

Traffic Impact Study

**Osaca Subdivision, Northumberland
County**

D.M. Wills Project Number 22-11056



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**Prepared for:
Hillstreet Developments Inc.**

Summary of Revisions

Revision No.	Revision Title	Date of Release	Summary of Revisions
1	Final Report	November 16, 2022	Final Report Submitted
2	Final Report	October 25, 2023	County's comments addressed - Final Report Submitted

This report has been formatted considering the requirements of the Accessibility for Ontarians with Disabilities Act.

Executive Summary

D.M. Wills Associates Limited has been retained by Hillstreet Developments Inc. to prepare a Traffic Impact Study to support a proposed residential subdivision, which is located at 5868 County Road (CR) 65, Northumberland County.

The proposed development will consist of 50 dwelling units. Based on the characteristics of the development and the surrounding area, the study area included the entrances of the development on CR 65. One of these entrances is proposed to align with Mastwood Road forming a four-legged intersection.

This study reviews the development details and the existing traffic conditions of the study area including the investigation of the available traffic volumes and the anticipated residential growth (estimated to be approximately 97 residential dwelling units in addition to the dwelling units proposed in this application) within the Village of Osaca. Based on this review and the development details, a traffic operation analysis has been conducted using Synchro 12.0 to investigate the impact of the traffic generated from the proposed development on the study area. This analysis is carried out for the traffic condition with the consideration of the development impact. The analysis has covered the a.m. and p.m. peaks, as well as the current (i.e., 2022) and horizon years (i.e., 2027 and 2032) scenarios. The study reviews the need for auxiliary turn lanes at the entrance of the development on CR 65.

Assuming a full build-out, the development is anticipated to generate about 10 entering and 28 exiting trips during the a.m. peak, and 32 and 18 entering and exiting trips during the p.m. peak, respectively. Based on the analysis, there is no impact of the development on the traffic operation of CR 65 at the entrances of the development including the intersection of CR 65 with Mastwood Road. The Level of Service (LOS) within the study area remains the same before and after considering the impact of the development for all the scenarios and it will operate consistently at LOS "A" or "B". These LOS levels reflect that the intersection of CR 65 and Mastwood Road/ Development Entrance will operate at acceptable traffic operation levels. For auxiliary lanes warrant analysis, the results of the current and the horizon years show that there will be no need for any additional auxiliary lanes on the northbound or the southbound approaches at the entrance(s) of the development.

Also, the sight distance and visibility requirements have been reviewed during a field visit. Our team has also conducted a review of the existing visibility at the intersection of CR 65 with Bells Hill Road and 6th Line. The visibility investigation showed that the existing posted speed limit in the area (60 km/hr) does not fulfill the sight distances at both intersections of CR 65 with Bells Hill Road and 6th Line. **Regardless of the development, the adequate posted speed limit should be 40 km/hr** for the following reasons:

- The significant growth that is anticipated to happen within the Village of Osaca with about 97 residential units in addition to 50 proposed residential units supported by this study (a total of 147 new residential units). This will increase the amount of traffic using CR 65 as discussed in this report.

- The active transportation traffic, which will likely share the road with the vehicular traffic, will increase.
- The sight distances at Bells Hill Road and 6th Line do not meet the requirements.

For the development entrances, according to the Transportation Association of Canada (TAC) Geometric Design Guide, the review indicated that there is sufficient visibility for both sides (i.e., east, and west) at the south entrance of the development on CR 65. On the other hand, to fulfill the sight distance requirements at the north entrance and proactively enhance traffic safety in this area, the following should be considered:

- Maintain a lateral clearance (25 m) from the centerline of the curve's inner lane regardless of the development. Within this lateral clearance, any vegetation, hill, landscaping, parking, fencing, etc. should be removed to ensure no line-of-sight obstruction exists as shown in figure 3.2.10 in the TAC.
- Reduce the posted speed limit within this area to 40 km/hr, which is already warranted due to the existing characteristics of this section of CR 65 and the anticipated growth within the village as discussed.

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1.0 Introduction and Background

D.M. Wills Associates Limited (Wills) has been retained by Hillstreet Developments Inc. to undertake a Traffic Impact Study (TIS) to support a proposed residential subdivision, which is located at 5868 County Road (CR) 65, Northumberland County (County).

The purpose of this TIS Report is to assess the impact of the proposed residential subdivision on traffic operations of CR 65 for future conditions, as well as to examine the need for auxiliary lanes at the entrance of the proposed development on CR 65. This study will assess the traffic operations in terms of the Level of Service (LOS) at the intersection of development entrance/Mastwood Road and CR 65. Therefore, the study area is defined here to include this intersection with its current geometry (T-intersection) and its proposed geometry of a four-legged intersection after the construction of the internal road of the subdivision.

The land, where the subdivision is proposed, is currently undeveloped. The proposed development is located on the west side of CR 65. The lands surrounding the proposed development are a mix of rural residential homes and farmlands. An aerial photo sketching the location plan of the proposed development is included in **Appendix A**.

The proposed development is planned to include 59 residential dwelling units as shown in **Appendix B**. The proposed development will directly access CR 65 which will align with Mastwood Road and will have another access to CR 65 north of the subdivision as shown in the conceptual site plan, which is included in **Appendix B**.

2.0 Background Traffic Analysis

2.1 Roadway Existing Conditions

Within the study area, CR 65 has a two-way two-lane rural cross-section with no shoulders and ditches on both sides of the road. The speed limit on CR 65 at the intersection with Mastwood Road is 80 km/hr; however, the speed limit is dropped to 60 km/hr close to the north of the development and before the horizontal curves on CR 65.

2.2 Existing and Future Background Traffic Conditions

This study uses the traffic counts that were collected by Ontario Traffic Inc. on June 23, 2022, at the intersections of CR 65 and Mastwood Road. The traffic counts collected at this intersection are included in **Appendix C**.

Based on the traffic data, the a.m. peak hour is identified between 7:15 a.m. and 8:15 a.m., while the p.m. peak hour occurs between 3:30 p.m. and 4:30 p.m. To obtain traffic volumes for the horizon years 2027 and 2032, the future traffic counts were estimated using an annual growth rate of 2%. This assumed annual growth rate is estimated to be

consistent with the traffic growth discussed in the Northumberland County Transportation Master Plan (NCTMP) in Tables 2.4 and 3.1.

Since the counts were collected during the summer, there is no need to apply a seasonal factor. However, the County has provided traffic data for CR 65 that was collected in 2018 and the AADT was 900 veh/day. To adjust the data recently collected with the County's records, the following assumptions were taken into consideration:

- Based on a 2% annual traffic growth rate, the anticipated AADT in 2022 is 974 veh/day.
- Based on the data provided by the County, the percentage of p.m. peak hour volume to the daily traffic count on Thursday is about 9.6%. The same percentage is assumed for the 2022 AADT. Accordingly, the p.m. peak hour traffic volume (for both directions) is about 94 veh/hr.
- Based on the 2022 traffic count, the p.m. peak hour is 61 veh/hr. Hence, the adjustment factor is estimated to be 1.53, which is the ratio between the traffic based on AADT calculations (94 veh/hr) and the collected traffic (61 veh/hr).

The collected traffic volumes during the peak hours and the adjusted volumes for the current year and horizon years are summarized in **Table 1**.

Table 1 - Estimated Current and Anticipated Background Traffic Volumes at the Intersection of CR 65 and Mastwood Road

	WBL	WBR	NBT	NBR	SBL	SBT
a.m. Peak Hour						
2022 (Current)	0	2	12	0	1	23
2022 (Adjusted)	0	3	18	0	2	35
2027	0	3	20	0	2	39
2032	0	4	22	0	2	43
p.m. Peak Hour						
2022 (Current)	4	2	31	2	0	22
2022 (Adjusted)	6	3	48	3	0	34
2027	7	3	52	3	0	37
2032	7	4	58	4	0	41

In addition to the existing traffic volumes growth, the planned/approved/in process development applications within the study area should be considered. Based on our discussion with the client, it is anticipated that a total of approximately 97 residential dwelling units will be built within the Village of Osaca. These units are anticipated to be part of multiple subdivision applications on CR 65. However, it is not available to our team at the moment whether some or all of these subdivisions will have direct access to CR 65.

The estimation of trips generated by these developments was derived from the *Trip Generation Manual, 11th Edition*¹, published by the Institute of Transportation Engineers (ITE). The ITE code of the land use, which closely describes the development, and the corresponding trip generation rates are shown in **Table 2**. Also, the table shows the average trip generation rates for this land use for both the a.m. and the p.m. peaks and the percentages of entering and exiting. Also, the ITE Manual provides equations to estimate the trips generated by this use. Given that the R-squared values for the equations are very high, the use of the equations will be warranted. These equations are as follows:

For a.m. peak hour: $T = 0.71(X) + 7.23$

For p.m. peak hour: $\ln(T) = 0.93 \ln(X) + 0.36$

where T is the trips generated and X is the number of dwelling units.

Table 2 - Trip Generation Rates during a.m. and p.m. Peak Hours of Generator

Land Use	ITE Code	a.m. Peak			p.m. Peak		
		Avg. Rate	Entering	Exiting	Avg. Rate	Entering	Exiting
Single detached dwelling unit	210	0.75	26%	74%	0.99	64%	36%

The trip generation equations provided by the ITE Manual for the peak hours of the generator (i.e., anticipated dwelling units) were used. Accordingly, the number of trips generated from these dwelling units can be estimated as shown in **Table 3**.

Table 3 - The Estimated Entering and Exiting Trips during a.m. and p.m. Peak Hours of Generator

Land Use	Number of Dwelling units	a.m. Peak			p.m. Peak		
		Avg. Rate	Entering	Exiting	Avg. Rate	Entering	Exiting
Single detached dwelling unit	97	76	20	56	101	65	36
Total		76	20	56	101	65	36

¹ Trip Generation Manual, Vol. 1, 2, and 3, 11th ed. ITE, Washington, D.C., 2021.

These trips are distributed based on the existing traffic pattern as presented in **Table 1**. The distribution ratios are shown in **Table 4** and the traffic added to the existing traffic conditions is shown in **Table 5**.

Table 4 - Trip Distribution Ratios North of the Intersection of CR 65 and Mastwood Road

Traffic Direction	AM Peak Hour	
	Volume	Ratio
Northbound Traffic	14	0.368
Southbound Traffic	24	0.632
Traffic Direction	PM Peak Hour	
	Volume	Ratio
Northbound Traffic	33	0.600
Southbound Traffic	22	0.400

Table 5 – Traffic Added to the Network due to the Anticipated Developments

	NBT	SBT
a.m. Peak	7	36
p.m. Peak	39	15

Based on the existing traffic conditions and assuming that the anticipated developments will generate the same amount of traffic over the study horizon, the total background traffic is summarized in **Table 6**.

Table 6 - Total Background Traffic Volumes at the Intersection of CR 65 and Mastwood Road

	WBL	WBR	NBT	NBR	SBL	SBT
a.m. Peak Hour						
2022	0	3	26	0	2	71
2027	0	3	28	0	2	74
2032	0	4	30	0	2	79
p.m. Peak Hour						
2022	6	3	86	3	0	48
2027	7	3	91	3	0	52
2032	7	4	97	4	0	56

2.3 Existing and Future Background Traffic Operation

Synchro 12 software is used to review the existing and future traffic operation of the study area without the development (i.e., background traffic conditions). Traffic operations were investigated for the total background traffic conditions of 2022, and the horizon years 2027 and 2032 as presented in **Table 6**. The Level of Service (LOS) results of the existing and future scenarios without the development impact (i.e., background traffic volumes) as well as the volume-to-capacity ratio (v/c ratio) are shown in **Table 7**. More details about the LOS definition and Synchro model results for these scenarios are presented in **Appendix D** and **Appendix E**, respectively.

Table 7 - LOS and v/c ratio at the intersection of CR 65 and Mastwood Road based on the Total Background Traffic Condition

	WB	NB	SBL
a.m. Peak Hour			
2022 (Adjusted)	A	-	A
2027	A	-	A
2032	A	-	A
p.m. Peak Hour			
2022 (Adjusted)	A	-	A
2027	A	-	A
2032	A	-	A

As shown in **Table 7**, the LOS's at the intersection of CR 65 and Mastwood Road are maintained over the study horizon at LOS "A". This reflects a smooth operation of the background traffic at this intersection.

3.0 Traffic Operation Conditions with the Development Consideration

3.1 Trip Generation

The estimation of trips generated by the proposed development was derived from the ITE Manual. The ITE code of the land use, which closely describes the development, and the corresponding trip generation rates are shown in **Table 2**. Also, the table shows the average trip generation rates for this land use for both the a.m. and the p.m. peaks and the percentages of entering and exiting. Also, the ITE Manual provides equations to estimate the trips generated by this use as discussed above.

The trip generation equations provided by the ITE Manual for the peak hours of the generator (i.e., anticipated dwelling units) were used. Accordingly, the number of trips generated from these dwelling units can be estimated as shown in **Table 8**.

Table 8 - The Estimated Entering and Exiting Trips during a.m. and p.m. Peak Hours of Generator

Land Use	Number of Dwelling units	a.m. Peak			p.m. Peak		
		Avg. Rate	Entering	Exiting	Avg. Rate	Entering	Exiting
Single detached dwelling unit	50	38	10	28	50	32	18
Total		38	10	28	50	32	18

3.2 Trip Distribution

Based on the existing turning movement ratios on CR 65, the trips generated from the development are distributed as shown in **Table 9**.

Table 9 - Trip Distribution Ratios at the Intersection of CR 65 and Mastwood Road

Traffic Direction	AM Peak Hour	
	Volume	Ratio
Northbound Traffic	12	0.316
Southbound Traffic	24	0.632
Westbound Traffic	2	0.053
Traffic Direction	PM Peak Hour	
	Volume	Ratio
Northbound Traffic	33	0.541
Southbound Traffic	22	0.361
Westbound Traffic	6	0.098

Based on the ratios in **Table 9** and the number of trips generated by the development shown in **Table 8**, the trip distribution at the entrance of the development is presented in **Table 10**.

Table 10 - The Turning Movement Volumes Added to the Intersection of CR 65 and Mastwood Road due to the Development Impact

Peak Hour	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
a.m.	9	1	18	0	1	0	3	0	0	0	0	6
p.m.	10	2	6	0	3	0	17	0	0	0	0	11

It is worth mentioning that the trip generated from the development will not increase over the horizon years since there is no expansion anticipated within the development.

The volumes reported in **Table 10** are then added to the total background traffic to further investigate the impact of the development on the traffic operation. The updated traffic volumes (rounded) at the entrance of the development with the consideration of the development are in **Table 11**.

Table 11 - Estimated Future Traffic Volumes with the Development Consideration at the Intersection of CR 65 and Mastwood Road

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
a.m. Peak Hour												
2022	9	1	18	0	1	3	3	26	0	2	71	6
2027	9	1	18	0	1	3	3	28	0	2	74	6
2032	9	1	18	0	1	4	3	30	0	2	79	6
p.m. Peak Hour												
2022	10	2	6	6	3	3	17	86	3	0	48	11
2027	10	2	6	7	3	3	17	91	3	0	52	11
2032	10	2	6	7	3	4	17	97	4	0	56	11

3.3 Existing and Future Traffic Operation with the Development Consideration

Again, Synchro 12 software was used to model the traffic within the study area. The model aims at assessing the traffic operation within the study area including the intersection of CR 65 and Mastwood Road. Different scenarios with the consideration of the traffic generated from the development were assessed including the adjusted 2022 scenario and the horizon years (2027 and 2032) for both a.m. and p.m. peak hours. The traffic volumes used in this assessment are summarized in **Table 11**. The results summary is presented in **Table 12**. The LOS definitions and the details of the simulation models and full results (i.e., volume to capacity ratio, queue length, delay, etc.) can be found in **Appendix E** and **Appendix F**, respectively.

Based on the traffic operation performance for the traffic with the development consideration, the traffic operation performance measure (i.e., LOS) at the intersection of CR 65 and Mastwood Road is consistently at LOS "A" over the study period for the a.m. peak hour. For the p.m. peak hour, the LOSs are anticipated to slightly drop to LOS "B", which is still acceptable. This reflects that the development will not have any significant impact on the traffic operation in this area of CR 65 as shown in the table below.

**Table 12 - LOS at the Intersection of CR 65 and Mastwood Road
based on Future Traffic Condition with the Development Consideration**

	EB	WB	NBL	SBL
a.m. Peak Hour				
2022 (Adjusted)	A	A	A	A
2027	A	A	A	A
2032	A	A	A	A
p.m. Peak Hour				
2022 (Adjusted)	A	B	A	A
2027	A	B	A	A
2032	B	B	A	A

In summary, the proposed development will have no impact on the traffic operation in terms of LOS within the study area on CR 65 at the development entrances.

4.0 Warrants for Auxiliary Lanes with Proposed Development

The warrants for auxiliary lanes were examined on CR 65 at the proposed entrance of the development in accordance with Appendix 9A of MTO's *Design Supplement for the 2017 Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads*².

The need for a left-turn lane at an unsignalized intersection (i.e., at the intersection of CR 65 and Mastwood Road) as established by the Design Supplement, Chapter 9A is based on the advancing traffic volume (V_A), the opposing traffic volume (V_O), the left-turning traffic volume (V_L), and the percentage of left-turning traffic in the advancing volume (LT%). As shown in **Table 11**, the southbound left turning traffic is significantly low (less than 5 vph), therefore, there is no need for a left turn lane and the warrant analysis is not carried out for this approach. For the northbound left-turn lane and as shown in **Table 13**, the left-turning volumes range from 3 to 17 vph in all the peak hours for the current and the horizon years. Based on the percentages shown in the table and for the 10% and 15% left-turning volume percentage charts in the design supplement, a left-turn lane installation on CR 65 at the intersection of CR 65 and Mastwood Road is not warranted for the highest anticipated traffic levels in 2032, as shown in **Appendix G**. It is assumed that the design speed is 80 km/h. This design speed is 20 km/h above the existing posted speed limit, which is 60 km/h within the study area.

² Transportation Association of Canada (TAC). *Geometric Design Guide for Canadian Roads: Design Controls, Classification and Consistency*. Transportation Association of Canada, 2017.

**Table 13 - Left Turning Volume Calculations
at the Intersection of CR 65 and Mastwood Road/Development Entrance**

	V _L	V _A	LT%	V _O
a.m. Peak				
2022 (Adjusted)	3	29	11%	79
2027	3	31	10%	82
2032	3	33	9%	87
p.m. Peak				
2022 (Adjusted)	17	106	16%	60
2027	17	112	15%	63
2032	17	118	15%	67

For the right turn lanes, the TAC Manual specifies that right turn lanes should be considered “when the volume of decelerating or accelerating vehicles compared with through traffic volumes causes undue hazard.” For the entrances of the proposed development, the southbound right-turn volume is low, which is 6 vph and 11 vph during the AM and PM Peak hours, respectively. These volumes are not anticipated to impede the through movement traffic, which is relatively low as well, at the intersection of CR 65 and Mastwood Road/development entrance.

5.0 Sight Lines Review

5.1 At the Development Entrance

A site visit was conducted on Friday, September 2, 2022, to check the sight lines at the proposed entrance of the development.

Given an environmental constraint, a north entrance is proposed for the north part of the subdivision which is anticipated to accommodate four dwelling units of the total 59 dwelling units. Due to the geometric characteristics of CR 65 at the north of the subdivision, the sight distance assessment includes two components; the first is related to the sight distances at the entrance, and the second component is related to sight distances on the horizontal curves (desktop review).

For the first component, the location of the entrance was explored in the field to find an entrance location that can fulfill the sight distance requirements of the TAC. According to the TAC Geometric Design Guide for Canadian Roads (June 2017) and in conjunction with the latest “MTO Design Supplement For TAC Geometric Design Guide for Canadian Roads – April 2020” (MTO DS), the required sight distances for a left turn from stop and right turn from stop are 170 m and 145 m, respectively, for a design speed of 80 km/hr, which is 20 km/hr above the 60 km/hr posted speed limit within the

area of the north entrance. During the field visit, a location of an entrance was selected to obtain the best sight distance, given the existing condition of dense vegetation and the alignment of CR 65. The location of the entrance being investigated in the field is shown in **Figure 1**.

Figure 1 - Approximate Location of the North Entrance



(For illustration purposes only and not to scale)

At this location, the available sight distances are 125 m and 120 m to the south of the entrance location and the north, respectively. Based on the existing posted speed limit (60 km/hr), these available sight distances will not fulfill the TAC requirements for sight distance. However, if the posted speed limit is lowered in this area to 40 km/hr, the required sight distance is 105 m for a design speed of 50 km/hr (assuming 10 km/hr above the speed limit for lower speed limits). This means that the sight distance at this entrance location will be fulfilled. Given the dense vegetation that existed during the field visit as shown in **Figure 2**, it is anticipated that the sight distance may improve if the vegetation was removed/treated. The measurement of the sight lines assumed both the driver's eye and the object to be seen are 1.08 m above the roadway surface.

Figure 2 - Pictures Taken in the Field at the Proposed Entrance Location on CR 65



Heading north on CR 65

Heading south on CR 65

For the second component, a minimum distance of lateral clearance on horizontal curves should be fulfilled to ensure a sufficient sight distance is available for vehicles traveling through the curve as indicated in the TAC in **Figure 3.2.10**. The required lateral clearance calculations were conducted based on equation 3.2.23 in the TAC. Given a design speed of 80 km/hr for a posted speed limit of 60 km/hr and about 80 m radius for the horizontal curve, the lateral clearance is estimated to be about 25 m. This lateral clearance is measured from the centreline of the inside lane of the curve and towards the subdivision. Within this lateral clearance, any sight obstruction should be removed including vegetation and the hill should be graded. In the future after the full build-out of the subdivision, no fences, no landscaping, nor parking should be allowed within this lateral clearance. If the speed limit is lowered in this section the lateral clearance can be reduced.

For the south entrance, the available sight distance extends beyond 210 m, which is the design sight distance for 100 km/hr design speed as in Table 9.9.4 in the TAC Geometric Design Guide for Canadian Roads (June 2017) and in conjunction with the latest "MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads – April 2020" (MTO DS). It is assumed that the design speed is 100 km/h, which is 20 km/h above the existing 80 km/hr posted speed limit. This available sight distance is at a proposed south entrance that aligns with Mastwood Road.

5.2 At 6th Line

During the field visit in 2022, it was noticed that the geometric characteristics and both the horizontal and vertical alignments of the area shown in **Figure 3** may cause traffic

safety issues with the existing speed limits. Therefore, it is recommended that the County review the speed limits within the shaded area as shown in the figure.

Figure 3 - Recommended Speed Limit Review Area



To support this recommendation, additional site visit was conducted on October 4, 2023 to investigate the sight distances at the intersection of 6th Line and CR 65. The sight distance observations were taken at 6th Line at both locations 1 and 2 highlighted in **Figure 3**. **Figure 4** shows pictures taken at locations 1 and 2 during the field visit. The observations showed that the sight distances at both locations are not met at design speed of 70 km/hr (for a posted speed limit of 60 km/hr) and based on the object and driver's eye heights mentioned before. The available sight distance for location one and looking to the left (north) is approximately 111 m. For location 2 and looking to the right (south), the available sight distance is approximately 106 m. These available sight distances for both locations **do not meet the sight distance for a posted speed of 60 km/hr nor 50 km/hr** (which corresponds to a design speed of 70 km/hr and 60 km/hr, respectively). Therefore, the County should consider the reduction of the speed limit to meet the sight distance requirements as required by the TAC design guide. More sight distance observations were collected as well at the intersection of Bells Hill Road and CR 65 as shown in **Figure 5**. The results showed that the available sight distance to the south/east is 140 m which means the sight distance requirements are not met based on the existing posted speed limit of 60 km/hr (assuming the design speed is 70 km/hr) and following the same procedure as discussed above.

Based on the discussion above, **the adequate posted speed limit for this section is 40 km/hr (assuming a design speed of 50 km/hr) regardless of the development.** This recommendation is based on the sight distance evaluation only.

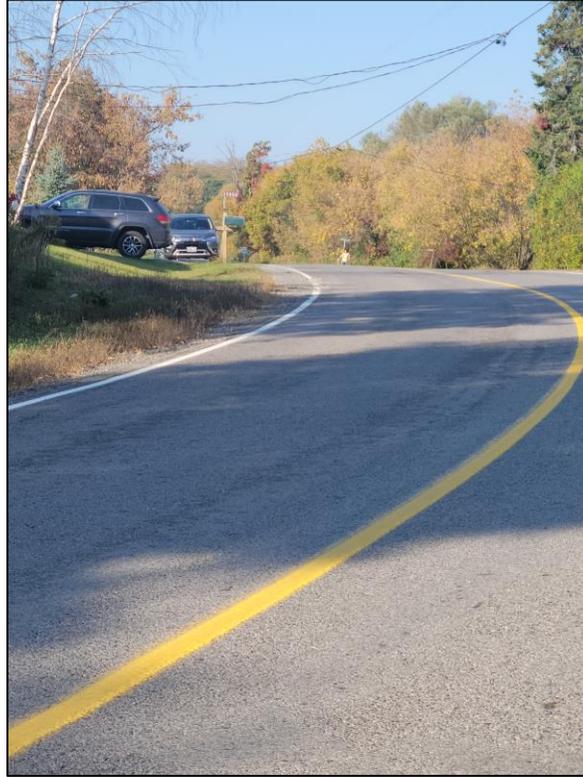
Figure 4 – Pictures at Location 1 and 2 on CR 65



Location 1

Location 2

Figure 5 – A Picture at 140 m to the South/East and Looking Towards Bells Hill Road



6.0 Conclusions and Recommendations

This Traffic Impact Study investigates and evaluates the impact of the proposed subdivision on CR 65 in Osaca, Northumberland County. The background traffic operation and the traffic operation with the consideration of the traffic generated from the development at the intersection within the study area were assessed.

Based on the analysis completed in this study, the new trips generated by the development will have no impact on CR 65 at the entrances of the development in the existing or future scenarios. The LOS with the consideration of the development will remain at LOS "A" on CR 65 and will drop slightly to LOS "B" on Mastwood Road for all the scenarios, which reflect a smooth traffic operation in the area.

Additionally, this study examines the need for auxiliary turn lanes at the entrance of the development. The results show that there is no need for any right-turn or left-turn lanes at the entrance of the development on CR 65.

Also, the sight distance and visibility requirements have been reviewed during a field visit to the development location. According to the TAC Manual, the review indicated that there is a traffic safety concern within the area due to the geometric characteristics. Therefore, a speed limit review should be carried out for this entire section. Based on the sight distance measurements that were carried out in the field,

the sight distance requirements at Bells Hill Road and 6th Line on CR 65 are not met based on the existing posted speed limit (60 km/hr). **Regardless of the development, the adequate posted speed limit should be 40 km/hr** for the following reasons:

- The significant growth that is anticipated to happen within the Village of Osaca with about 97 residential units in addition to 50 proposed residential units supported by this study (total of 147 new residential units). This will increase the amount of traffic using CR 65 as discussed in this report.
- The active transportation traffic will increase in addition to the vehicular traffic.
- The sight distances at Bells Hill Road and 6th Line do not meet the requirements.

For the north entrance of the development, the existing site condition will not fulfill the sight distance either for the horizontal curve or for a proposed entrance as required by the TAC. Therefore, to fulfill the sight distance requirements and proactively enhance traffic safety in this area, the following should be considered:

- Maintain a lateral clearance for the inside of the horizontal curve regardless of the development. Within this lateral clearance, any vegetation, hill, landscaping, parking, fencing, etc. should be removed to ensure no line-of-sight obstruction exists as shown in figure 3.2.10 in the TAC.
- Reduce the posted speed limit within this area to 40 km/hr, which is already warranted due to the existing characteristics of this section of CR 65 and the anticipated growth within the village as discussed.

It is anticipated that the entrance of the development will be constructed according to Northumberland County's requirements.

Respectfully Submitted,



Mostafa Tawfeek Mohammed, Ph.D., P.Eng., PTOE, RSP1
Senior Traffic Engineer

MT/af

Appendix A

Location Plan



Figure A – Location Plan

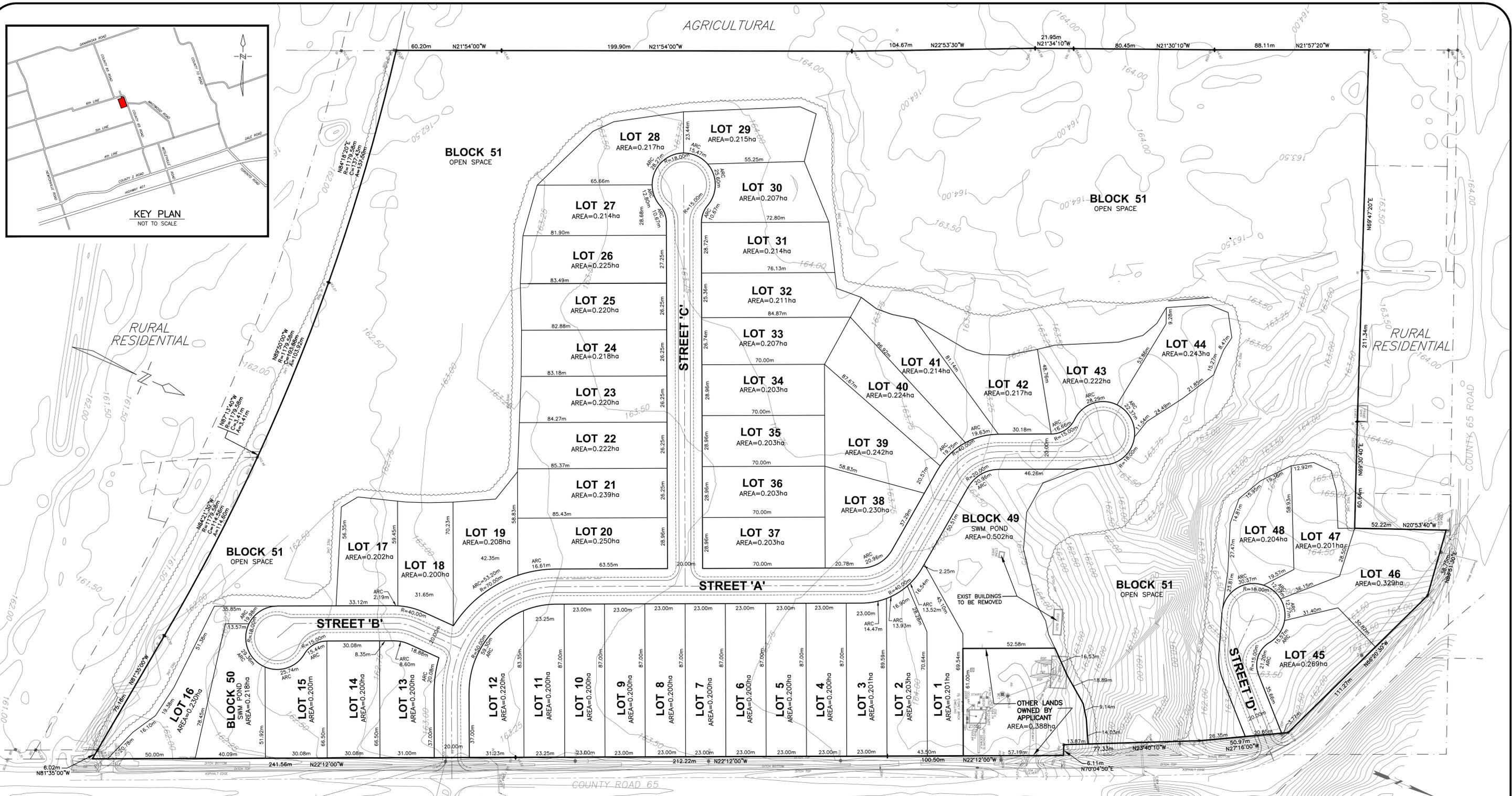


*For illustration purposes only. Not to scale.

Appendix B

Conceptual Site Plan





LAND USE SCHEDULE				
PROPOSED USE	LOT/BLK #	# OF LOTS/BLKS	# OF UNITS	AREA (ha)
LOW DENSITY RESIDENTIAL SINGLE DETACHED	LOTS 1 - 48	48	48	10.349
NON RESIDENTIAL				
SWM PONDS	BLOCK 49,50	2		0.720
OPEN SPACE	BLOCK 51	1		11.520
ROADS	20.0m ROW			2.034
TOTALS		51	48	24.623

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT				
a) AS SHOWN ON THE DRAFT PLAN	g) AS SHOWN ON THE DRAFT PLAN			
b) AS SHOWN ON THE DRAFT PLAN	h) WELL AND SEPTIC			
c) AS SHOWN ON THE DRAFT PLAN	i) SAND AND SANDY SILT			
d) SEE LAND USE SCHEDULE	j) AS SHOWN ON THE DRAFT PLAN			
e) AS SHOWN ON THE DRAFT PLAN	k) PRIVATE WELL			
f) AS SHOWN ON THE DRAFT PLAN	l) AS SHOWN ON THE DRAFT PLAN			
f.1) NOT APPLICABLE				
No.	REVISION	DATE	BY	APPROVED

OWNER'S AUTHORIZATION
I/WE LAND OWNER BEING THE REGISTERED OWNER OF THE SUBJECT LANDS HEREBY AUTHORIZE D.G.BIDDLE AND ASSOC. LTD. TO PREPARE AND SUBMIT A DRAFT PLAN OF SUBDIVISION FOR APPROVAL
SIGNED _____ TITLE _____ DATE _____

SURVEYOR'S CERTIFICATE
I HEREBY CERTIFY THAT THE BOUNDARY OF THE LANDS TO BE SUBDIVIDED AS SHOWN ON THIS PLAN AND THEIR RELATIONSHIP TO ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN
ONTARIO LAND SURVEYOR ONTARIO LAND SURVEYORS
SIGNED _____ O.L.S. DATE _____

PRELIMINARY
DRAFT PLAN
PART OF LOT 27, CONCESSION 5
FORMERLY IN THE TOWNSHIP OF HOPE
NOW IN THE
MUNICIPALITY OF PORT HOPE
COUNTY OF NORTHUMBERLAND

SCALE: 1:1000
 DRAWN BY: B.B.
 DESIGN BY: M.F.
 CHECKED BY: M.F.
 PLOT DATE: 15/10/2023

122049

DP-1

D.G. Biddle & Associates Limited
consulting engineers and planners
96 KING STREET EAST, OSHAWA, ON L1H 1B6
PHONE (905) 576-8500 • FAX (905) 576-9730
info@dgbiddle.com

X:\STAFF\JOB FILES\122049\122049 DRAWINGS\122049-2023\003-DRAFT PLAN.DWG

Appendix C

Traffic Data





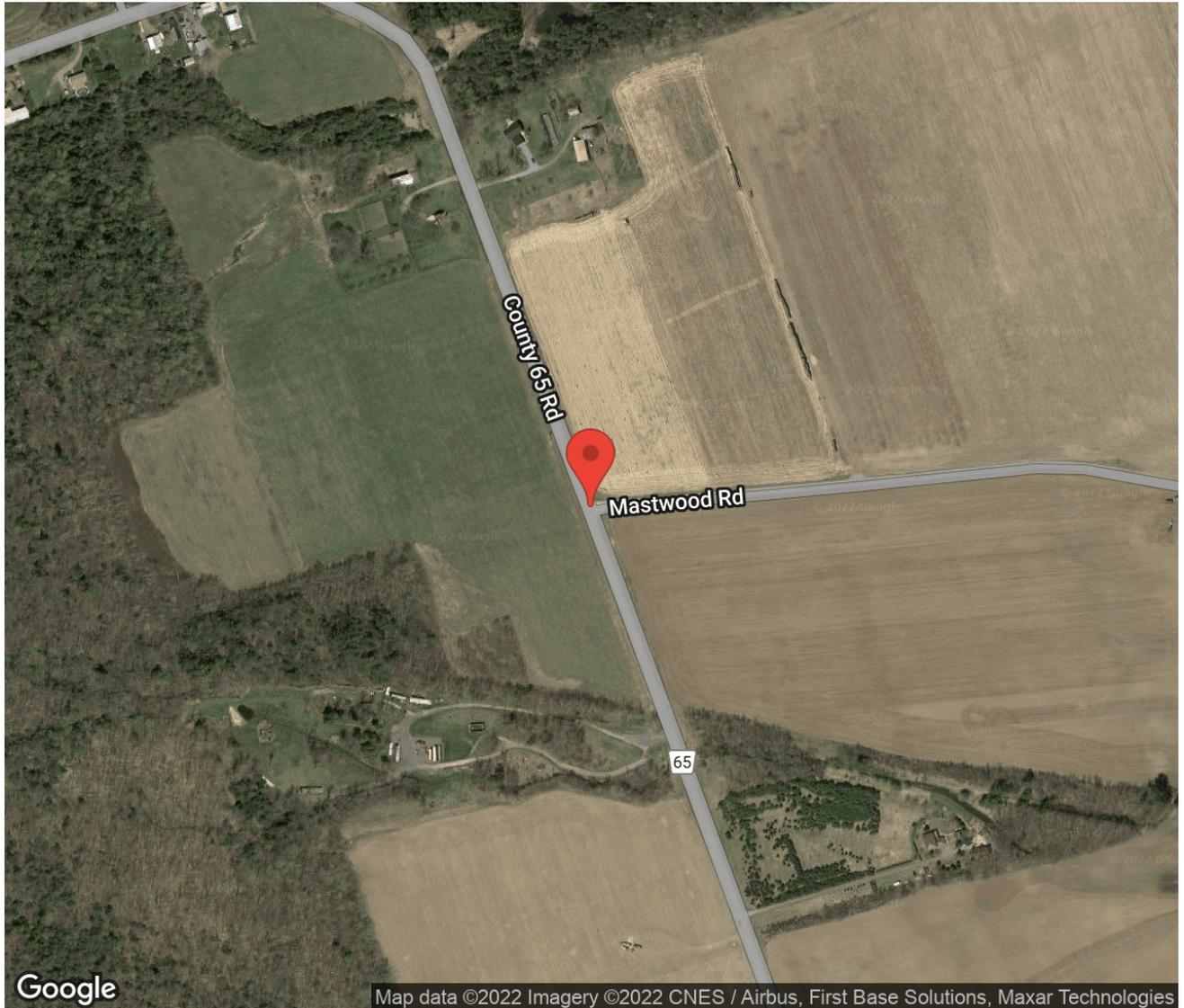
Project #22-211 - D.M. Wills Associates

Intersection Count Report

Intersection: CR 65 & Mastwood Rd
Municipality: Port Hope
Count Date: Thursday, Jun 23, 2022
Site Code: 2221100001
Count Categories: Cars, Trucks, Bicycles, Pedestrians
Count Period: 07:00-18:00
Weather: Clear
Comments:

Traffic Count Map

Intersection: CR 65 & Mastwood Rd
Site Code: 2221100001
Municipality: Port Hope
Count Date: Jun 23, 2022



Traffic Count Summary

Intersection: CR 65 & Mastwood Rd
 Site Code: 2221100001
 Municipality: Port Hope
 Count Date: Jun 23, 2022

CR 65 - Traffic Summary

Hour	North Approach Totals						South Approach Totals						Total
	Includes Cars, Trucks, Bicycles						Includes Cars, Trucks, Bicycles						
	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	
07:00 - 08:00	1	24	0	0	25	0	0	10	0	0	10	0	35
08:00 - 09:00	0	19	0	0	19	0	0	10	0	0	10	0	29
09:00 - 10:00	0	13	0	0	13	0	0	12	1	0	13	0	26
10:00 - 11:00	0	16	0	0	16	0	0	13	1	0	14	0	30
11:00 - 12:00	2	13	0	0	15	0	0	16	1	0	17	0	32
12:00 - 13:00	0	5	0	0	5	0	0	6	3	0	9	0	14
13:00 - 14:00	0	18	0	0	18	0	0	11	0	0	11	0	29
14:00 - 15:00	1	14	0	0	15	0	0	19	3	0	22	0	37
15:00 - 16:00	0	7	0	0	7	0	0	5	2	0	7	0	14
16:00 - 17:00	0	22	0	0	22	0	0	31	2	0	33	0	55
17:00 - 18:00	4	16	0	0	20	0	0	24	1	0	25	0	45
GRAND TOTAL	8	167	0	0	175	0	0	157	14	0	171	0	346



Traffic Count Data

Intersection: CR 65 & Mastwood Rd
 Site Code: 2221100001
 Municipality: Port Hope
 Count Date: Jun 23, 2022

North Approach - CR 65

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
07:00	0	7	0	0	7	0	0	0	0	0	0	0	0	0	0	0
07:15	0	7	0	0	7	0	0	0	0	0	0	0	0	0	0	0
07:30	0	5	0	0	5	0	1	0	0	1	0	0	0	0	0	0
07:45	1	3	0	0	4	0	1	0	0	1	0	0	0	0	0	0
08:00	0	5	0	0	5	0	1	0	0	1	0	0	0	0	0	0
08:15	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0
08:30	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0
08:45	0	7	0	0	7	0	0	0	0	0	0	0	0	0	0	0
09:00	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0
09:15	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0
09:30	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0
09:45	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0
10:00	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0
10:15	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0
10:30	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0
10:45	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0
11:00	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0
11:15	2	3	0	0	5	0	0	0	0	0	0	0	0	0	0	0
11:30	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0
11:45	0	2	0	0	2	0	1	0	0	1	0	0	0	0	0	0

Start Time	Cars					Trucks					Bicycles					Total Peds
	↶	↑	↷	↶	Total	↶	↑	↷	↶	Total	↶	↑	↷	↶	Total	
12:00	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
12:15	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
12:30	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0
12:45	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
13:00	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0
13:15	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0
13:30	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0
13:45	0	6	0	0	6	0	0	0	0	0	0	0	0	0	0	0
14:00	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0
14:15	1	4	0	0	5	0	0	0	0	0	0	0	0	0	0	0
14:30	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0
14:45	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0
15:00	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0
15:15	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
15:30	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
15:45	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0
16:00	0	8	0	0	8	0	0	0	0	0	0	0	0	0	0	0
16:15	0	7	0	0	7	0	0	0	0	0	0	0	0	0	0	0
16:30	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0
16:45	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0
17:00	1	4	0	0	5	0	0	0	0	0	0	0	0	0	0	0
17:15	1	5	0	0	6	0	0	0	0	0	0	0	0	0	0	0
17:30	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0
17:45	2	4	0	0	6	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	8	163	0	0	171	0	4	0	0	4	0	0	0	0	0	0
GRAND TOTAL	8	163	0	0	171	0	4	0	0	4	0	0	0	0	0	0

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
12:00	0	1	2	0	3	0	0	0	0	0	0	0	0	0	0	0
12:15	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0
12:30	0	2	1	0	3	0	0	0	0	0	0	0	0	0	0	0
12:45	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
13:00	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
13:15	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0
13:30	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0
13:45	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0
14:00	0	7	0	0	7	0	2	0	0	2	0	0	0	0	0	0
14:15	0	2	1	0	3	0	0	0	0	0	0	0	0	0	0	0
14:30	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0
14:45	0	4	2	0	6	0	0	0	0	0	0	0	0	0	0	0
15:00	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0
15:15	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
15:30	0	2	1	0	3	0	0	0	0	0	0	0	0	0	0	0
15:45	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
16:00	0	3	0	0	3	0	1	0	0	1	0	0	0	0	0	0
16:15	0	11	0	0	11	0	1	0	0	1	0	0	0	0	0	0
16:30	0	8	1	0	9	0	0	0	0	0	0	0	0	0	0	0
16:45	0	6	1	0	7	0	1	0	0	1	0	0	0	0	0	0
17:00	0	6	0	0	6	0	0	0	0	0	0	0	0	0	0	0
17:15	0	5	1	0	6	0	0	0	0	0	0	0	0	0	0	0
17:30	0	7	0	0	7	0	1	0	0	1	0	0	0	0	0	0
17:45	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	0	148	14	0	162	0	9	0	0	9	0	0	0	0	0	0
GRAND TOTAL	0	148	14	0	162	0	9	0	0	9	0	0	0	0	0	0

Peak Hour Diagram

Specified Period

From: 07:00:00
To: 10:00:00

One Hour Peak

From: 07:15:00
To: 08:15:00

Intersection: CR 65 & Mastwood Rd
Site Code: 2221100001
Count Date: Jun 23, 2022

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: CR 65 runs N/S

North Approach

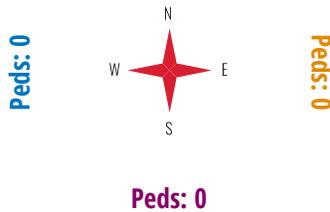
	Out	In	Total
	21	12	33
	3	2	5
	0	0	0
Totals	24	14	38

CR 65

	0	0	0
	3	0	0
	20	1	0
Totals	23	1	0



Peds: 0



Peds: 0

Totals	12	0	0
	10	0	0
	2	0	0
	0	0	0

CR 65

East Approach

	Out	In	Total
	2	1	3
	0	0	0
	0	0	0
Totals	2	1	3

Mastwood Rd

Totals			
	0	0	0
	2	2	0
	0	0	0

South Approach

	Out	In	Total
	10	20	30
	2	3	5
	0	0	0
Totals	12	23	35

 - Cars

 - Trucks

 - Bicycles

Comments



Peak Hour Summary

Intersection: CR 65 & Mastwood Rd
 Site Code: 2221100001
 Count Date: Jun 23, 2022
 Period: 07:00 - 10:00

Peak Hour Data (07:15 - 08:15)

Start Time	North Approach CR 65						South Approach CR 65						East Approach Mastwood Rd						West Approach						Total Vehicles
	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	
07:15	0	7		0	0	7		2	0	0	0	2	0		0	0	0	0					0		9
07:30	0	6		0	0	6		1	0	0	0	1	0		2	0	0	0					0		9
07:45	1	4		0	0	5		6	0	0	0	6	0		0	0	0	0					0		11
08:00	0	6		0	0	6		3	0	0	0	3	0		0	0	0	0					0		9
Grand Total	1	23		0	0	24		12	0	0	0	12	0		2	0	0	2					0	0	38
Approach %	4.2	95.8		0	-		100	0	0		-		0		100	0		-					0		
Totals %	2.6	60.5		0	63.2		31.6	0	0		31.6		0		5.3	0		5.3					0		
PHF	0.25	0.82		0	0.86		0.5	0	0		0.5		0		0.25	0		0.25					0		0.86
Cars	1	20		0		21	10	0	0		10	0		2	0		2						0		33
% Cars	100	87		0		87.5	83.3	0	0		83.3	0		100	0		100						0		86.8
Trucks	0	3		0		3	2	0	0		2	0		0	0		0						0		5
% Trucks	0	13		0		12.5	16.7	0	0		16.7	0		0	0		0						0		13.2
Bicycles	0	0		0		0	0	0	0		0	0		0	0		0						0		0
% Bicycles	0	0		0		0	0	0	0		0	0		0	0		0						0		0
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	0

Peak Hour Diagram

Specified Period

From: 10:00:00
To: 14:00:00

One Hour Peak

From: 10:45:00
To: 11:45:00

Intersection: CR 65 & Mastwood Rd
Site Code: 2221100001
Count Date: Jun 23, 2022

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: CR 65 runs N/S

North Approach

	Out	In	Total
	17	20	37
	0	1	1
	0	0	0
Totals	17	21	38

CR 65

	0	0	0
	0	0	0
	15	2	0
Totals	15	2	0



Peds: 0



Peds: 0

Totals	16	2	0
	15	2	0
	1	0	0
	0	0	0

CR 65

East Approach

	Out	In	Total
	5	4	9
	0	0	0
	0	0	0
Totals	5	4	9

Mastwood Rd

Totals			
	0	0	0
	5	5	0
	0	0	0

South Approach

	Out	In	Total
	17	15	32
	1	0	1
	0	0	0
Totals	18	15	33

 - Cars

 - Trucks

 - Bicycles

Comments



Peak Hour Summary

Intersection: CR 65 & Mastwood Rd
 Site Code: 2221100001
 Count Date: Jun 23, 2022
 Period: 10:00 - 14:00

Peak Hour Data (10:45 - 11:45)

Start Time	North Approach CR 65						South Approach CR 65						East Approach Mastwood Rd						West Approach						Total Vehicles	
	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total		
10:45	0	5		0	0	5		4	1	0	0	5	0		2	0	0	2					0			12
11:00	0	3		0	0	3		6	0	0	0	6	0		1	0	0	1					0			10
11:15	2	3		0	0	5		2	0	0	0	2	0		1	0	0	1					0			8
11:30	0	4		0	0	4		4	1	0	0	5	0		1	0	0	1					0			10
Grand Total	2	15	0	0	17	16	2	0	0	18	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	40
Approach %	11.8	88.2	0	-	-	88.9	11.1	0	-	-	0	100	0	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals %	5	37.5	0	42.5	-	40	5	0	45	-	0	12.5	0	12.5	-	-	-	-	-	-	-	-	-	-	-	0
PHF	0.25	0.75	0	0.85	-	0.67	0.5	0	0.75	-	0	0.63	0	0.63	-	-	-	-	-	-	-	-	-	-	-	0.83
Cars	2	15	0	17	-	15	2	0	17	-	0	5	0	5	-	-	-	-	-	-	-	-	-	-	-	39
% Cars	100	100	0	100	-	93.8	100	0	94.4	-	0	100	0	100	-	-	-	-	-	-	-	-	-	-	-	97.5
Trucks	0	0	0	0	-	1	0	0	1	-	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	1
% Trucks	0	0	0	0	-	6.3	0	0	5.6	-	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	2.5
Bicycles	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	0
% Bicycles	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	0
Peds				0	-				0	-				0	-				0	-				0	-	0
% Peds				0	-				0	-				0	-				0	-				0	-	0

Peak Hour Diagram

Specified Period

From: 14:00:00
To: 18:00:00

One Hour Peak

From: 16:00:00
To: 17:00:00

Intersection: CR 65 & Mastwood Rd
Site Code: 2221100001
Count Date: Jun 23, 2022

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: CR 65 runs N/S

North Approach

	Out	In	Total
	22	30	52
	0	3	3
	0	0	0
Totals	22	33	55

CR 65

	0	0	0
	0	0	0
	22	0	0
Totals	22	0	0



Peds: 0

Peds: 0



Peds: 0

Peds: 0

Totals	31	2	0
	28	2	0
	3	0	0
	0	0	0

CR 65

East Approach

	Out	In	Total
	6	2	8
	0	0	0
	0	0	0
Totals	6	2	8

Mastwood Rd

Totals			
	0	0	0
	2	2	0
	4	4	0

South Approach

	Out	In	Total
	30	26	56
	3	0	3
	0	0	0
Totals	33	26	59

 - Cars

 - Trucks

 - Bicycles

Comments



Peak Hour Summary

Intersection: CR 65 & Mastwood Rd
 Site Code: 2221100001
 Count Date: Jun 23, 2022
 Period: 14:00 - 18:00

Peak Hour Data (16:00 - 17:00)

Start Time	North Approach CR 65						South Approach CR 65						East Approach Mastwood Rd						West Approach						Total Vehicles	
	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total		
16:00	0	8		0	0	8		4	0	0	0	4	1		0	0	0	1					0			13
16:15	0	7		0	0	7		12	0	0	0	12	2		1	0	0	3					0			22
16:30	0	3		0	0	3		8	1	0	0	9	1		1	0	0	2					0			14
16:45	0	4		0	0	4		7	1	0	0	8	0		0	0	0	0					0			12
Grand Total	0	22		0	0	22		31	2	0	0	33	4		2	0	0	6					0		0	61
Approach %	0	100		0	-	-	93.9	6.1	0	-	-	66.7		33.3	0	-									-	
Totals %	0	36.1		0	36.1	-	50.8	3.3	0	54.1	-	6.6		3.3	0	9.8									0	
PHF	0	0.69		0	0.69	0.69	0.65	0.5	0	0.69	0.69	0.5		0.5	0	0.5					0			0.69		
Cars	0	22		0	22	22	28	2	0	30	30	4		2	0	6	6					0		0	58	
% Cars	0	100		0	100	100	90.3	100	0	90.9	90.9	100		100	0	100	100					0		0	95.1	
Trucks	0	0		0	0	0	3	0	0	3	3	0		0	0	0	0					0		0	3	
% Trucks	0	0		0	0	0	9.7	0	0	9.1	9.1	0		0	0	0	0					0		0	4.9	
Bicycles	0	0		0	0	0	0	0	0	0	0	0		0	0	0	0					0		0	0	
% Bicycles	0	0		0	0	0	0	0	0	0	0	0		0	0	0	0					0		0	0	
Peds				0	-	-				0	-					0	-					0		-	0	
% Peds				0	-	-				0	-					0	-					0		-	0	

Appendix D

Level of Service Criteria for Unsignalized Intersections



According to the HCM 2010, T-intersections with a stop sign on the stem of the T are considered two-way stop-controlled intersections and have the same Level of Service (LOS) definitions and criteria as any Two-way Stop-Controlled intersection. For this type of intersection, the LOS is determined based on the control delay and is determined for each minor road lane group and the left-turn movement of the major road. The control delay, in this case, includes the delay due to deceleration to stop from the free-flow speed at the back of a queue (formed because of the stop sign), the move-up time within the queue, stopped delay at the front of the queue, and delay due to acceleration back to free-flow speed. The calculation of the control delay of a specific movement is a function of the flow rate and the capacity of this specific movement.

The description and criteria of the LOS at two-way stop-controlled intersections are summarized in the table below.

Table D - LOS for Two-Way Stop-Controlled Intersections

Description of Conditions	Control Delay (sec/veh)	LOS by v/c Ratio	
		v/c ≤ 1.0	v/c > 1.0
No delay for stop-controlled approaches	0 - 10	A	F
Operations with minor delay	> 10 - 15	B	F
Operations with moderate delay	> 15 - 25	C	F
Operations with some delay	> 25 - 35	D	F
Operations with high delay	> 35 - 50	E	F
Operation with extreme congestion with very high delay	> 50	F	F

Appendix E

Synchro Reports for the Background Traffic Conditions



Intersection						
Int Delay, s/veh	0.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	3	26	0	2	71
Future Vol, veh/h	0	3	26	0	2	71
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	25	25	50	50	86	86
Heavy Vehicles, %	0	0	17	17	13	13
Mvmt Flow	0	12	52	0	2	83

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	139	52	0	0	52
Stage 1	52	-	-	-	-
Stage 2	87	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.23
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.317
Pot Cap-1 Maneuver	859	1021	-	-	1486
Stage 1	976	-	-	-	-
Stage 2	941	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	858	1021	-	-	1486
Mov Cap-2 Maneuver	858	-	-	-	-
Stage 1	976	-	-	-	-
Stage 2	940	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	8.6	0	0.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	1021	1486
HCM Lane V/C Ratio	-	-	0.012	0.002
HCM Control Delay (s/veh)	-	-	8.6	7.4
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

Intersection						
Int Delay, s/veh	0.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	3	28	0	2	74
Future Vol, veh/h	0	3	28	0	2	74
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	25	25	50	50	86	86
Heavy Vehicles, %	0	0	17	17	13	13
Mvmt Flow	0	12	56	0	2	86

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	146	56	0	0	56
Stage 1	56	-	-	-	-
Stage 2	90	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.23
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.317
Pot Cap-1 Maneuver	851	1016	-	-	1481
Stage 1	972	-	-	-	-
Stage 2	939	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	850	1016	-	-	1481
Mov Cap-2 Maneuver	850	-	-	-	-
Stage 1	972	-	-	-	-
Stage 2	938	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	8.6	0	0.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	1016	1481
HCM Lane V/C Ratio	-	-	0.012	0.002
HCM Control Delay (s/veh)	-	-	8.6	7.4
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

Intersection						
Int Delay, s/veh	0.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	0	4	30	0	2	79
Future Vol, veh/h	0	4	30	0	2	79
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	25	25	50	50	86	86
Heavy Vehicles, %	0	0	17	17	13	13
Mvmt Flow	0	16	60	0	2	92

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	156	60	0	0	60
Stage 1	60	-	-	-	-
Stage 2	96	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.23
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.317
Pot Cap-1 Maneuver	840	1011	-	-	1476
Stage 1	968	-	-	-	-
Stage 2	933	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	839	1011	-	-	1476
Mov Cap-2 Maneuver	839	-	-	-	-
Stage 1	968	-	-	-	-
Stage 2	932	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	8.6	0	0.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	1011	1476
HCM Lane V/C Ratio	-	-	0.016	0.002
HCM Control Delay (s/veh)	-	-	8.6	7.4
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

HCM 2010 TWSC
 3: County Road 65 & Mastwood Road

2022 - PM Peak - Background Condition

Intersection						
Int Delay, s/veh	0.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	3	86	3	0	48
Future Vol, veh/h	6	3	86	3	0	48
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	50	50	69	69	69	69
Heavy Vehicles, %	0	0	9	9	0	0
Mvmt Flow	12	6	125	4	0	70

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	197	127	0	0	129
Stage 1	127	-	-	-	-
Stage 2	70	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2
Pot Cap-1 Maneuver	796	929	-	-	1469
Stage 1	904	-	-	-	-
Stage 2	958	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	796	929	-	-	1469
Mov Cap-2 Maneuver	796	-	-	-	-
Stage 1	904	-	-	-	-
Stage 2	958	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	9.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	836	1469
HCM Lane V/C Ratio	-	-	0.022	-
HCM Control Delay (s/veh)	-	-	9.4	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection						
Int Delay, s/veh	0.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	3	91	3	0	52
Future Vol, veh/h	7	3	91	3	0	52
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	50	50	69	69	69	69
Heavy Vehicles, %	0	0	9	9	0	0
Mvmt Flow	14	6	132	4	0	75

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	209	134	0	0	136	0
Stage 1	134	-	-	-	-	-
Stage 2	75	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	784	920	-	-	1461	-
Stage 1	897	-	-	-	-	-
Stage 2	953	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	784	920	-	-	1461	-
Mov Cap-2 Maneuver	784	-	-	-	-	-
Stage 1	897	-	-	-	-	-
Stage 2	953	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	9.5	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	820	1461
HCM Lane V/C Ratio	-	-	0.024	-
HCM Control Delay (s/veh)	-	-	9.5	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection						
Int Delay, s/veh	0.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	7	4	97	4	0	56
Future Vol, veh/h	7	4	97	4	0	56
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	50	50	69	69	69	69
Heavy Vehicles, %	0	0	9	9	0	0
Mvmt Flow	14	8	141	6	0	81

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	225	144	0	0	147	0
Stage 1	144	-	-	-	-	-
Stage 2	81	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	768	909	-	-	1447	-
Stage 1	888	-	-	-	-	-
Stage 2	947	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	768	909	-	-	1447	-
Mov Cap-2 Maneuver	768	-	-	-	-	-
Stage 1	888	-	-	-	-	-
Stage 2	947	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	9.5	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	814	1447
HCM Lane V/C Ratio	-	-	0.027	-
HCM Control Delay (s/veh)	-	-	9.5	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Appendix F

**Synchro Reports for the Traffic Conditions with the
Development**



HCM 2010 TWSC

3: County Road 65 & Subdivision Entrance/Mastwood Road 2022 - AM Peak - Development Impact Condition

Intersection												
Int Delay, s/veh	2.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	9	1	18	0	1	3	3	26	0	2	71	6
Future Vol, veh/h	9	1	18	0	1	3	3	26	0	2	71	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	25	92	25	92	50	50	86	86	92
Heavy Vehicles, %	2	2	2	0	2	0	2	17	17	13	13	2
Mvmt Flow	10	1	20	0	1	12	3	52	0	2	83	7

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	156	149	87	159	152	52	90	0	0	52	0	0
Stage 1	91	91	-	58	58	-	-	-	-	-	-	-
Stage 2	65	58	-	101	94	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.23	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.317	-	-
Pot Cap-1 Maneuver	810	743	971	811	740	1021	1505	-	-	1486	-	-
Stage 1	916	820	-	959	847	-	-	-	-	-	-	-
Stage 2	946	847	-	910	817	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	798	741	971	792	738	1021	1505	-	-	1486	-	-
Mov Cap-2 Maneuver	798	741	-	792	738	-	-	-	-	-	-	-
Stage 1	914	819	-	957	845	-	-	-	-	-	-	-
Stage 2	932	845	-	890	816	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s/v	9.1		8.7		0.4		0.2	
HCM LOS	A		A					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1505	-	-	898	989	1486	-	-
HCM Lane V/C Ratio	0.002	-	-	0.034	0.013	0.002	-	-
HCM Control Delay (s/veh)	7.4	0	-	9.1	8.7	7.4	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0	0	-	-

HCM 2010 TWSC

3: County Road 65 & Subdivision Entrance/Mastwood Road 2027 - AM Peak - Development Impact Condition

Intersection												
Int Delay, s/veh	2.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	9	1	18	0	1	3	3	28	0	2	74	6
Future Vol, veh/h	9	1	18	0	1	3	3	28	0	2	74	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	25	92	25	92	50	50	86	86	92
Heavy Vehicles, %	2	2	2	0	2	0	2	17	17	13	13	2
Mvmt Flow	10	1	20	0	1	12	3	56	0	2	86	7
Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	163	156	90	166	159	56	93	0	0	56	0	0
Stage 1	94	94	-	62	62	-	-	-	-	-	-	-
Stage 2	69	62	-	104	97	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.23	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.317	-	-
Pot Cap-1 Maneuver	802	736	968	803	733	1016	1501	-	-	1481	-	-
Stage 1	913	817	-	954	843	-	-	-	-	-	-	-
Stage 2	941	843	-	907	815	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	790	734	968	784	731	1016	1501	-	-	1481	-	-
Mov Cap-2 Maneuver	790	734	-	784	731	-	-	-	-	-	-	-
Stage 1	911	816	-	952	841	-	-	-	-	-	-	-
Stage 2	927	841	-	887	814	-	-	-	-	-	-	-
Approach	EB		WB		NB			SB				
HCM Control Delay, s/v	9.2		8.7		0.4			0.2				
HCM LOS	A		A									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	1501	-	-	893	984	1481	-	-				
HCM Lane V/C Ratio	0.002	-	-	0.034	0.013	0.002	-	-				
HCM Control Delay (s/veh)	7.4	0	-	9.2	8.7	7.4	0	-				
HCM Lane LOS	A	A	-	A	A	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0.1	0	0	-	-				

HCM 2010 TWSC

3: County Road 65 & Subdivision Entrance/Mastwood Road 2032 - AM Peak - Development Impact Condition

Intersection

Int Delay, s/veh 2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	9	1	18	0	1	4	3	30	0	2	79	6
Future Vol, veh/h	9	1	18	0	1	4	3	30	0	2	79	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	25	92	25	92	50	50	86	86	92
Heavy Vehicles, %	2	2	2	0	2	0	2	17	17	13	13	2
Mvmt Flow	10	1	20	0	1	16	3	60	0	2	92	7

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	175	166	96	176	169	60	99	0	0	60	0	0
Stage 1	100	100	-	66	66	-	-	-	-	-	-	-
Stage 2	75	66	-	110	103	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.23	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.317	-	-
Pot Cap-1 Maneuver	788	727	960	791	724	1011	1494	-	-	1476	-	-
Stage 1	906	812	-	950	840	-	-	-	-	-	-	-
Stage 2	934	840	-	900	810	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	773	725	960	772	722	1011	1494	-	-	1476	-	-
Mov Cap-2 Maneuver	773	725	-	772	722	-	-	-	-	-	-	-
Stage 1	904	811	-	948	838	-	-	-	-	-	-	-
Stage 2	916	838	-	880	809	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	9.2	8.7	0.4	0.2
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1494	-	-	881	986	1476	-	-
HCM Lane V/C Ratio	0.002	-	-	0.035	0.017	0.002	-	-
HCM Control Delay (s/veh)	7.4	0	-	9.2	8.7	7.4	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

HCM 2010 TWSC

3: County Road 65 & Subdivision Entrance/Mastwood Road 2022 - PM Peak - Development Impact Condition

Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	10	2	6	6	3	3	17	86	3	0	48	11
Future Vol, veh/h	10	2	6	6	3	3	17	86	3	0	48	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	50	92	50	92	69	69	69	69	92
Heavy Vehicles, %	2	2	2	0	2	0	2	9	9	0	0	2
Mvmt Flow	11	2	7	12	3	6	18	125	4	0	70	12

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	244	241	76	244	245	127	82	0	0	129	0	0
Stage 1	76	76	-	163	163	-	-	-	-	-	-	-
Stage 2	168	165	-	81	82	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.1	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.2	-	-
Pot Cap-1 Maneuver	710	660	985	714	657	929	1515	-	-	1469	-	-
Stage 1	933	832	-	844	763	-	-	-	-	-	-	-
Stage 2	834	762	-	932	827	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	696	651	985	700	648	929	1515	-	-	1469	-	-
Mov Cap-2 Maneuver	696	651	-	700	648	-	-	-	-	-	-	-
Stage 1	921	832	-	833	753	-	-	-	-	-	-	-
Stage 2	814	752	-	923	827	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	9.8	10	0.9	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1515	-	-	765	743	1469	-	-
HCM Lane V/C Ratio	0.012	-	-	0.026	0.029	-	-	-
HCM Control Delay (s/veh)	7.4	0	-	9.8	10	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

HCM 2010 TWSC

3: County Road 65 & Subdivision Entrance/Mastwood Road 2027 - PM Peak - Development Impact Condition

Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	10	2	6	7	3	3	17	91	3	0	52	11
Future Vol, veh/h	10	2	6	7	3	3	17	91	3	0	52	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	50	92	50	92	69	69	69	69	92
Heavy Vehicles, %	2	2	2	0	2	0	2	9	9	0	0	2
Mvmt Flow	11	2	7	14	3	6	18	132	4	0	75	12

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	256	253	81	256	257	134	87	0	0	136	0	0
Stage 1	81	81	-	170	170	-	-	-	-	-	-	-
Stage 2	175	172	-	86	87	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.1	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.2	-	-
Pot Cap-1 Maneuver	697	650	979	701	647	920	1509	-	-	1461	-	-
Stage 1	927	828	-	837	758	-	-	-	-	-	-	-
Stage 2	827	756	-	927	823	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	683	642	979	688	639	920	1509	-	-	1461	-	-
Mov Cap-2 Maneuver	683	642	-	688	639	-	-	-	-	-	-	-
Stage 1	915	828	-	826	748	-	-	-	-	-	-	-
Stage 2	807	746	-	918	823	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s/v	9.9		10.1		0.9		0	
HCM LOS	A		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1509	-	-	754	728	1461	-	-
HCM Lane V/C Ratio	0.012	-	-	0.026	0.032	-	-	-
HCM Control Delay (s/veh)	7.4	0	-	9.9	10.1	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

HCM 2010 TWSC

3: County Road 65 & Subdivision Entrance/Mastwood Road 2032 - PM Peak - Development Impact Condition

Intersection												
Int Delay, s/veh	1.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	10	2	6	7	3	4	17	97	4	0	56	11
Future Vol, veh/h	10	2	6	7	3	4	17	97	4	0	56	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	50	92	50	92	69	69	69	69	92
Heavy Vehicles, %	2	2	2	0	2	0	2	9	9	0	0	2
Mvmt Flow	11	2	7	14	3	8	18	141	6	0	81	12

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	273	270	87	272	273	144	93	0	0	147	0	0
Stage 1	87	87	-	180	180	-	-	-	-	-	-	-
Stage 2	186	183	-	92	93	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.1	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.2	-	-
Pot Cap-1 Maneuver	679	636	971	685	634	909	1501	-	-	1447	-	-
Stage 1	921	823	-	826	750	-	-	-	-	-	-	-
Stage 2	816	748	-	920	818	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	663	628	971	672	626	909	1501	-	-	1447	-	-
Mov Cap-2 Maneuver	663	628	-	672	626	-	-	-	-	-	-	-
Stage 1	909	823	-	815	740	-	-	-	-	-	-	-
Stage 2	795	738	-	911	818	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	10	10.1	0.8	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1501	-	-	736	725	1447	-	-
HCM Lane V/C Ratio	0.012	-	-	0.027	0.035	-	-	-
HCM Control Delay (s/veh)	7.4	0	-	10	10.1	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Appendix G

Left Turn Lane Warrants Charts



Figure G1 - AM Peak (2032)

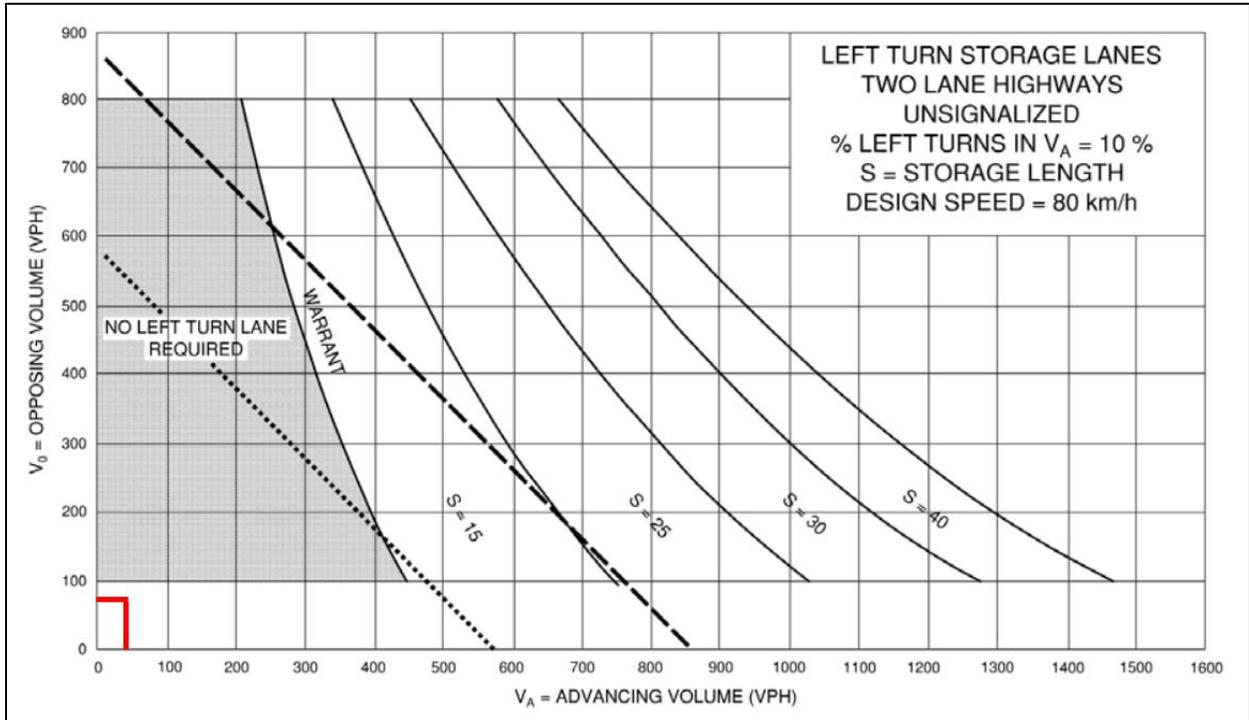


Figure G2 - PM Peak (2032)

