



TOWN OF CALEDON
PLANNING
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Sept.29, 2020

FP Mayfield West (Caledon) Inc.

TRANSPORTATION IMPACT STUDY

DRAFT PLAN OF SUBDIVISION

12529 CHINGUACOUSY ROAD
TOWN OF CALEDON

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September 18, 2020

Reference Number: 21146/100

Mr. Mitchell Taleski
Senior Project Manager
FP Mayfield West (Caledon) Inc.
1 Herons Hill Way
Toronto, ON
M2J 0G2

Dear Mr. Taleski:

RE: Transportation Impact Study
12529 Chinguacousy Road
Town of Caledon

LEA Consulting Ltd. (LEA) is pleased to present the findings of our Transportation Impact Study for the Draft Plan of Subdivision application for the property municipally known as 12529 Chinguacousy Road located in the Town of Caledon, owned by FP Mayfield West (Caledon) Inc. The property is within the Stage 2 of the Mayfield West Phase 2 (MW2) Secondary Plan Area.

This report concludes that the traffic associated with the planned development maintains acceptable conditions for the road network in the surrounding area, and minor intensification for the planned full build-out year of the subdivision does not change the recommendations from the 2018 Transportation Master Plan by Paradigm Consulting.

Should you have any questions regarding this Transportation Impact Study, please do not hesitate to contact the undersigned.

Yours truly,
LEA CONSULTING LTD.

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Encl.

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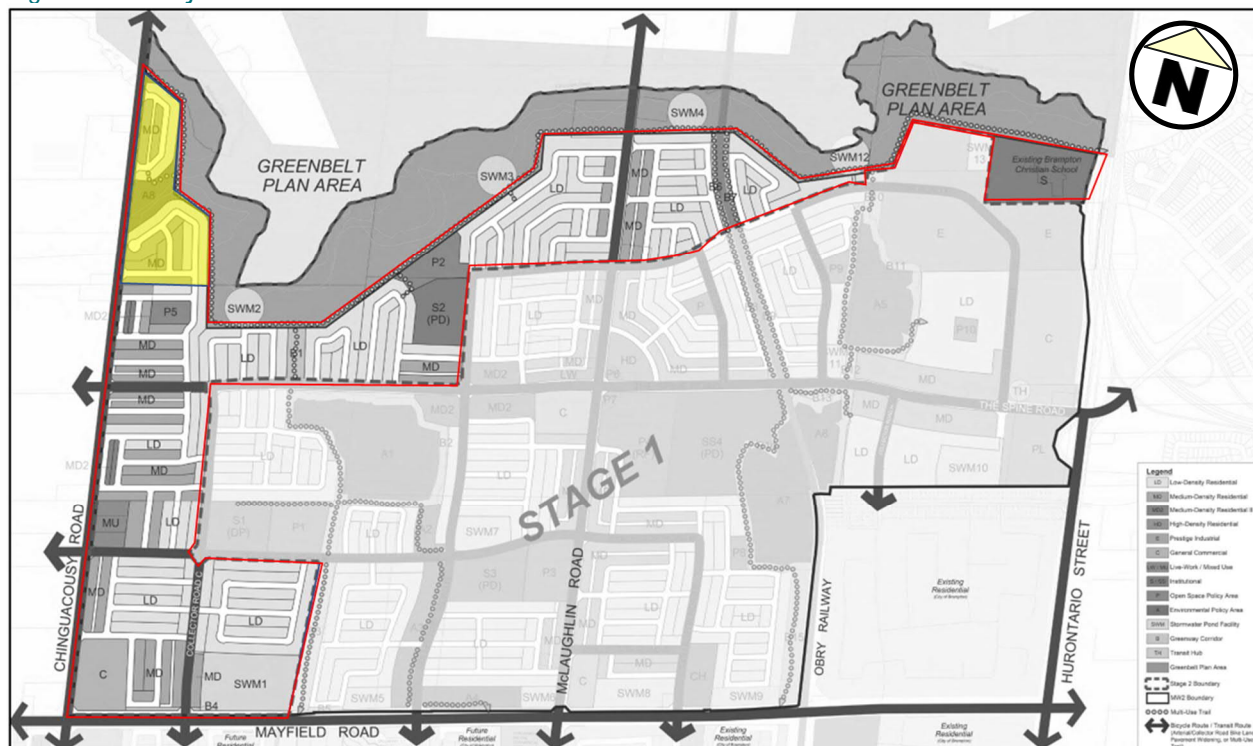
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1 INTRODUCTION

1.1 BACKGROUND

LEA Consulting Ltd. (LEA) has been retained to undertake a Transportation Impact Study (TIS) in support of a Draft Plan of Subdivision application for the property municipally known as 12529 Chinguacousy Road located in the Town of Caledon, owned by FP Mayfield West (Caledon Inc.) (herein referred to as the “subject site”). The property is within the Stage 2 of the Mayfield West Phase 2 (MW2) Secondary Plan Area. Figure 1-1 illustrates the location of the subject site (highlighted in yellow) within the approved Stage 2 area of the MW2 Secondary Plan. Please note that only a portion of the total property is part of this Draft Plan Application (in yellow, below) and the remainder of the property will be developed in a future phase as part of future Draft Plan Application processes.

Figure 1-1: Subject Site



In November 2018, Paradigm Transportation Solutions Limited (Paradigm) completed the Mayfield West Phase 2 Stage 2 Transportation Assessment (herein referred to as “2018 TMP”). Since then, there has been some minor intensification to the subdivision lands. As such, this Transportation Impact Study aims to reassess the transportation demands on the network and confirm if the conclusions found in the 2018 TMP still hold true.

The proposed development, as illustrated in Figure 1-2 will include approximately 205 residential units, consisting of 78 single-detached houses and 127 townhouse units, 38 of which are rear lane townhouse units. Table 1.1 summarizes the changes between the 2018 TMP and the current 2020 Updated Draft Plan.

Figure 1-2: Proposed Draft Plan



Table 1.1: Net Change in Subject Site Density

Plans	Number of Single-Family Detached Houses	Number of Townhouse Units
2018 TMP	77 Units	163 Units
2020 Updated Draft Plan	78 Units	127 Units
Net Change	+1 Units	-36 Units
Overall	-35 units	

Overall, the Updated Draft Plan would result in 35 less units than the 2018 TMP. However, to be conservative, the trip generation from the 2018 TMP will be maintained for the analysis in this TIS.

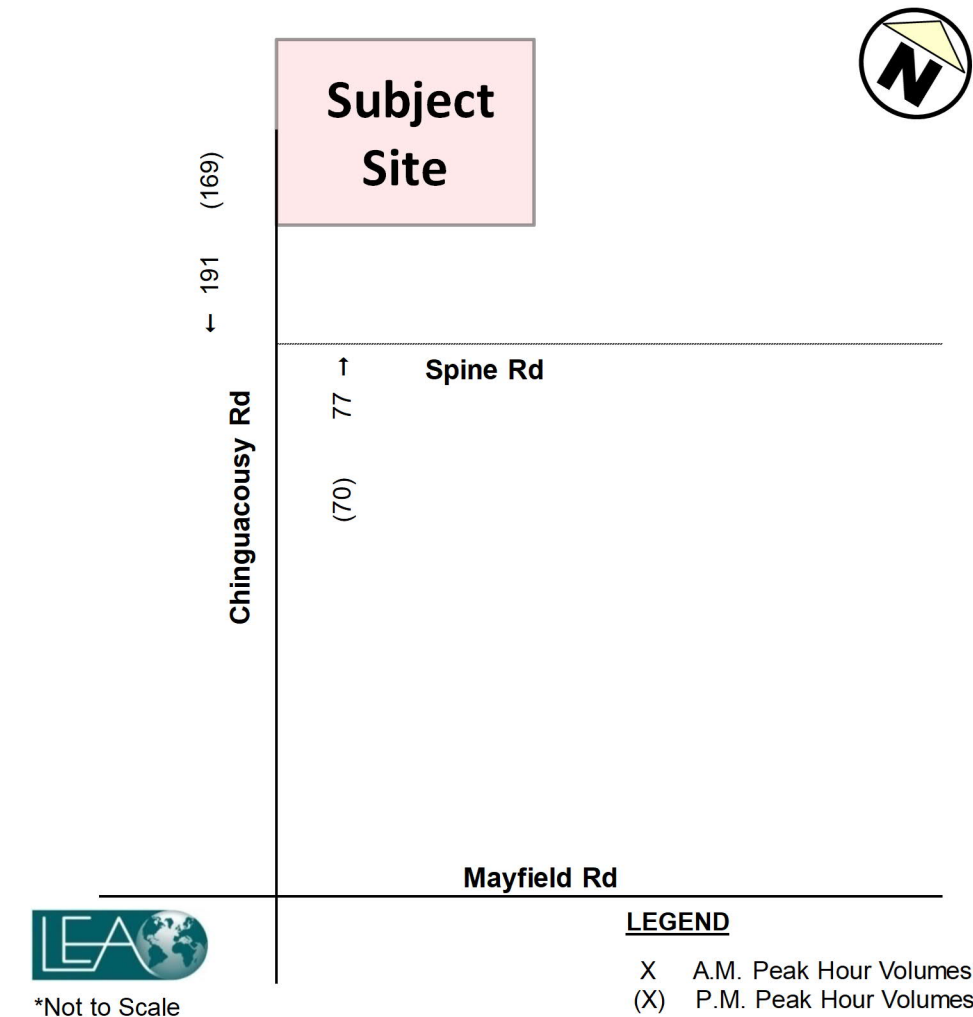
2 TRAFFIC CONDITIONS

2.1 EXISTING ROAD NETWORK

The study area, west of Chinguacousy Road, is currently comprised of undeveloped lands/farmlands. On the east side of Chinguacousy Road, where the subject site is located, construction is commencing in Stage 1 of Mayfield West Phase (2 to the south); however, the adjacent properties along Chinguacousy Road remain un-developed as they are part of Stage 2. Chinguacousy Road is currently a two-lane road (one lane per direction) with a rural cross-section, but will be urbanized by the Town in the future.

Turning movement counts (TMCs) for the intersections within the study area were obtained from the 2018 Transportation Master Plan by Paradigm. Existing traffic volumes are illustrated in Figure 2-1. The obtained traffic data are enclosed in Appendix A.

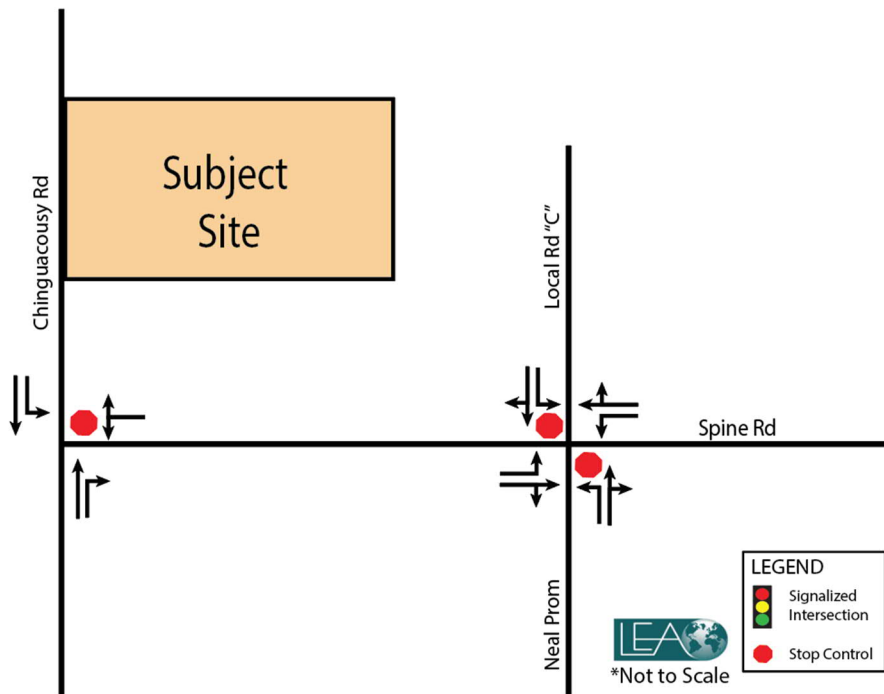
Figure 2-1: Existing Traffic Volumes



2.2 PLANNED IMPROVEMENTS

Several improvements are planned within the study area to better accommodate the planned subdivision. The planned road network and lane configurations are illustrated in Figure 2-2.

Figure 2-2: Planned Road Network Configuration



2.3 SITE TRIPS

Trip generation for the development was based on the ITE Trip Generation Manual 10th Edition. Given the proposed uses, LUC 210 – Single Family Detached (Low Density Residential) and LUC 220 - Multifamily Housing (Low-Rise) was used for the development. Table 2.1 summarizes the trip generation of the subject site using the site statistics from the 2018 TMP.

Table 2.1: 2018 TMP Trip Generation

Land Use	Unit #	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Single Family Detached (Low Density Residential)	77	0.20	0.57	0.77	0.64	0.36	1.00
Modal Split		5%					
Trips Generated		14	42	56	47	27	73
Multifamily Housing (Low-Rise)	163	0.16	0.40	0.56	0.39	0.27	0.67
Modal Split		5%					
Trips Generated		24	63	86	61	43	103
Total Trips		38	105	143	108	70	176

Table 2.2 below illustrates the trip generation for the site based on site statistics from the latest draft plan. In comparison with the 2018 TMP trip generation, there would be about 20-21 less two-way trips during both peak hours, which means that site trips are lower than initially expected. However, to be conservative, the trip generation from the 2018 TMP will be used.

Table 2.2: 2020 Draft Plan Trip Generation

Land Use	Unit #	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Single Family Detached (Low Density Residential)	78	0.20	0.56	0.76	0.64	0.36	1.00
Modal Split		5%					
Trips Generated		14	42	56	48	27	74
Multifamily Housing (Low-Rise)	127	0.16	0.41	0.56	0.39	0.27	0.67
Modal Split		5%					
Trips Generated		19	48	67	47	33	80
Total Trips		33	90	123	95	60	155

A 5% modal split reduction was applied to the trip generation. This is consistent with the 2018 TMP.

Directional trip distribution of the site traffic from the 2018 TMP was derived using Transportation Tomorrow Survey (TTS) 2011 data. The site traffic was assigned to the road network based on trip patterns in the study area, location and configuration of the site access, and the route providing the shortest travel time. These values were extracted from the 2018 TMP, and are outlined in Table 2.3. .

Table 2.3: 2011 Trip Distribution

Origin/Destination	AM		PM	
	In	Out	In	Out
York & Toronto	11%	23%	27%	6%
Simcoe & Barrie	4%	1%	3%	0%
Dufferin & Orangeville	7%	3%	4%	2%
Waterloo, Wellington & Guelph	1%	0%	0%	0%
Brantford, Hamilton, Halton & Niagara	2%	3%	3%	1%
Caledon	54%	43%	36%	83%
Brampton	18%	15%	16%	6%
Mississauga	3%	11%	11%	2%
TOTAL	100%		100%	

Table 2.4 summarizes the trip distribution based on 2016 TTS data. The detailed TTS data results are found in Appendix B.

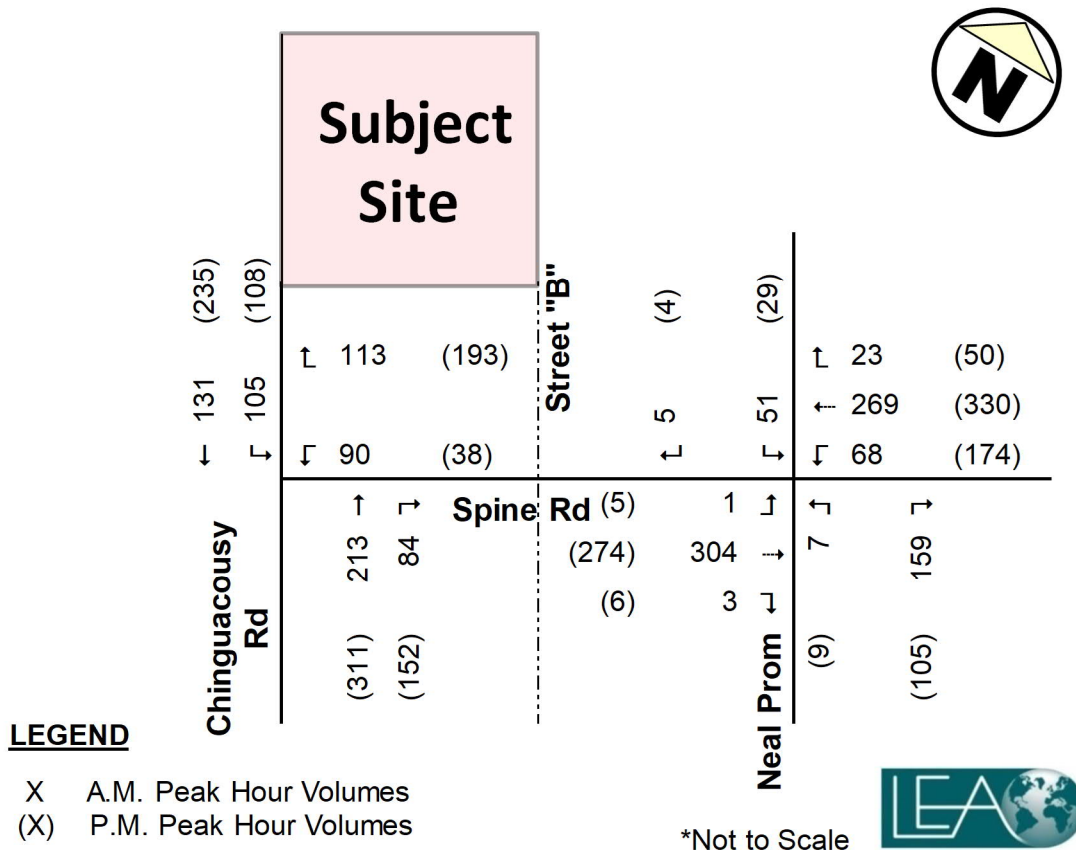
Table 2.4: 2016 Trip Distribution

Origin/Destination	AM		PM	
	In	Out	In	Out
York & Toronto	10%	25%	33%	6%
Simcoe & Barrie	4%	2%	3%	1%
Dufferin & Orangeville	4%	2%	3%	3%
Waterloo, Wellington & Guelph	1%	1%	2%	0%
Brantford, Hamilton, Halton & Niagara	4%	2%	4%	1%
Caledon	51%	41%	26%	81%
Brampton	24%	18%	19%	6%
Mississauga	2%	9%	10%	1%
TOTAL	100%		100%	

When comparing the 2016 TTS Trip Distribution from the 2011 TTS Trip Distribution, the trip distributions are similar. Thus, the trip distribution and assignment from the TMP is still applicable.

The site traffic volumes were extracted from the TMP and include site traffic generated from all units in the Mayfield West Plan during the weekday AM and PM peak hours. These volumes are illustrated in Figure 2-3.

Figure 2-3: Site Traffic



2.4 FUTURE TOTAL TRAFFIC CONDITIONS

Future total traffic is the summation of the future background traffic and the trips generated by the proposed development. Consistent with the 2018 TMP, a 2% growth rate per year was used. Three horizon years were analyzed for the future total traffic conditions:

- ▶ 2026 – Planned full build out of the subdivision
- ▶ 2031 – Planned build-out + 5 years, consistent with the 2018 TMP
- ▶ 2041 – Consistent with the 2018 TMP

2.4.1 2026 Horizon

The 2026 future total volumes are illustrated in Figure 2-4, while the summarized capacity analysis results showing movements of interest are shown in Table 2.5.

Figure 2-4: 2026 Future Total Traffic Volumes

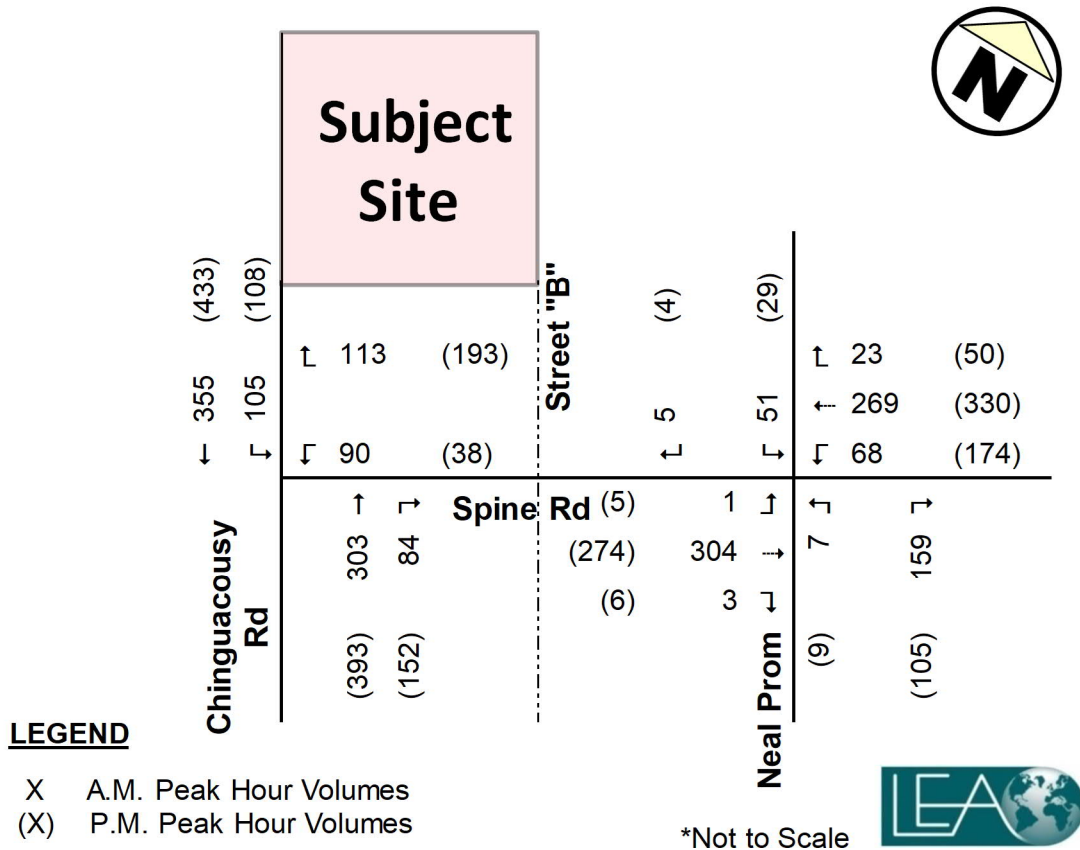


Table 2.5: 2026 Future Total Unsignalized Intersection Capacity Analysis

Intersection	Movement of Interest	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	95 th Queue (m)	v/c	LOS
AM Peak Hour							
Chinguacousy Road and Spine Road	WBL	98	262	26.7	1.7	0.37	D
Spine Road and Neal Promenade	SBL	55	195	30.6	1.1	0.28	D
PM Peak Hour							
Chinguacousy Road and Spine Road	WBL	41	198	27.9	0.8	0.21	D
Spine Road and Neal Promenade	NBL	10	172	27.2	0.2	0.06	D
	SBL	32	134	39.9	0.9	0.24	E

While the movements summarized above are all expected to operate at a LOS of “D” or worse, they are expected to operate at acceptable conditions under the proposed stop control. Due to the low volume of vehicles making left-turns during the peak hours, the overall intersection capacities are considered acceptable.

When reviewing the ICU Level of Service and the intersection capacity utilizations for the AM and PM peak hours, findings are consistent with the TMP, and have both intersections operating at a LOS of “A”. Detailed Synchro Analysis results can be found in Appendix C.

2.4.2 2031 Horizon

The 2031 future total volumes are illustrated in Figure 2-5, while the summarized capacity analysis results are shown in Table 2.6.

Figure 2-5: 2031 Future Total Traffic Volumes

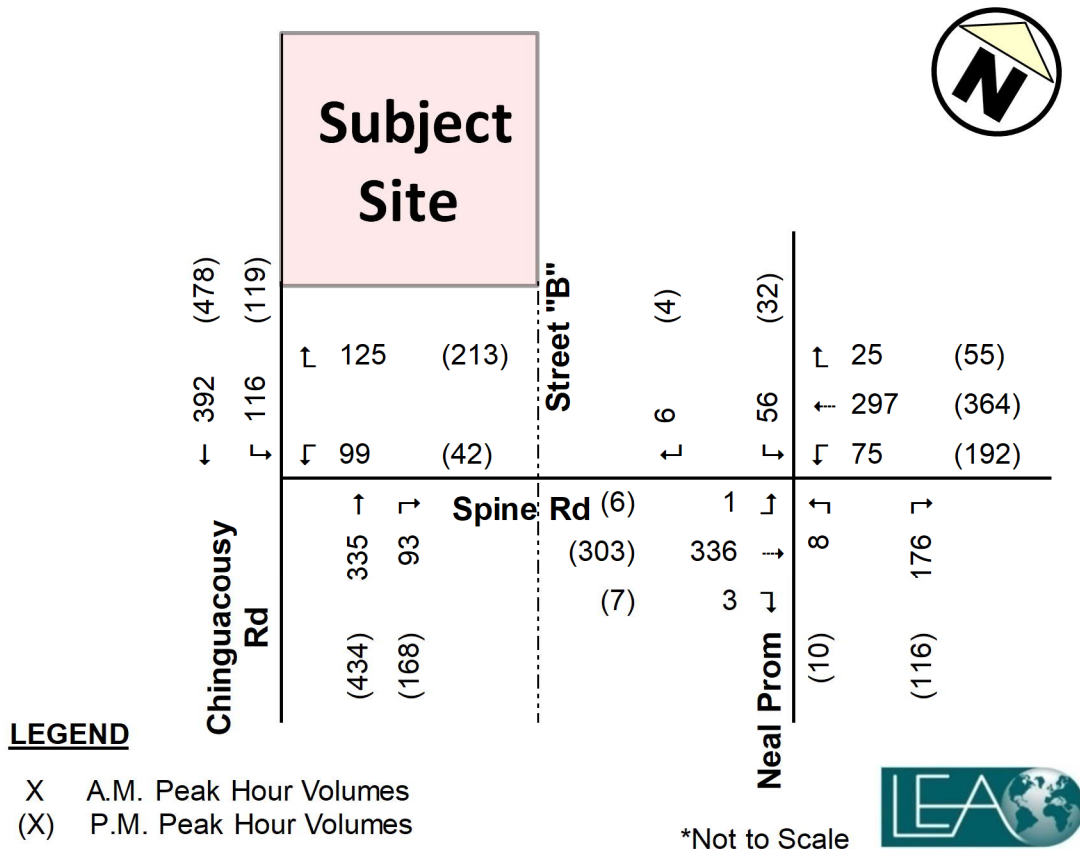


Table 2.6: 2031 Future Total Unsignalized Intersection Capacity Analysis

Intersection	Movement of Interest	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	95 th Queue (m)	v/c	LOS
AM Peak Hour							
Chinguacousy Road and Spine Road	WBL	108	225	34.9	2.4	0.48	D
Spine Road and Neal Promenade	SBL	61	159	41.0	1.6	0.38	E
PM Peak Hour							
Chinguacousy Road and Spine Road	WBL	46	165	35.0	1.1	0.28	E
Spine Road and Neal Promenade	NBL	7	141	32.7	0.2	0.08	D
	SBL	35	106	54.7	1.3	0.33	F

The traffic conditions in horizon 2031 are expected to operate slightly worsen compared to horizon 2026. Overall, all movements are expected to operate with very good v/c ratio with the highest at 0.48. The 95th percentile queue lengths also operate under acceptable conditions.

The ICU Level of Service and the intersections capacity utilizations for the AM and PM peak hours are consistent with the TMP findings, with both intersections operating with a Level of Service of "A" during the AM and PM peak hours, which is consistent with the TMP. Detailed Synchro Analysis results can be found in Appendix D.

2.4.3 2041 Horizon

The 2041 future total volumes are illustrated in Figure 2-6, while the summarized capacity analysis results are shown in Table 2.7.

Figure 2-6: 2041 Future Total Traffic Volumes

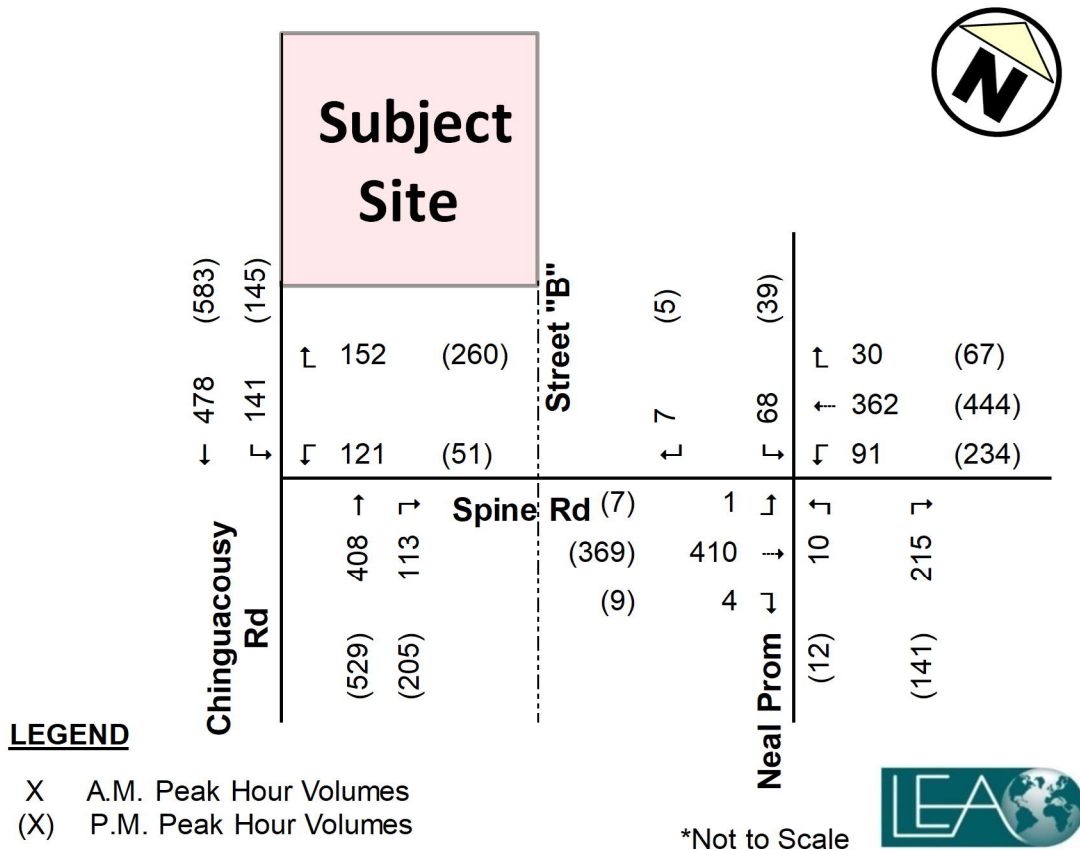


Table 2.7: 2041 Future Total Unsignalized Intersection Capacity Analysis

Intersection	Movement of Interest	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	95 th Queue (m)	v/c	LOS
AM Peak Hour							
Chinguacousy Road and Spine Road	WBL	132	158	89.9	5.6	0.83	F
Spine Road and Neal Promenade	NBL	11	185	25.7	0.2	0.06	D
	SBL	74	97	113.4	4.0	0.76	F
PM Peak Hour							
Chinguacousy Road and Spine Road	WBL	55	105	72.5	2.4	0.53	F
Spine Road and Neal Promenade	NBL	13	88	52.9	0.5	0.15	F
	SBL	42	60	152.1	3.0	0.71	F

Compared to horizon 2031, the traffic conditions are expected to operate worsen in 2041. One movement of interest (southbound left-turn at Spine/Neal Promenade during PM) is expected to operate at a LOS of "F" among all intersections analyzed. When reviewing the 95th percentile queue lengths and the v/c ratios, all movements are expected to operate at acceptable conditions.

Again, when assessing the ICU level of service and the intersection capacity utilizations, both intersections operate at acceptable levels, with a Level of Service of "A" during the AM peak hour, and a Level of Service of "B" during the PM peak hour, which is, again, consistent with the TMP. Detailed Synchro Analysis results can be found in Appendix E.

3 SIGNAL WARRANT ANALYSES

Traffic signal warrant analyses were conducted based on the methodologies outlined in Ontario Traffic Manual (OTM) Book 12: Traffic Signals for all three horizon years. Appendix F contains the detailed warrant calculation sheets. Table 3.1 summarizes the results of the signal warrants. Traffic signals are not warranted for either intersection under all three horizon years. This is consistent with the findings from the TMP.

Table 3.1: Signal Warrant Analyses

Intersection	Horizon Year	Traffic Signals
Chinguacousy Road and Spine Road	2026	Not Warranted
	2031	Not Warranted
	2041	Not Warranted
Spine Road and Neal Promenade	2026	Not Warranted
	2031	Not Warranted
	2041	Not Warranted

4 PARKING REVIEW

Parking ratios for both on-site (off-street) parking and on-street parking were recommended in the 2018 TMP. These parking requirements are summarized in Table 4.1 below.

Table 4.1: Required Parking Ratios

Source	Land Use/Units	Parking Rate		Total Minimum Requirements	
		On-Site	On-Street	On-Site	On-Street
2018 TMP	Detached 78 Units	2 spaces per unit	1 space per unit	156	78
	Townhouse 127 Units	2 spaces per unit	0.5 spaces per unit	254	64
Total				410	142

Based on the latest site plans received, 65 on-street parking spaces are proposed within the subject site. This is a deficit of 77 parking spaces.

Vehicle ownership trends were analyzed from 2016 Transportation Tomorrow Survey (TTS) data in the existing neighborhoods surrounding the subject site. These results are summarized in Table 4.2 below.

Table 4.2: Vehicle Ownership (2016 TTS)

Number of Vehicles	Percentage of Households
1	28%
2	50%
3+	21%

The 2016 TTS data shows that the majority of households own two or less vehicles. Given the information, household with more than 2 parking spaces (including garage space) would have surplus to serve some of the visitor parking requirements. Based on this assumption, the latest parking plans (attached in Appendix G) indicate that 60 units will have two surplus spaces, located on-site (off-street). This would result in 120 surplus off-street parking spaces.

When considering the surplus parking with the on-street parking proposed for the subject site, a total of 185 spaces would be provided. This would be considered sufficient in meeting the on-street visitors parking requirements.

5 CONCLUSIONS AND RECOMMENDATIONS

The updated Draft Plan being submitted by FP Mayfield West (Caledon) Inc. for the Town of Caledon (part of the Mayfield West Phase 2 area) has a mix of low-density and medium-density housing, providing a total of 205 residential units. Compared to the 2018 TMP, this is a net reduction of 35 units. The trip generation resulting from the subject site would be lower than the trip generation originally calculated, meaning that the overall traffic analysis is more conservative.

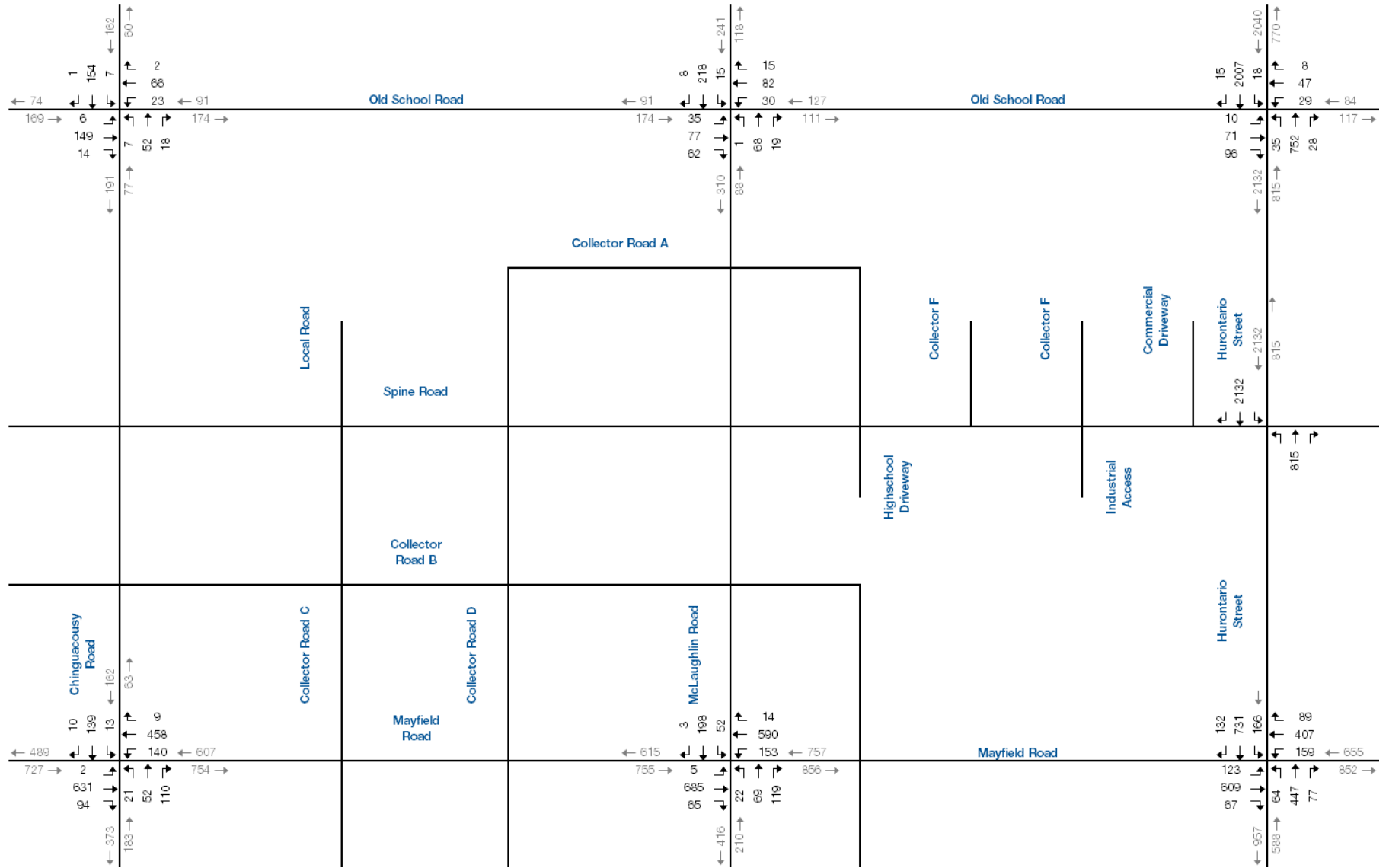
The 2018 TMP recommended that the intersections of Chinguacousy Road at Spine Road and Spine Road at Neal Promenade to operate under stop-control. The findings in this report are consistent with the findings from the TMP.

A total on-street parking supply of 65 spaces is proposed in the subject site. While this results in a deficit of 77 visitor parking spaces, an additional 120 spaces are proposed to be provided off-street. Based on the vehicle ownership rates in the surrounding area, the proposed on- and off-street spaces provided within the site will be sufficient to serve the expected demand.

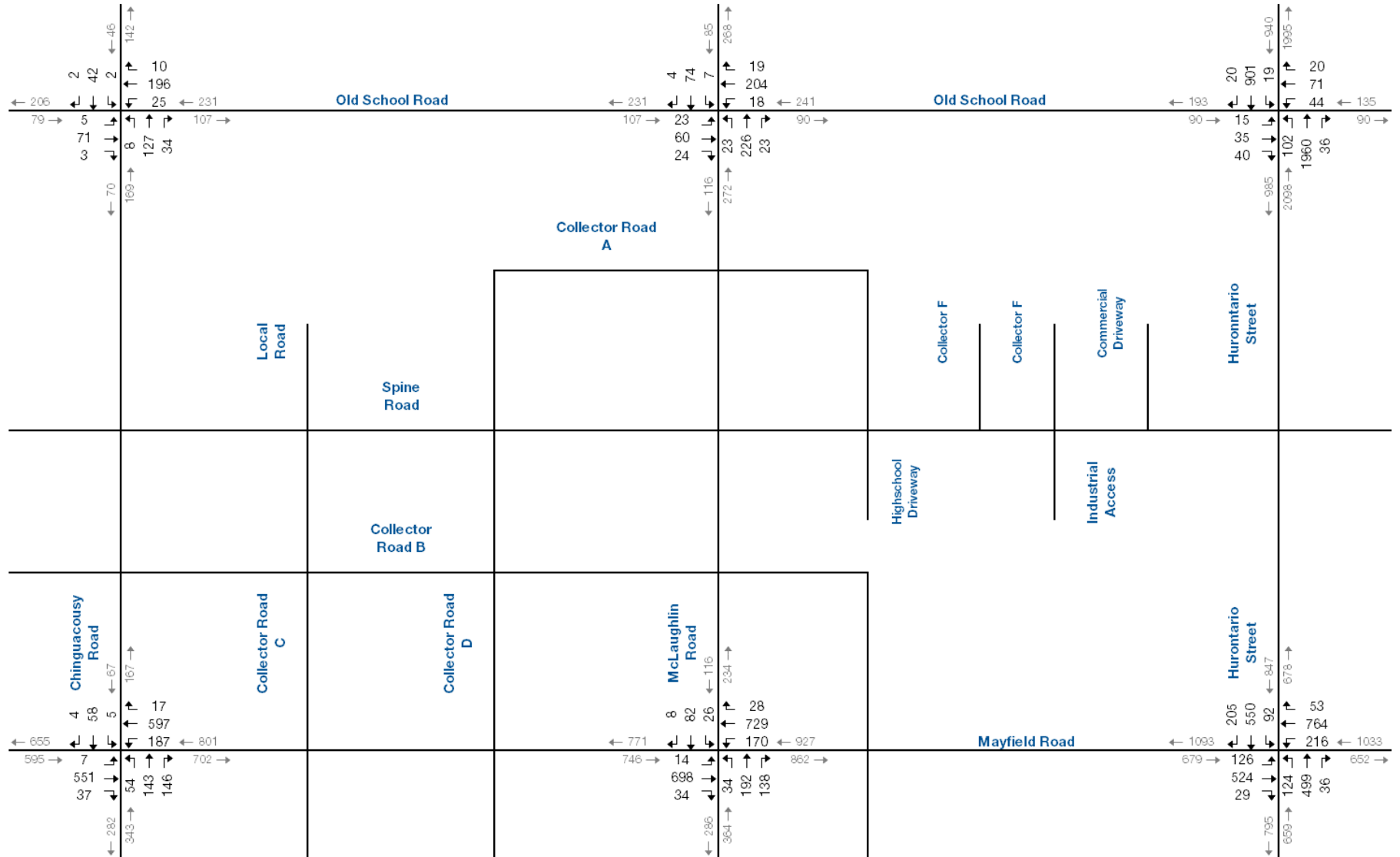


APPENDIX A

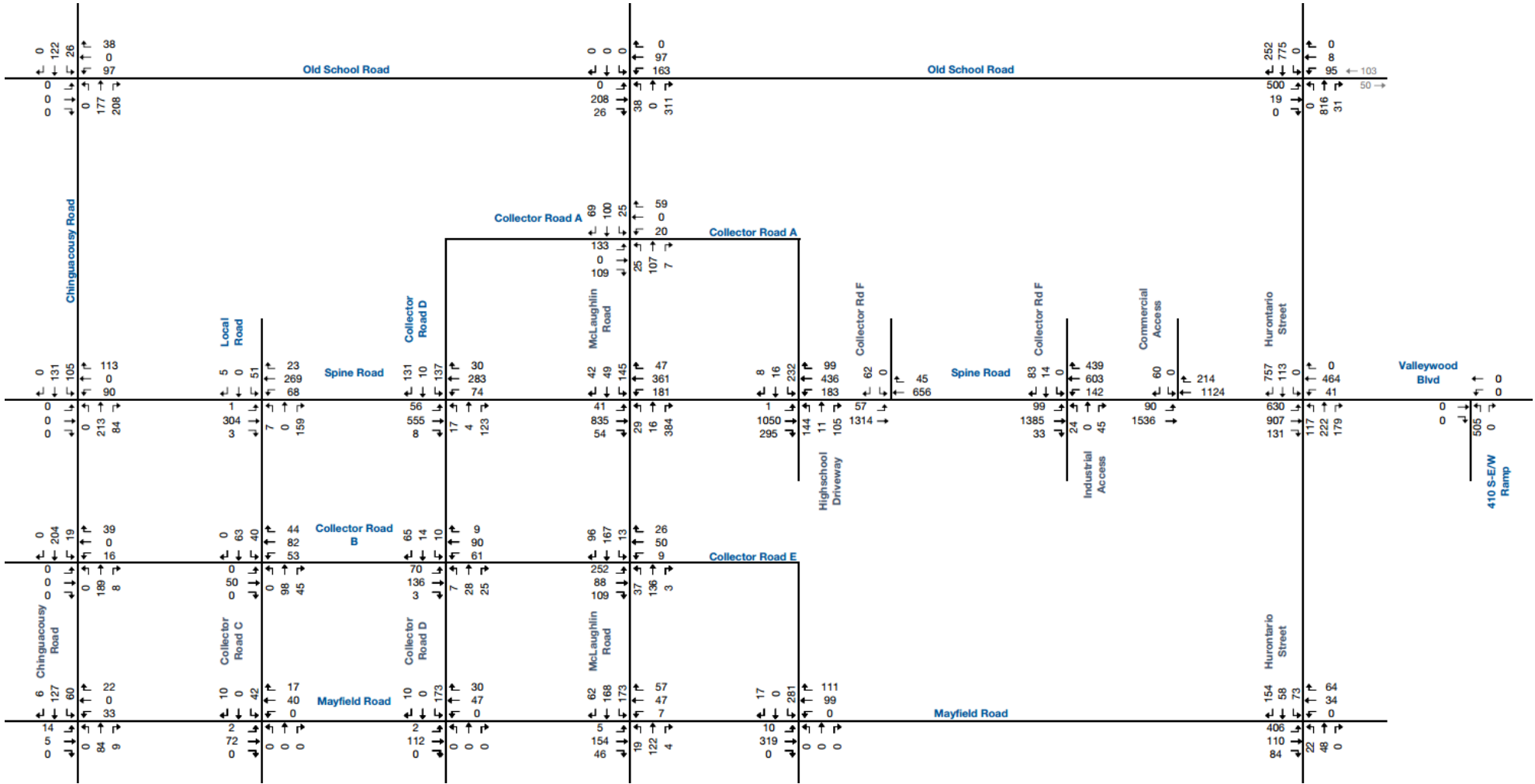
2018 Transportation Master
Plan Traffic Data



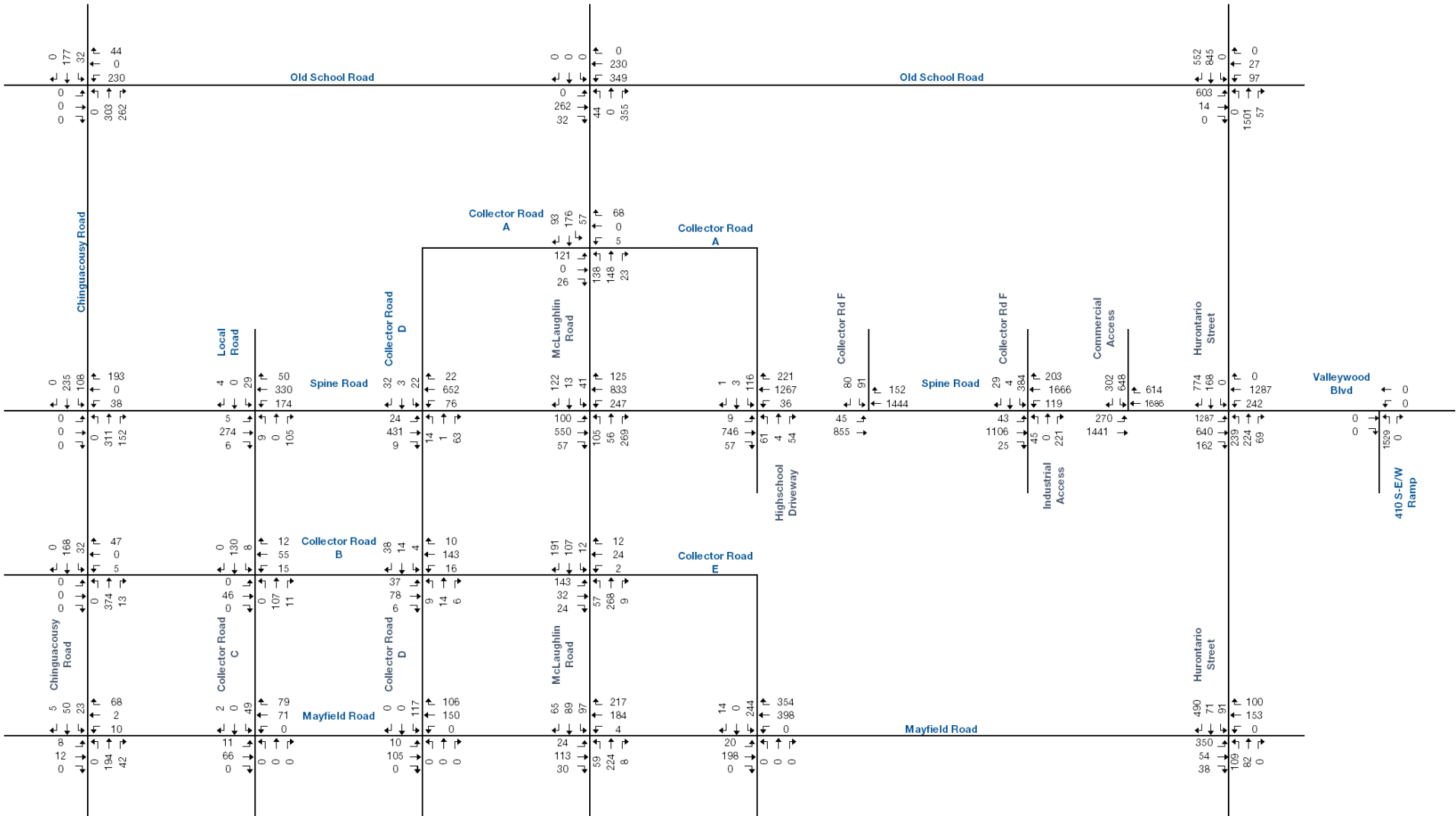
Existing Traffic – AM Peak Hour



Existing Traffic – PM Peak Hour



Site Trip Assignment – AM Peak Hour



Site Trip Assignment – PM Peak Hour

Figure 2.4



APPENDIX B

2016 Transportation Tomorrow Survey Data
Results

Thu Sep 10 2020 10:10:12 GMT-0400 (Eastern Daylight Time) - Run Time: 2118ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of origin - pd_orig

Column: Planning district of destination - pd_dest

Filters:

Planning district of destination - pd_dest In 34

and

Planning district of origin - pd_orig In 34

35

36

and

Start time of trip - start_time In 0700-0859

Trip 2016

Table:

	Caledon
Caledon	10737
Brampton	5063
Mississauga	426

Inbound AM - Regional

Thu Sep 10 2020 10:08:54 GMT-0400 (Eastern Daylight Time) - Run Time: 2668ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Regional municipality of origin - region_orig

Column: Planning district of destination - pd_dest

Filters:

Planning district of destination - pd_dest In 34

and

Start time of trip - start_time In 0700-0859

Trip 2016

Table:

	Caledon
Toronto	780
Durham	21
York	1270
Peel	16227
Halton	781
Hamilton	11
Niagara	9
Guelph	86
Wellington	178
Orangeville	530
Barrie	45
Simcoe	707
Orillia	28
Dufferin	304

Thu Sep 10 2020 10:10:40 GMT-0400 (Eastern Daylight Time) - Run Time: 2137ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of origin - pd_orig

Column: Planning district of destination - pd_dest

Filters:

Planning district of destination - pd_dest In 34

and

Planning district of origin - pd_orig In 34

35

36

and

Start time of trip - start_time In 1600-1759

Trip 2016

Table:

	Caledon
Caledon	5343
Brampton	3901
Mississauga	2024

Inbound PM - Regional

Thu Sep 10 2020 10:09:27 GMT-0400 (Eastern Daylight Time) - Run Time: 2089ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Regional municipality of origin - region_orig

Column: Planning district of destination - pd_dest

Filters:

Planning district of destination - pd_dest In 34

and

Start time of trip - start_time In 1600-1759

Trip 2016

Table:

	Caledon
Toronto	3833
Durham	64
York	2959
Peel	11268
Halton	722
Hamilton	37
Niagara	21
Waterloo	101
Guelph	103
Wellington	179
Orangeville	383
Barrie	29
Simcoe	598
Dufferin	208

Thu Sep 10 2020 10:07:15 GMT-0400 (Eastern Daylight Time) - Run Time: 2178ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of household - pd_hhld

Column: Planning district of destination - pd_dest

Filters:

Planning district of household - pd_hhld In 34

and

Planning district of destination - pd_dest In 34

35

36

and

Start time of trip - start_time In 0700-0859

Trip 2016

Table:

	Caledon	Brampton	Mississauga
Caledon	11026	4871	2346

Outbound AM - Regional

Thu Sep 10 2020 10:04:43 GMT-0400 (Eastern Daylight Time) - Run Time: 2293ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of household - pd_hhld

Column: Regional municipality of destination - region_dest

Filters:

Planning district of household - pd_hhld In 34

and

Start time of trip - start_time In 0700-0859

Trip 2016

Table:

	Toronto	Durham	York	Peel	Halton	Hamilton	Waterloo	Guelph	Wellington	Orangeville	Barrie	Simcoe	Dufferin	External
Caledon	3331	34	3294	18243	479	95	30	56	195	462	120	372	77	29

Outbound PM - Caledon, Brampton, Mississauga

Thu Sep 10 2020 10:07:52 GMT-0400 (Eastern Daylight Time) - Run Time: 2403ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of household - pd_hhld

Column: Planning district of destination - pd_dest

Filters:

Planning district of household - pd_hhld In 34

and

Planning d 35 36

and

Start time of trip - start_time In 1600-1759

Trip 2016

Table:

	Caledon	Brampton	Mississauga
Caledon	18995	1314	325

Outbound PM - Regional

Thu Sep 10 2020 10:06:01 GMT-0400 (Eastern Daylight Time) - Run Time: 2116ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of household - pd_hhld

Column: Regional municipality of destination - region_dest

Filters:

Planning district of household - pd_hhld In 34

and

Start time of trip - start_time In 1600-1759

Trip 2016

Table:

	Toronto	Durham	York	Peel	Halton	Waterloo	Wellington	Orangeville	Simcoe	Dufferin	External
Caledon	693	10	733	20634	177	21	88	536	269	146	73



APPENDIX C

Intersection Capacity Analysis Results –
Future Total Conditions (2026)

Lanes, Volumes, Timings
1: Chinguacousy Rd & Spine Rd

09/02/2020



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	90	113	303	84	105	355
Future Volume (vph)	90	113	303	84	105	355
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.7	3.5	3.5	3.7
Storage Length (m)	15.0	0.0		15.0	15.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1750	1566	1883	1566	1750	1883
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1750	1566	1883	1566	1750	1883
Link Speed (k/h)	50		80			80
Link Distance (m)	308.8		1007.6			652.7
Travel Time (s)	22.2		45.3			29.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	98	123	329	91	114	386
Shared Lane Traffic (%)						
Lane Group Flow (vph)	98	123	329	91	114	386
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.5		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	1.6		1.6			1.6
Two way Left Turn Lane						
Headway Factor	1.01	1.01	0.99	1.01	1.01	0.99
Turning Speed (k/h)	24	14		14	24	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	36.8%
Analysis Period (min)	15
	ICU Level of Service A

HCM 2010 TWSC
 1: Chinguacousy Rd & Spine Rd

09/02/2020

Intersection

Int Delay, s/veh 4.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	90	113	303	84	105	355
Future Vol, veh/h	90	113	303	84	105	355
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	150	0	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	98	123	329	91	114	386

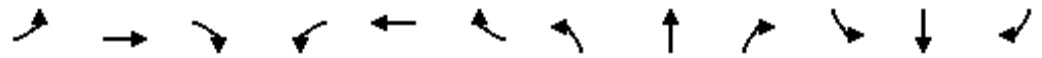
Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	943	329	0
Stage 1	329	-	-
Stage 2	614	-	-
Critical Hdwy	6.42	6.22	-
Critical Hdwy Stg 1	5.42	-	-
Critical Hdwy Stg 2	5.42	-	-
Follow-up Hdwy	3.518	3.318	-
Pot Cap-1 Maneuver	291	712	-
Stage 1	729	-	-
Stage 2	540	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	262	712	-
Mov Cap-2 Maneuver	262	-	-
Stage 1	729	-	-
Stage 2	486	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18	0	1.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	262	712	1139
HCM Lane V/C Ratio	-	-	0.373	0.173	0.1
HCM Control Delay (s)	-	-	26.7	11.1	8.5
HCM Lane LOS	-	-	D	B	A
HCM 95th %tile Q(veh)	-	-	1.7	0.6	0.3

Lanes, Volumes, Timings
2: Neal Prom/Local Rd & Spine Rd

09/02/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	304	3	68	269	23	7	0	159	51	0	5
Future Volume (vph)	1	304	3	68	269	23	7	0	159	51	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.5	3.5	3.5	3.5	3.5
Storage Length (m)	15.0		0.0	15.0		0.0	15.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.988			0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	1882	0	1750	1861	0	1750	1566	0	1750	1566	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1750	1882	0	1750	1861	0	1750	1566	0	1750	1566	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		308.8			979.8			505.7			130.7	
Travel Time (s)		22.2			70.5			36.4			9.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	330	3	74	292	25	8	0	173	55	0	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1	333	0	74	317	0	8	173	0	55	5	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	0.99	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	46.5%
Analysis Period (min)	15
	ICU Level of Service A

HCM 2010 TWSC
2: Neal Prom/Local Rd & Spine Rd

09/02/2020

Intersection

Int Delay, s/veh 4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Vol, veh/h	1	304	3	68	269	23	7	0	159	51	0	5
Future Vol, veh/h	1	304	3	68	269	23	7	0	159	51	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	150	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	330	3	74	292	25	8	0	173	55	0	5

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	317	0	0	333
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	1243	-	-	1226
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1243	-	-	1226
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.5	12	28.8
HCM LOS			B	D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	291	710	1243	-	-	1226	-	-	195	735
HCM Lane V/C Ratio	0.026	0.243	0.001	-	-	0.06	-	-	0.284	0.007
HCM Control Delay (s)	17.7	11.7	7.9	-	-	8.1	-	-	30.6	9.9
HCM Lane LOS	C	B	A	-	-	A	-	-	D	A
HCM 95th %tile Q(veh)	0.1	1	0	-	-	0.2	-	-	1.1	0

Lanes, Volumes, Timings
1: Chinguacousy Rd & Spine Rd

09/02/2020



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	38	193	393	152	108	433
Future Volume (vph)	38	193	393	152	108	433
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.7	3.5	3.5	3.7
Storage Length (m)	15.0	0.0		15.0	15.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1750	1566	1883	1566	1750	1883
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1750	1566	1883	1566	1750	1883
Link Speed (k/h)	50		80			80
Link Distance (m)	308.8		1007.6			652.7
Travel Time (s)	22.2		45.3			29.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	210	427	165	117	471
Shared Lane Traffic (%)						
Lane Group Flow (vph)	41	210	427	165	117	471
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.5		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	1.6		1.6			1.6
Two way Left Turn Lane						
Headway Factor	1.01	1.01	0.99	1.01	1.01	0.99
Turning Speed (k/h)	24	14		14	24	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	40.0%
Analysis Period (min)	15
	ICU Level of Service A

HCM 2010 TWSC
 1: Chinguacousy Rd & Spine Rd

09/02/2020

Intersection						
Int Delay, s/veh	3.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	38	193	393	152	108	433
Future Vol, veh/h	38	193	393	152	108	433
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	150	0	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	41	210	427	165	117	471

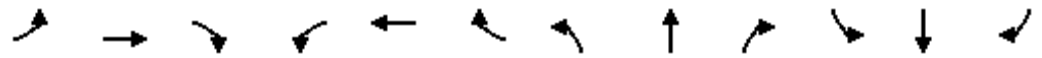
Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1132	427	0	0	592
Stage 1	427	-	-	-	-
Stage 2	705	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	225	628	-	-	984
Stage 1	658	-	-	-	-
Stage 2	490	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	198	628	-	-	984
Mov Cap-2 Maneuver	198	-	-	-	-
Stage 1	658	-	-	-	-
Stage 2	432	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16	0	1.8
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	198	628	984
HCM Lane V/C Ratio	-	-	0.209	0.334	0.119
HCM Control Delay (s)	-	-	27.9	13.6	9.2
HCM Lane LOS	-	-	D	B	A
HCM 95th %tile Q(veh)	-	-	0.8	1.5	0.4

Lanes, Volumes, Timings
2: Neal Prom/Local Rd & Spine Rd

09/02/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	274	6	174	330	50	9	0	105	29	0	4
Future Volume (vph)	5	274	6	174	330	50	9	0	105	29	0	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.5	3.5	3.5	3.5	3.5
Storage Length (m)	15.0		0.0	15.0		0.0	15.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.980			0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	1878	0	1750	1846	0	1750	1566	0	1750	1566	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1750	1878	0	1750	1846	0	1750	1566	0	1750	1566	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		308.8			979.8			505.7			130.7	
Travel Time (s)		22.2			70.5			36.4			9.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	298	7	189	359	54	10	0	114	32	0	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	305	0	189	413	0	10	114	0	32	4	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	0.99	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	42.7%
Analysis Period (min)	15
	ICU Level of Service A

HCM 2010 TWSC
 2: Neal Prom/Local Rd & Spine Rd

09/02/2020

Intersection

Int Delay, s/veh 4.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Vol, veh/h	5	274	6	174	330	50	9	0	105	29	0	4
Future Vol, veh/h	5	274	6	174	330	50	9	0	105	29	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	150	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	298	7	189	359	54	10	0	114	32	0	4

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	413	0	0	305
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	1146	-	-	1256
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1146	-	-	1256
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	2.6	12.1	36.3
HCM LOS			B	E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	172	738	1146	-	-	1256	-	-	134	662
HCM Lane V/C Ratio	0.057	0.155	0.005	-	-	0.151	-	-	0.235	0.007
HCM Control Delay (s)	27.2	10.8	8.2	-	-	8.4	-	-	39.9	10.5
HCM Lane LOS	D	B	A	-	-	A	-	-	E	B
HCM 95th %tile Q(veh)	0.2	0.5	0	-	-	0.5	-	-	0.9	0

APPENDIX D

Intersection Capacity Analysis Results –
Future Total Conditions (2031)

Lanes, Volumes, Timings
1: Chinguacousy Rd & Spine Rd

09/02/2020



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	99	125	335	93	116	392
Future Volume (vph)	99	125	335	93	116	392
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.7	3.5	3.5	3.7
Storage Length (m)	15.0	0.0		15.0	15.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1750	1566	1883	1566	1750	1883
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1750	1566	1883	1566	1750	1883
Link Speed (k/h)	50		80			80
Link Distance (m)	308.8		1007.6			652.7
Travel Time (s)	22.2		45.3			29.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	108	136	364	101	126	426
Shared Lane Traffic (%)						
Lane Group Flow (vph)	108	136	364	101	126	426
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.5		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	1.6		1.6			1.6
Two way Left Turn Lane						
Headway Factor	1.01	1.01	0.99	1.01	1.01	0.99
Turning Speed (k/h)	24	14		14	24	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	39.5%
Analysis Period (min)	15
	ICU Level of Service A

HCM 2010 TWSC
 1: Chinguacousy Rd & Spine Rd

09/02/2020

Intersection						
Int Delay, s/veh	5.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↕	↖	↗	↕
Traffic Vol, veh/h	99	125	335	93	116	392
Future Vol, veh/h	99	125	335	93	116	392
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	150	0	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	108	136	364	101	126	426

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1042	364	0	0	465
Stage 1	364	-	-	-	-
Stage 2	678	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	254	681	-	-	1096
Stage 1	703	-	-	-	-
Stage 2	504	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	225	681	-	-	1096
Mov Cap-2 Maneuver	225	-	-	-	-
Stage 1	703	-	-	-	-
Stage 2	446	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21.9	0	2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	- 225 681 1096	-	-
HCM Lane V/C Ratio	-	- 0.478 0.2 0.115	-	-
HCM Control Delay (s)	-	- 34.9 11.6 8.7	-	-
HCM Lane LOS	-	- D B A	-	-
HCM 95th %tile Q(veh)	-	- 2.4 0.7 0.4	-	-

Lanes, Volumes, Timings
2: Neal Prom/Local Rd & Spine Rd

09/02/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	336	3	75	297	25	8	0	176	56	0	6
Future Volume (vph)	1	336	3	75	297	25	8	0	176	56	0	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.5	3.5	3.5	3.5	3.5
Storage Length (m)	15.0		0.0	15.0		0.0	15.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.988			0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	1882	0	1750	1861	0	1750	1566	0	1750	1566	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1750	1882	0	1750	1861	0	1750	1566	0	1750	1566	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		308.8			979.8			505.7			130.7	
Travel Time (s)		22.2			70.5			36.4			9.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	365	3	82	323	27	9	0	191	61	0	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1	368	0	82	350	0	9	191	0	61	7	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	0.99	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	49.6%
Analysis Period (min)	15
	ICU Level of Service A

HCM 2010 TWSC
2: Neal Prom/Local Rd & Spine Rd

09/02/2020

Intersection												
Int Delay, s/veh	5.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Vol, veh/h	1	336	3	75	297	25	8	0	176	56	0	6
Future Vol, veh/h	1	336	3	75	297	25	8	0	176	56	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	150	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	365	3	82	323	27	9	0	191	61	0	7

Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	350	0	0	368	0	0	873	883	367	965	871	337
Stage 1	-	-	-	-	-	-	369	369	-	501	501	-
Stage 2	-	-	-	-	-	-	504	514	-	464	370	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1209	-	-	1191	-	-	271	285	678	234	289	705
Stage 1	-	-	-	-	-	-	651	621	-	552	543	-
Stage 2	-	-	-	-	-	-	550	535	-	578	620	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1209	-	-	1191	-	-	254	265	678	159	269	705
Mov Cap-2 Maneuver	-	-	-	-	-	-	254	265	-	159	269	-
Stage 1	-	-	-	-	-	-	650	620	-	551	506	-
Stage 2	-	-	-	-	-	-	507	498	-	415	619	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	0		1.6		12.7		38	
HCM LOS					B		E	

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	254	678	1209	-	-	1191	-	-	159	705
HCM Lane V/C Ratio	0.034	0.282	0.001	-	-	0.068	-	-	0.383	0.009
HCM Control Delay (s)	19.7	12.4	8	-	-	8.2	-	-	41	10.2
HCM Lane LOS	C	B	A	-	-	A	-	-	E	B
HCM 95th %tile Q(veh)	0.1	1.2	0	-	-	0.2	-	-	1.6	0

Lanes, Volumes, Timings
 1: Chinguacousy Rd & Spine Rd

09/02/2020



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	42	213	434	168	119	478
Future Volume (vph)	42	213	434	168	119	478
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.7	3.5	3.5	3.7
Storage Length (m)	15.0	0.0		15.0	15.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1750	1566	1883	1566	1750	1883
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1750	1566	1883	1566	1750	1883
Link Speed (k/h)	50		80			80
Link Distance (m)	308.8		1007.6			652.7
Travel Time (s)	22.2		45.3			29.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	46	232	472	183	129	520
Shared Lane Traffic (%)						
Lane Group Flow (vph)	46	232	472	183	129	520
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.5		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	1.6		1.6			1.6
Two way Left Turn Lane						
Headway Factor	1.01	1.01	0.99	1.01	1.01	0.99
Turning Speed (k/h)	24	14		14	24	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	42.8%
Analysis Period (min)	15
	ICU Level of Service A

HCM 2010 TWSC
1: Chinguacousy Rd & Spine Rd

09/02/2020

Intersection						
Int Delay, s/veh	4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	42	213	434	168	119	478
Future Vol, veh/h	42	213	434	168	119	478
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	150	0	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	46	232	472	183	129	520

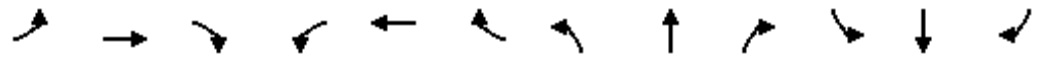
Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1250	472	0	0	655
Stage 1	472	-	-	-	-
Stage 2	778	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	191	592	-	-	932
Stage 1	628	-	-	-	-
Stage 2	453	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	165	592	-	-	932
Mov Cap-2 Maneuver	165	-	-	-	-
Stage 1	628	-	-	-	-
Stage 2	390	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.2	0	1.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	165	592	932
HCM Lane V/C Ratio	-	-	0.277	0.391	0.139
HCM Control Delay (s)	-	-	35	14.9	9.5
HCM Lane LOS	-	-	E	B	A
HCM 95th %tile Q(veh)	-	-	1.1	1.9	0.5

Lanes, Volumes, Timings
2: Neal Prom/Local Rd & Spine Rd

09/02/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	303	7	192	364	55	10	0	116	32	0	4
Future Volume (vph)	6	303	7	192	364	55	10	0	116	32	0	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.5	3.5	3.5	3.5	3.5
Storage Length (m)	15.0		0.0	15.0		0.0	15.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.980			0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	1876	0	1750	1846	0	1750	1566	0	1750	1566	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1750	1876	0	1750	1846	0	1750	1566	0	1750	1566	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		308.8			979.8			505.7			130.7	
Travel Time (s)		22.2			70.5			36.4			9.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	329	8	209	396	60	11	0	126	35	0	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	337	0	209	456	0	11	126	0	35	4	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	0.99	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	45.4%
Analysis Period (min)	15
	ICU Level of Service A

Intersection

Int Delay, s/veh 4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Vol, veh/h	6	303	7	192	364	55	10	0	116	32	0	4
Future Vol, veh/h	6	303	7	192	364	55	10	0	116	32	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	150	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	329	8	209	396	60	11	0	126	35	0	4

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	456	0	0	337
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	1105	-	-	1222
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1105	-	-	1222
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	2.7	12.9	49.8
HCM LOS			B	E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	141	709	1105	-	-	1222	-	-	106	628
HCM Lane V/C Ratio	0.077	0.178	0.006	-	-	0.171	-	-	0.328	0.007
HCM Control Delay (s)	32.7	11.2	8.3	-	-	8.6	-	-	54.7	10.8
HCM Lane LOS	D	B	A	-	-	A	-	-	F	B
HCM 95th %tile Q(veh)	0.2	0.6	0	-	-	0.6	-	-	1.3	0



APPENDIX E

Intersection Capacity Analysis –
Future Total Conditions (2041)

Lanes, Volumes, Timings
1: Chinguacousy Rd & Spine Rd

09/02/2020



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	121	152	408	113	141	478
Future Volume (vph)	121	152	408	113	141	478
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.7	3.5	3.5	3.7
Storage Length (m)	15.0	0.0		15.0	15.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1750	1566	1883	1566	1750	1883
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1750	1566	1883	1566	1750	1883
Link Speed (k/h)	50		80			80
Link Distance (m)	308.8		1007.6			652.7
Travel Time (s)	22.2		45.3			29.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	132	165	443	123	153	520
Shared Lane Traffic (%)						
Lane Group Flow (vph)	132	165	443	123	153	520
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.5		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	1.6		1.6			1.6
Two way Left Turn Lane						
Headway Factor	1.01	1.01	0.99	1.01	1.01	0.99
Turning Speed (k/h)	24	14		14	24	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	46.0%
Analysis Period (min)	15
	ICU Level of Service A

HCM 2010 TWSC
 1: Chinguacousy Rd & Spine Rd

09/02/2020

Intersection						
Int Delay, s/veh	10					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↑	↖	↗	↑
Traffic Vol, veh/h	121	152	408	113	141	478
Future Vol, veh/h	121	152	408	113	141	478
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	150	0	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	132	165	443	123	153	520

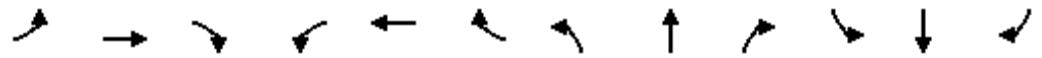
Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1269	443	0	0	566
Stage 1	443	-	-	-	-
Stage 2	826	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	186	615	-	-	1006
Stage 1	647	-	-	-	-
Stage 2	430	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	158	615	-	-	1006
Mov Cap-2 Maneuver	158	-	-	-	-
Stage 1	647	-	-	-	-
Stage 2	365	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	47.1	0	2.1
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	158	615	1006
HCM Lane V/C Ratio	-	-	0.832	0.269	0.152
HCM Control Delay (s)	-	-	89.9	13	9.2
HCM Lane LOS	-	-	F	B	A
HCM 95th %tile Q(veh)	-	-	5.6	1.1	0.5

Lanes, Volumes, Timings
2: Neal Prom/Local Rd & Spine Rd

09/02/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	410	4	91	362	30	10	0	215	68	0	7
Future Volume (vph)	1	410	4	91	362	30	10	0	215	68	0	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.5	3.5	3.5	3.5	3.5
Storage Length (m)	15.0		0.0	15.0		0.0	15.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.988			0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	1882	0	1750	1861	0	1750	1566	0	1750	1566	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1750	1882	0	1750	1861	0	1750	1566	0	1750	1566	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		308.8			979.8			505.7			130.7	
Travel Time (s)		22.2			70.5			36.4			9.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	446	4	99	393	33	11	0	234	74	0	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1	450	0	99	426	0	11	234	0	74	8	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	0.99	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	57.3%
Analysis Period (min)	15
	ICU Level of Service B

HCM 2010 TWSC
2: Neal Prom/Local Rd & Spine Rd

09/02/2020

Intersection												
Int Delay, s/veh	10											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Vol, veh/h	1	410	4	91	362	30	10	0	215	68	0	7
Future Vol, veh/h	1	410	4	91	362	30	10	0	215	68	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	150	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	446	4	99	393	33	11	0	234	74	0	8

Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	426	0	0	450	0	0	1062	1074	448	1175	1060	410
Stage 1	-	-	-	-	-	-	450	450	-	608	608	-
Stage 2	-	-	-	-	-	-	612	624	-	567	452	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1133	-	-	1110	-	-	201	220	611	168	224	642
Stage 1	-	-	-	-	-	-	589	572	-	483	486	-
Stage 2	-	-	-	-	-	-	480	478	-	508	570	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1133	-	-	1110	-	-	185	200	611	97	204	642
Mov Cap-2 Maneuver	-	-	-	-	-	-	185	200	-	97	204	-
Stage 1	-	-	-	-	-	-	588	571	-	483	443	-
Stage 2	-	-	-	-	-	-	432	435	-	313	569	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	0		1.6		15		103.8	
HCM LOS					C		F	

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	185	611	1133	-	-	1110	-	-	97	642
HCM Lane V/C Ratio	0.059	0.382	0.001	-	-	0.089	-	-	0.762	0.012
HCM Control Delay (s)	25.7	14.5	8.2	-	-	8.6	-	-	113.4	10.7
HCM Lane LOS	D	B	A	-	-	A	-	-	F	B
HCM 95th %tile Q(veh)	0.2	1.8	0	-	-	0.3	-	-	4	0

Lanes, Volumes, Timings
1: Chinguacousy Rd & Spine Rd

09/02/2020



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	51	260	529	205	145	583
Future Volume (vph)	51	260	529	205	145	583
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.7	3.5	3.5	3.7
Storage Length (m)	15.0	0.0		15.0	15.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1750	1566	1883	1566	1750	1883
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1750	1566	1883	1566	1750	1883
Link Speed (k/h)	50		80			80
Link Distance (m)	308.8		1007.6			652.7
Travel Time (s)	22.2		45.3			29.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	283	575	223	158	634
Shared Lane Traffic (%)						
Lane Group Flow (vph)	55	283	575	223	158	634
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.5		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	1.6		1.6			1.6
Two way Left Turn Lane						
Headway Factor	1.01	1.01	0.99	1.01	1.01	0.99
Turning Speed (k/h)	24	14		14	24	
Sign Control	Stop		Free			Free

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	50.6%
Analysis Period (min)	15
	ICU Level of Service A

HCM 2010 TWSC
1: Chinguacousy Rd & Spine Rd

09/02/2020

Intersection

Int Delay, s/veh 5.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	51	260	529	205	145	583
Future Vol, veh/h	51	260	529	205	145	583
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	150	0	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	55	283	575	223	158	634

Major/Minor

	Minor1	Major1	Major2		
Conflicting Flow All	1525	575	0	0	798
Stage 1	575	-	-	-	-
Stage 2	950	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	130	518	-	-	824
Stage 1	563	-	-	-	-
Stage 2	376	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	105	518	-	-	824
Mov Cap-2 Maneuver	105	-	-	-	-
Stage 1	563	-	-	-	-
Stage 2	304	-	-	-	-

Approach

	WB	NB	SB
HCM Control Delay, s	28.6	0	2.1
HCM LOS	D		

Minor Lane/Major Mvmt

	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	105	518	824
HCM Lane V/C Ratio	-	-	0.528	0.546	0.191
HCM Control Delay (s)	-	-	72.5	20	10.4
HCM Lane LOS	-	-	F	C	B
HCM 95th %tile Q(veh)	-	-	2.4	3.2	0.7

Lanes, Volumes, Timings
2: Neal Prom/Local Rd & Spine Rd

09/02/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	369	9	234	444	67	12	0	141	39	0	5
Future Volume (vph)	7	369	9	234	444	67	12	0	141	39	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.5	3.5	3.5	3.5	3.5
Storage Length (m)	15.0		0.0	15.0		0.0	15.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.980			0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	1876	0	1750	1846	0	1750	1566	0	1750	1566	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1750	1876	0	1750	1846	0	1750	1566	0	1750	1566	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		308.8			979.8			505.7			130.7	
Travel Time (s)		22.2			70.5			36.4			9.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	401	10	254	483	73	13	0	153	42	0	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	8	411	0	254	556	0	13	153	0	42	5	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	0.99	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	58.3%
ICU Level of Service	B
Analysis Period (min)	15

HCM 2010 TWSC
 2: Neal Prom/Local Rd & Spine Rd

09/02/2020

Intersection

Int Delay, s/veh 7.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Vol, veh/h	7	369	9	234	444	67	12	0	141	39	0	5
Future Vol, veh/h	7	369	9	234	444	67	12	0	141	39	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	150	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	8	401	10	254	483	73	13	0	153	42	0	5

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	556	0	0	411
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	1015	-	-	1148
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1015	-	-	1148
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	2.8	15.5	136.1
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	88	645	1015	-	-	1148	-	-	60	556
HCM Lane V/C Ratio	0.148	0.238	0.007	-	-	0.222	-	-	0.707	0.01
HCM Control Delay (s)	52.9	12.3	8.6	-	-	9	-	-	152.1	11.5
HCM Lane LOS	F	B	A	-	-	A	-	-	F	B
HCM 95th %tile Q(veh)	0.5	0.9	0	-	-	0.8	-	-	3	0



APPENDIX F

Signal Warrant Sheets

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 21146.000
 LOCATION: Chinguacousy Road/Spine Road
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: Chinguacousy Road/Spine Road
 COMMENT: Future Total Traffic - 2026
 ANALYSIS PREPARED BY: JL on September 16, 2020
 AREA TYPE: (RURAL or URBAN) Rural 10:05 AM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion	=	
A. Requirement =	900	150%	=	1350
AM+PM PK HR/4 =				592
Compliance				44%
B. Requirement =	225	225%	=	506
AM+PM PK HR/4 =				109
Compliance				21%
<u>Conclusion Warrant 1:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO

Warrant 2- Delay to Cross Traffic

A. Requirement =	900	150%	=	1350
AM+PM PK HR/4 =				483
Compliance				36%
B. Requirement =	170	150%	=	255
AM+PM PK HR/4 =				32
Compliance				13%
<u>Conclusion Warrant 2:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO

WARRANT MET--> NO

TIME	MINOR APPROACH (EB)			MAJOR APPROACH (NB)			MINOR APPROACH (WB)			MAJOR APPROACH (SB)			Ped. cross- ing major approach
	Spine Road			Chinguacousy Road			Spine Road			Chinguacousy Road			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	0	0	0	0	303	84	90	0	113	105	355	0	
PM	0	0	0	0	393	152	38	0	193	108	433	0	
AM&PM	0	0	0	0	696	236	128	0	306	213	788	0	
Average Hourly Volume	0	0	0	0	174	59	32	0	77	53	197	0	0

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 21146.000
 LOCATION: Chinguacousy Road/Spine Road
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: Chinguacousy Road/Spine Road
 COMMENT: Future Total Traffic - 2031
 ANALYSIS PREPARED BY: JL on September 16, 2020
 AREA TYPE: (RURAL or URBAN) Rural 10:05 AM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion			
A. Requirement =	900	150%	=		1350
AM+PM PK HR/4 =					654
Compliance					48%
B. Requirement =	225	225%	=		506
AM+PM PK HR/4 =					120
Compliance					24%
 <u>Conclusion Warrant 1:</u>					
				100% Satisfied-->	NO
				80% Satisfied-->	NO

Warrant 2- Delay to Cross Traffic

A. Requirement =	900	150%	=		1350
AM+PM PK HR/4 =					534
Compliance					40%
B. Requirement =	170	150%	=		255
AM+PM PK HR/4 =					35
Compliance					14%
 <u>Conclusion Warrant 2:</u>					
				100% Satisfied-->	NO
				80% Satisfied-->	NO

WARRANT MET--> NO

TIME	MINOR APPROACH (EB)			MAJOR APPROACH (NB)			MINOR APPROACH (WB)			MAJOR APPROACH (SB)			Ped. cross- ing major approach
	Spine Road			Chinguacousy Road			Spine Road			Chinguacousy Road			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	0	0	0	0	335	93	99	0	125	116	392	0	
PM	0	0	0	0	434	168	42	0	213	119	478	0	
AM&PM	0	0	0	0	769	261	141	0	338	235	870	0	
Average Hourly	0	0	0	0	192	65	35	0	85	59	218	0	0

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 21146.000
 LOCATION: Chinguacousy Road/Spine Road
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: Chinguacousy Road/Spine Road
 COMMENT: Future Total Traffic - 2041
 ANALYSIS PREPARED BY: JL on September 16, 2020
 AREA TYPE: (RURAL or URBAN) Rural 10:05 AM

Warrant 1- Minimum Vehicular Volume	Minimum Requirement	Volume Expansion	=	
A. Requirement =	900	150%	=	1350
AM+PM PK HR/4 =				797
Compliance				59%
 B. Requirement =	 225	 225%	 =	 506
AM+PM PK HR/4 =				146
Compliance				29%
 <u>Conclusion Warrant 1:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO
 Warrant 2- Delay to Cross Traffic				
A. Requirement =	900	150%	=	1350
AM+PM PK HR/4 =				651
Compliance				48%
 B. Requirement =	 170	 150%	 =	 255
AM+PM PK HR/4 =				43
Compliance				17%
 <u>Conclusion Warrant 2:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO
 <u>WARRANT MET--></u>				 NO

TIME	MINOR APPROACH (EB)			MAJOR APPROACH (NB)			MINOR APPROACH (WB)			MAJOR APPROACH (SB)			Ped. cross- ing major approach
	Spine Road			Chinguacousy Road			Spine Road			Chinguacousy Road			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	0	0	0	0	408	113	121	0	152	141	478	0	
PM	0	0	0	0	529	205	51	0	260	145	583	0	
AM&PM	0	0	0	0	937	318	172	0	412	286	1061	0	
Average Hourly	0	0	0	0	234	80	43	0	103	72	265	0	0

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 21146.000
 LOCATION: Spine Road/Neal Promenade
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: Spine Road/Neal Promenade
 COMMENT: Future Total Traffic - 2026
 ANALYSIS PREPARED BY: JL on September 16, 2020
 AREA TYPE: (RURAL or URBAN) Rural 10:05 AM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion		
A. Requirement =	720	150%	=	1080
AM+PM PK HR/4 =				469
Compliance				43%
B. Requirement =	170	150%	=	255
AM+PM PK HR/4 =				92
Compliance				36%
 <u>Conclusion Warrant 1:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO

Warrant 2- Delay to Cross Traffic

A. Requirement =	720	150%	=	1080
AM+PM PK HR/4 =				377
Compliance				35%
B. Requirement =	75	150%	=	113
AM+PM PK HR/4 =				24
Compliance				21%
 <u>Conclusion Warrant 2:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO

WARRANT MET--> NO

TIME	MINOR APPROACH (NB)			MAJOR APPROACH (EB)			MINOR APPROACH (SB)			MAJOR APPROACH (WB)			Ped. cross- ing major approach
	Neal Promenade			Spine Road			Neal Promenade			Spine Road			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	7	0	159	1	304	3	51	0	5	68	269	23	
PM	9	0	105	5	274	6	29	0	4	174	330	50	
AM&PM	16	0	264	6	578	9	80	0	9	242	599	73	
Average Hourly	4	0	66	2	145	2	20	0	2	61	150	18	0

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 21146.000
 LOCATION: Spine Road/Neal Promenade
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: Spine Road/Neal Promenade
 COMMENT: Future Total Traffic - 2031
 ANALYSIS PREPARED BY: JL on September 16, 2020
 AREA TYPE: (RURAL or URBAN) Rural 10:05 AM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion		
A. Requirement =	720	150%	=	1080
AM+PM PK HR/4 =				518
Compliance				48%
B. Requirement =	170	150%	=	255
AM+PM PK HR/4 =				102
Compliance				40%
 <u>Conclusion Warrant 1:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO

Warrant 2- Delay to Cross Traffic

A. Requirement =	720	150%	=	1080
AM+PM PK HR/4 =				416
Compliance				39%
B. Requirement =	75	150%	=	113
AM+PM PK HR/4 =				27
Compliance				24%
 <u>Conclusion Warrant 2:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO

WARRANT MET--> NO

TIME	MINOR APPROACH (NB)			MAJOR APPROACH (EB)			MINOR APPROACH (SB)			MAJOR APPROACH (WB)			Ped. cross- ing major approach
	Neal Promenade			Spine Road			Neal Promenade			Spine Road			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	8	0	176	1	336	3	56	0	6	75	297	25	
PM	10	0	116	6	303	7	32	0	4	192	364	55	
AM&PM	18	0	292	7	639	10	88	0	10	267	661	80	
Average Hourly	5	0	73	2	160	3	22	0	3	67	165	20	0

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 21146.000
 LOCATION: Spine Road/Neal Promenade
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: Spine Road/Neal Promenade
 COMMENT: Future Total Traffic - 2041
 ANALYSIS PREPARED BY: JL on September 16, 2020
 AREA TYPE: (RURAL or URBAN) Rural 10:05 AM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion		
A. Requirement =	720	150%	=	1080
AM+PM PK HR/4 =				631
Compliance				58%
B. Requirement =	170	150%	=	255
AM+PM PK HR/4 =				124
Compliance				49%
 <u>Conclusion Warrant 1:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO

Warrant 2- Delay to Cross Traffic

A. Requirement =	720	150%	=	1080
AM+PM PK HR/4 =				507
Compliance				47%
B. Requirement =	75	150%	=	113
AM+PM PK HR/4 =				33
Compliance				29%
 <u>Conclusion Warrant 2:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO

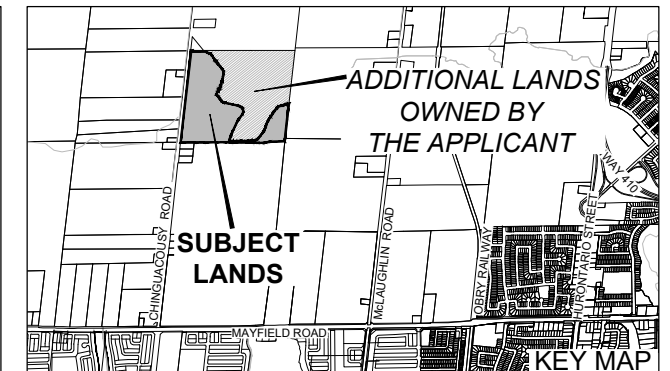
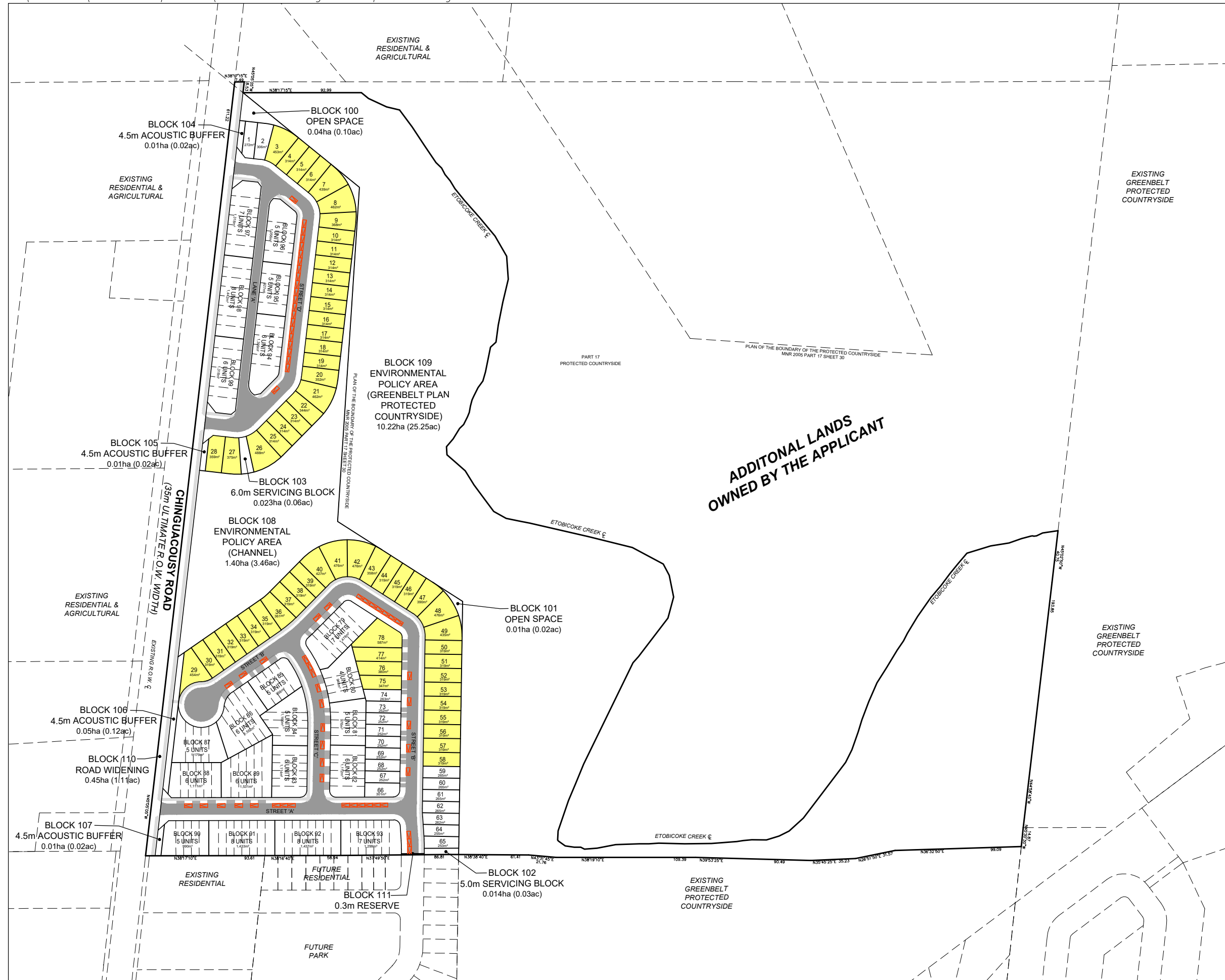
WARRANT MET--> NO

TIME	MINOR APPROACH (NB)			MAJOR APPROACH (EB)			MINOR APPROACH (SB)			MAJOR APPROACH (WB)			Ped. cross- ing major approach
	Neal Promenade			Spine Road			Neal Promenade			Spine Road			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	10	0	215	1	410	4	68	0	7	91	362	30	
PM	12	0	141	7	369	9	39	0	5	234	444	67	
AM&PM	22	0	356	8	779	13	107	0	12	325	806	97	
Average Hourly	6	0	89	2	195	3	27	0	3	81	202	24	0



APPENDIX G

Parking Plan



ON-STREET PARKING PLAN
FP MAYFIELD WEST (CALEDON) INC.
FILE # 21T-_____

PART OF LOT 20, CONCESSION 2, W.H.S.
 (GEOGRAPHIC TOWNSHIP OF CHINGUACOUSY, COUNTY OF PEEL)
 TOWN OF CALEDON
 REGIONAL MUNICIPALITY OF PEEL

ON-STREET PARKING REQUIREMENTS				
UNIT TYPE	No. of UNITS	REQUIRED SPACES PER UNIT	REQUIRED	PROVIDED
DETACHED	78	1.0	78	65
TOWNHOUSES	127	0.50	64	
TOTAL	205		142	

SURPLUS OFF-STREET PARKING PROVIDED
 60 UNITS WITH SURPLUS PARKING (60 x 2 SURPLUS SPACES = 120 SPACES)

TOTAL ON-STREET & SURPLUS PARKING PROVIDED
 65 ON-STREET SPACES + 120 SURPLUS OFF-STREET SPACES = 185 SPACES

- LEGEND**
- POTENTIAL SIDEWALK LOCATIONS
 - CONCEPTUAL PAVEMENT / DRIVEWAYS
 - POTENTIAL ON-STREET PARKING (3.0 x 6.0m)
 - LOTS WITH SURPLUS OFF-STREET PARKING (DOUBLE CAR DRIVEWAY & GARAGE - 60 UNITS)

NOTE

- 9.0m MINIMUM SETBACK FROM INTERSECTIONS FOR ALL ON-STREET PARKING SPACES.

