

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 E**).

No infrastructure improvements are recommended within the study area.

### 3.4 Background (2026) Intersection Operation

The results of the LOS analysis under background (2026) traffic volumes during the AM and PM peak hour can be found below in **Table 8**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix F**.

Location	A	M Peak Hou	ır	F	PM Peak Hour				
(N-S Street / E-W Street)	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS			
County Road 18 / County Road 17 (signalized)	0.38	8.7	А	0.57	10.6	В			
EB	0.45	23.3	С	0.39	21.2	С			
WB	0.43	23.2	С	0.43	21.4	С			
NB	0.26	4.5	Α	0.60	8.8	Α			
SB	0.37	5.2	Α	0.53	8.0	Α			
County Road 17 / Thomson Trail (unsignalized)	-	1.9	А	-	1.2	A			
NB	0.04	9.4	Α	0.03	9.8	Α			

#### Table 8 – Background (2026) LOS



The results of the LOS analysis indicate that all intersections are operating within the typical design limits noted in Section 3.2.

An analysis was completed for left turn movements at the unsignalized study area intersections, based on the criteria outlined in Appendix 9A of the MTO DS. Based on the MTO criteria, auxiliary left turn lanes are not warranted (results are provided in **Appendix D**).

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

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 E**).

No infrastructure improvements are recommended within the study area.

## 3.5 Background (2031) Intersection Operation

The results of the LOS analysis under background (2031) traffic volumes during the AM and PM peak hour can be found below in **Table 9**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix F**.

Location		M Peak Ho	ur	PM Peak Hour			
(N-S Street / E-W Street)	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS	
County Road 18 / County Road 17 (signalized)	0.47	9.7	А	0.72	14.2	В	
EB	0.39	21.1	С	0.44	21.4	С	
WB	0.39	21.2	С	0.51	21.8	С	
NB	0.35	6.0	A	0.77	13.4	В	
SB	0.49	7.2	Α	0.70	11.8	В	
County Road 17 / Thomson Trail (unsignalized)	-	1.6	A	-	1.0	A	
NB	0.05	9.6	Α	0.04	10.2	В	

Table 9 – Background (2031) LOS

The results of the LOS analysis indicate that all intersections are operating within the typical design limits noted in Section 3.2.

An analysis was completed for left turn movements at the unsignalized study area intersections, based on the criteria outlined in Appendix 9A of the MTO DS. Based on the MTO criteria, auxiliary left turn lanes are not warranted (results are provided in **Appendix D**).

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

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 E**).

No infrastructure improvements are recommended within the study area.



# 4 **Proposed Development Traffic Generation and** Assignment

## 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 210 (Single-Family Detached Housing) – General Urban / Suburban Setting.

The estimated trip generation of the proposed development is illustrated below in **Table 10**. The AM and PM peak traffic generation for the proposed 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 10 – Estimated Traffic Generation of Proposed Development

		A	/ Peak	Hour	Р	M Peak	Hour
Land Use	Size	IN	OUT	TOTAL	IN	OUT	TOTAL
Single-Family Detached Housing ITE Land Use: 210	71 units*	14	42	56	46	27	73

\*Includes the proposed 43 single family detached units and 28 semi-detached units.

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 traffic for the proposed development has been calculated based on the 2016 TTS data for traffic zone 8411 retrieved using the TTS IDRS (output attached as **Appendix F**). TTS data provides historical origin and destination work trip percentages for specific areas within the County and the GTHA.

Traffic distribution for the trips generated by 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 proposed development is illustrated in **Table 11** using the methodology outlined above.



Travel Direction (to/from)	Percentage of Total Traffic Generation
West via 10 <sup>th</sup> Sideroad	14%
East via County Road 17	16%
South via County Road 18	61%
North via County Road 18	9%
Total	100%

#### Table 11 – Proposed Development Traffic Distribution

Using the traffic distributions pattern noted above, the traffic assignment for the proposed development was calculated for the AM and PM peak hour and is illustrated in **Figure 7**.

## 4.3 **Total Horizon Year Traffic Volumes with the Proposed Development**

For the total (2026 and 2031) horizon year traffic volumes, the proposed development traffic was added to the background (2026 and 2031) traffic volumes. The resulting total (2026 and 2031) horizon year traffic volumes for the AM and PM peak hour are illustrated in **Figures 8** and **9**.





Figure 7 – Proposed Development Traffic Assignment



Mansfield Residential 2735528 Ontario Inc. JDE-21035 Date: February 2<sup>nd</sup>, 2024









#### Figure 9 – Total (2031) Traffic Volumes

# 5 Intersection Operation with Proposed Development

## 5.1 Total (2026) Intersection Operation

The results of the LOS analysis under total (2026) 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 G**.



Location	A	M Peak Hou	Jr	F	PM Peak Hou           /C         Delay (s)           60         11.2           40         21.2           47         21.7	ır	
(N-S Street / E-W Street)	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS	
County Road 18 / County Road 17 (signalized)	0.40	9.3	А	0.60	11.2	В	
EB	0.33	20.7	С	0.40	21.2	С	
WB	0.40	21.3	С	0.47	21.7	С	
NB	0.29	5.5	А	0.63	9.5	Α	
SB	0.40	6.4	А	0.55	8.4	А	
County Road 17 / Thomson Trail & Street 'C' (unsignalized)	-	2.9	А	-	2.0	А	
NB	0.05	9.8	А	0.04	10.5	В	
SB	0.03	9.1	А	0.02	9.6	А	
County Road 18 / Street 'A' (unsignalized)	-	0.4	А	-	0.3	А	
WB	0.05	13.6	В	0.06	21.0	С	

#### Table 12 - Total (2026) LOS

The results of the LOS analysis indicate that all intersections are operating within the typical design limits noted in Section 3.2.

An analysis was completed for left turn movements at the unsignalized study area intersections, based on the criteria outlined in Appendix 9A of the MTO DS. Based on the MTO criteria, auxiliary left turn lanes are not warranted (results are provided in **Appendix D**).

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

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 E**).

No infrastructure improvements are recommended within the study area

## 5.2 Total (2031) Intersection Operation

The results of the LOS analysis under total (2031) 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 G**.



Location	A	M Peak Ho	ur	F	PM Peak Hou	ur
(N-S Street / E-W Street)	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
County Road 18 / County Road 17 (signalized)	0.50	10.2	В	0.75	15.6	В
EB	0.38	20.9	С	0.46	21.4	С
WB	0.47	21.8	С	0.54	22.3	С
NB	0.36	6.3	Α	0.81	15.4	В
SB	0.51	7.7	Α	0.73	12.8	В
County Road 17 / Thomson Trail & Street 'C' (unsignalized)	-	2.6	A	-	1.8	A
NB	0.05	10.0	В	0.04	10.9	В
SB	0.03	9.2	Α	0.02	9.8	Α
County Road 18 / Street 'A' (unsignalized)	-	0.4	A	-	0.4	A
WB	0.06	15.9	С	0.10	34.8	D

#### Table 13 - Total (2031) LOS

The results of the LOS analysis indicate that all intersections are operating within the typical design limits noted in Section 3.2. The egress movement at the Street A connection operates at a satisfactory level of service (LOS D). It is noted that during the same peak period, the alternate access point (Street C), provides an excellent level of service (LOS A) with minor delays. Consequently, should the delays at Street A become an issue, motorists will have the opportunity to divert to a secondary access point.

An analysis was completed for left turn movements at the unsignalized study area intersections, based on the criteria outlined in Appendix 9A of the MTO DS. Based on the MTO criteria, auxiliary left turn lanes are not warranted (results are provided in **Appendix D**).

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

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 E**).

No infrastructure improvements are recommended within the study area.

### 5.3 Sight Distance Review

A review of the available sight distance for the proposed municipal roads within the study area was completed as part of this analysis.

The sight distance south (greater than 200 metres) of Street 'A' at County Road 18 is greater than the minimum visibility requirements identified in the County's Entrance Policy 5-3-17 [County Entrance Policy] (160 metres for commercial entrance on a road with a posted speed limit of 50 km/h).

The sight stance north of Street 'A' at County Road 18 does not meet the minimum visibility requirements identified in the County Entrance Policy. Consequently, County Road 18 will need to be reconstructed to improve the vertical curve and sight distance. Preliminary plan and profile drawings are provided in Appendix H. The drawing illustrate the minimum visibility requirements identified in the County Entrance Policy can be met from Street 'A' with the proposed road reconstruction. The decision point elevation on Street "A" and at the adjacent driveway was assumed to be 0.25 metres below the centerline of County Road 18, which is a conservative approach.



A detailed design for the road reconstruction will be completed as part of the detailed engineering design, however, the vertical curve values used in the preliminary design meet the minimum TAC requirements for a posted speed of 50km/h. Depending on the final design configuration, the existing 50km/h zone on County Road 18 may need to be extended slightly to the north.

The sight distance east (greater than 200 metres) and west (greater than 200 metres) of the Street 'C' at County Road 17 is greater than the minimum visibility requirements identified in the County Entrance Policy (160 metres for commercial entrance on a road with a posted speed limit of 50 km/h).

With the proposed road reconstruction of County Road 18, the sight distance for the proposed municipal roads within the study area are suitable for their intended use.

### 5.4 Site Access

Street 'C' at County Road 17 will operate efficiently as full-movement accesses, with two-way stop control for the northbound and southbound movements. No lane improvements are recommended on County Road 17 at Street 'C'. A single northbound and southbound lane on Street 'C' will provide the necessary capacity to service the proposed development.

Street 'A' at the County Road 18 will operate efficiently as a full-movement access, with one-way stop control for westbound movements. No lane improvements are recommended on County Road 18 at Street 'A'. A single westbound lane on Street 'A' will provide the necessary capacity to service the proposed development.

The proposed spacing (measured edge of driveway to edge of road) between the Street 'C' & Thomson Trail / County Road 17 intersection and the existing driveways to the east and west are in excess of the suggested minimum corner clearance requirements for a intersections as identified in the TAC Guidelines – Figure 8.8.2 (Suggested Minimum Corner Clearances to Accesses or Public Lanes at Major Intersections) – 25 metres for unsignalized condition.

The proposed spacing (approximately 135 meters, measured edge to edge of road) between the Street 'A' / County Road 18 intersection and the County Road 17 / County Road 18 intersection is in excess of the suggested minimum corner clearance requirements for an intersection 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 to edge of road) between the Street 'A' / County Road 18 intersection and the existing driveway to the south and between the Street 'A' / County Road 18 intersection and the existing driveway to the north are in excess of the suggested minimum corner clearance requirements for an intersection as identified in the TAC Guidelines – Figure 8.8.2 (Suggested Minimum Corner Clearances to Accesses or Public Lanes at Major Intersections) – 25 metres and 35 metres for unsignalized condition.

Furthermore, the anticipated 95<sup>th</sup> percentile queue length for the southbound movements at the County Road 17 / County Road 18 intersection (56 and 112 meters during the AM and PM peak hours for the critical total (2031) scenario) is less than the proposed spacing (measured edge to edge of road) between the Street 'A' / County Road 18 intersection and the County Road 17 / County Road 18 intersection.



# 6 Summary

**2735528 Ontario Inc.** retained **JD Engineering** to prepare this traffic impact study in support of the proposed development, located in the northeast quadrant of the County Road 18 / County Road 17 intersection in the Township of Mulmur [Township], County of Dufferin [County]. The proposed Site Plan is shown in **Appendix A**. This chapter summarizes the conclusions and recommendations from the study.

The proposed residential development is anticipated to consist of 43 single family detached units, and 28 semi-detached units.

- 1. The proposed development is expected to generate a total of 56 AM and 73 PM peak hour trips.
- 2. Detailed turning movement traffic and pedestrian counts for the County Road 18 / County Road 17 intersection were commissioned by JD Engineering.
- 3. An intersection operation analysis was completed at the study area intersections, using the existing (2024) and background (2026 and 2031) 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. No geometric lane improvements or traffic signal improvements are recommended within the study area.
- 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 (2026 and 2031) traffic volumes with the proposed development operational at the study area intersections. No geometric lane improvements or traffic signal improvements are recommended within the study area.
- 6. Street 'A' will operate efficiently as full-movement accesses, with one-way stop control for the westbound movements. A single eastbound and westbound lane at Street 'A' will provide the necessary capacity to service the proposed development.
- 7. Street 'C' will operate efficiently as full-movement access, with two-way stop control for the northbound and southbound movements. A single northbound and southbound lane at Street 'C' will provide the necessary capacity to service the proposed development.
- 8. County Road 18 will need to be reconstructed to improve the vertical curve and sight distance. Preliminary plan and profile drawings are provided in Appendix H.
- 9. With the above-noted road reconstruction, the sight distance available for Street 'A' and Street 'C' are suitable for their intended use.
- 10. In summary, the proposed development will not cause any operational issues and will not add a notable delay or congestion to the local roadway network.



Mansfield Residential 2735528 Ontario Inc. JDE-21035 Date: February 2<sup>nd</sup>, 2024

# Appendix A – Site Plan





Mansfield Residential 2735528 Ontario Inc. JDE-21035 Date: February 2<sup>nd</sup>, 2024

# Appendix B – Traffic Count Data





		Accu-Tra	affic In	С.					
Morning Pe	ak Diag	ram	Specified           From:         7:0           To:         9:0	<b>Period</b> 00:00 00:00	One Hour Peak           From:         8:00:00           To:         9:00:00				
Municipality:MansulationSite #:21053Intersection:AirporTFR File #:1Count date:13-Ju	ield 00001 t Rd & 10Th Si -21	deroad	Weather of Person co Person pr Person ch	conditions: ounted: repared: necked:					
North Leg Total: 327         North Entering:       181         North Peds:       0         Peds Cross:       ►         Heavys Trucks       Cars       Total         0       0       34       34         Leavys Trucks       Cars       Total         0       0       34       34         Leavys Trucks       Cars       Total         0       0       34       34         Leavys Trucks       Cars       Total         0       0       11       11         0       0       27       27	Heavys 0 Trucks 0 Cars 6 Totals 6 Is	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Troort Rd	Heavys 14 Trucks 3 Cars 129 Totals 146	Cars Trucks Heavys Totals23012423014001401				
$\begin{array}{cccc} 0 & 0 & 6 \\ \hline 0 & 0 & 44 \end{array} 6$	$\nabla$	Airport Rd	句 介		CarsTrucksHeavysTotals590059				
Peds Cross:XWest Peds:0West Entering:44West Leg Total:78	Cars 166 Trucks 1 Heavys <u>3</u> Totals 170	Ca Truci Heavy Tota	rs 5 95 (s 0 3 (s <u>0 13</u> (s <u>5 111</u>	7 107 0 3 0 13 7	Peds Cross: ► South Peds: 0 South Entering: 123 South Leg Total: 293				
		Comm	nents						
		Comm							



	Accu-1	raffic Inc.				
Afternoon F	Peak Diagram	Specified Period           From:         16:00:00           To:         19:00:00	One Hour Peak           From:         16:00:00           To:         17:00:00			
Municipality:MansSite #:21053Intersection:AirporTFR File #:1Count date:13-Ju	field 300001 t Rd & 10Th Sideroad I-21	Weather conditions: Person counted: Person prepared: Person checked:				
** Signalized Inters	Heavys 0 5 1	Major Road: Airport R	d runs N/S			
North Entering: 233 North Peds: 0 Peds Cross: M	Trucks         0         4         2           Cars         8         179         34           Totals         8         188         37	6 221 Trucks 2 Cars 269 Totals 277	East Entering: 78 East Peds: 0 Peds Cross: X			
Heavys Trucks Cars Tota 0 0 74 74	als 🖓 🖟 🖒 Sideroad	Airport Rd	Cars         Trucks         Heavys         Totals           22         0         0         22           42         0         0         42           14         0         0         14           78         0         0         1			
Heavys Trucks Cars Tota 0 1 18 19 1 1 22 24		s 10Th	Sideroad			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Airport		Cars Trucks Heavys Totals 88 4 2 94			
Peds Cross: X West Peds: 0 West Entering: 58 West Leg Total: 132	Cars 207 Trucks 5 Heavys 5 Totals 217	Cars     24     229     32     285       rucks     0     1     1     2       vavys     0     6     0     6       fotals     24     236     33	Peds Cross: ► South Peds: 0 South Entering: 293 South Leg Total: 510			
	Сог	nments				



# Accu-Traffic Inc.

# **Total Count Diagram**

Municipality:	Mans	field				Wea	ther o	conditi	ions:				
Site #:	2105	300001											
Intersection:	Airpo	rt Rd & 10	0Th S	ideroad									
TFR File #:	1					Pers	son co	ounted	l:				
Count date:	13-Ju	I-21				Pers	son pr	epare	d: 1.				
						Fers	son cr	iecked	1.				
** Signalized I	nters	ection	**			Maje	or Roa	ad: Ai	rport I	Rd ru	uns N/S		
North Leg Total: 18	59	Heavys	1	13	2	16	$\bigtriangleup$	Heavys	34		East Le	eg Total:	727
North Entering: 86	4	Trucks	1	8	2	11		Trucks	8		East E	ntering:	364
North Peds: 0		Cars	40	671	126	837		Cars	953		East P	eds:	0
Peds Cross: 🛛 🛤		Totals	42	692	130			Totals	995	- L	Peds C	Cross:	X
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Peds Cross <sup>.</sup> X		Care	812	_	-	Cars 62	769	84	915	Γ	Peds (	cross:	×
West Peds: 0		Trucks	10		т	rucks 0	6	1	7		South	Peds:	0
West Entering: 26	В	Heavys	14	$\downarrow$	He	avys 0	32	0	32		South	Entering	954
West Leg Total: 52	4	Totals	836	- '	Т	otals 62	807	85	J		South	Leg Tota	ıl: 1790
		I			•							-	
					Con	nments							



# Accu-Traffic Inc. Traffic Count Summary

Intersection:	Airport F	Rd & 107	Th Sider	oad	Count [	<sup>Date:</sup> 13-Jul-21	21 Municipality: Mansfield						
	Nort	h Appro	ach Tot	als		10 001 21			Sout	h Appro	ach To	tals	
Hour	Includ	es Cars. T	rucks. & H	leavvs	Total	North/South	Hour	.	Include	es Cars. T	rucks. & H	leavys	Total
Ending	Loft	Thru	Pight	Grand	Peds	Approaches	Ending	g	Loft	Thru	Right	Grand	Peds
7:00:00 8:00:00 9:00:00 16:00:00 17:00:00 18:00:00 19:00:00	Left 0 19 25 0 37 26 23	Thru 0 122 150 0 188 138 94	Right 0 10 6 0 8 8 10	Total 0 151 181 0 233 172 127	0 0 0 0 0 0	0 240 304 0 526 427 321	7:00:0 8:00:0 9:00:0 16:00: 17:00: 18:00: 19:00:	9 00 00 00 00 00 00 00 00	Left 0 4 5 0 24 19 10	Thru 0 77 111 0 236 214 169	Right 0 8 7 0 33 22 15	Total 0 89 123 0 293 255 194	0 0 0 0 0 0
Totals:	130	692	42	864	0	1818	S Tota	als:	62	807	85	954	0
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Totals:	86	152	126	364	0	632	W Tota	als:	62	148	58	268	0
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Mansfield Residential 2735528 Ontario Inc. JDE-21035 Date: February 2<sup>nd</sup>, 2024

Appendix C – Synchro Analysis Output – Existing Traffic Volumes



### Mansfield Residential 6: Airport Rd (County Rd 18) & 10th Sideroad/County Rd 17

	٦	-	-	-	1	1	1	Ŧ	
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Configurations		4		4		4		4	
Traffic Volume (vph)	21	37	20	32	7	206	32	279	
Future Volume (vph)	21	37	20	32	7	206	32	279	
Lane Group Flow (vph)	0	76	0	96	0	258	0	376	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		
Detector Phase	4	4	8	8	2	2	6	6	
Switch Phase									
Minimum Initial (s)	7.0	7.0	7.0	7.0	25.0	25.0	25.0	25.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	32.0	32.0	32.0	32.0	
Total Split (s)	21.0	21.0	21.0	21.0	35.0	35.0	35.0	35.0	
Total Split (%)	37.5%	37.5%	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%	
Yellow Time (s)	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0		0.0		0.0	
Total Lost Time (s)		6.0		6.0		7.0		7.0	
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	Max	Max	Max	Max	
v/c Ratio		0.28		0.33		0.21		0.29	
Control Delay		18.9		15.7		5.2		5.6	
Queue Delay		0.0		0.0		0.0		0.0	
Total Delay		18.9		15.7		5.2		5.6	
Queue Length 50th (m)		5.4		4.9		9.4		14.9	
Queue Length 95th (m)		14.0		14.3		21.0		31.1	
Internal Link Dist (m)		439.9		535.3		514.2		133.5	
Turn Bay Length (m)									
Base Capacity (vph)		506		520		1220		1297	
Starvation Cap Reductn		0		0		0		0	
Spillback Cap Reductn		0		0		0		0	
Storage Cap Reductn		0		0		0		0	
Reduced v/c Ratio		0.15		0.18		0.21		0.29	
Intersection Summary									
Cycle Length: 56									
Actuated Cycle Length: 48.3									
Natural Cycle: 55									
Control Type: Semi Act-Unco	ord								
Splits and Phases: 6: Airpo	ort Rd (Co	ounty Rd <sup>2</sup>	18) & 10th	n Sideroa	d/County	Rd 17			

<b>▲</b> ¶ <sub>Ø2</sub>	A <sub>04</sub>	
35 s	21 s	
▼Ø6	<b>↓</b> Ø8	
35 s	21 s	

Mansfield ResidentialHCM Signalized Intersection Capacity Analysis6: Airport Rd (County Rd 18) & 10th Sideroad/County Rd 17Existing (2024) AM Peak Hour

	≯	-	$\rightarrow$	1	-	*	1	1	1	1	↓	-
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			\$			4	
Traffic Volume (vph)	21	37	8	20	32	31	7	206	11	32	279	16
Future Volume (vph)	21	37	8	20	32	31	7	206	11	32	279	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			7.0			7.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			0.95			0.99			0.99	
Flt Protected		0.98			0.99			1.00			1.00	
Satd. Flow (prot)		1841			1756			1669			1832	
Flt Permitted		0.86			0.89			0.99			0.95	
Satd. Flow (perm)		1604			1590			1651			1753	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adi, Flow (vph)	24	43	9	23	37	36	8	237	13	37	321	18
RTOR Reduction (vph)	0	8	0	0	32	0	0	2	0	0	2	0
Lane Group Flow (vph)	0	68	0	0	64	0	0	256	0	0	374	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	4%	0%	14%	0%	0%	3%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2	_		6	•	
Actuated Green, G (s)	-	5.0		-	5.0		_	32.8		-	32.8	
Effective Green, g (s)		5.0			5.0			32.8			32.8	
Actuated g/C Ratio		0.10			0.10			0.65			0.65	
Clearance Time (s)		6.0			6.0			7.0			7.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Gro Cap (vph)		157			156			1066			1131	
v/s Ratio Prot												
v/s Ratio Perm		c0.04			0.04			0.15			c0.21	
v/c Ratio		0.43			0.41			0.24			0.33	
Uniform Delay, d1		21.6			21.5			3.8			4.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.9			1.7			0.5			0.8	
Delay (s)		23.5			23.2			4.3			4.8	
Level of Service		С			С			А			А	
Approach Delay (s)		23.5			23.2			4.3			4.8	
Approach LOS		С			С			А			А	
Intersection Summary												
HCM 2000 Control Delay			8.6	Н	CM 2000	Level of	Service		Α			
HCM 2000 Volume to Capacity	/ ratio		0.34									
Actuated Cycle Length (s)			50.8	S	um of los	t time (s)			13.0			
Intersection Capacity Utilization	n		46.8%	IC	U Level	of Service	;		А			
Analysis Period (min)			15									
c Critical Lane Group												

### Mansfield Residential 7: Thomson Trail & County Rd 17

	-	$\rightarrow$	1	-	1	1
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	ĥ			र्स	M	
Traffic Volume (veh/h)	70	9	3	52	27	8
Future Volume (Veh/h)	70	9	3	52	27	8
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.92	0.92
Hourly flow rate (vph)	80	10	3	60	29	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)						
pX. platoon unblocked						
vC. conflicting volume			90		151	85
vC1. stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			90		151	85
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					•	•.=
tE(s)			22		35	33
n0 queue free %			100		97	99
cM capacity (veh/h)			1505		839	974
	(		1000		000	011
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	90	63	38			
Volume Left	0	3	29			
Volume Right	10	0	9			
cSH	1700	1505	868			
Volume to Capacity	0.05	0.00	0.04			
Queue Length 95th (m)	0.0	0.0	1.1			
Control Delay (s)	0.0	0.4	9.3			
Lane LOS		А	А			
Approach Delay (s)	0.0	0.4	9.3			
Approach LOS			А			
Intersection Summarv						
Average Delay			20			
Intersection Canacity Utiliz:	ation		15.2%	IC	Ulevelo	of Service
Analysis Period (min)			15.275	10		

## Mansfield Residential 6: Airport Rd (County Rd 18) & 10th Sideroad/County Rd 17

	≯	-	-	-	1	1	1	Ŧ	
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Configurations		4.		4		4.		<b>.</b>	
Traffic Volume (vph)	31	33	19	57	31	433	48	346	
Future Volume (vph)	31	33	19	57	31	433	48	346	
Lane Group Flow (vph)	0	95	0	119	0	577	0	465	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		
Detector Phase	4	4	8	8	2	2	6	6	
Switch Phase									
Minimum Initial (s)	7.0	7.0	7.0	7.0	25.0	25.0	25.0	25.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	32.0	32.0	32.0	32.0	
Total Split (s)	21.0	21.0	21.0	21.0	35.0	35.0	35.0	35.0	
Total Split (%)	37.5%	37.5%	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%	
Yellow Time (s)	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0		0.0		0.0	
Total Lost Time (s)		6.0		6.0		7.0		7.0	
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	Max	Max	Max	Max	
v/c Ratio		0.36		0.39		0.51		0.45	
Control Delay		18.5		17.9		8.7		8.2	
Queue Delay		0.0		0.0		0.0		0.0	
Total Delay		18.5		17.9		8.7		8.2	
Queue Length 50th (m)		6.0		7.1		27.6		21.3	
Queue Length 95th (m)		15.9		18.1		58.5		46.3	
Internal Link Dist (m)		439.9		535.3		514.2		133.5	
Turn Bay Length (m)									
Base Capacity (vph)		459		525		1138		1040	
Starvation Cap Reductn		0		0		0		0	
Spillback Cap Reductn		0		0		0		0	
Storage Cap Reductn		0		0		0		0	
Reduced v/c Ratio		0.21		0.23		0.51		0.45	
Intersection Summary									
Cycle Length: 56									
Actuated Cycle Length: 49.9									
Natural Cycle: 55									
Control Type: Semi Act-Unco	ord								
Splits and Phases: 6: Airpo	ort Rd (Co	unty Rd 1	18) & 10th	Sideroa	d/County	Rd 17			

1 ø2	<u></u> 04	
35 s	21 s	
	Ø8	
35 s	21 s	

Mansfield ResidentialHCM Signalized Intersection Capacity Analysis6: Airport Rd (County Rd 18) & 10th Sideroad/County Rd 17Existing (2024) PM Peak Hour

	≯	-	$\rightarrow$	1	+	•	1	1	1	1	Ŧ	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			÷			÷			\$	
Traffic Volume (vph)	31	33	19	19	57	28	31	433	44	48	346	15
Future Volume (vph)	31	33	19	19	57	28	31	433	44	48	346	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			7.0			7.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.97			0.96			0.99			1.00	
Flt Protected		0.98			0.99			1.00			0.99	
Satd. Flow (prot)		1694			1814			1821			1787	
Flt Permitted		0.85			0.91			0.96			0.89	
Satd. Flow (perm)		1475			1670			1744			1598	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	35	38	22	22	65	32	35	492	50	55	393	17
RTOR Reduction (vph)	0	19	0	0	28	0	0	5	0	0	2	0
Lane Group Flow (vph)	0	76	0	0	91	0	0	572	0	0	463	0
Heavy Vehicles (%)	5%	8%	7%	0%	0%	0%	0%	3%	3%	8%	5%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.0			7.0			31.0			31.0	
Effective Green, g (s)		7.0			7.0			31.0			31.0	
Actuated g/C Ratio		0.14			0.14			0.61			0.61	
Clearance Time (s)		6.0			6.0			7.0			7.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		202			229			1060			971	
v/s Ratio Prot												
v/s Ratio Perm		0.05			c0.05			c0.33			0.29	
v/c Ratio		0.38			0.40			0.54			0.48	
Uniform Delay, d1		20.0			20.1			5.8			5.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.2			1.1			2.0			1.7	
Delay (s)		21.2			21.2			7.8			7.2	
Level of Service		С			С			А			А	
Approach Delay (s)		21.2			21.2			7.8			7.2	
Approach LOS		С			С			А			А	
Intersection Summary												
HCM 2000 Control Delay			9.9	Н	CM 2000	Level of	Service		А			
HCM 2000 Volume to Capa	city ratio		0.51									
Actuated Cycle Length (s)			51.0	S	um of lost	time (s)			13.0			
Intersection Capacity Utiliza	tion		54.0%	IC	CU Level of	of Service	;		А			
Analysis Period (min)			15									
o Critical Lana Croup												

c Critical Lane Group

### Mansfield Residential 7: Thomson Trail & County Rd 17

	-	$\rightarrow$	1	+	1	1
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1.			ង	W.	
Traffic Volume (veh/h)	91	30	9	84	18	5
Future Volume (Veh/h)	91	30	9	84	18	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	103	34	10	95	20	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			137		235	120
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			137		235	120
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		97	99
cM capacity (veh/h)			1447		748	931
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	137	105	26			
Volume Left	0	10	20			
Volume Right	34	0	6			
cSH	1700	1447	784			
Volume to Capacity	0.08	0.01	0.03			
Queue Length 95th (m)	0.0	0.2	0.8			
Control Delay (s)	0.0	0.8	9.8			
Lane LOS		А	А			
Approach Delay (s)	0.0	0.8	9.8			
Approach LOS			А			
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utiliz	zation		21.9%	IC	U Level o	of Service
Analysis Period (min)			15			

Mansfield Residential 2735528 Ontario Inc. JDE-21035 Date: February 2<sup>rd</sup>, 2024

Appendix D – MTO Left Turn Warrant Analysis





Exhibit 9A-10



Exhibit 9A-10

PM Peak Hour (Critical Scenario)

TAC Geometric Design Guide for Canadian Roads, June 2017

MTO Design Supplement





V<sub>A</sub> = ADVANCING VOLUME (VPH)

Mansfield Residential 2735528 Ontario Inc. JDE-21035 Date: February 2<sup>nd</sup>, 2024

Appendix E – OTM Signal Justification Sheets



### Justification No. 7 - 2031 Total Traffic (Critical Case)

Street 'A' / County Road 18

			(	Compliance	;	Signal	Underground
Justification	Description		Secti	onal	Entiro %	Warrant	Provisions
		Rest. Flow	Numerical	%		wanam	Warrant
	A. Vehicle volume, all aproaches						
1. Minimum Vehicluar	(average hour)	720	525	73%	204	NO	NO
Volume	B. Vehicle volume, along minor streets				2 70		
	(average hour)	255	9	3%		NO	NO
	A. Vehicle volume, major street						
	(average hour)	720	511	71%		NO	NO
2. Delay to cross traffic	B. Combined vehicle and pedestrian				6%		
-	volume crossing artery from minor						
	streets (average hour)	75	7	9%		NO	NO

### Justification No. 7 - 2031 Total Traffic (Critical Case)

Street 'C' & Thomson Trail / County Road 17

			(	Compliance	;	Signal	Underground
Justification	Description		Secti	onal	Entire %	Warrant	Provisions
		Rest. Flow	Numerical	%	Little 70	wanan	Warrant
	A. Vehicle volume, all aproaches			•			
1. Minimum Vehicluar	(average hour)	720	143	20%	110/	NO	NO
Volume	B. Vehicle volume, along minor streets				1170		
	(average hour)	170	23	14%		NO	NO
	A. Vehicle volume, major street						
	(average hour)	720	107	15%		NO	NO
<ol><li>Delay to cross traffic</li></ol>	B. Combined vehicle and pedestrian				12%		
-	volume crossing artery from minor						
	streets (average hour)	75	14	19%		NO	NO

Mansfield Residential 2735528 Ontario Inc. JDE-21035 Date: February 2<sup>nd</sup>, 2024

Appendix F – Synchro Analysis Output – Background Traffic Volumes



### Mansfield Residential 6: Airport Rd (County Rd 18) & 10th Sideroad/County Rd 17

	≯	-	-	-	1	<b>†</b>	1	ŧ	
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Configurations		4		4		\$		4	
Traffic Volume (vph)	22	40	22	34	7	225	35	306	
Future Volume (vph)	22	40	22	34	7	225	35	306	
Lane Group Flow (vph)	0	81	0	102	0	281	0	412	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		
Detector Phase	4	4	8	8	2	2	6	6	
Switch Phase									
Minimum Initial (s)	7.0	7.0	7.0	7.0	25.0	25.0	25.0	25.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	32.0	32.0	32.0	32.0	
Total Split (s)	21.0	21.0	21.0	21.0	35.0	35.0	35.0	35.0	
Total Split (%)	37.5%	37.5%	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%	
Yellow Time (s)	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0		0.0		0.0	
Total Lost Time (s)		6.0		6.0		7.0		7.0	
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	Max	Max	Max	Max	
v/c Ratio		0.29		0.34		0.23		0.32	
Control Delay		18.8		15.8		5.4		5.9	
Queue Delay		0.0		0.0		0.0		0.0	
Total Delay		18.8		15.8		5.4		5.9	
Queue Length 50th (m)		5.8		5.2		10.5		16.9	
Queue Length 95th (m)		14.6		15.0		23.3		35.4	
Internal Link Dist (m)		439.9		535.3		514.2		133.5	
Turn Bay Length (m)									
Base Capacity (vph)		511		524		1217		1289	
Starvation Cap Reductn		0		0		0		0	
Spillback Cap Reductn		0		0		0		0	
Storage Cap Reductn		0		0		0		0	
Reduced v/c Ratio		0.16		0.19		0.23		0.32	
Intersection Summary									
Cycle Length: 56									
Actuated Cycle Length: 48									
Natural Cycle: 55									
Control Type: Semi Act-Unco	oord								
Splits and Phases: 6: Airpo	ort Rd (Co	ounty Rd 1	18) & 10th	Sideroa	d/County	Rd 17			

1 ø2	<u></u> Ø4	
35 s	21 s	
▼Ø6	<b>₩</b> Ø8	
35 s	21 s	

Mansfield ResidentialHCM Signalized Intersection Capacity Analysis6: Airport Rd (County Rd 18) & 10th Sideroad/County Rd 17Background (2026) AM Peak Hour

	≯	-	$\rightarrow$	1	-	•	1	1	1	1	Ŧ	-
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (vph)	22	40	9	22	34	33	7	225	12	35	306	17
Future Volume (vph)	22	40	9	22	34	33	7	225	12	35	306	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			7.0			7.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			0.95			0.99			0.99	
Flt Protected		0.98			0.99			1.00			1.00	
Satd. Flow (prot)		1840			1756			1669			1831	
FIt Permitted		0.86			0.89			0.99			0.95	
Satd. Flow (perm)		1604			1584			1651			1747	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	25	46	10	25	39	38	8	259	14	40	352	20
RTOR Reduction (vph)	0	9	0	0	34	0	0	3	0	0	3	0
Lane Group Flow (vph)	0	72	0	0	68	0	0	278	0	0	409	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	4%	0%	14%	0%	0%	3%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		5.1			5.1			32.4			32.4	
Effective Green, g (s)		5.1			5.1			32.4			32.4	
Actuated g/C Ratio		0.10			0.10			0.64			0.64	
Clearance Time (s)		6.0			6.0			7.0			7.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		161			159			1059			1120	
v/s Ratio Prot												
v/s Ratio Perm		c0.04			0.04			0.17			c0.23	
v/c Ratio		0.45			0.43			0.26			0.37	
Uniform Delay, d1		21.4			21.3			3.9			4.2	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.0			1.8			0.6			0.9	
Delay (s)		23.3			23.2			4.5			5.2	
Level of Service		С			С			Α			Α	
Approach Delay (s)		23.3			23.2			4.5			5.2	
Approach LOS		С			С			А			А	
Intersection Summary												
HCM 2000 Control Delay			8.7	Н	CM 2000	Level of	Service		А			
HCM 2000 Volume to Capacity	/ ratio		0.38									
Actuated Cycle Length (s)			50.5	S	um of los	t time (s)			13.0			
Intersection Capacity Utilization	n		50.7%	IC	CU Level	of Service	;		А			
Analysis Period (min)			15									
c Critical Lane Group												

### Mansfield Residential 7: Thomson Trail & County Rd 17

	-	$\rightarrow$	1	+	▲	1	
Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	1.			4	M		_
Traffic Volume (veh/h)	76	9	3	56	27	8	
Future Volume (Veh/h)	76	9	3	56	27	8	
Sian Control	Free			Free	Stop		
Grade	0%			0%	0%		
Peak Hour Factor	0.87	0.87	0.87	0.87	0.92	0.92	
Hourly flow rate (vph)	87	10	3	64	29	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)							
pX, platoon unblocked							
vC, conflicting volume			97		162	92	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			97		162	92	
tC, single (s)			4.1		6.4	6.2	
tC, 2 stage (s)							
tF (s)			2.2		3.5	3.3	
p0 queue free %			100		96	99	
cM capacity (veh/h)			1496		827	965	
Direction, Lane #	EB 1	WB 1	NB 1				
Volume Total	97	67	38				
Volume Left	0	3	29				
Volume Right	10	0	9				
cSH	1700	1496	856				
Volume to Capacity	0.06	0.00	0.04				
Queue Length 95th (m)	0.0	0.0	1.1				
Control Delay (s)	0.0	0.3	9.4				
Lane LOS		А	А				
Approach Delay (s)	0.0	0.3	9.4				
Approach LOS			А				
Intersection Summary							
Average Delay			1.9				
Intersection Capacity Utiliz	zation		15.4%	IC	U Level c	of Service	
Analysis Period (min)			15				

### Mansfield Residential 6: Airport Rd (County Rd 18) & 10th Sideroad/County Rd 17

	≯	-	-	+	1	<b>†</b>	1	ŧ	
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Configurations		4		\$		4		\$	
Traffic Volume (vph)	33	35	21	61	33	475	52	379	
Future Volume (vph)	33	35	21	61	33	475	52	379	
Lane Group Flow (vph)	0	102	0	128	0	633	0	508	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		
Detector Phase	4	4	8	8	2	2	6	6	
Switch Phase									
Minimum Initial (s)	7.0	7.0	7.0	7.0	25.0	25.0	25.0	25.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	32.0	32.0	32.0	32.0	
Total Split (s)	21.0	21.0	21.0	21.0	35.0	35.0	35.0	35.0	
Total Split (%)	37.5%	37.5%	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%	
Yellow Time (s)	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0		0.0		0.0	
Total Lost Time (s)		6.0		6.0		7.0		7.0	
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	Max	Max	Max	Max	
v/c Ratio		0.37		0.41		0.56		0.50	
Control Delay		18.4		18.2		9.7		9.1	
Queue Delay		0.0		0.0		0.0		0.0	
Total Delay		18.4		18.2		9.7		9.1	
Queue Length 50th (m)		6.4		7.9		32.6		24.9	
Queue Length 95th (m)		16.6		19.2		69.8		54.4	
Internal Link Dist (m)		439.9		535.3		514.2		133.5	
Turn Bay Length (m)									
Base Capacity (vph)		465		521		1128		1025	
Starvation Cap Reductn		0		0		0		0	
Spillback Cap Reductn		0		0		0		0	
Storage Cap Reductn		0		0		0		0	
Reduced v/c Ratio		0.22		0.25		0.56		0.50	
Intersection Summary									
Cycle Length: 56									
Actuated Cycle Length: 50.1									
Natural Cycle: 55									
Control Type: Semi Act-Unco	ord								
Splits and Dhasper 6: Airpa			18) & 10+4	Sidaraa	d/County	Dd 17			
					a county				

dØ2	A <sub>04</sub>	
35 s	21 s	
	<b>₩</b> Ø8	
35 s	21 s	

Mansfield ResidentialHCM Signalized Intersection Capacity Analysis6: Airport Rd (County Rd 18) & 10th Sideroad/County Rd 17Background (2026) PM Peak Hour

	≯	-	$\mathbf{F}$	∢	+	•	1	Ť	۲	1	Ŧ	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			\$			\$	
Traffic Volume (vph)	33	35	21	21	61	31	33	475	48	52	379	16
Future Volume (vph)	33	35	21	21	61	31	33	475	48	52	379	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			7.0			7.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.97			0.96			0.99			1.00	
Flt Protected		0.98			0.99			1.00			0.99	
Satd. Flow (prot)		1693			1813			1821			1788	
Flt Permitted		0.87			0.91			0.95			0.88	
Satd. Flow (perm)		1497			1664			1737			1581	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	38	40	24	24	69	35	38	540	55	59	431	18
RTOR Reduction (vph)	0	21	0	0	28	0	0	5	0	0	2	0
Lane Group Flow (vph)	0	81	0	0	100	0	0	628	0	0	506	0
Heavy Vehicles (%)	5%	8%	7%	0%	0%	0%	0%	3%	3%	8%	5%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.2			7.2			31.0			31.0	
Effective Green, g (s)		7.2			7.2			31.0			31.0	
Actuated g/C Ratio		0.14			0.14			0.61			0.61	
Clearance Time (s)		6.0			6.0			7.0			7.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		210			234			1051			957	
v/s Ratio Prot												
v/s Ratio Perm		0.05			c0.06			c0.36			0.32	
v/c Ratio		0.39			0.43			0.60			0.53	
Uniform Delay, d1		20.0			20.1			6.2			5.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.2			1.2			2.5			2.1	
Delay (s)		21.2			21.4			8.8			8.0	
Level of Service		С			С			Α			Α	
Approach Delay (s)		21.2			21.4			8.8			8.0	
Approach LOS		С			С			А			А	
Intersection Summary												
HCM 2000 Control Delay 10.6					CM 2000	Level of S	Service		В			
HCM 2000 Volume to Capaci	ty ratio		0.57									
Actuated Cycle Length (s)			51.2	S	um of lost	time (s)			13.0			

ICU Level of Service

57.8%

15

Analysis Period (min) c Critical Lane Group

Intersection Capacity Utilization

В

### Mansfield Residential 7: Thomson Trail & County Rd 17

	-	$\rightarrow$	1	-	1	1
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1.			ដ	W.	
Traffic Volume (veh/h)	98	30	9	91	18	5
Future Volume (Veh/h)	98	30	9	91	18	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	111	34	10	103	20	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)	Nono			110110		
Unstream signal (m)						
nX platoon unblocked						
vC. conflicting volume			145		251	128
vC1 stage 1 conf vol			140		201	120
vC1, stage 1 confive						
			1/15		251	128
tC single (s)			/ 1		6.4	62
tC, single (s) $tC_2$ stage (s)			4.1		0.4	0.2
10, 2 stage (s)			2.2		25	2.2
n guovo frog %			2.2		07	0.0
p0 queue liee %			1427		97 720	99
civi capacity (ven/n)			1437		132	922
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	145	113	26			
Volume Left	0	10	20			
Volume Right	34	0	6			
cSH	1700	1437	769			
Volume to Capacity	0.09	0.01	0.03			
Queue Length 95th (m)	0.0	0.2	0.8			
Control Delay (s)	0.0	0.7	9.8			
Lane LOS		А	А			
Approach Delay (s)	0.0	0.7	9.8			
Approach LOS			А			
Interception Cummers						
			1.0			
Average Delay	·		1.2	10		( <b>0</b> ·
Intersection Capacity Util	Ization		22.3%	IC	U Level o	of Service
Analysis Period (min)			15			

### Mansfield Residential 6: Airport Rd (County Rd 18) & 10th Sideroad/County Rd 17

	≯	-	-	+	1	<b>†</b>	1	ŧ	
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Configurations		\$		\$		\$		\$	
Traffic Volume (vph)	26	50	27	42	9	283	43	383	
Future Volume (vph)	26	50	27	42	9	283	43	383	
Lane Group Flow (vph)	0	100	0	126	0	351	0	511	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		
Detector Phase	4	4	8	8	2	2	6	6	
Switch Phase									
Minimum Initial (s)	7.0	7.0	7.0	7.0	25.0	25.0	25.0	25.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	32.0	32.0	32.0	32.0	
Total Split (s)	21.0	21.0	21.0	21.0	35.0	35.0	35.0	35.0	
Total Split (%)	37.5%	37.5%	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%	
Yellow Time (s)	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0		0.0		0.0	
Total Lost Time (s)		6.0		6.0		7.0		7.0	
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	Max	Max	Max	Max	
v/c Ratio		0.34		0.41		0.33		0.46	
Control Delay		19.4		16.7		7.0		8.2	
Queue Delay		0.0		0.0		0.0		0.0	
Total Delay		19.4		16.7		7.0		8.2	
Queue Length 50th (m)		7.1		6.5		14.5		23.6	
Queue Length 95th (m)		16.9		17.5		31.6		49.7	
Internal Link Dist (m)		439.9		535.3		514.2		133.5	
Turn Bay Length (m)									
Base Capacity (vph)		506		506		1069		1123	
Starvation Cap Reductn		0		0		0		0	
Spillback Cap Reductn		0		0		0		0	
Storage Cap Reductn		0		0		0		0	
Reduced v/c Ratio		0.20		0.25		0.33		0.46	
Intersection Summary									
Cycle Length: 56									
Actuated Cycle Length: 50									
Natural Cycle: 55									
Control Type: Semi Act-Unc	oord								
Splits and Phases: 6: Airp	ort Rd (Co	ounty Rd <sup>2</sup>	18) & 10tł	n Sideroa	d/County	Rd 17			

1 ø2	<u></u> Ø4	
35 s	21 s	
▼Ø6	<b>₩</b> Ø8	
35 s	21 s	

Mansfield ResidentialHCM Signalized Intersection Capacity Analysis6: Airport Rd (County Rd 18) & 10th Sideroad/County Rd 17Background (2031) AM Peak Hour

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			÷			\$	
Traffic Volume (vph)	26	50	11	27	42	41	9	283	14	43	383	19
Future Volume (vph)	26	50	11	27	42	41	9	283	14	43	383	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			7.0			7.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			0.95			0.99			0.99	
Flt Protected		0.99			0.99			1.00			1.00	
Satd. Flow (prot)		1839			1756			1669			1833	
Flt Permitted		0.89			0.88			0.98			0.94	
Satd. Flow (perm)		1654			1573			1644			1727	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	30	57	13	31	48	47	10	325	16	49	440	22
RTOR Reduction (vph)	0	11	0	0	40	0	0	2	0	0	2	0
Lane Group Flow (vph)	0	89	0	0	86	0	0	349	0	0	509	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	4%	0%	14%	0%	0%	3%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.1			7.1			31.0			31.0	
Effective Green, g (s)		7.1			7.1			31.0			31.0	
Actuated g/C Ratio		0.14			0.14			0.61			0.61	
Clearance Time (s)		6.0			6.0			7.0			7.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		229			218			997			1047	
v/s Ratio Prot												
v/s Ratio Perm		0.05			c0.05			0.21			c0.29	
v/c Ratio		0.39			0.39			0.35			0.49	
Uniform Delay, d1		20.0			20.0			5.0			5.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.1			1.2			1.0			1.6	
Delay (s)		21.1			21.2			6.0			7.2	
Level of Service		С			С			Α			Α	
Approach Delay (s)		21.1			21.2			6.0			7.2	
Approach LOS		С			С			Α			Α	
Intersection Summary												
HCM 2000 Control Delay			9.7	H	CM 2000	Level of S	Service		Α			
HCM 2000 Volume to Capacit	y ratio		0.47									
Actuated Cycle Length (s)			51.1	S	um of lost	time (s)			13.0			
Intersection Capacity Utilization	n		59.9%	IC	CU Level of	of Service			В			
Analysis Period (min)			15									

c Critical Lane Group

### Mansfield Residential 7: Thomson Trail & County Rd 17

	-	$\rightarrow$	1	-	1	1
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	ĥ			र्स	M	
Traffic Volume (veh/h)	93	9	3	69	27	8
Future Volume (Veh/h)	93	9	3	69	27	8
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.92	0.92
Hourly flow rate (vph)	107	10	3	79	29	9
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)	Nono			110110		
Unstream signal (m)						
nX platoon unblocked						
vC conflicting volume			117		107	112
vC1 stage 1 conf vol			117		151	112
vC1, stage 1 conf vol						
			117		107	112
tC single (s)			117		64	62
tC, single (s) $tC_{2}$ stage (s)			4.1		0.4	0.2
tC, Z stage (s)			2.2		3.5	2.2
n quouo froo %			100		0.0	00
oM conceity (yeb/b)			1471		90 700	99
civi capacity (ven/n)			1471		790	941
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	117	82	38			
Volume Left	0	3	29			
Volume Right	10	0	9			
cSH	1700	1471	821			
Volume to Capacity	0.07	0.00	0.05			
Queue Length 95th (m)	0.0	0.0	1.2			
Control Delay (s)	0.0	0.3	9.6			
Lane LOS		А	А			
Approach Delay (s)	0.0	0.3	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Util	ization		16.1%	IC	U Level o	of Service
Analysis Period (min)			15			

## Mansfield Residential 6: Airport Rd (County Rd 18) & 10th Sideroad/County Rd 17

	≯	-	-	-	1	<b>†</b>	1	↓ .	
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Configurations		4		\$		4		\$	
Traffic Volume (vph)	40	43	26	76	41	596	65	476	
Future Volume (vph)	40	43	26	76	41	596	65	476	
Lane Group Flow (vph)	0	124	0	159	0	791	0	637	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		
Detector Phase	4	4	8	8	2	2	6	6	
Switch Phase									
Minimum Initial (s)	7.0	7.0	7.0	7.0	25.0	25.0	25.0	25.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	32.0	32.0	32.0	32.0	
Total Split (s)	21.0	21.0	21.0	21.0	35.0	35.0	35.0	35.0	
Total Split (%)	37.5%	37.5%	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%	
Yellow Time (s)	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0		0.0		0.0	
Total Lost Time (s)		6.0		6.0		7.0		7.0	
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	Max	Max	Max	Max	
v/c Ratio		0.42		0.47		0.72		0.66	
Control Delay		18.9		19.3		15.6		14.2	
Queue Delay		0.0		0.0		0.0		0.0	
Total Delay		18.9		19.3		15.6		14.2	
Queue Length 50th (m)		8.0		10.6		51.4		38.8	
Queue Length 95th (m)		19.3		23.6		#131.4		#105.2	
Internal Link Dist (m)		439.9		535.3		514.2		133.5	
Turn Bay Length (m)									
Base Capacity (vph)		458		519		1098		968	
Starvation Cap Reductn		0		0		0		0	
Spillback Cap Reductn		0		0		0		0	
Storage Cap Reductn		0		0		0		0	
Reduced v/c Ratio		0.27		0.31		0.72		0.66	
Intersection Summary									
Cycle Length: 56									
Actuated Cycle Length: 50.9	)								
Natural Cycle: 60									
Control Type: Semi Act-Unc	oord								
# 95th percentile volume e	exceeds ca	pacity, qu	ieue may	be longe	r.				
Queue shown is maximu	m after two	o cycles.							
Splits and Phases: 6: Airc	oort Rd (Co	ounty Rd <sup>2</sup>	18) & 10tł	n Sideroa	d/Countv	Rd 17			
1							4	14	
35s							21 s	7	
06							1	18	

21 s

35 s

Mansfield ResidentialHCM Signalized Intersection Capacity Analysis6: Airport Rd (County Rd 18) & 10th Sideroad/County Rd 17Background (2031) PM Peak Hour

	≯	-	$\mathbf{\hat{z}}$	4	+	*	1	Ť	1	1	ŧ	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (vph)	40	43	26	26	76	38	41	596	59	65	476	19
Future Volume (vph)	40	43	26	26	76	38	41	596	59	65	476	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			7.0			7.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.97			0.96			0.99			1.00	
Flt Protected		0.98			0.99			1.00			0.99	
Satd. Flow (prot)		1692			1814			1821			1788	
Flt Permitted		0.86			0.92			0.94			0.84	
Satd. Flow (perm)		1488			1680			1711			1515	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	45	49	30	30	86	43	47	677	67	74	541	22
RTOR Reduction (vph)	0	24	0	0	28	0	0	5	0	0	2	0
Lane Group Flow (vph)	0	100	0	0	131	0	0	786	0	0	635	0
Heavy Vehicles (%)	5%	8%	7%	0%	0%	0%	0%	3%	3%	8%	5%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		8.0			8.0			31.1			31.1	
Effective Green, g (s)		8.0			8.0			31.1			31.1	
Actuated g/C Ratio		0.15			0.15			0.60			0.60	
Clearance Time (s)		6.0			6.0			7.0			7.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		228			257			1021			904	
v/s Ratio Prot												
v/s Ratio Perm		0.07			c0.08			c0.46			0.42	
v/c Ratio		0.44			0.51			0.77			0.70	
Uniform Delay, d1		20.0			20.2			7.8			7.3	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.4			1.6			5.6			4.5	
Delay (s)		21.4			21.8			13.4			11.8	
Level of Service		С			С			В			В	
Approach Delay (s)		21.4			21.8			13.4			11.8	
Approach LOS		С			С			В			В	
Intersection Summary												
HCM 2000 Control Delay			14.2	Н	CM 2000	Level of	Service		В			
HCM 2000 Volume to Capacit	ty ratio		0.72									
Actuated Cycle Length (s)			52.1	S	um of lost	time (s)			13.0			
Intersection Capacity Utilization	on		69.4%	IC	CU Level o	of Service	•		С			
Analysis Period (min)			15									
c Critical Lane Group												

### Mansfield Residential 7: Thomson Trail & County Rd 17

	-	$\mathbf{r}$	1	+	1	1		
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations	î,			ជ	W.		_	
Traffic Volume (veh/h)	121	30	9	112	18	5		
Future Volume (Veh/h)	121	30	9	112	18	5		
Sign Control	Free			Free	Stop			
Grade	0%			0%	0%			
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88		
Hourly flow rate (vph)	138	34	10	127	20	6		
Pedestrians								
Lane Width (m)								
Walking Speed (m/s)								
Percent Blockage								
Right turn flare (veh)								
Median type	None			None				
Median storage veh)								
Upstream signal (m)								
pX, platoon unblocked								
vC, conflicting volume			172		302	155		
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol			172		302	155		
tC, single (s)			4.1		6.4	6.2		
tC, 2 stage (s)								
tF (s)			2.2		3.5	3.3		
p0 queue free %			99		97	99		
cM capacity (veh/h)			1405		685	891		
Direction, Lane #	EB 1	WB 1	NB 1					
Volume Total	172	137	26					
Volume Left	0	10	20					
Volume Right	34	0	6					
cSH	1700	1405	723					
Volume to Capacity	0.10	0.01	0.04					
Queue Length 95th (m)	0.0	0.2	0.9					
Control Delay (s)	0.0	0.6	10.2					
Lane LOS		А	В					
Approach Delay (s)	0.0	0.6	10.2					
Approach LOS			В					
Intersection Summary								
Average Delay			1.0					
Intersection Capacity Util	lization		23.3%	IC	U Level o	of Service		
Analysis Period (min)			15					

Mansfield Residential 2735528 Ontario Inc. JDE-21035 Date: February 2<sup>nd</sup>, 2024

Appendix G – Synchro Analysis Output – Total Traffic Volumes



Mansfield Re	sidentia	al				
6: Airport Rd	(County	y Rd 18	) & ′	10th	Sideroad/County	/ Rd 17

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Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Configurations		4		4		4		\$	
Traffic Volume (vph)	23	41	33	37	7	230	35	320	
Future Volume (vph)	23	41	33	37	7	230	35	320	
Lane Group Flow (vph)	0	83	0	119	0	290	0	431	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		
Detector Phase	4	4	8	8	2	2	6	6	
Switch Phase									
Minimum Initial (s)	7.0	7.0	7.0	7.0	25.0	25.0	25.0	25.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	32.0	32.0	32.0	32.0	
Total Split (s)	21.0	21.0	21.0	21.0	35.0	35.0	35.0	35.0	
Total Split (%)	37.5%	37.5%	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%	
Yellow Time (s)	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0		0.0		0.0	
Total Lost Time (s)		6.0		6.0		7.0		7.0	
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	Max	Max	Max	Max	
v/c Ratio		0.29		0.40		0.27		0.38	
Control Delay		18.8		17.6		6.5		7.4	
Queue Delay		0.0		0.0		0.0		0.0	
Total Delay		18.8		17.6		6.5		7.4	
Queue Length 50th (m)		6.0		6.7		11.3		18.6	
Queue Length 95th (m)		14.8		17.3		25.4		39.4	
Internal Link Dist (m)		439.9		535.3		514.2		133.5	
Turn Bay Length (m)									
Base Capacity (vph)		496		491		1073		1136	
Starvation Cap Reductn		0		0		0		0	
Spillback Cap Reductn		0		0		0		0	
Storage Cap Reductn		0		0		0		0	
Reduced v/c Ratio		0.17		0.24		0.27		0.38	
Intersection Summary									
Cycle Length: 56									
Actuated Cycle Length: 50									
Natural Cycle: 55									
Control Type: Semi Act-Unc	coord								
Solits and Phases: 6. Air	nort Rd (Ca	untv Rd <sup>,</sup>	18) & 1በዙ	n Sideroa	d/County	Rd 17			
					arcounty		<b>A</b>		

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35 s	21s	
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35 s	21 s	

 Mansfield Residential
 HCM Signalized Intersection Capacity Analysis

 6: Airport Rd (County Rd 18) & 10th Sideroad/County Rd 17
 Total (2026) AM Peak Hour

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			÷			\$			\$	
Traffic Volume (vph)	23	41	9	33	37	33	7	230	16	35	320	20
Future Volume (vph)	23	41	9	33	37	33	7	230	16	35	320	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			7.0			7.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			0.96			0.99			0.99	
Flt Protected		0.98			0.98			1.00			1.00	
Satd. Flow (prot)		1840			1767			1669			1831	
Flt Permitted		0.87			0.86			0.99			0.95	
Satd. Flow (perm)		1628			1547			1649			1747	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	26	47	10	38	43	38	8	264	18	40	368	23
RTOR Reduction (vph)	0	9	0	0	33	0	0	4	0	0	3	0
Lane Group Flow (vph)	0	74	0	0	86	0	0	286	0	0	428	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	4%	0%	14%	0%	0%	3%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.1			7.1			31.0			31.0	
Effective Green, g (s)		7.1			7.1			31.0			31.0	
Actuated g/C Ratio		0.14			0.14			0.61			0.61	
Clearance Time (s)		6.0			6.0			7.0			7.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		226			214			1000			1059	
v/s Ratio Prot												
v/s Ratio Perm		0.05			c0.06			0.17			c0.25	
v/c Ratio		0.33			0.40			0.29			0.40	
Uniform Delay, d1		19.9			20.1			4.8			5.2	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.9			1.2			0.7			1.1	
Delay (s)		20.7			21.3			5.5			6.4	
Level of Service		С			С			А			А	
Approach Delay (s)		20.7			21.3			5.5			6.4	
Approach LOS		С			С			А			А	
Intersection Summary												
HCM 2000 Control Delay			9.3	Н	CM 2000	Level of	Service		А			
HCM 2000 Volume to Capac	city ratio		0.40									
Actuated Cycle Length (s)			51.1	S	um of lost	time (s)			13.0			
Intersection Capacity Utilizat	ion		53.3%	IC	U Level o	of Service	)		А			
Analysis Period (min)			15									
c Critical Lane Group												

### Mansfield Residential 1: Airport Rd (County Rd 18) & Street A

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Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	¥		ţ,			र्स
Traffic Volume (veh/h)	17	4	282	6	1	358
Future Volume (Veh/h)	17	4	282	6	1	358
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)	18	4	307	7	1	389
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			158			
pX, platoon unblocked						
vC, conflicting volume	702	310			314	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	702	310			314	
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	99			100	
cM capacity (veh/h)	404	730			1246	
Direction. Lane #	WB 1	NB 1	SB 1			
Volume Total	22	314	390			
Volume Left	18	0	1			
Volume Right	4	7	0			
cSH	440	1700	1246			
Volume to Capacity	0.05	0.18	0.00			
Queue Length 95th (m)	1.3	0.0	0.0			
Control Delay (s)	13.6	0.0	0.0			
Lane LOS	B	0.0	A			
Approach Delay (s)	13.6	0.0	0.0			
Approach LOS	В	0.0				
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utiliz	zation		29.6%	IC	U Level o	of Service
Analysis Period (min)			15			

Mansfield Residential 7: Thomson Trail/Street C & County Rd 17

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			\$			4			4	
Traffic Volume (veh/h)	5	76	9	3	56	2	27	0	8	7	0	14
Future Volume (Veh/h)	5	76	9	3	56	2	27	0	8	7	0	14
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	6	87	10	3	64	2	31	0	9	8	0	16
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	66			97			191	176	92	184	180	65
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	66			97			191	176	92	184	180	65
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			96	100	99	99	100	98
cM capacity (veh/h)	1536			1496			753	713	965	766	710	999
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	103	69	40	24								
Volume Left	6	3	31	8								
Volume Right	10	2	9	16								
cSH	1536	1496	792	907								
Volume to Capacity	0.00	0.00	0.05	0.03								
Queue Length 95th (m)	0.1	0.0	1.3	0.7								
Control Delay (s)	0.5	0.3	9.8	9.1								
Lane LOS	А	А	А	А								
Approach Delay (s)	0.5	0.3	9.8	9.1								
Approach LOS			А	А								
Intersection Summary												
Average Delay			2.9									
Intersection Capacity Util	ization		17.1%	IC	CU Level o	of Service			А			
Analysis Period (min)			15									
Mansfield R	esidentia	al										
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6: Airport Ro	I (Count	y Rd 18	) & 1	0th S	Sideroad/County	y Rd 17						

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Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Configurations		\$		4		\$		4	
Traffic Volume (vph)	36	38	28	63	33	489	52	388	
Future Volume (vph)	36	38	28	63	33	489	52	388	
Lane Group Flow (vph)	0	108	0	139	0	664	0	520	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		
Detector Phase	4	4	8	8	2	2	6	6	
Switch Phase									
Minimum Initial (s)	7.0	7.0	7.0	7.0	25.0	25.0	25.0	25.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	32.0	32.0	32.0	32.0	
Total Split (s)	21.0	21.0	21.0	21.0	35.0	35.0	35.0	35.0	
Total Split (%)	37.5%	37.5%	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%	
Yellow Time (s)	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0		0.0		0.0	
Total Lost Time (s)		6.0		6.0		7.0		7.0	
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	Max	Max	Max	Max	
v/c Ratio		0.38		0.44		0.59		0.51	
Control Delay		18.5		19.2		10.8		9.6	
Queue Delay		0.0		0.0		0.0		0.0	
Total Delay		18.5		19.2		10.8		9.6	
Queue Length 50th (m)		6.9		9.1		36.3		26.6	
Queue Length 95th (m)		17.3		21.1		78.0		58.5	
Internal Link Dist (m)		439.9		535.3		514.2		133.5	
Turn Bay Length (m)									
Base Capacity (vph)		464		506		1120		1015	
Starvation Cap Reductn		0		0		0		0	
Spillback Cap Reductn		0		0		0		0	
Storage Cap Reductn		0		0		0		0	
Reduced v/c Ratio		0.23		0.27		0.59		0.51	
Intersection Summary									
Cycle Length: 56									
Actuated Cycle Length: 50.5									
Natural Cycle: 60									
Control Type: Semi Act-Unco	ord								
				o		B			
Splits and Phases: 6: Airpo	ort Rd (Co	ounty Rd 2	18) & 10th	Sideroa	d/County	Kd 17			

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35 s	21 s	
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35 s	21 s	

Mansfield ResidentialHCM Signalized Intersection Capacity Analysis6: Airport Rd (County Rd 18) & 10th Sideroad/County Rd 17Total (2026) PM Peak Hour

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		÷			÷			÷			÷	
Traffic Volume (vph)	36	38	21	28	63	31	33	489	62	52	388	18
Future Volume (vph)	36	38	21	28	63	31	33	489	62	52	388	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			7.0			7.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.97			0.97			0.99			0.99	
Flt Protected		0.98			0.99			1.00			0.99	
Satd. Flow (prot)		1696			1815			1816			1787	
Flt Permitted		0.87			0.89			0.95			0.88	
Satd. Flow (perm)		1503			1632			1734			1575	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	41	43	24	32	72	35	38	556	70	59	441	20
RTOR Reduction (vph)	0	20	0	0	26	0	0	6	0	0	2	0
Lane Group Flow (vph)	0	88	0	0	113	0	0	658	0	0	518	0
Heavy Vehicles (%)	5%	8%	7%	0%	0%	0%	0%	3%	3%	8%	5%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.6			7.6			31.1			31.1	
Effective Green, g (s)		7.6			7.6			31.1			31.1	
Actuated g/C Ratio		0.15			0.15			0.60			0.60	
Clearance Time (s)		6.0			6.0			7.0			7.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		220			239			1043			947	
v/s Ratio Prot												
v/s Ratio Perm		0.06			c0.07			c0.38			0.33	
v/c Ratio		0.40			0.47			0.63			0.55	
Uniform Delay, d1		20.0			20.2			6.6			6.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.2			1.5			2.9			2.3	
Delay (s)		21.2			21.7			9.5			8.4	
Level of Service		С			С			А			А	
Approach Delay (s)		21.2			21.7			9.5			8.4	
Approach LOS		С			С			А			А	
Intersection Summary												
HCM 2000 Control Delay			11.2	Н	CM 2000	Level of	Service		В			
HCM 2000 Volume to Capac	city ratio		0.60									
Actuated Cycle Length (s)			51.7	S	um of lost	time (s)			13.0			
Intersection Capacity Utilizat	tion		58.6%	IC	U Level o	of Service	;		В			
Analysis Period (min)			15									
c Critical Lane Group												

Mansfield Residential 7: Thomson Trail/Street C & County Rd 17

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (veh/h)	17	98	30	9	91	8	18	0	5	5	0	9
Future Volume (Veh/h)	17	98	30	9	91	8	18	0	5	5	0	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	19	111	34	10	103	9	20	0	6	6	0	10
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	112			145			304	298	128	300	310	108
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	112			145			304	298	128	300	310	108
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			97	100	99	99	100	99
cM capacity (veh/h)	1478			1437			632	602	922	639	592	946
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	164	122	26	16								
Volume Left	19	10	20	6								
Volume Right	34	9	6	10								
cSH	1478	1437	682	802								
Volume to Capacity	0.01	0.01	0.04	0.02								
Queue Length 95th (m)	0.3	0.2	1.0	0.5								
Control Delay (s)	1.0	0.7	10.5	9.6								
Lane LOS	А	А	В	А								
Approach Delay (s)	1.0	0.7	10.5	9.6								
Approach LOS			В	А								
Intersection Summary												
Average Delay			2.0									
Intersection Capacity Utili	zation		21.5%	IC	CU Level o	of Service			А			
Analysis Period (min)			15									

## Mansfield Residential 1: Airport Rd (County Rd 18) & Street A

	✓	•	<b>†</b>	1	×	Ŧ
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	¥		٦.			ۍ ۲
Traffic Volume (veh/h)	11	2	540	17	4	448
Future Volume (Veh/h)	11	2	540	17	4	448
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)	12	2	587	18	4	487
Pedestrians		_			·	
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			158			
pX, platoon unblocked	0.81	0.81			0.81	
vC. conflicting volume	1091	596			605	
vC1. stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	995	383			395	
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)	219	538			942	
Direction Lane #	\\/D 1	NP 1	CP 1			
Volumo Totol		ROF	401			
	14	005	491			
Volume Leit	12	10	4			
	2	1700	040			
COFI Volume to Consolity	239	0.20	942			
Volume to Capacity	0.06	0.30	0.00			
Queue Length 95th (m)	1.5	0.0	0.1			
Control Delay (S)	21.0	0.0	0.1			
Lalle LUS	01.0	0.0	A			
Approach Delay (s)	21.0	0.0	0.1			
Approach LOS	C					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utiliz	zation		39.5%	IC	U Level o	f Service
Analysis Period (min)			15			

Mansfield Res	sidential				
6: Airport Rd (	(County Rd	18) &	10th	Sideroad/Cour	nty Rd 17

	٦	-	-	-	1	1	1	Ŧ	
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Configurations		4		4		4		4	
Traffic Volume (vph)	27	51	38	45	9	288	43	397	
Future Volume (vph)	27	51	38	45	9	288	43	397	
Lane Group Flow (vph)	0	103	0	143	0	362	0	530	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6	-	
Detector Phase	4	4	8	8	2	2	6	6	
Switch Phase			-				-	-	
Minimum Initial (s)	7.0	7.0	7.0	7.0	25.0	25.0	25.0	25.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	32.0	32.0	32.0	32.0	
Total Split (s)	21.0	21.0	21.0	21.0	35.0	35.0	35.0	35.0	
Total Split (%)	37.5%	37.5%	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%	
Yellow Time (s)	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0		0.0		0.0	
Total Lost Time (s)		6.0		6.0		7.0		7.0	
l ead/l ag		0.0		0.0		1.0		1.0	
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	Max	Max	Max	Max	
v/c Ratio		0.33		0.46		0.34		0.48	
Control Delay		18.9		18.3		7 4		8.9	
Queue Delay		0.0		0.0		0.0		0.0	
Total Delay		18.9		18.3		7.4		8.9	
Queue Length 50th (m)		7.4		8.3		15.5		25.9	
Queue Length 95th (m)		17.2		20.1		34.8		55.6	
Internal Link Dist (m)		439.9		535.3		514.2		133.5	
Turn Bay Length (m)						••••=			
Base Capacity (vph)		503		488		1060		1114	
Starvation Cap Reductn		0		0		0		0	
Spillback Cap Reductn		0		0		0		0	
Storage Cap Reductn		0		0		0		0	
Reduced v/c Ratio		0.20		0.29		0.34		0.48	
Intersection Summary									
Cycle Length: 56									
Actuated Cycle Length: 50.5									
Natural Cycle: 55									
Control Type: Semi Act-Unco	ord								

Splits and Phases:	6: Airport Rd (C	County Rd 18)	& 10th Sideroad/County	/ Rd 17

1 ø2	<u>→</u> <sub>Ø4</sub>					
35 s		21 s				
▼Ø6		<b>₩</b> Ø8				
35 s		21 s				

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ement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
	۶	-	$\mathbf{r}$	•	-	•	•	Ť	1	5	Ŧ	~		
Airport Rd (County	7 Rd 1	d 18) & 10th Sideroad/County Rd						y Rd 17 Total (20				31) AM Peak Hour		
nsfield Residentia					HCI	vi Sign	alized	Interse	ersection Capacity Analysis					

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4			4	
Traffic Volume (vph)	27	51	11	38	45	41	9	288	18	43	397	22
Future Volume (vph)	27	51	11	38	45	41	9	288	18	43	397	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			7.0			7.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			0.96			0.99			0.99	
Flt Protected		0.99			0.98			1.00			1.00	
Satd. Flow (prot)		1840			1765			1669			1832	
Flt Permitted		0.89			0.86			0.98			0.94	
Satd. Flow (perm)		1663			1539			1644			1727	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	31	59	13	44	52	47	10	331	21	49	456	25
RTOR Reduction (vph)	0	11	0	0	37	0	0	3	0	0	2	0
Lane Group Flow (vph)	0	92	0	0	106	0	0	359	0	0	528	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	4%	0%	14%	0%	0%	3%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		7.6			7.6			31.1			31.1	
Effective Green, g (s)		7.6			7.6			31.1			31.1	
Actuated g/C Ratio		0.15			0.15			0.60			0.60	
Clearance Time (s)		6.0			6.0			7.0			7.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		244			226			988			1038	
v/s Ratio Prot												
v/s Ratio Perm		0.06			c0.07			0.22			c0.31	
v/c Ratio		0.38			0.47			0.36			0.51	
Uniform Delay, d1		19.9			20.2			5.3			5.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.0			1.5			1.0			1.8	
Delay (s)		20.9			21.8			6.3			7.7	
Level of Service		С			С			А			А	
Approach Delay (s)		20.9			21.8			6.3			7.7	
Approach LOS		С			С			А			Α	
Intersection Summary												
HCM 2000 Control Delay			10.2	H	CM 2000	Level of	Service		В			
HCM 2000 Volume to Capacity	y ratio		0.50									
Actuated Cycle Length (s)			51.7	S	um of los	t time (s)			13.0			
Intersection Capacity Utilizatio	n		62.5%	IC	U Level	of Service	•		В			
Analysis Period (min)			15									
c Critical Lane Group												

Mansfield Residential 7: Thomson Trail/Street C & County Rd 17

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			4			4	
Traffic Volume (veh/h)	5	93	9	3	69	2	27	0	8	7	0	14
Future Volume (Veh/h)	5	93	9	3	69	2	27	0	8	7	0	14
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	6	107	10	3	79	2	31	0	9	8	0	16
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	81			117			226	211	112	219	215	80
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	81			117			226	211	112	219	215	80
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			96	100	99	99	100	98
cM capacity (veh/h)	1517			1471			714	682	941	727	679	980
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	123	84	40	24								
Volume Left	6	3	31	8								
Volume Right	10	2	9	16								
cSH	1517	1471	755	878								
Volume to Capacity	0.00	0.00	0.05	0.03								
Queue Length 95th (m)	0.1	0.0	1.3	0.7								
Control Delay (s)	0.4	0.3	10.0	9.2								
Lane LOS	А	А	В	А								
Approach Delay (s)	0.4	0.3	10.0	9.2								
Approach LOS			В	А								
Intersection Summary												
Average Delay			2.6									
Intersection Capacity Utili	zation		18.1%	IC	CU Level o	of Service			А			
Analysis Period (min)			15									

## Mansfield Residential 1: Airport Rd (County Rd 18) & Street A

	4	•	1	1	1	Ŧ
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	¥		ţ,			स
Traffic Volume (veh/h)	17	4	352	6	1	447
Future Volume (Veh/h)	17	4	352	6	1	447
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)	18	4	383	7	1	486
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			158			
pX, platoon unblocked	0.96	0.96			0.96	
vC. conflicting volume	874	386			390	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	848	339			343	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	99			100	
cM capacity (veh/h)	318	674			1167	
Direction Lane #	WB 1	NB 1	SB 1			
Volume Total	22	390	487			
Volume Left	18	0.00	1			
Volume Right	4	7	0			
	352	1700	1167			
Volume to Canacity	0.06	0.23	0.00			
Ouque Length 95th (m)	1.6	0.23	0.00			
Control Delay (s)	15.0	0.0	0.0			
Lang LOS	10.0	0.0	0.0			
Approach Delay (s)	15.0	0.0	0.0			
Approach LOS	1J.9	0.0	0.0			
	U		_	_		_
Intersection Summary			0.4			
Average Delay			0.4			( <b>0</b> ·
Intersection Capacity Utili	zation		34.3%	IC	U Level c	of Service
Analysis Period (min)			15			

## Mansfield Residential 6: Airport Rd (County Rd 18) & 10th Sideroad/County Rd 17

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Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Configurations		\$		4		4		4	
Traffic Volume (vph)	43	46	33	78	41	610	65	485	
Future Volume (vph)	43	46	33	78	41	610	65	485	
Lane Group Flow (vph)	0	131	0	170	0	823	0	649	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		
Detector Phase	4	4	8	8	2	2	6	6	
Switch Phase									
Minimum Initial (s)	7.0	7.0	7.0	7.0	25.0	25.0	25.0	25.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	32.0	32.0	32.0	32.0	
Total Split (s)	21.0	21.0	21.0	21.0	35.0	35.0	35.0	35.0	
Total Split (%)	37.5%	37.5%	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%	
Yellow Time (s)	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0		0.0		0.0	
Total Lost Time (s)		6.0		6.0		7.0		7.0	
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	Мах	Max	Мах	Max	
v/c Ratio		0.43		0.49	-	0.76	-	0.68	
Control Delay		19.3		19.9		17.7		15.3	
Queue Delay		0.0		0.0		0.0		0.0	
Total Delay		19.3		19.9		17.7		15.3	
Queue Length 50th (m)		8.8		11.9		57.4		41.6	
Queue Length 95th (m)		20.5		25.4		#143.2		#111.4	
Internal Link Dist (m)		439.9		535.3		514.2		133.5	
Turn Bay Length (m)									
Base Capacity (vph)		446		508		1087		958	
Starvation Cap Reductn		0		0		0		0	
Spillback Cap Reductn		0		0		0		0	
Storage Cap Reductn		0		0		0		0	
Reduced v/c Ratio		0.29		0.33		0.76		0.68	
Intersection Summary									
Cycle Length: 56									
Actuated Cycle Length: 51.4									
Natural Cycle: 60									
Control Type: Semi Act-Unco	ord								
# 95th percentile volume ex	xceeds ca	pacity, qu	eue may	be longe	r.				
Queue shown is maximur	n after two	cycles.							
Splits and Phases: 6: Airpo	ort Rd (Co	unty Rd 1	8) & 10th	Sideroa	d/County	Rd 17			
1 m2	, , , , , , , , , , , , , , , , , , ,						4	14	
35 s							21 s		
-							+	10	
▼ 100							₹ 6	0	

Mansfield ResidentialHCM Signalized Intersection Capacity Analysis6: Airport Rd (County Rd 18) & 10th Sideroad/County Rd 17Total (2031) PM Peak Hour

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			\$			\$			\$	
Traffic Volume (vph)	43	46	26	33	78	38	41	610	73	65	485	21
Future Volume (vph)	43	46	26	33	78	38	41	610	73	65	485	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			7.0			7.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.97			0.97			0.99			1.00	
Flt Protected		0.98			0.99			1.00			0.99	
Satd. Flow (prot)		1695			1815			1817			1788	
Flt Permitted		0.85			0.91			0.94			0.84	
Satd. Flow (perm)		1463			1666			1709			1510	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	49	52	30	38	89	43	47	693	83	74	551	24
RTOR Reduction (vph)	0	22	0	0	25	0	0	6	0	0	2	0
Lane Group Flow (vph)	0	109	0	0	145	0	0	817	0	0	647	0
Heavy Vehicles (%)	5%	8%	7%	0%	0%	0%	0%	3%	3%	8%	5%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		8.5			8.5			31.1			31.1	
Effective Green, g (s)		8.5			8.5			31.1			31.1	
Actuated g/C Ratio		0.16			0.16			0.59			0.59	
Clearance Time (s)		6.0			6.0			7.0			7.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		236			269			1010			892	
v/s Ratio Prot												
v/s Ratio Perm		0.07			c0.09			c0.48			0.43	
v/c Ratio		0.46			0.54			0.81			0.73	
Uniform Delay, d1		20.0			20.2			8.4			7.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.4			2.1			7.0			5.1	
Delay (s)		21.4			22.3			15.4			12.8	
Level of Service		С			С			В			В	
Approach Delay (s)		21.4			22.3			15.4			12.8	
Approach LOS		С			С			В			В	
Intersection Summary												
HCM 2000 Control Delay			15.6	Н	CM 2000	Level of	Service		В			
HCM 2000 Volume to Capac	ity ratio		0.75									
Actuated Cycle Length (s)			52.6	S	um of los	t time (s)			13.0			
Intersection Capacity Utilizat	ion		70.2%	IC	U Level	of Service	)		С			
Analysis Period (min)			15									
c Critical Lane Group												

Mansfield Residential 7: Thomson Trail/Street C & County Rd 17

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			4			4	
Traffic Volume (veh/h)	17	121	30	9	112	8	18	0	5	5	0	9
Future Volume (Veh/h)	17	121	30	9	112	8	18	0	5	5	0	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	19	138	34	10	127	9	20	0	6	6	0	10
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	136			172			354	349	155	350	362	132
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	136			172			354	349	155	350	362	132
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			97	100	99	99	100	99
cM capacity (veh/h)	1448			1405			585	563	891	591	554	918
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	191	146	26	16								
Volume Left	19	10	20	6								
Volume Right	34	9	6	10								
cSH	1448	1405	635	760								
Volume to Capacity	0.01	0.01	0.04	0.02								
Queue Length 95th (m)	0.3	0.2	1.0	0.5								
Control Delay (s)	0.8	0.6	10.9	9.8								
Lane LOS	А	А	В	А								
Approach Delay (s)	0.8	0.6	10.9	9.8								
Approach LOS			В	А								
Intersection Summary												
Average Delay			1.8									
Intersection Capacity Utiliz	zation		23.2%	IC	CU Level o	of Service			А			
Analysis Period (min)			15									

## Mansfield Residential 1: Airport Rd (County Rd 18) & Street A

	✓	•	<b>†</b>	1	1	ŧ
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	¥		ĥ		-	র
Traffic Volume (veh/h)	11	2	677	17	4	562
Future Volume (Veh/h)	11	2	677	17	4	562
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)	12	2	736	18	4	611
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			158			
pX, platoon unblocked	0.68	0.68			0.68	
vC, conflicting volume	1364	745			754	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1300	391			405	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	90	100			99	
cM capacity (veh/h)	120	448			786	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	14	754	615			
Volume Left	12	0	4			
Volume Right	2	18	0			
cSH	135	1700	786			
Volume to Capacity	0.10	0.44	0.01			
Queue Length 95th (m)	2.7	0.0	0.1			
Control Delay (s)	34.8	0.0	0.1			
Lane LOS	D		А			
Approach Delay (s)	34.8	0.0	0.1			
Approach LOS	D					
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utili	zation		46.7%	IC	U Level o	of Service
Analysis Period (min)			15			

Mansfield Residential 2735528 Ontario Inc. JDE-21035 Date: February 2<sup>rd</sup>, 2024

# Appendix H – Sight Distance Drawings





The position of existing above ground and underground utilities and facilities are not necessarily shown on the drawings, and where shown, the accuracy of the position of such utilities and facilities is not guaranteed. Before starting work, the contractor shall confirm the exact location of all existing utilities and facilities, and shall assume all liability for damage to them

Drawings shall not be used for construction unless sealed and signed. All work to be performed in accordance with the Occupational Health & Safety Act 1990.

Any errors and/or omissions shall be reported to Pinestone Engineering Ltd. without delay.



<u>BENCHMARK</u> BM#1 TOP OF IRON BAR AT NORTH WEST CORNER OF THE SITE ELEV. 310.14 SEAL

DRAWN BY:	CHECKED BY:				NORTH ARROW	PROJECT:
C.A.	J.V.				-	
DESIGNED BY						
DESIGNED BT:						
J.V./C.A.						DRAWING:
SCALE:	DATE:				-	
HOR. 1:750	JAN 2024					
VER1. 1:150		NO. YY.MM.DD	REVISION	BY		

AIRPORT ROAD SIGHT LINE PROFILE 0.25m BELOW CENTRELINE ELEVATION



PP-2

DRAWING No.

20-11584B

PROJECT No. :