



BURNSIDE

## Traffic Study – Final Report

**Chinguacousy Road between Mayfield  
Road and Old School Road**

**Town of Caledon**

# DRAFT

R.J. Burnside & Associates Limited  
6990 Creditview Road, Unit 2  
Mississauga ON L5N 8R9 CANADA

August 12, 2022  
300051561.0000

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

## Distribution List

No. of Hard Copies	PDF	Email	Organization Name
0	Yes	Yes	Town of Caledon

## Record of Revisions

Revision	Date	Description
0	February 8, 2022	Initial Submission to Town of Caledon
1	February 25, 2022	Final Submission to Town of Caledon
2	March 28, 2022	Revised Final Submission to Town of Caledon
3	August 12, 2022	Revised Final Submission to Town of Caledon

R.J. Burnside & Associates Limited

**DRAFT**

Report Prepared By:  
 Xinli Tu, B.A.Sc, E.I.T  
 Transportation Planner  
 XT

Gordon Hui, B.A.Sc, E.I.T  
 Senior Transportation Planner  
 GH

Report Reviewed By:

Ray Bacquie, P. Eng., MBA  
 Senior Vice President / Project Manager  
 RB

## Table of Contents

<b>1.0</b>	<b>Background.....</b>	<b>1</b>
<b>2.0</b>	<b>Scope of Work.....</b>	<b>2</b>
<b>3.0</b>	<b>Intersection Operations Assessment.....</b>	<b>2</b>
<b>4.0</b>	<b>Data Collection.....</b>	<b>3</b>
4.1	Turning Movement Counts.....	3
4.2	Average Annual Daily Traffic (AADT).....	4
4.3	Region of Peel Transportation Model.....	4
<b>5.0</b>	<b>Existing Conditions .....</b>	<b>5</b>
5.1	Existing Road Network .....	5
5.2	Existing Traffic Volumes .....	6
5.3	Existing Traffic Operations.....	6
<b>6.0</b>	<b>Future Conditions .....</b>	<b>7</b>
6.1	Planned Land Use .....	7
6.2	Future Road Improvements .....	7
6.3	Future Traffic Volumes .....	9
6.3.1	Traffic Growth Rate .....	9
6.3.2	Future Traffic Volumes .....	10
6.4	Future Midblock Capacity Analysis .....	14
6.5	Future Traffic Operations.....	15
6.5.1	2031 Traffic Operations.....	15
6.5.2	2041 Traffic Operations.....	16
6.5.3	2051 Traffic Operations.....	19
6.6	Traffic Operations with Proposed Improvements .....	21
<b>7.0</b>	<b>Summary of Traffic Needs and Justifications.....</b>	<b>28</b>

## Tables

Table 1: Turning Movement Count Data Summary .....	4
Table 2: AADT Data Summary .....	4
Table 3: Existing Traffic Operations.....	7
Table 4: Growth Rates.....	10
Table 5: Chinguacousy Road Midblock Capacity Summary .....	14
Table 6: 2031 Scenario without GTA West .....	15
Table 7: 2041 Scenario with GTA West .....	17
Table 8: 2041 Scenario without GTA West .....	18
Table 9: 2051 Scenario with GTA West .....	19
Table 10: 2051 Scenario without GTA West .....	20
Table 12: Improved Operations – 2031 Scenario without GTA West .....	22
Table 13: Improved Operations – 2041 Scenario with GTA West .....	23
Table 14: Improved Operations – 2041 Scenario without GTA West .....	24
Table 15: Improved Operations – 2051 Scenario with GTA West .....	25

Table 16: Improved Operations – 2051 Scenario without GTA West .....	26
Table 11: Proposed Improvements Justification and Phasing .....	29
Table 20: Turn Lane Requirements .....	31

## Figures

Figure 1: Study Corridor .....	1
Figure 2: Existing Road Network .....	5
Figure 3: Existing Traffic Volumes .....	6
Figure 4: Future Base Lane Configuration .....	9
Figure 5: Future Traffic Volumes with GTA West.....	12
Figure 6: Future Traffic Volumes without GTA West.....	13
Figure 9: GTA West Scenario LOS Summary.....	27
Figure 10: No GTA West Scenario LOS Summary .....	28
Figure 7: Proposed Improvements.....	30

## Appendices

Appendix A Count Data	
Appendix B EMME Model Documentation	
Appendix C EMME Volume Plots	
Appendix D Signal Timing Data	
Appendix E Existing Conditions Synchro Reports	
Appendix F 2031 Traffic Operations Synchro Reports	
Appendix G 2041 Traffic Operations Synchro Reports	
Appendix H 2051 Traffic Operations Synchro Reports	
Appendix I Improved Traffic Operations Synchro Reports	
Appendix J Signal Warrants	

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

### **Disclaimer**

Other than by the addressee, copying or distribution of this document, in whole or in part, is not permitted without the express written consent of R.J. Burnside & Associates Limited.

In the preparation of the various instruments of service contained herein, R.J. Burnside & Associates Limited was required to use and rely upon various sources of information (including but not limited to: reports, data, drawings, observations) produced by parties other than R.J. Burnside & Associates Limited. For its part R.J. Burnside & Associates Limited has proceeded based on the belief that the third party/parties in question produced this documentation using accepted industry standards and best practices and that all information was therefore accurate, correct and free of errors at the time of consultation. As such, the comments, recommendations and materials presented in this instrument of service reflect our best judgment in light of the information available at the time of preparation. R.J. Burnside & Associates Limited, its employees, affiliates and subcontractors accept no liability for inaccuracies or errors in the instruments of service provided to the client, arising from deficiencies in the aforementioned third party materials and documents.

R.J. Burnside & Associates Limited makes no warranties, either express or implied, of merchantability and fitness of the documents and other instruments of service for any purpose other than that specified by the contract.

## 1.0 Background

The Town of Caledon has retained R.J. Burnside & Associates Ltd. (“Burnside”) to complete a Needs and Justification traffic study as part of a Municipal Class Environmental Assessment (MCEA) for the Chinguacousy Road study corridor between Mayfield Road and Old School Road, as illustrated in **Figure 1**.

**Figure 1: Study Corridor**



The 2017 Town of Caledon Transportation Master Plan (TMP) and 2018 Mayfield West Phase 2 Stage 2 Transportation Assessment (MW2 TA) recommended a widening of Chinguacousy Road from Mayfield Road to Spine Road from two lanes to four lanes by 2031. As part of this Environmental Assessment, a transportation assessment was completed to re-confirm the needs from the 2017 Caledon TMP and assess existing and future traffic to identify any operational constraints. This report documents the analysis methodology, results of the transportation assessment and proposed road network improvements to accommodate future demand along the study corridor.

## 2.0 Scope of Work

On March 31, 2021, the Town of Caledon initiated a Schedule ‘C’ Class Environmental Assessment Study for Chinguacousy Road from Mayfield Road to Old School Road. On October 8, 2021, the Town retained Burnside to conduct a Needs and Justification Study and a defined scope was established based on discussions between Burnside and the Town of Caledon prior to this traffic study’s commencement.

The scope of work includes the following:

### Existing Traffic Conditions

- Derive and assess existing traffic demand for the AM and PM peak period, including intersection and mid-block volumes.

### Future Traffic Conditions

- Forecast future 2031, 2041, and 2051 traffic volumes at intersections and mid-blocks for the AM and PM peak period for a scenario with GTA West and without GTA West;
- Conduct future year traffic operations analysis for the 2031, 2041, and 2051 horizon years; and
- Report intersection operations performance metrics, including level-of-service (LOS), delay, v/c ratios, and 95th and 50th percentile queues.

Based on intersection operations and future forecasted volumes, the study is to recommend capacity improvements, including: the number of midblock through lanes, intersection traffic control type, need for exclusive turning lanes and storage lengths.

Note that the intersection analysis at Mayfield Road and Chinguacousy Road was included for the completeness of the study only as the intersection is being constructed through Peel Region’s Mayfield Road construction project.

## 3.0 Intersection Operations Assessment

Operations were assessed for intersections in the study area using the software program Synchro 11, which employs methodology from the *Highway Capacity Manual (HCM)*, published by the Transportation Research Board National Research Council.

Synchro 11 can analyze both signalized and unsignalized intersections in a road corridor or network which accounts for the spacing, interaction, queues and operations between intersections. The analysis has utilized the HCM2000 methodology for signalized intersections and HCM 6<sup>th</sup> Edition methodology for all-way stop-controlled (AWSC) intersections.

The signalized intersection analysis considers two separate measures of performance:

- The capacity of all intersection movements, which is based on a volume to capacity ratio that measures the degree of capacity utilized.

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

- The level of service (LOS) for all intersection movements, which is based on the average control delay per vehicle for the various movements through the intersection and overall. Delay is an indicator of how long a vehicle must wait to complete a movement and is represented by a letter between A and F, with F being the longest delay. The link between LOS and delay (in seconds) for signalized intersections is summarized below.

Level of Service	Control Delay per Vehicle(s)
A	≤ 10
B	> 10 – 20
C	> 20 – 35
D	> 35 – 55
E	> 55 – 80
F	> 80

The unsignalized intersection analysis considers two separate measures of performance:

- The capacity of the intersection's critical movements, which is based on a volume to capacity ratio.
- The level of service for the critical movements, which is based on the average control delay per vehicle for the various critical movements within the intersection. The link between LOS and delay (in seconds) for unsignalized intersections is summarized below.

Level of Service	Control Delay per Vehicle(s)
A	0 – 10
B	> 10 – 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50

## 4.0 Data Collection

### 4.1 Turning Movement Counts

Turning movement count data at the two study intersections were provided by the Town and extracted from the Mayfield West Phase 2 Stage 2 Transportation Assessment (January 2018) prepared by Paradigm Solutions. A summary of the count data provided is summarized in **Table 1**. The count data is provided in **Appendix A**.

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

**Table 1: Turning Movement Count Data Summary**

Intersection Location	Date of Count	Source
Mayfield Road / Chinguacousy Road	2018 <sup>1</sup>	Mayfield West Phase 2 Stage 2 Transportation Assessment (January 2018)
	Thursday, September 26, 2019	Town of Caledon
Old School Road / Chinguacousy Road	2018 <sup>1</sup>	Mayfield West Phase 2 Stage 2 Transportation Assessment (January 2018)
	Tuesday, April 11, 2017	Town of Caledon

Note: 1. The study source noted that counts were derived based on recent turning movement counts collected by the Town of Caledon, Peel Region and the Ministry of Transportation (MTO); no specific date was identified. For the purpose of analysis, it is assumed that these counts reflect 2018 conditions (i.e., the same year the study was conducted).

#### **4.2 Average Annual Daily Traffic (AADT)**

Historical average annual daily traffic (AADT) was provided by the Town for mid-block road segments in the study area. The AADT traffic data is summarized in **Table 2**.

**Table 2: AADT Data Summary**

Location	2014	2016	2017	2021
Chinguacousy Road, north of Old School Road	670	1,494	-	998
Old School Road, west of Chinguacousy Road	1,252	-	1,509	2,677
Old School Road, east of Chinguacousy Road	1,074	-	1,807	3,270

#### **4.3 Region of Peel Transportation Model**

The Region provided EMME modelling files for the 2011, 2031, 2041, and 2051 horizon years based on an updated Peel Region model that was originally developed in 2016.

Model updates and additional network refinements were made by Burnside to ensure consistency with future planned improvements. **Appendix B** provides a detailed summary of these model changes.

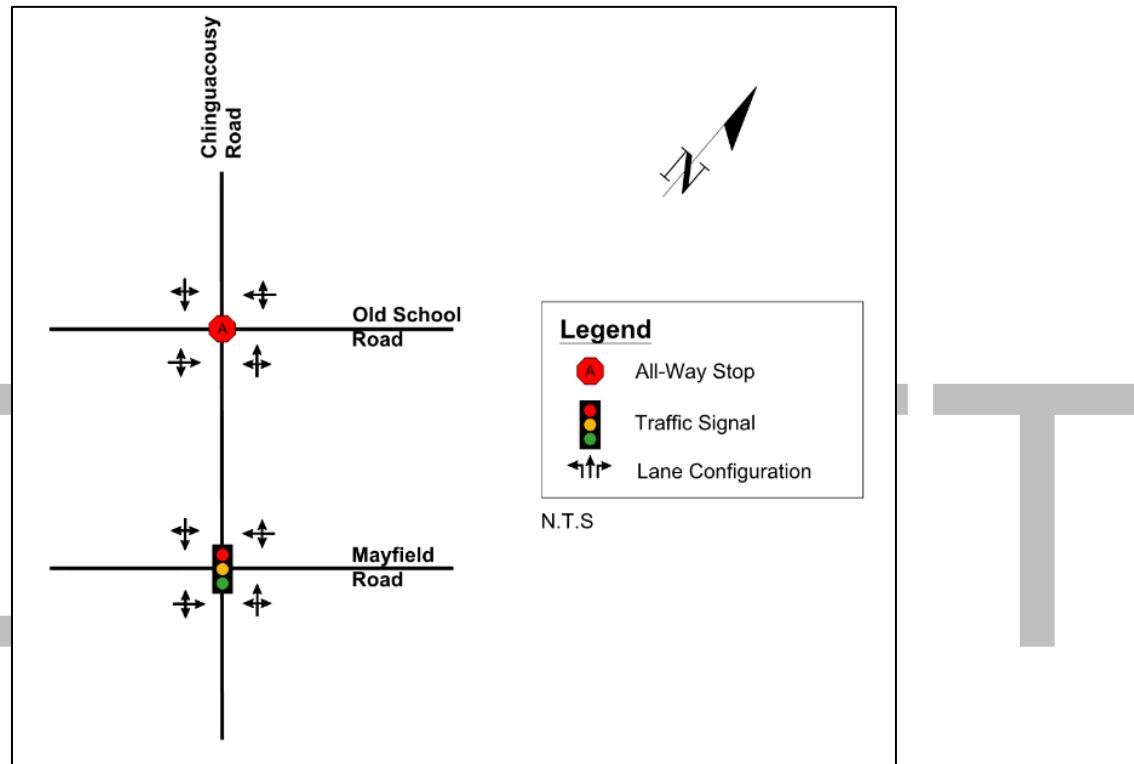
Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

## 5.0 Existing Conditions

### 5.1 Existing Road Network

The existing road network is described below and illustrated in **Figure 2**, with existing traffic control.

**Figure 2: Existing Road Network**



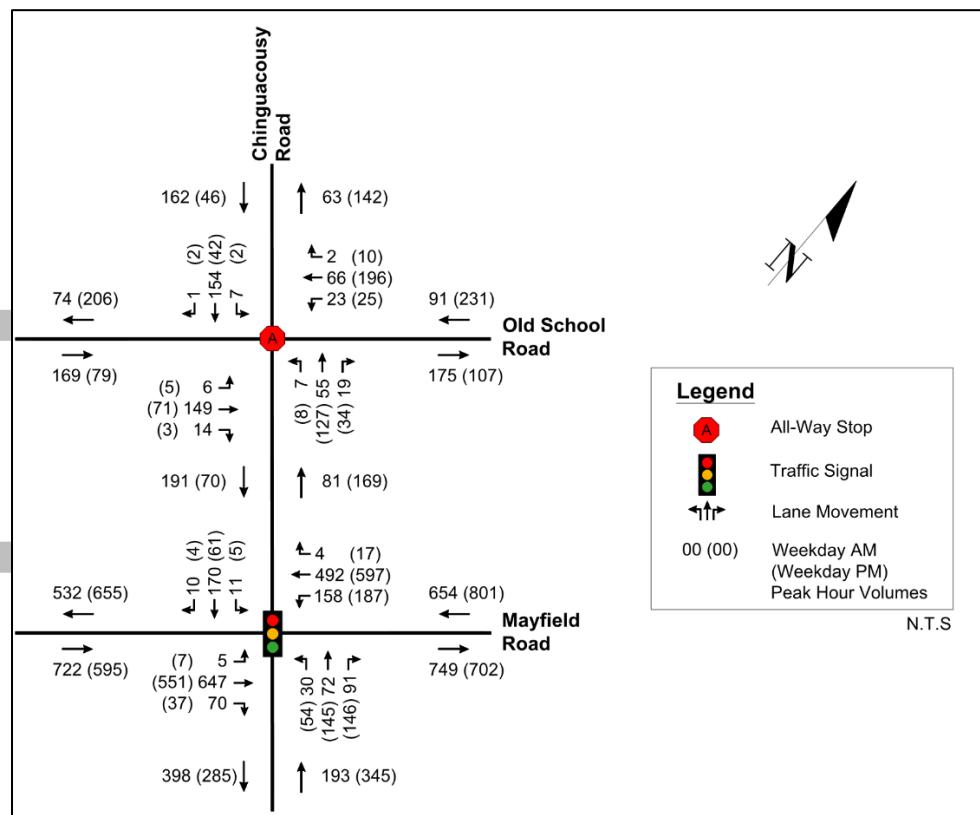
Chinguacousy Road	Chinguacousy Road is a north-south collector road with a posted speed limit of 80 km/h. The roadway consists of a 2-lane rural cross-section with no sidewalks provided on either side. Heavy trucks are prohibited from utilizing the road.
Mayfield Road	Mayfield Road is an east-west arterial road under the jurisdiction of the Region with a posted speed limit of 80 km/h. Within the vicinity of the study area, the roadway consists of a 2-lane rural cross-section with no sidewalks provided on either side.
Old School Road	Old School Road is an east-west collector road with a posted speed limit of 70 km/h. The roadway consists of a 2-lane rural cross-section with no sidewalks provided on either side.

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

## 5.2 Existing Traffic Volumes

The existing traffic volumes (base year 2019 PreCovid-19 Pandemic) used for the analysis reflects the highest turning movement traffic counts among the various data sources, as summarized in **Table 1**, for a conservative analysis. The volumes along the study corridor were balanced by proportionally adjusting upstream or downstream volumes to the higher adjacent volume, resulting in the AM and PM peak hour traffic volumes as shown in **Figure 3**.

**Figure 3: Existing Traffic Volumes**



## 5.3 Existing Traffic Operations

Existing operations for the Mayfield Road / Chinguacousy Road and Old School Road / Chinguacousy Road are summarized in **Table 3**. The detailed Synchro reports are provided in **Appendix E**.

Under existing conditions, the overall intersection of Chinguacousy Road / Mayfield Road is operating with a level-of-service (LOS) F during the PM peak hour, with the westbound left-through-right movement operating with a LOS F during the PM peak hour and exceeding capacity during both peak hours.

All movements at the Chinguacousy Road / Old School Road intersection are operating with excess capacity, a LOS B or better, and queues within respective link distances.

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

**Table 3: Existing Traffic Operations**

<b>Movement</b>	<b>Storage / Link Distance (m)<sup>1</sup></b>	<b>Weekday AM Peak Hour</b>				<b>Weekday PM Peak Hour</b>			
		v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)	v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)
<b>Chinguacousy Road / Mayfield Road</b>									
Overall	-	0.94	D	-	-	1.04	F	-	-
EBLTR	600	0.73	B	86	125	0.67	B	64	100
WBLTR	300	1.09	E	144	203	1.30	F	163	230
NBLTR	180	0.53	D	26	47	0.63	C	39	67
SBLTR	900	0.55	D	33	53	0.12	B	8	16
<b>Chinguacousy Road / Old School Road</b>									
EBLTR	100+	0.24	A	- <sup>1</sup>	1	0.12	A	- <sup>1</sup>	1
WBLTR	100+	0.14	A	- <sup>1</sup>	1	0.34	B	- <sup>1</sup>	1
NBLTR	100+	0.16	B	- <sup>1</sup>	1	0.24	A	- <sup>1</sup>	1
SBLTR	100+	0.24	A	- <sup>1</sup>	1	0.07	A	- <sup>1</sup>	1

Note: 1. HCM 6<sup>th</sup> Edition methodology does not report 50<sup>th</sup> percentile queues.

## 6.0 Future Conditions

### 6.1 Planned Land Use

The Town is projected to grow to 300,000 in population and 125,000 in employment by 2051. Intensification of lands in the southern area of Caledon is planned to accommodate this growth. Areas with planned land uses, along with their respective buildout years, include:

- The Mayfield West Stage 2 Phase 2 Secondary Plan (2031);
- Bolton Residential Expansion Study (BRES) area (2031);
- Partial buildout of Settlement Area Boundary Expansion (SABE) lands (2041); and
- Full buildout of SABE lands (2051).

The Chinguacousy Road corridor between Mayfield Road and Old School Road extends through designated SABE community lands and Mayfield West Stage 2 Phase 2 lands, both of which are primary contributors of traffic growth along the study corridor. As mentioned previously, population and employment growth allocated to these areas have been incorporated in the EMME transportation models.

### 6.2 Future Road Improvements

Future proposed road improvements are also expected to impact traffic along the Chinguacousy Road study corridor, as summarized below:

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

### **2031 Improvements**

- Construction of a new east-west Spine Road, located between Mayfield Road and Old School Road and extends from Hurontario Street to Chinguacousy Road (Town of Caledon 2017 Transportation Master Plan)
- 2 to 4 lane widening of Chinguacousy Road between Mayfield Road and Spine Road (Town of Caledon 2017 Transportation Master Plan)
- 2 to 6 lane widening of Mayfield Road between Chinguacousy Road and Hurontario Street (Region of Peel 2019 Long Range Transportation Plan)
- 2 to 4 lane widening of Mayfield Road between Chinguacousy Road and Mississauga Road (Region of Peel 2019 Long Range Transportation Plan)
- Dual westbound left turn lanes at the Chinguacousy Road / Mayfield Road intersection (Mayfield Road 2016 Environmental Assessment)

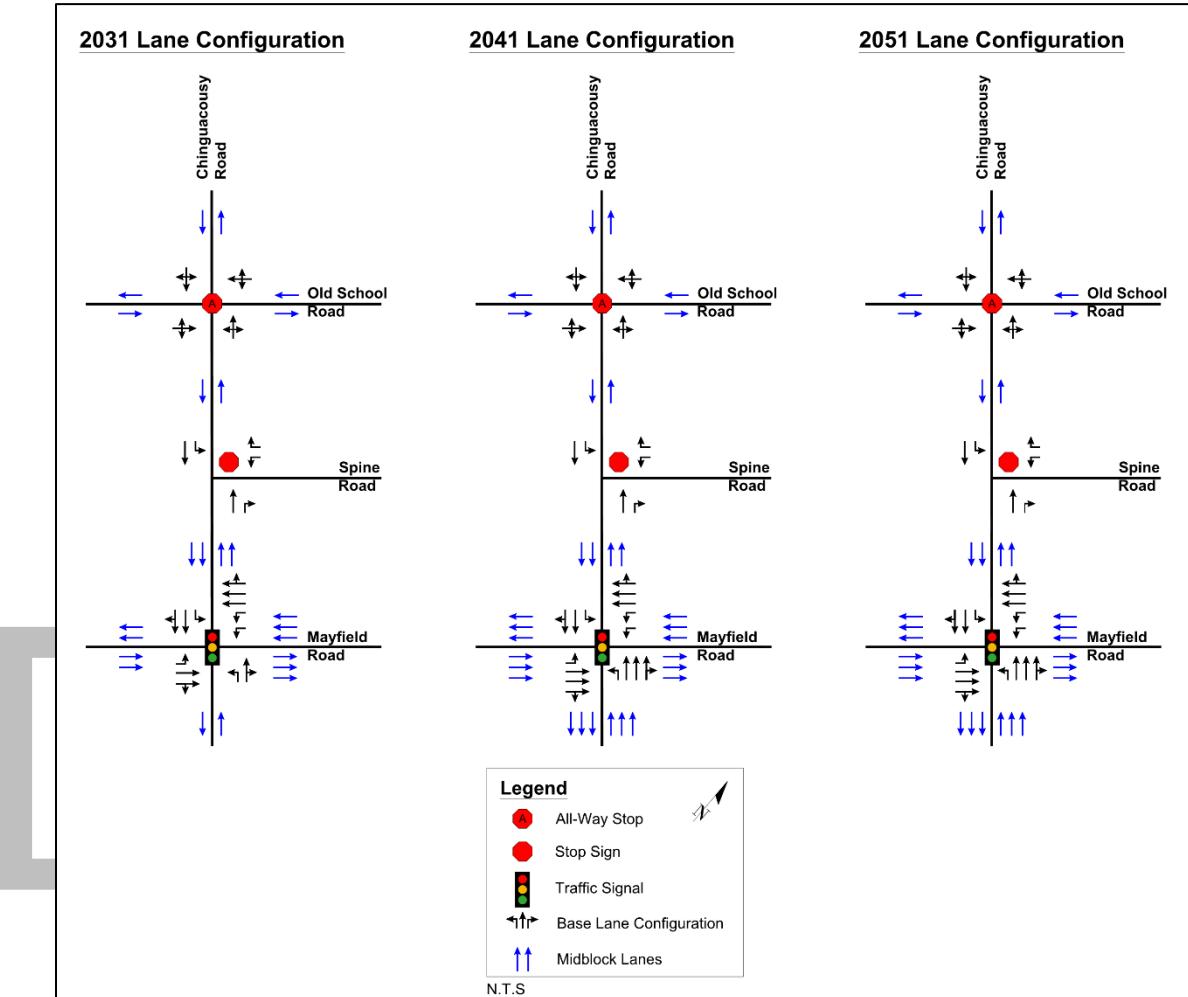
### **2041 Improvements**

- 2 to 6 lane widening of Chinguacousy Road between Wanless Drive and Mayfield Road (City of Brampton 2015 Transportation Master Plan)
- 4 to 6 lane widening of Mayfield Road between Chinguacousy Road and Mississauga Road (Region of Peel 2019 Long Range Transportation Plan)

These road improvements have been incorporated in the EMME transportation models under future horizon years. The assumed future lane configurations for the study intersections are illustrated in **Figure 4**. Note that these lane configurations reflect the base scenario with the above planned improvements and does not include the improvements recommended as part of this traffic study.

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

**Figure 4: Future Base Lane Configuration**



- Notes:
1. At signalized intersections, the convention is to provide for dedicated left-turn lanes at all approaches.
  2. The base lane configuration at Spine Road / Chinguacousy Road is consistent with the 2018 Mayfield West Phase 2 Stage 2 Transportation Assessment.

## 6.3 Future Traffic Volumes

### 6.3.1 Traffic Growth Rate

To project future traffic conditions, annual growth rates were derived using forecasted volumes along the study road network (i.e., Chinguacousy Road, Mayfield Road and Old School Road) from the updated EMME transportation model. The growth rates that were applied are summarized in **Table 4**. The EMME plots illustrating traffic volumes for each horizon year and condition is provided in **Appendix C**.

The modelled traffic volumes used to derive growth rates for each horizon period reflect an “unconstrained” demand model in which the forecasted travel demand is assigned to

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

a transportation network that includes all future proposed improvements (as listed in **Section 6.2**). This “unconstrained” model provides a better indication of the true demand of travel in the Town, as it captures the full effect of latent demand such that future trips that desire to use the study corridor can do so without diverting to other roadways.

**Table 4: Growth Rates**

Road and Time Period <sup>1</sup>	Annual Growth Rate	
	With GTA West	No GTA West
<b>Chinguacousy Road</b>		
2011 – 2031	11%	6%
2031 – 2041	3%	9%
2041 – 2051	0.5%	1%
<b>Mayfield Road, West of Chinguacousy Road</b>		
2011 – 2031	3%	4%
2031 – 2041	3%	4%
2041 – 2051	0.5%	1%
<b>Mayfield Road, East of Chinguacousy Road</b>		
2011 – 2031	5%	6%
2031 – 2041	1%	1%
2041 – 2051	0.5%	1%
<b>Old School Road</b>		
2011 – 2031	9%	9%
2031 – 2041	1%	1%
2041 – 2051	1%	1%

Note: 1. Growth rates along Mayfield Road east and west of Chinguacousy Road were distinguished to account for the phasing difference in future lane widenings (i.e., Mayfield Road east of Chinguacousy Road is widened to 6-lanes by 2031 whereas Mayfield Road west of Chinguacousy is widened to 6-lanes by 2041).

### 6.3.2 Future Traffic Volumes

The above corridor growth rates derived from the EMME AM peak hour model, reflecting growth in the Region, were applied to all movements of the AM and PM counts to forecast future traffic conditions. Turning movements at the Spine Road / Chinguacousy Road intersection under future 2031 and 2041 conditions were derived based on traffic projections from the 2018 Mayfield West Phase 2 Stage 2 Transportation Assessment; the 2051 intersection volumes were derived by applying a 2% per annum growth to the 2041 volumes. The imbalance observed along Chinguacousy Road between Mayfield Road and Spine Road is consistent with the MW2 TA and is a result of turning movements using the planned collector road between the two study intersections.

Projected traffic in the MW2 TA and this study varies recognizing that the model was used to forecast future traffic conditions. The model accounts for regional growth and applies land use assumptions that are different than those for the MW2 TA (e.g., MW2 TA assumes full buildout of the MW2 area by 2031). The MW2 TA was completed in 2018, prior to updates to the regionally approved land use model (which accounts for

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

growth allocation of lands within southern Caledon beyond the MW2 area) following the Peel Region Municipal Comprehensive Review (MCR).

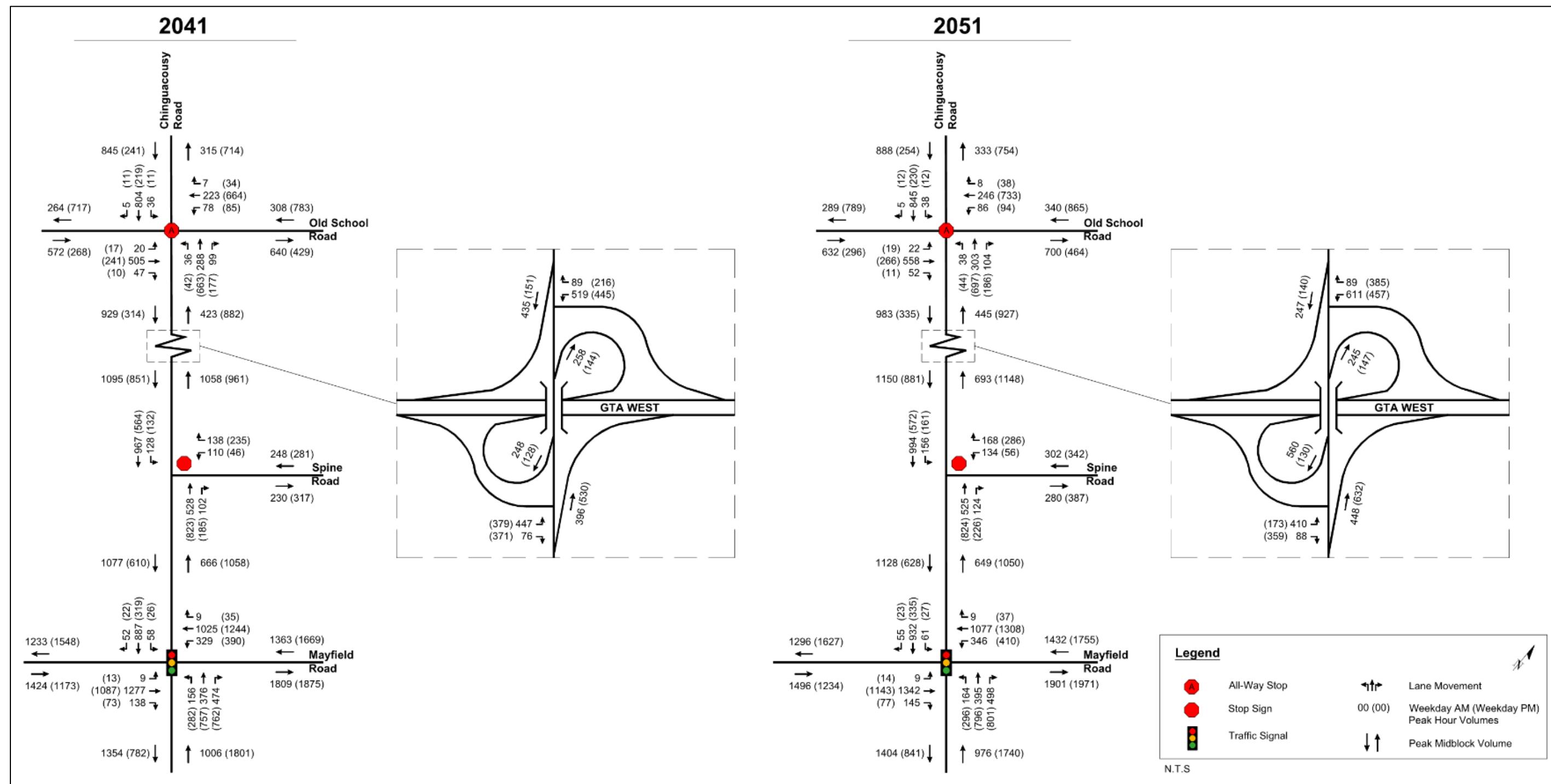
Under the scenarios with GTA West, the ramp volumes for the AM peak hour were estimated based on the proportion of turning movements at on/off ramps according to the EMME model, to the existing traffic counts; the reverse traffic patterns were applied to derive PM peak hour traffic. Note that the model used to derive these volumes were developed for the Region; the MTO model for GTA West was not provided at the time of this study.

The resulting future traffic volumes for the scenario with and without GTA West are illustrated in **Figure 5** and **Figure 6**, respectively.

# DRAFT

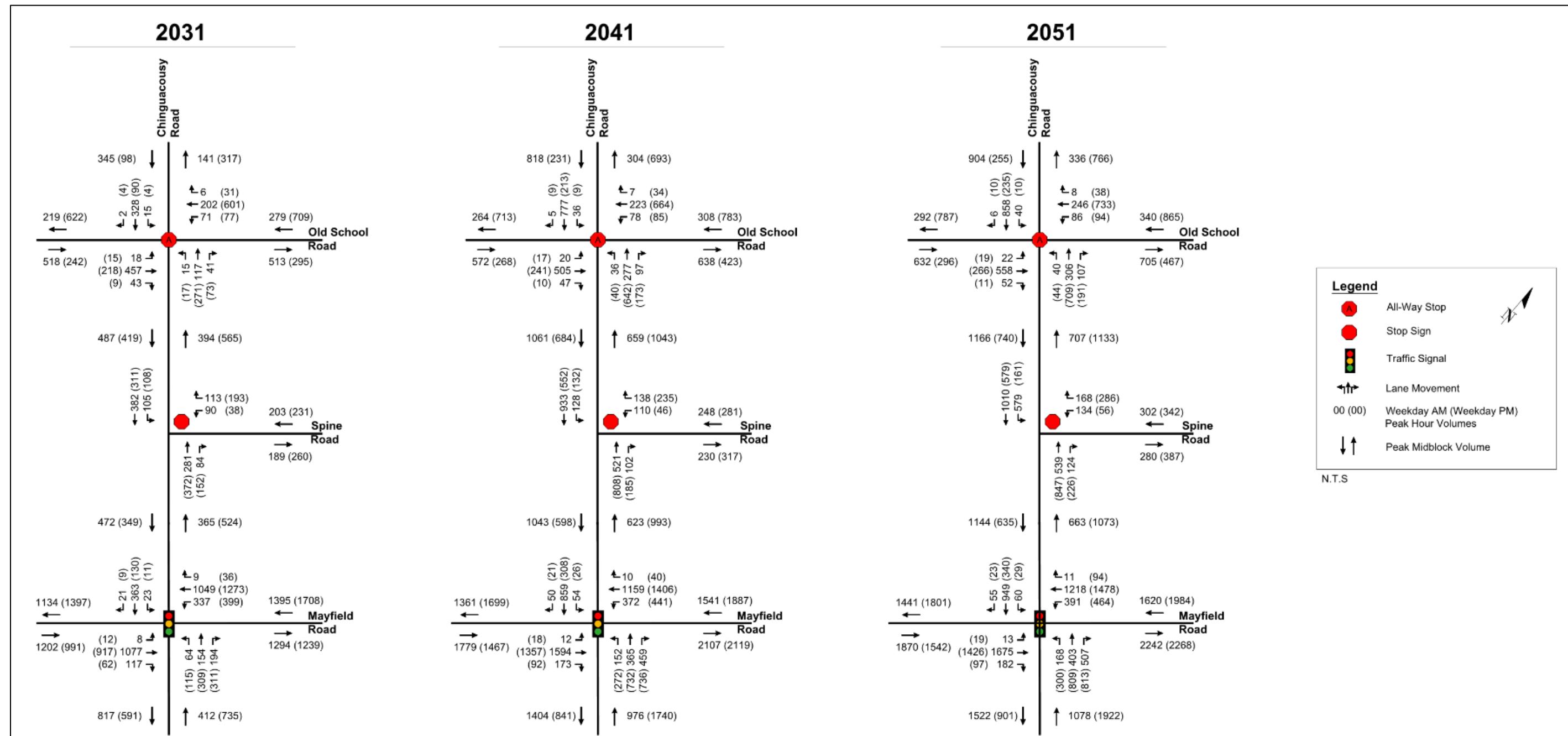
Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

Figure 5: Future Traffic Volumes with GTA West



Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

Figure 6: Future Traffic Volumes without GTA West



## 6.4 Future Midblock Capacity Analysis

The need for additional capacity improvements along Chinguacousy Road was assessed based on forecasted midblock volumes and capacity. The analysis takes into consideration that the roadway environment along Chinguacousy Road will change from rural (with limited adjacent uses and activity) to urban (with adjacent land uses that reduce lane throughput). As a result, the per lane capacity, originally included in the Region's EMME model for Chinguacousy Road at 1,000 vehicles/hour/lane (v/h/l), was reduced to 900 v/h/l for Chinguacousy Road. This reflects a capacity typically used for an urban arterial roadway, the roadway classification that is planned for Chinguacousy Road with the Settlement Area Boundary Expansion. The results of the midblock capacity analysis are summarized in **Table 5**.

**Table 5: Chinguacousy Road Midblock Capacity Summary**

Chinguacousy Segment	Horizon Year	Total Capacity (v/h)	AM Peak Hour				PM Peak Hour			
			Midblock Volume (veh)		Volume / Capacity		Midblock Volume(veh)		Volume / Capacity	
			NB	SB	NB	SB	NB	SB	NB	SB
<b>GTA West Scenario</b>										
Between Mayfield and Spine	2031	1800	-	-	-	-	-	-	-	-
	2041	1800	630	1077	35%	60%	1008	610	56%	34%
	2051	1800	649	1128	36%	63%	1050	628	58%	35%
<b>No GTA West Scenario</b>										
Between Spine and Old School	2031	1800	365	472	20%	26%	524	349	29%	19%
	2041	1800	623	1043	35%	58%	993	598	55%	33%
	2051	1800	663	1144	37%	64%	1073	635	60%	35%
<b>GTA West Scenario</b>										
North of Old School	2031	900	-	-	-	-	-	-	-	-
	2041	900	666	1095	74%	122%	1058	851	118%	95%
	2051	900	693	1347	77%	150%	1148	881	128%	98%
<b>No GTA West Scenario</b>										
Between Spine and Old School	2031	900	394	487	44%	54%	565	419	63%	47%
	2041	900	659	1061	73%	118%	1043	684	116%	76%
	2051	900	707	1166	79%	130%	1133	740	126%	82%
<b>GTA West Scenario</b>										
North of Old School	2031	900	-	-	-	-	-	-	-	-
	2041	900	315	845	35%	94%	714	241	79%	27%
	2051	900	333	888	37%	99%	754	254	84%	28%
<b>No GTA West Scenario</b>										
North of Old School	2031	900	141	345	16%	38%	317	98	35%	11%
	2041	900	304	818	34%	91%	693	231	77%	26%
	2051	900	336	904	37%	100%	766	255	85%	28%

Note: 1. Peak midblock volumes reported.

A review of midblock volumes along Chinguacousy Road under future traffic conditions indicate the following:

- The planned 4-lane widening of Chinguacousy Road between Mayfield Road and Spine Road is sufficient to accommodate forecasted demand, as volume to capacity ratios per direction are estimated to be less than 64%; and
- The widening of Chinguacousy Road north of Spine Road and beyond Old School Road, is warranted by 2041 as volume to capacity ratios are projected to exceed 0.90.

## 6.5 Future Traffic Operations

Future traffic operations were assessed for the 2031, 2041 and 2051 horizon years under a scenario with and without GTA West. These scenarios include all future road improvements and associated lane configurations as illustrated in **Figure 4** as a base. Signal timings were optimized under all future horizon years and scenarios. Additional improvements were identified for each horizon year, which were then carried forward and reassessed as part of the subsequent horizon year.

Traffic operations, including level-of-service (LOS), v/c ratio, and 90<sup>th</sup> and 50<sup>th</sup> percentile queues, were assessed. Signal timing data for the Chinguacousy Road / Mayfield Road intersection is provided in **Appendix D**.

### 6.5.1 2031 Traffic Operations

Future 2031 traffic operations for all study intersections are summarized in **Table 6**. GTA West will not be constructed by 2031 and was therefore not analyzed as a scenario. The detailed Synchro reports are provided in **Appendix F**.

**Table 6: 2031 Scenario without GTA West**

<b>Movement</b>	<b>Storage / Link Distance (m)</b>	<b>Weekday AM Peak Hour</b>				<b>Weekday PM Peak Hour</b>			
		<b>v/c</b>	<b>LOS</b>	<b>50<sup>th</sup> Queue (m)</b>	<b>95<sup>th</sup> Queue (m)</b>	<b>v/c</b>	<b>LOS</b>	<b>50<sup>th</sup> Queue (m)</b>	<b>95<sup>th</sup> Queue (m)</b>
<b>Chinguacousy Road / Mayfield Road (Signalized)</b>									
Overall	-	1.19	D	-	-	0.99	D	-	-
EBL	- <sup>1</sup>	0.05	A	1	3	0.08	B	2	5
EBTR	670	0.65	B	73	90	0.51	B	67	81
WBL(x2)	- <sup>1</sup>	1.35	F	46	46	0.87	D	38	75
WBTR	310	0.41	A	37	44	0.46	B	60	70
NBL	- <sup>1</sup>	0.47	D	11	25	0.33	C	24	44
NBTR	290	0.81	D	55	97	1.21	F	197	284
SBL	- <sup>1</sup>	0.33	D	4	12	0.20	D	3	9
SBTR	750	0.51	C	34	47	0.13	C	14	24

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

<b>Movement</b>	<b>Storage / Link Distance (m)</b>	<b>Weekday AM Peak Hour</b>				<b>Weekday PM Peak Hour</b>			
		<b>v/c</b>	<b>LOS</b>	<b>50<sup>th</sup> Queue (m)</b>	<b>95<sup>th</sup> Queue (m)</b>	<b>v/c</b>	<b>LOS</b>	<b>50<sup>th</sup> Queue (m)</b>	<b>95<sup>th</sup> Queue (m)</b>
<b>Chinguacousy Road / Spine Road (Unsignalized)</b>									
WBL	270	0.38	D	-	13	0.17	C	-	5
WBR	270	0.17	B	-	5	0.32	B	-	11
NBT	750	0.18	A	-	0	0.24	A	-	0
NBR	750	0.05	A	-	0	0.10	A	-	0
SBL	- <sup>1</sup>	0.10	A	-	3	0.12	A	-	3
SBT	2000	0.24	A	-	0	0.20	A	-	0
<b>Chinguacousy Road / Old School Road (Unsignalized)</b>									
NBLTR	2000	0.52	C	-	3	0.73	D	-	6
EBLTR	1000	1.13	F	-	20	0.51	C	-	3
WBLTR	1000	0.66	D	-	5	1.41	F	-	36
SBLTR	3000	0.80	E	-	8	0.23	B	-	1

Note: 1. Required storage length determined as part of the solutions analysis.

Under 2031 traffic conditions, the westbound left-turn and northbound through-right movements at the intersection of Mayfield Road / Chinguacousy Road are projected to exceed capacity and operate with a level-of-service (LOS) F during the AM and PM peak hour, respectively. At the Old School Road / Chinguacousy Road, the eastbound approach and westbound approach are projected to exceed capacity and operate with a LOS F during the AM and PM peak hour, respectively. There are no forecasted operational concerns at the Spine Road / Chinguacousy Road intersection by 2031.

The following improvements are proposed by 2031 to address the operational concerns above:

#### **Mayfield Road / Chinguacousy Road Intersection**

- Protected and permissive northbound left turn phase
- Additional northbound through-right lane

#### **Old School Road / Chinguacousy Road Intersection**

- Signalization, including exclusive left-turn lanes at all approaches (warranted based on MTO signal warrants in **Appendix K**)

#### **6.5.2 2041 Traffic Operations**

Future 2041 traffic operations for all study intersections under scenarios with and without GTA West are summarized in **Table 7** and **Table 8**, respectively. Note that the 4-lane widening of Chinguacousy Road north of Spine Road, as triggered by future 2041 midblock traffic volumes (see **Section 6.4**), under the scenario with and without GTA West, were included as part of this analysis for the 2041 horizon year. The detailed Synchro reports are provided in **Appendix G**.

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

Table 7: 2041 Scenario with GTA West

Movement	Storage / Link Distance (m)	Weekday AM Peak Hour				Weekday PM Peak Hour			
		v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)	v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)
<b>Chinguacousy Road / Mayfield Road (Signalized)</b>									
Overall	-	0.99	D	-	-	0.90	C	-	-
EBL	- <sup>1</sup>	0.08	C	2	7	0.14	C	2	7
EBTR	670	0.99	E	149	176	0.89	D	64	89
WBL(x2)	- <sup>1</sup>	0.95	F	50	77	0.88	D	32	56
WBTR	310	0.50	C	73	84	0.58	B	52	65
NBL(x2)	- <sup>1</sup>	0.89	F	24	44	0.84	D	23	43
NBTR	290	0.41	C	45	55	1.00	C	61	80
SBL	- <sup>1</sup>	0.57	E	15	34	0.33	D	4	12
SBTR	750	1.03	F	154	188	0.46	C	25	37
<b>Chinguacousy Road / Spine Road (Unsignalized)</b>									
WBL	270	1.04	F	-	54	0.56	F	-	20
WBR	270	0.21	B	-	6	0.46	C	-	18
NBT	750	0.17	A	-	0	0.26	A	-	0
NBR	- <sup>1</sup>	0.07	A	-	0	0.12	A	-	0
SBL	- <sup>1</sup>	0.15	A	-	5	0.23	B	-	7
SBT	1000	0.31	A	-	0	0.18	A	-	0
<b>Chinguacousy Road / Old School Road (Signalized)</b>									
Overall	-	0.72	B	-	-	0.79	B	-	-
NBL	- <sup>1</sup>	0.05	A	1	4	0.12	A	1	4
NBTR	300	0.85	C	39	87	0.31	A	15	27
EBL	- <sup>1</sup>	0.49	B	5	19	0.21	A	5	12
EBTR	1000	0.36	B	13	26	0.87	C	59	119
WBL	- <sup>1</sup>	0.41	C	3	13	0.11	B	3	9
WBTR	1000	0.26	A	9	16	0.68	B	38	56
SBL	- <sup>1</sup>	0.10	A	2	6	0.08	B	1	4
SBTR	3000	0.60	B	28	42	0.20	B	9	16

Note: 1. Required storage length determined as part of the solutions analysis.

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

Table 8: 2041 Scenario without GTA West

Movement	Storage / Link Distance (m)	Weekday AM Peak Hour				Weekday PM Peak Hour			
		v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)	v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)
<b>Chinguacousy Road / Mayfield Road (Signalized)</b>									
Overall	-	1.09	E	-	-	0.96	C	-	-
EBL	- <sup>1</sup>	0.12	C	3	8	0.19	C	3	9
EBTR	670	1.05	E	204	224	0.95	D	93	124
WBL(x2)	- <sup>1</sup>	1.10	F	64	93	0.91	E	41	68
WBTR	310	0.51	B	76	86	0.58	B	63	77
NBL(x2)	- <sup>1</sup>	1.10	F	26	48	0.88	E	26	47
NBTR	290	0.46	C	50	61	1.06	C	74	93
SBL	- <sup>1</sup>	0.61	E	14	34	0.38	D	5	13
SBTR	750	1.15	F	164	198	0.49	C	28	41
<b>Chinguacousy Road / Spine Road (Unsignalized)</b>									
WBL	270	1.00	F	-	51	0.54	F	-	19
WBR	270	0.21	B	-	6	0.45	C	-	18
NBT	750	0.17	A	-	0	0.26	A	-	0
NBR	- <sup>1</sup>	0.07	A	-	0	0.12	A	-	0
SBL	- <sup>1</sup>	0.15	A	-	5	0.22	B	-	7
SBT	2000	0.30	A	-	0	0.18	A	-	0
<b>Chinguacousy Road / Old School Road (Signalized)</b>									
Overall	-	0.71	B	-	-	0.78	B	-	-
NBL	- <sup>1</sup>	0.05	A	1	4	0.12	A	1	4
NBTR	2000	0.85	C	39	87	0.31	A	15	27
EBL	- <sup>1</sup>	0.49	B	5	19	0.21	A	5	12
EBTR	1000	0.36	B	13	26	0.87	C	59	119
WBL	- <sup>1</sup>	0.38	B	3	12	0.10	B	3	9
WBTR	1000	0.25	A	8	15	0.66	B	36	54
SBL	- <sup>1</sup>	0.10	A	2	6	0.07	B	1	4
SBTR	3000	0.58	B	26	40	0.19	B	9	15

Note: 1. Required storage length determined as part of the solutions analysis.

Under 2041 traffic conditions, the westbound left-turn, northbound left-turn, and southbound through-right movements at the Mayfield Road / Chinguacousy Road intersection are projected to experience a LOS F during the AM peak hour. At the Spine Road / Chinguacousy Road intersection, the westbound left-turn movement is forecasted to experience a LOS F during both peak hours. With the signalization of the Old School Road / Chinguacousy Road intersection, no operational concerns were identified in the scenario with or without GTA West.

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

The following improvements are proposed by 2041 to address the operational concerns above:

#### **Mayfield Road / Chinguacousy Road Intersection**

- Exclusive eastbound right-turn lane
- Exclusive northbound right-turn lane
- Exclusive southbound right-turn lane

#### **Spine Road / Chinguacousy Road Intersection**

- Signalization (recommended to address operational concerns)

### **6.5.3 2051 Traffic Operations**

Future 2051 traffic operations for all study intersections under scenarios with and without GTA West are summarized in **Table 9** and **Table 10**, respectively. The detailed Synchro reports are provided in **Appendix H**.

**Table 9: 2051 Scenario with GTA West**

<b>Movement</b>	<b>Storage / Link Distance (m)</b>	<b>Weekday AM Peak Hour</b>				<b>Weekday PM Peak Hour</b>			
		<b>v/c</b>	<b>LOS</b>	<b>50<sup>th</sup> Queue (m)</b>	<b>95<sup>th</sup> Queue (m)</b>	<b>v/c</b>	<b>LOS</b>	<b>50<sup>th</sup> Queue (m)</b>	<b>95<sup>th</sup> Queue (m)</b>
<b>Chinguacousy Road / Mayfield Road (Signalized)</b>									
Overall	-	0.96	D	-	-	1.01	D	-	-
EBL	- <sup>1</sup>	0.09	C	2	7	0.17	C	2	8
EBT	670	0.97	E	142	167	0.92	D	74	100
EBR	- <sup>1</sup>	0.11	C	0	15	0.05	C	0	1
WBL(x2)	- <sup>1</sup>	0.94	F	53	79	0.91	E	38	65
WBTR	310	0.54	C	80	90	0.63	B	66	81
NBL(x2)	- <sup>1</sup>	0.90	F	25	45	0.67	D	26	39
NBT	290	0.21	C	27	34	0.40	B	37	47
NBR	- <sup>1</sup>	0.57	C	50	85	0.98	E	92	178
SBL	- <sup>1</sup>	0.35	D	14	28	0.24	C	5	13
SBT	750	0.98	E	142	179	0.44	C	28	42
SBR	- <sup>1</sup>	0.06	C	0	2	0.02	C	0	0

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

<b>Movement</b>	<b>Storage / Link Distance (m)</b>	<b>Weekday AM Peak Hour</b>				<b>Weekday PM Peak Hour</b>			
		<b>v/c</b>	<b>LOS</b>	<b>50<sup>th</sup> Queue (m)</b>	<b>95<sup>th</sup> Queue (m)</b>	<b>v/c</b>	<b>LOS</b>	<b>50<sup>th</sup> Queue (m)</b>	<b>95<sup>th</sup> Queue (m)</b>
<b>Chinguacousy Road / Spine Road (Signalized)</b>									
Overall	-	0.51	A	-	-	0.54	A	-	-
WBL	270	0.43	B	7	17	0.16	B	5	12
WBR	270	0.16	B	1	10	0.62	C	16	37
NBT	750	0.28	A	9	18	0.40	A	20	40
NBR	- <sup>1</sup>	0.08	A	0	5	0.15	A	0	8
SBL	- <sup>1</sup>	0.36	A	6	17	0.51	B	8	34
SBT	1000	0.53	A	20	38	0.28	A	13	26
<b>Chinguacousy Road / Old School Road (Signalized)</b>									
Overall	-	0.77	B	-	-	0.84	B	-	-
EBL	- <sup>1</sup>	0.06	A	2	5	0.16	A	2	5
EBTR	1000	0.91	C	46	100	0.32	A	18	31
WBL	- <sup>1</sup>	0.54	B	6	22	0.23	A	6	14
WBTR	1000	0.39	B	15	28	0.90	C	74	144
NBL	- <sup>1</sup>	0.48	C	3	14	0.12	B	4	10
NBTR	300	0.28	A	9	16	0.75	C	46	66
SBL	- <sup>1</sup>	0.11	A	2	7	0.10	B	1	5
SBTR	3000	0.64	B	29	44	0.22	B	11	18

Note: 1. Required storage length determined as part of the solutions analysis.

Table 10: 2051 Scenario without GTA West

<b>Movement</b>	<b>Storage / Link Distance (m)</b>	<b>Weekday AM Peak Hour</b>				<b>Weekday PM Peak Hour</b>			
		<b>v/c</b>	<b>LOS</b>	<b>50<sup>th</sup> Queue (m)</b>	<b>95<sup>th</sup> Queue (m)</b>	<b>v/c</b>	<b>LOS</b>	<b>50<sup>th</sup> Queue (m)</b>	<b>95<sup>th</sup> Queue (m)</b>
<b>Chinguacousy Road / Mayfield Road (Signalized)</b>									
Overall	-	1.05	E	-	-	1.03	D	-	-
EBL	- <sup>1</sup>	0.14	C	3	9	0.24	D	4	12
EBT	670	1.03	E	222	240	0.98	E	139	172
EBR	- <sup>1</sup>	0.20	C	12	29	0.07	C	0	12
WBL(x2)	- <sup>1</sup>	1.06	F	75	105	0.92	E	64	95
WBTR	310	0.55	C	99	109	0.65	C	109	124
NBL(x2)	- <sup>1</sup>	1.12	F	34	58	0.74	E	40	55
NBT	290	0.24	C	34	42	0.41	C	56	67
NBR	- <sup>1</sup>	0.65	D	78	118	1.01	E	157	246
SBL	- <sup>1</sup>	0.37	D	17	31	0.23	D	7	16
SBT	750	1.06	F	185	219	0.40	D	41	56
SBR	- <sup>1</sup>	0.06	D	0	5	0.02	D	0	0

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

Movement	Storage / Link Distance (m)	Weekday AM Peak Hour				Weekday PM Peak Hour			
		v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)	v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)
<b>Chinguacousy Road / Spine Road (Signalized)</b>									
Overall	-	0.51	A	-	-	0.56	A	-	-
WBL	270	0.43	B	7	17	0.16	B	5	12
WBR	270	0.18	B	2	10	0.63	C	17	38
NBT	750	0.29	A	9	18	0.41	A	21	41
NBR	- <sup>1</sup>	0.08	A	0	5	0.15	A	0	8
SBL	- <sup>1</sup>	0.37	A	5	17	0.53	B	9	39
SBT	2000	0.54	A	20	38	0.28	A	13	27
<b>Chinguacousy Road / Old School Road (Signalized)</b>									
Overall	-	0.78	B	-	-	0.84	C	-	-
EBL	- <sup>1</sup>	0.06	A	2	5	0.16	A	2	5
EBTR	1000	0.91	C	46	100	0.33	A	19	32
WBL	- <sup>1</sup>	0.54	B	6	22	0.24	A	6	15
WBTR	1000	0.39	B	15	28	0.92	C	78	148
NBL	- <sup>1</sup>	0.50	C	3	15	0.12	B	4	10
NBTR	300	0.29	A	9	17	0.74	B	46	66
SBL	- <sup>1</sup>	0.11	A	2	7	0.08	B	1	4
SBTR	3000	0.65	B	30	45	0.21	B	11	18

Note: 1. Required storage length determined as part of the solutions analysis.

Under 2051 traffic conditions, the Spine Road and Old School Road intersections along Chinguacousy are projected to operate under acceptable conditions. The westbound left-turn and northbound left-turn movements at the Mayfield Road / Chinguacousy Road intersection are still projected to operate with a LOS F under the scenarios with and without GTA West; the southbound through-right movement will also operate over capacity and with a LOS F under the scenario without GTA West. It is recommended that the Town monitor this intersection for potential future improvements beyond 2051.

## 6.6 Traffic Operations with Proposed Improvements

Implementing the proposed improvements identified under each horizon year above result in the traffic operations summarized in the tables below. The 2041 and 2051 traffic operations with GTA West are summarized in **Table 12** and **Table 14**, respectively. The 2031, 2041 and 2051 traffic operations without GTA West are summarized in **Table 11**, **Table 13** and **Table 15**, respectively. The detailed Synchro reports are provided in **Appendix I**.

With the implementation of proposed improvements shown in **Figure 9**, the operations for the Chinguacousy Road / Mayfield Road intersection have improved significantly. All movements are projected to operate with a level-of-service (LOS) E or better and

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

queues within respective storage / link distances, with the exception of the westbound left-turn and northbound left-turn movement, which are both forecasted to operate with a LOS F under 2041 and 2051 traffic conditions with or without GTA West. The southbound through movement is also projected to exceed capacity and operate with a LOS F in 2051 under the scenario without GTA West.

The proposed signalization of the Old School Road and Spine Road intersections along Chinguacousy by 2031 and 2041, respectively, including the associated proposed lane configurations, improves traffic operations significantly. All movements at both intersections are forecasted to operate with a LOS C or better under future traffic conditions with signalization.

A LOS summary of the study intersections, with proposed improvements implemented, under the scenario with and without GTA West are illustrated in **Figure 7** and **Figure 8**, respectively.

**Table 11: Improved Operations – 2031 Scenario without GTA West**

<b>Movement</b>	<b>Storage / Link Distance (m)</b>	<b>Weekday AM Peak Hour</b>				<b>Weekday PM Peak Hour</b>			
		<b>v/c</b>	<b>LOS</b>	<b>50<sup>th</sup> Queue (m)</b>	<b>95<sup>th</sup> Queue (m)</b>	<b>v/c</b>	<b>LOS</b>	<b>50<sup>th</sup> Queue (m)</b>	<b>95<sup>th</sup> Queue (m)</b>
<b>Chinguacousy Road / Mayfield Road (Signalized)</b>									
Overall	-	0.85	C	-	-	0.76	C	-	-
EBL	- <sup>1</sup>	0.06	B	1	5	0.12	C	2	7
EBTR	670	0.96	D	129	169	0.97	D	90	134
WBL(x2)	- <sup>1</sup>	0.88	E	38	61	0.71	D	35	50
WBTR	310	0.42	B	42	50	0.49	B	49	60
NBL	- <sup>1</sup>	0.46	C	11	22	0.36	C	15	28
NBTR	290	0.26	C	14	25	0.46	C	26	43
SBL	- <sup>1</sup>	0.20	D	5	13	0.09	C	2	7
SBTR	750	0.67	D	43	58	0.20	C	11	19
<b>Chinguacousy Road / Spine Road (Unsignalized)</b>									
WBL	270	0.38	D	-	13	0.17	C	-	5
WBR	270	0.17	B	-	5	0.32	B	-	11
NBT	750	0.18	A	-	0	0.24	A	-	0
NBR	- <sup>1</sup>	0.05	A	-	0	0.10	A	-	0
SBL	- <sup>1</sup>	0.10	A	-	3	0.12	A	-	3
SBT	2000	0.24	A	-	0	0.20	A	-	0
<b>Chinguacousy Road / Old School Road (Signalized)</b>									
Overall	-	0.60	B	-	-	0.67	B	-	-
NBL	- <sup>1</sup>	0.04	A	1	4	0.11	A	1	4
NBTR	2000	0.78	B	36	64	0.29	B	15	26

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

Movement	Storage / Link Distance (m)	Weekday AM Peak Hour				Weekday PM Peak Hour			
		v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)	v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)
EBL	- <sup>1</sup>	0.42	B	5	14	0.20	A	5	12
EBTR	1000	0.33	B	13	24	0.83	C	56	92
WBL	- <sup>1</sup>	0.08	A	1	4	0.03	B	2	5
WBTR	1000	0.20	A	7	18	0.49	B	27	53
SBL	- <sup>1</sup>	0.03	A	1	4	0.01	B	1	2
SBTR	3000	0.45	B	21	42	0.14	B	7	16

Note: 1. Required storage length determined as part of the solutions analysis.

**Table 12: Improved Operations – 2041 Scenario with GTA West**

Movement	Storage / Link Distance (m)	Weekday AM Peak Hour				Weekday PM Peak Hour			
		v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)	v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)
<b>Chinguacousy Road / Mayfield Road (Signalized)</b>									
Overall	-	1.01	D	-	-	0.99	C	-	-
EBL	- <sup>1</sup>	0.09	C	2	6	0.15	C	2	7
EBT	670	0.96	D	112	138	0.89	D	61	85
EBR	- <sup>1</sup>	0.10	C	0	14	0.29	D	0	0
WBL(x2)	- <sup>1</sup>	0.95	E	42	68	0.88	D	32	56
WBTR	310	0.53	C	64	75	0.60	B	54	68
NBL	- <sup>1</sup>	1.00	F	26	67	0.71	C	31	50
NBT	290	0.20	C	21	28	0.40	B	31	41
NBR	- <sup>1</sup>	0.53	C	36	68	0.95	D	70	151
SBL	- <sup>1</sup>	0.35	D	12	24	0.23	C	4	11
SBT	750	1.01	E	116	153	0.43	C	23	35
SBR	- <sup>1</sup>	0.05	C	0	0	0.09	D	0	0
<b>Chinguacousy Road / Spine Road (Signalized)</b>									
Overall	-	0.48	A	-	-	0.42	A	-	-
WBL	270	0.38	B	6	14	0.15	B	4	11
WBR	270	0.09	B	0	8	0.51	C	11	28
NBT	750	0.28	A	8	17	0.38	A	17	37
NBR	- <sup>1</sup>	0.07	A	0	5	0.13	A	0	7
SBL	- <sup>1</sup>	0.29	A	4	13	0.39	A	6	21
SBT	1000	0.51	A	18	34	0.26	A	11	24
<b>Chinguacousy Road / Old School Road (Signalized)</b>									
Overall	-	0.72	B	-	-	0.79	B	-	-
EBL	- <sup>1</sup>	0.05	A	1	4	0.12	A	1	4

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

Movement	Storage / Link Distance (m)	Weekday AM Peak Hour				Weekday PM Peak Hour			
		v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)	v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)
EBTR	1000	0.85	C	39	87	0.31	A	15	27
WBL	- <sup>1</sup>	0.49	B	5	19	0.21	A	5	12
WBTR	1000	0.36	B	13	26	0.87	C	59	119
NBL	- <sup>1</sup>	0.41	C	3	13	0.11	B	3	9
NBTR	300	0.26	A	9	16	0.68	B	38	56
SBL	- <sup>1</sup>	0.10	A	2	6	0.08	B	1	4
SBTR	3000	0.60	B	28	42	0.20	B	9	16

Note: 1. Required storage length determined as part of the solutions analysis.

Table 13: Improved Operations – 2041 Scenario without GTA West

Movement	Storage / Link Distance (m)	Weekday AM Peak Hour				Weekday PM Peak Hour			
		v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)	v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)
<b>Chinguacousy Road / Mayfield Road (Signalized)</b>									
Overall	-	1.07	E	-	-	1.02	D	-	-
EBL	- <sup>1</sup>	0.12	C	3	9	0.21	C	3	9
EBT	670	0.98	E	195	220	0.95	D	88	118
EBR	- <sup>1</sup>	0.17	C	8	24	0.06	C	0	4
WBL(x2)	- <sup>1</sup>	1.07	F	72	102	0.92	E	41	69
WBTR	310	0.53	C	93	103	0.61	B	67	81
NBL	- <sup>1</sup>	1.11	F	45	91	0.74	C	36	59
NBT	290	0.21	C	30	38	0.42	C	36	46
NBR	- <sup>1</sup>	0.57	D	62	97	0.97	E	81	162
SBL	- <sup>1</sup>	0.33	D	15	29	0.23	C	4	12
SBT	750	1.01	F	156	194	0.44	C	26	39
SBR	- <sup>1</sup>	0.05	D	0	3	0.02	C	0	0
<b>Chinguacousy Road / Spine Road (Signalized)</b>									
Overall	-	0.46	A	-	-	0.50	A	-	-
WBL	270	0.38	B	6	14	0.12	B	3	7
WBR	270	0.09	B	0	8	0.58	B	10	23
NBT	750	0.27	A	8	17	0.45	A	17	37
NBR	- <sup>1</sup>	0.07	A	0	5	0.13	A	0	8
SBL	- <sup>1</sup>	0.29	A	4	13	0.47	B	6	28
SBT	2000	0.49	A	17	33	0.31	A	11	24
<b>Chinguacousy Road / Old School Road (Signalized)</b>									
Overall	-	0.71	B	-	-	0.78	B	-	-
EBL	- <sup>1</sup>	0.05	A	1	4	0.12	A	1	4

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

<b>Movement</b>	<b>Storage / Link Distance (m)</b>	<b>Weekday AM Peak Hour</b>				<b>Weekday PM Peak Hour</b>			
		<b>v/c</b>	<b>LOS</b>	<b>50<sup>th</sup> Queue (m)</b>	<b>95<sup>th</sup> Queue (m)</b>	<b>v/c</b>	<b>LOS</b>	<b>50<sup>th</sup> Queue (m)</b>	<b>95<sup>th</sup> Queue (m)</b>
EBTR	1000	0.85	C	39	87	0.31	A	15	27
WBL	- <sup>1</sup>	0.49	B	5	19	0.21	A	5	12
WBTR	1000	0.36	B	13	26	0.87	C	59	119
NBL	- <sup>1</sup>	0.38	B	3	12	0.10	B	3	9
NBTR	300	0.25	A	8	15	0.66	B	36	54
SBL	- <sup>1</sup>	0.10	A	2	6	0.07	B	1	4
SBTR	3000	0.58	B	26	40	0.19	B	9	15

Note: 1. Required storage length determined as part of the solutions analysis.

**Table 14: Improved Operations – 2051 Scenario with GTA West**

<b>Movement</b>	<b>Storage / Link Distance (m)</b>	<b>Weekday AM Peak Hour</b>				<b>Weekday PM Peak Hour</b>			
		<b>v/c</b>	<b>LOS</b>	<b>50<sup>th</sup> Queue (m)</b>	<b>95<sup>th</sup> Queue (m)</b>	<b>v/c</b>	<b>LOS</b>	<b>50<sup>th</sup> Queue (m)</b>	<b>95<sup>th</sup> Queue (m)</b>
<b>Chinguacousy Road / Mayfield Road (Signalized)</b>									
Overall	-	1.11	D	-	-	1.05	C	-	-
EBL	- <sup>1</sup>	0.09	C	2	7	0.16	C	2	7
EBT	670	0.97	E	142	167	0.94	D	65	92
EBR	- <sup>1</sup>	0.11	C	0	15	0.05	C	0	0
WBL(x2)	- <sup>1</sup>	0.94	F	53	79	0.93	E	34	60
WBTR	310	0.54	C	80	90	0.63	B	58	72
NBL	- <sup>1</sup>	1.22	F	46	90	0.76	C	33	58
NBT	290	0.21	C	27	34	0.42	B	33	43
NBR	- <sup>1</sup>	0.57	C	50	85	1.02	E	85	165
SBL	- <sup>1</sup>	0.35	D	14	28	0.24	C	4	11
SBT	750	0.98	E	142	179	0.44	C	25	37
SBR	- <sup>1</sup>	0.06	C	0	2	0.02	C	0	0
<b>Chinguacousy Road / Spine Road (Signalized)</b>									
Overall	-	0.51	A	-	-	0.54	A	-	-
WBL	270	0.43	B	7	17	0.16	B	5	12
WBR	270	0.16	B	1	10	0.62	C	16	37
NBT	750	0.28	A	9	18	0.40	A	20	40
NBR	- <sup>1</sup>	0.08	A	0	5	0.15	A	0	8
SBL	- <sup>1</sup>	0.36	A	6	17	0.51	B	8	34
SBT	1000	0.53	A	20	38	0.28	A	13	26
<b>Chinguacousy Road / Old School Road (Signalized)</b>									
Overall	-	0.77	B	-	-	0.84	B	-	-

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

Movement	Storage / Link Distance (m)	Weekday AM Peak Hour				Weekday PM Peak Hour			
		v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)	v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)
EBL	- <sup>1</sup>	0.06	A	2	5	0.16	A	2	5
EBTR	1000	0.91	C	46	100	0.32	A	18	31
WBL	- <sup>1</sup>	0.54	B	6	22	0.23	A	6	14
WBTR	1000	0.39	B	15	28	0.90	C	74	144
NBL	- <sup>1</sup>	0.48	C	3	14	0.12	B	4	10
NBTR	300	0.28	A	9	16	0.75	C	46	66
SBL	- <sup>1</sup>	0.11	A	2	7	0.10	B	1	5
SBTR	3000	0.64	B	29	44	0.22	B	11	18

Note: 1. Required storage length determined as part of the solutions analysis.

**Table 15: Improved Operations – 2051 Scenario without GTA West**

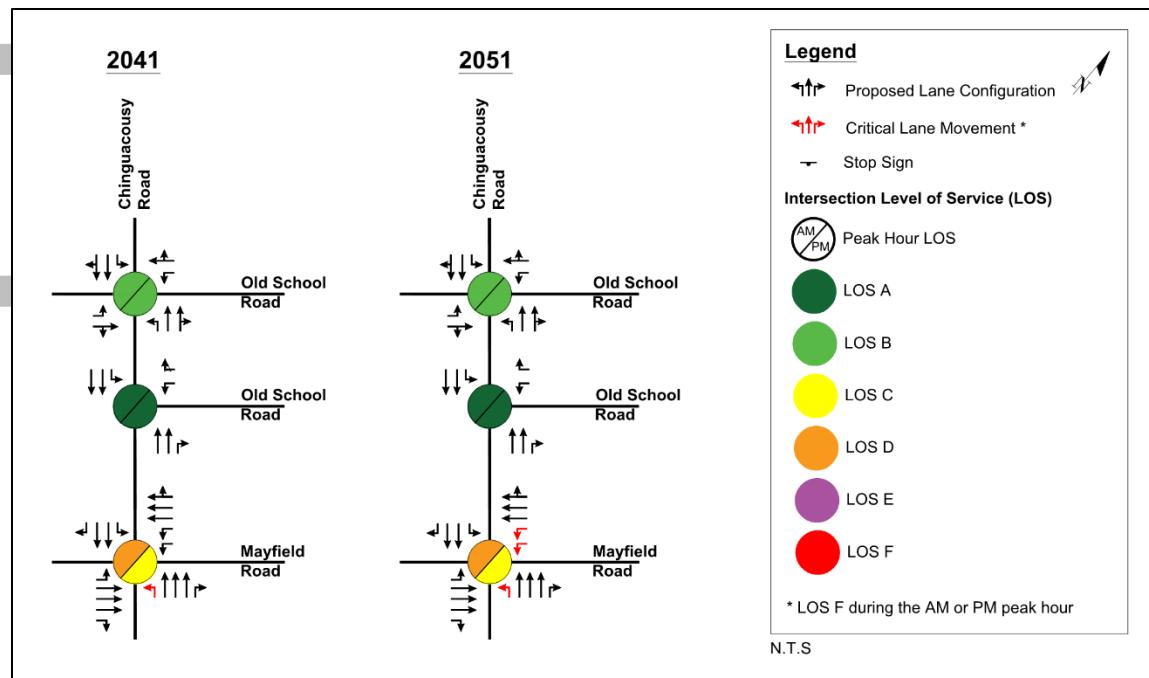
Movement	Storage / Link Distance (m)	Weekday AM Peak Hour				Weekday PM Peak Hour			
		v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)	v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)
<b>Chinguacousy Road / Mayfield Road (Signalized)</b>									
Overall	-	1.15	E	-	-	1.09	D	-	-
EBL	- <sup>1</sup>	0.14	C	3	9	0.24	C	3	10
EBT	670	1.03	E	222	240	1.01	E	108	141
EBR	- <sup>1</sup>	0.19	C	10	26	0.06	C	0	6
WBL(x2)	- <sup>1</sup>	1.12	F	78	109	0.95	E	49	79
WBTR	310	0.56	C	100	110	0.65	C	82	97
NBL	- <sup>1</sup>	1.22	F	57	104	0.78	C	44	72
NBT	290	0.23	C	34	42	0.44	C	44	55
NBR	- <sup>1</sup>	0.66	D	80	121	1.07	F	133	205
SBL	- <sup>1</sup>	0.39	D	17	32	0.28	D	5	14
SBT	750	1.11	F	193	227	0.48	D	33	46
SBR	- <sup>1</sup>	0.06	D	0	5	0.02	C	0	0
<b>Chinguacousy Road / Spine Road (Signalized)</b>									
Overall	-	0.51	A	-	-	0.56	A	-	-
WBL	270	0.43	B	7	17	0.16	B	5	12
WBR	270	0.18	B	2	10	0.63	C	17	38
NBT	750	0.29	A	9	18	0.41	A	21	41
NBR	- <sup>1</sup>	0.08	A	0	5	0.15	A	0	8
SBL	- <sup>1</sup>	0.37	A	5	17	0.53	B	9	39
SBT	2000	0.54	A	20	38	0.28	A	13	27
<b>Chinguacousy Road / Old School Road (Signalized)</b>									

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

Movement	Storage / Link Distance (m)	Weekday AM Peak Hour				Weekday PM Peak Hour			
		v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)	v/c	LOS	50 <sup>th</sup> Queue (m)	95 <sup>th</sup> Queue (m)
Overall	-	0.78	B	-	-	0.84	C	-	-
EBL	<sup>-1</sup>	0.06	A	2	5	0.16	A	2	5
EBTR	1000	0.91	C	46	100	0.33	A	19	32
WBL	<sup>-1</sup>	0.54	B	6	22	0.24	A	6	15
WBTR	1000	0.39	B	15	28	0.92	C	78	148
NBL	<sup>-1</sup>	0.50	C	3	15	0.12	B	4	10
NBTR	300	0.29	A	9	17	0.74	B	46	66
SBL	<sup>-1</sup>	0.11	A	2	7	0.08	B	1	4
SBTR	3000	0.65	B	30	45	0.21	B	11	18

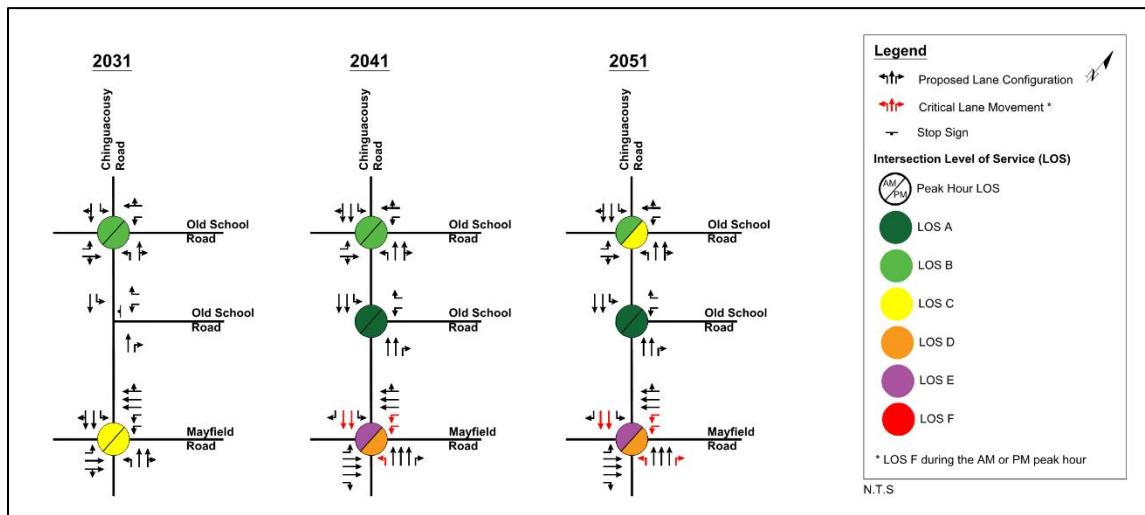
Note: 1. Required storage length determined as part of the solutions analysis.

Figure 7: GTA West Scenario LOS Summary



Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

**Figure 8: No GTA West Scenario LOS Summary**



## 7.0 Summary of Traffic Needs and Justifications

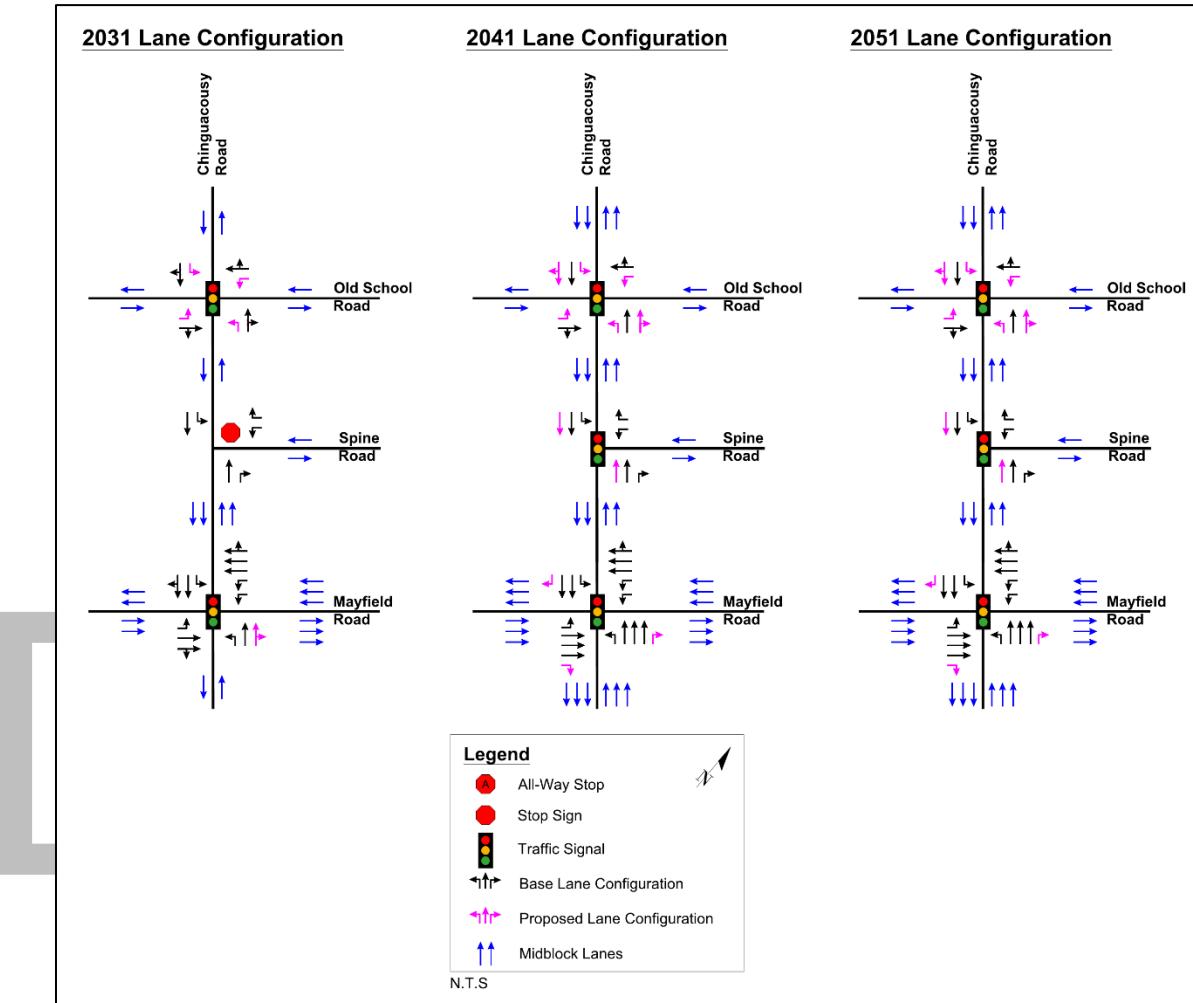
Recommended improvements and associated phasing to address traffic needs along the study corridor are summarized in **Table 16** and illustrated in **Figure 9**.

The following is a summary of key findings and recommendations from this study:

- The future midblock capacity analysis re-confirmed that the 4-lane widening along Chinguacousy Road between Mayfield Road and Spine Road is needed and that 4-lanes will be sufficient to accommodate forecasted demand. This need is consistent with the findings of the 2017 Transportation Master Plan. The midblock capacity analysis also indicates the need for a 4-lane widening along Chinguacousy Road north of Spine Road by 2041.
- A high-level traffic operations comparison between the scenario with and without GTA West does not show significant differences. Operational issues identified for both study intersections are generally the same between the two scenarios for each horizon year.
- The recommended signalization of Spine Road / Chinguacousy Road addresses future 2041 operational concerns, particularly the delays experienced by westbound left turning traffic. It is recommended that signals be provisioned for during construction and traffic operations be monitored for installation.
- The recommended signalization of Old School Road / Chinguacousy Road should also be monitored in the interim to consider earlier phasing to address potential delays experienced at the eastbound and westbound approach.
- It is recommended that the Region consider the 6-lane widening of Mayfield Road, west of Chinguacousy Road, by 2031 instead of 2041, to provide better lane alignment with the 6-lane widening of Mayfield Road, east of Chinguacousy Road, which is proposed for 2031.

**Table 16: Proposed Improvements Justification and Phasing**

		<b>Proposed Improvements</b>	<b>Justification</b>
2031	Mayfield Road / Chinguacousy Road	<ul style="list-style-type: none"> <li>➤ Protected and permissive northbound left-turn phase</li> <li>➤ Additional northbound through-right lane</li> </ul>	<p>Protected and permissive left turn phases reduce delay and improves capacity for left turn vehicles</p> <p>It is recommended that an additional lane be provided at the northbound approach by 2031 to improve capacity and alignment with the 4-lane widening of Chinguacousy Road, between Mayfield Road and Spine Road, by 2031.</p>
	Old School Road / Chinguacousy Road	<ul style="list-style-type: none"> <li>➤ Signalization</li> <li>➤ Exclusive northbound left-turn lane</li> <li>➤ Exclusive southbound left-turn lane</li> <li>➤ Exclusive eastbound left-turn lane</li> <li>➤ Exclusive westbound left-turn lane</li> </ul>	<p>MTO Signal Warrants (See Appendix K)</p> <p>Best practice is to include exclusive left-turn lanes at all approaches of a signalized intersection to improve safety and reduce delay</p>
2041	Mayfield Road / Chinguacousy Road	<ul style="list-style-type: none"> <li>➤ Exclusive eastbound right-turn lane</li> <li>➤ Exclusive northbound right-turn lane</li> <li>➤ Exclusive southbound right-turn lane</li> </ul>	Improves approach capacity
	Spine Road / Chinguacousy Road	<ul style="list-style-type: none"> <li>➤ Signalization</li> </ul>	Reduces delay at the westbound approach; signalization recommended as part of the 2018 Mayfield West Phase 2 Stage 2 Transportation Assessment
	Widening	<ul style="list-style-type: none"> <li>➤ 4-lane widening of Chinguacousy Road north of Spine Road</li> </ul>	Improves approach capacity

**Figure 9: Proposed Improvements**

The required storage lengths for recommended exclusive turn lanes under the ultimate lane configuration are summarized in **Table 17**. Storage lengths that accommodate the 50<sup>th</sup> and 95<sup>th</sup> percentile queue of the highest AM or PM peak hour traffic in 2041 (the recommended design year), considering both the scenario with and without GTA West, are provided. It is recommended that the design consider a shorter storage length for exclusive right-turn lanes with extensive queueing requirements to minimize impacts on the right-of-way.

Chinguacousy Road between Mayfield Road and Old School Road – Traffic Study  
August 12, 2022

**Table 17: Turn Lane Requirements**

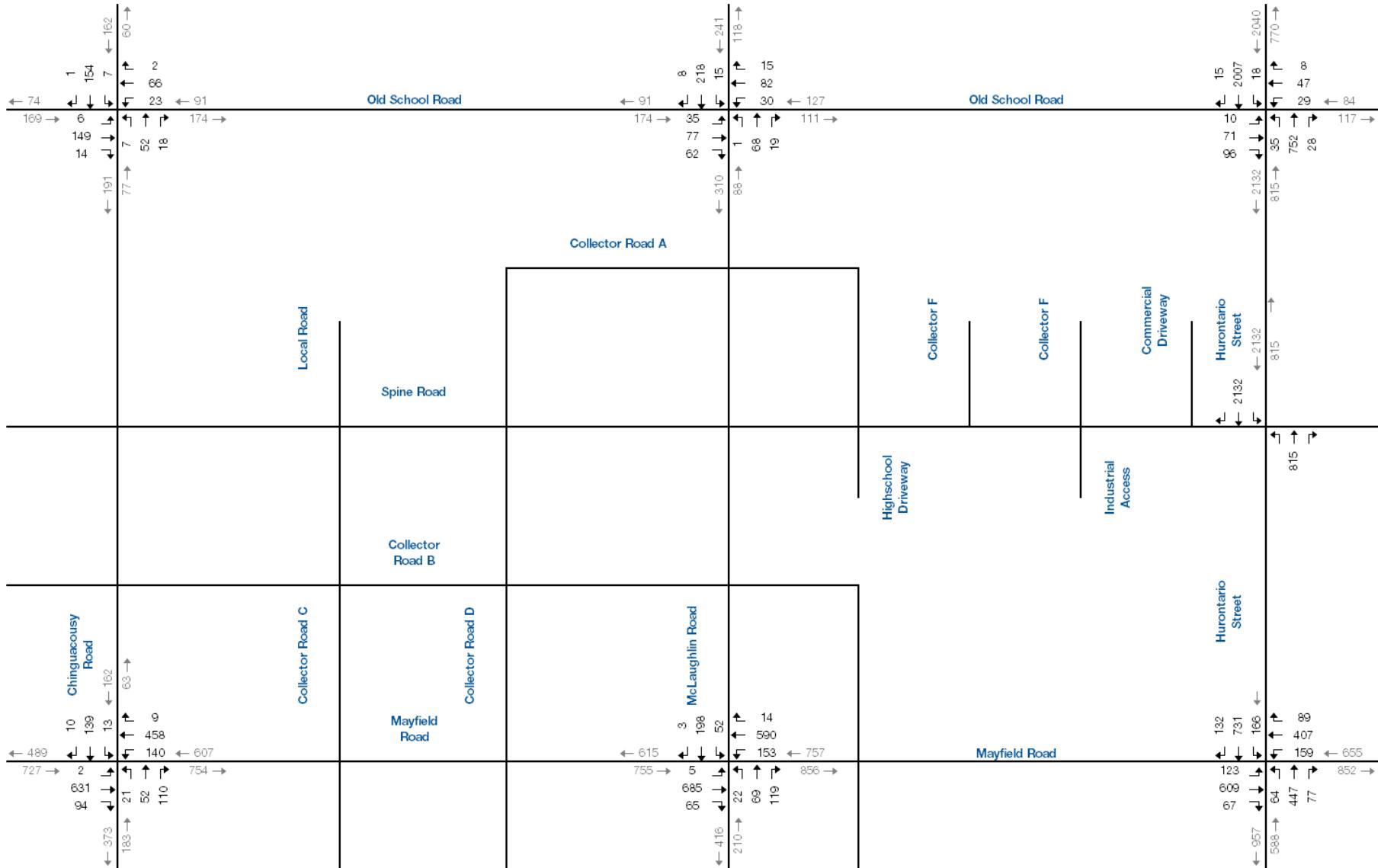
Turn Lane	Storage Length Required (m)	
	50 <sup>th</sup> Percentile Queue	95 <sup>th</sup> Percentile Queue
<b>Mayfield Road / Chinguacousy Road Intersection</b>		
Eastbound right-turn	15	25
Northbound right-turn	85	165
Southbound right-turn	15	15
Eastbound left-turn	15	15
Westbound dual lefts	75	105
Northbound left-turn	45	95
Southbound left-turn	15	30
<b>Spine Road / Chinguacousy Road Intersection</b>		
Northbound right-turn	15	15
Southbound left-turn	15	30
<b>Old School Road / Chinguacousy Road Intersection</b>		
Eastbound left-turn	15	15
Westbound left-turn	15	20
Northbound left-turn	15	15
Southbound left-turn	15	15



## Appendix A

### Count Data

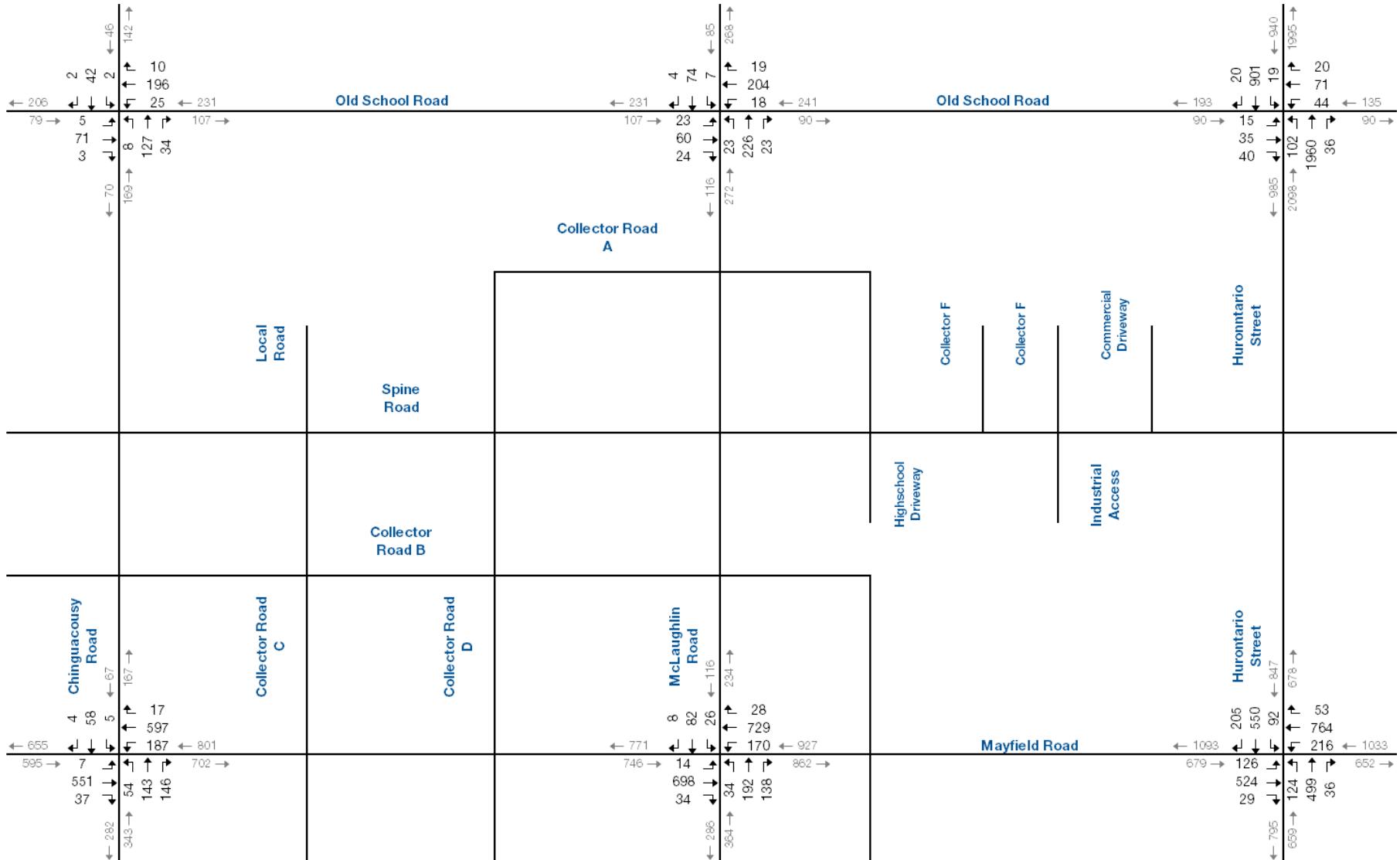
# DRAFT



## Existing Traffic – AM Peak Hour

Mayfield West Phase 2 Stage 2 Transportation Assessment  
180001

Figure 2.1



## Existing Traffic – PM Peak Hour

Mayfield West Phase 2 Stage 2 Transportation Assessment  
180001

Figure 2.2

**Peak Hour: 07:00 AM - 08:00 AM Weather: Moderate Rain (15.36 °C)**

Start Time	Southbound						Westbound						Northbound						Eastbound						Int. Total (15 min)
	Left	Thru	Right	UTurn	Peds	Approach Total	Left	Thru	Right	UTurn	Peds	Approach Total	Left	Thru	Right	UTurn	Peds	Approach Total	Left	Thru	Right	UTurn	Peds	Approach Total	
07:00:00	2	20	4	0	0	26	35	92	1	0	0	128	7	16	16	0	0	39	1	143	11	0	0	155	348
07:15:00	3	21	1	0	0	25	46	114	2	0	0	162	4	21	27	0	0	52	1	174	15	0	0	190	429
07:30:00	2	47	0	0	0	49	35	147	1	0	0	183	10	17	22	0	0	49	2	184	19	0	0	205	486
07:45:00	2	46	3	0	0	51	42	139	0	0	0	181	9	18	26	0	0	53	1	146	25	0	0	172	457
<b>Grand Total</b>	9	134	8	0	0	151	158	492	4	0	0	654	30	72	91	0	0	193	5	647	70	0	0	722	1720
<b>Approach%</b>	6%	88.7%	5.3%	0%	-	-	24.2%	75.2%	0.6%	0%	-	-	15.5%	37.3%	47.2%	0%	-	-	0.7%	89.6%	9.7%	0%	-	-	-
<b>Totals %</b>	0.5%	7.8%	0.5%	0%	8.8%	9.2%	28.6%	0.2%	0%	38%	1.7%	4.2%	5.3%	0%	11.2%	0.3%	37.6%	4.1%	0%	42%	-	-	-	-	-
<b>PHF</b>	0.75	0.71	0.5	0	0.74	0.86	0.84	0.5	0	0.89	0.75	0.86	0.84	0	0.91	0.63	0.88	0.7	0	0.88	-	-	-	-	-
<b>Heavy</b>	4	5	4	0	13	15	43	1	0	59	9	2	2	0	13	1	29	4	0	34	-	-	-	-	-
<b>Heavy %</b>	44.4%	3.7%	50%	0%	8.6%	9.5%	8.7%	25%	0%	9%	30%	2.8%	2.2%	0%	6.7%	20%	4.5%	5.7%	0%	4.7%	-	-	-	-	-
<b>Lights</b>	5	129	4	0	138	143	449	3	0	595	21	70	89	0	180	4	618	66	0	688	-	-	-	-	-
<b>Lights %</b>	55.6%	96.3%	50%	0%	91.4%	90.5%	91.3%	75%	0%	91%	70%	97.2%	97.8%	0%	93.3%	80%	95.5%	94.3%	0%	95.3%	-	-	-	-	-
<b>Single-Unit Trucks</b>	0	1	0	0	1	10	18	0	0	28	2	0	0	0	2	0	13	1	0	14	-	-	-	-	-
<b>Single-Unit Trucks %</b>	0%	0.7%	0%	0%	0.7%	6.3%	3.7%	0%	0%	4.3%	6.7%	0%	0%	0%	1%	0%	2%	1.4%	0%	1.9%	-	-	-	-	-
<b>Buses</b>	4	4	4	0	12	5	7	1	0	13	5	2	2	0	9	1	10	3	0	14	-	-	-	-	-
<b>Buses %</b>	44.4%	3%	50%	0%	7.9%	3.2%	1.4%	25%	0%	2%	16.7%	2.8%	2.2%	0%	4.7%	20%	1.5%	4.3%	0%	1.9%	-	-	-	-	-
<b>Articulated Trucks</b>	0	0	0	0	0	0	18	0	0	18	2	0	0	0	2	0	6	0	0	6	-	-	-	-	-
<b>Articulated Trucks %</b>	0%	0%	0%	0%	0%	0%	3.7%	0%	0%	2.8%	6.7%	0%	0%	0%	1%	0%	0.9%	0%	0%	0.8%	-	-	-	-	-
<b>Bicycles on Road</b>	0	0	0	0	0	-	0	0	0	0	0	0	0	-	-	0	0	0	0	0	-	-	-	-	-
<b>Bicycles on Road%</b>	-	-	-	-	%	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-



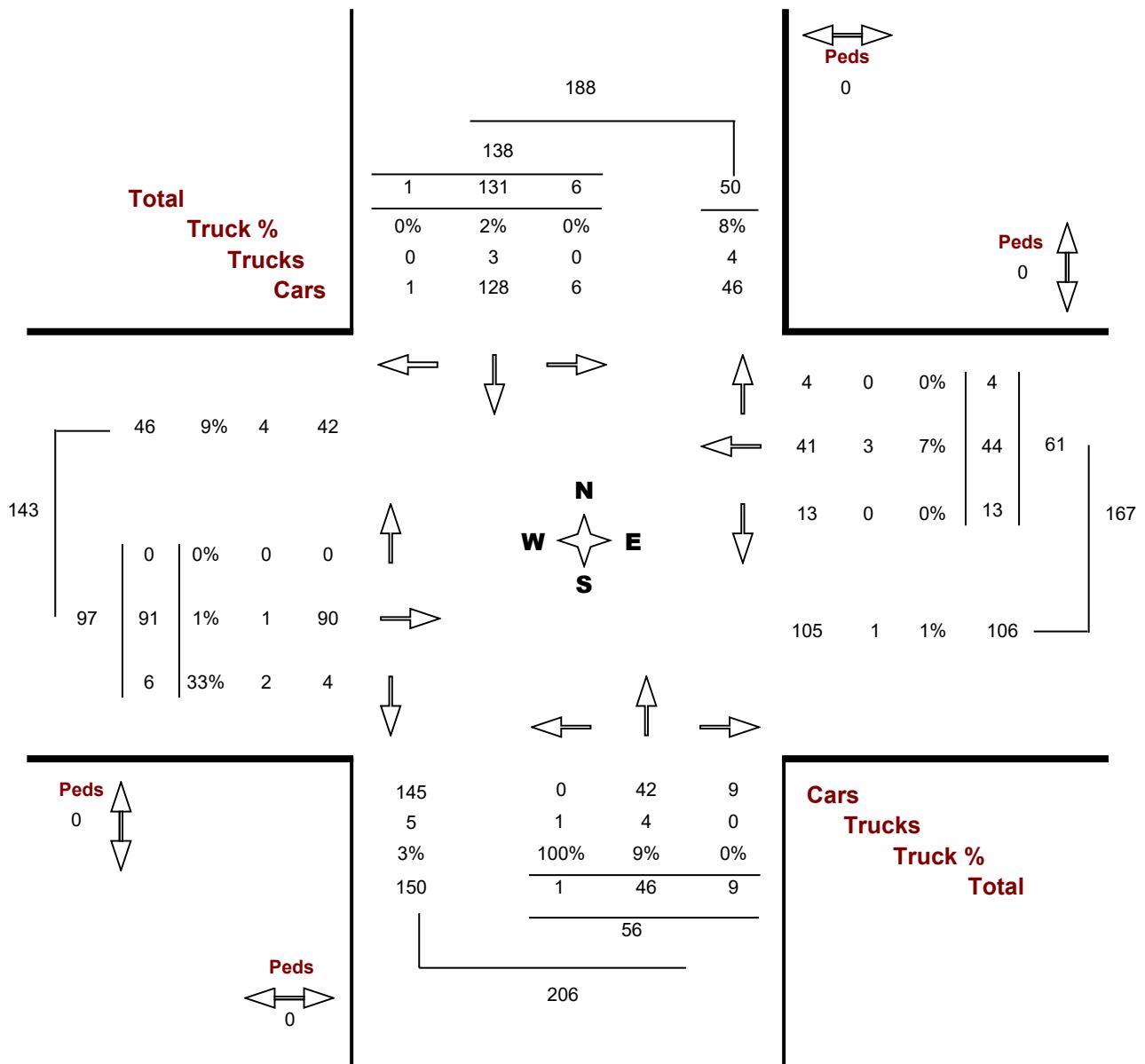
**Peak Hour: 05:00 PM - 06:00 PM Weather: Scattered Clouds (20.41 °C)**

Start Time	Southbound						Westbound						Northbound						Eastbound						Int. Total (15 min)
	Left	Thru	Right	UTurn	Peds	Approach Total	Left	Thru	Right	UTurn	Peds	Approach Total	Left	Thru	Right	UTurn	Peds	Approach Total	Left	Thru	Right	UTurn	Peds	Approach Total	
17:00:00	3	23	2	0	0	28	36	140	2	0	0	178	6	24	37	0	0	67	9	172	7	0	0	188	461
17:15:00	0	14	1	0	0	15	41	169	3	0	0	213	8	23	23	0	0	54	2	150	11	0	0	163	445
17:30:00	1	29	2	0	0	32	34	162	1	0	0	197	7	16	27	0	0	50	1	172	11	0	0	184	463
17:45:00	2	22	2	0	0	26	35	150	1	0	0	186	6	18	23	0	0	47	1	145	12	0	0	158	417
<b>Grand Total</b>	<b>6</b>	<b>88</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>101</b>	<b>146</b>	<b>621</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>774</b>	<b>27</b>	<b>81</b>	<b>110</b>	<b>0</b>	<b>0</b>	<b>218</b>	<b>13</b>	<b>639</b>	<b>41</b>	<b>0</b>	<b>0</b>	<b>693</b>	<b>1786</b>
<b>Approach%</b>	5.9%	87.1%	6.9%	0%	-	18.9%	80.2%	0.9%	0%	-	12.4%	37.2%	50.5%	0%	-	1.9%	92.2%	5.9%	0%	-	-	-	-	-	
<b>Totals %</b>	0.3%	4.9%	0.4%	0%	5.7%	8.2%	34.8%	0.4%	0%	43.3%	1.5%	4.5%	6.2%	0%	12.2%	0.7%	35.8%	2.3%	0%	38.8%	-	-	-	-	
<b>PHF</b>	0.5	0.76	0.88	0	0.79	0.89	0.92	0.58	0	0.91	0.84	0.84	0.74	0	0.81	0.36	0.93	0.85	0	0.92	-	-	-	-	
<b>Heavy</b>	1	1	1	0	3	1	27	0	0	28	2	3	8	0	13	0	29	2	0	31	-	-	-	-	
<b>Heavy %</b>	16.7%	1.1%	14.3%	0%	3%	0.7%	4.3%	0%	0%	3.6%	7.4%	3.7%	7.3%	0%	6%	0%	4.5%	4.9%	0%	4.5%	-	-	-	-	
<b>Lights</b>	5	87	6	0	98	145	594	7	0	746	25	78	102	0	205	13	610	39	0	662	-	-	-	-	
<b>Lights %</b>	83.3%	98.9%	85.7%	0%	97%	99.3%	95.7%	100%	0%	96.4%	92.6%	96.3%	92.7%	0%	94%	100%	95.5%	95.1%	0%	95.5%	-	-	-	-	
<b>Single-Unit Trucks</b>	0	0	1	0	1	0	14	0	0	14	0	2	5	0	7	0	18	1	0	19	-	-	-	-	
<b>Single-Unit Trucks %</b>	0%	0%	14.3%	0%	1%	0%	2.3%	0%	0%	1.8%	0%	2.5%	4.5%	0%	3.2%	0%	2.8%	2.4%	0%	2.7%	-	-	-	-	
<b>Buses</b>	0	1	0	0	1	1	2	0	0	3	2	1	1	0	4	0	3	1	0	4	-	-	-	-	
<b>Buses %</b>	0%	1.1%	0%	0%	1%	0.7%	0.3%	0%	0%	0.4%	7.4%	1.2%	0.9%	0%	1.8%	0%	0.5%	2.4%	0%	0.6%	-	-	-	-	
<b>Articulated Trucks</b>	1	0	0	0	1	0	11	0	0	11	0	0	2	0	2	0	8	0	0	8	-	-	-	-	
<b>Articulated Trucks %</b>	16.7%	0%	0%	0%	1%	0%	1.8%	0%	0%	1.4%	0%	0%	1.8%	0%	0.9%	0%	1.3%	0%	0%	1.2%	-	-	-	-	
<b>Bicycles on Road</b>	0	0	0	0	0	-	0	0	0	0	0	0	0	0	-	0	0	0	0	-	-	-	-	-	
<b>Bicycles on Road%</b>	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	%	-	-	-	-	



## Turning Movements Report - AM Period

**Location.....** CHINGUACOUSY RD @ OLD SCHOOL RD  
**Municipality.....** Caledon  
**GeolD.....** 15525  
**Count Date.....** Tuesday, 11 April, 2017      **Peak Hour.....** 07:30 AM — 08:30 AM





## Turning Movements Report - PM Period

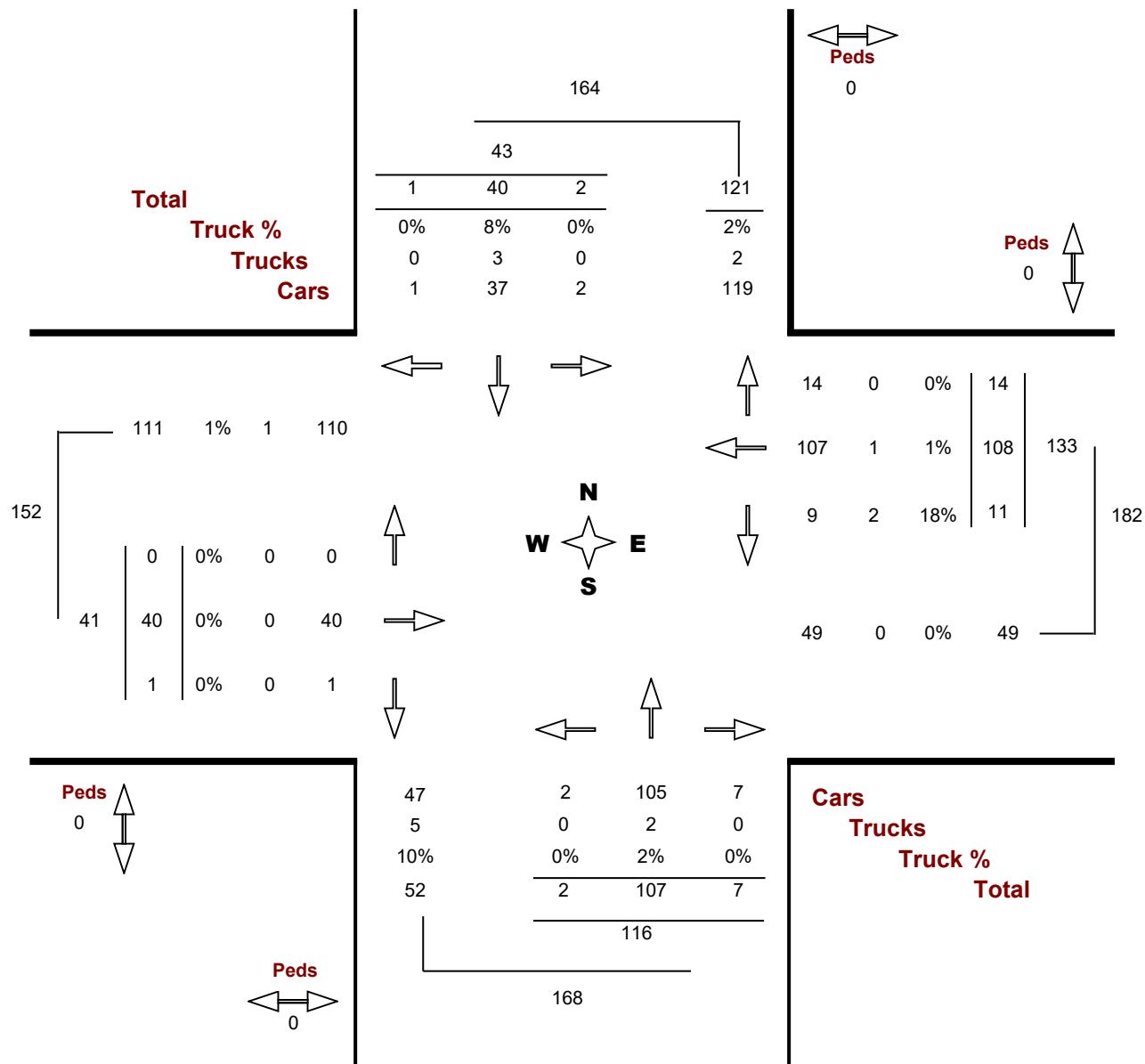
**Location.....** CHINGUACOUSY RD @ OLD SCHOOL RD

**Municipality.....** Caledon

**GeolD.....** 15525

**Count Date.....** Tuesday, 11 April, 2017

**Peak Hour.....** 03:45 PM — 04:45 PM





[THE DIFFERENCE IS OUR PEOPLE]

---

## Appendix B

### EMME Model Documentation

# DRAFT



February 8, 2022

**Via: Email**

Arash Olia, Ph.D., P.Eng.  
Manager, Transportation Engineering  
Town of Caledon  
6311 Old Church Road  
Caledon Ontario L7C 1J6

Jillian Britto, P.Eng.  
Coordinator, Transportation Development

Dear Arash:

**Re: Caledon EMME Model Documentation**  
**Caledon Multi-Modal Transportation Master Plan (MMTMP)**  
**Project No.: 300051561.0000**

R.J. Burnside & Associates Limited ("Burnside") was retained by the Town of Caledon ("Town") to conduct a Multi-Modal Transportation Master Plan and a Needs and Justification traffic study for the Chinguacousy Road Schedule 'C' Class Environmental Assessment.

As a part of the transportation assessment for these studies, Burnside is using the Region's transportation EMME model to forecast future traffic for the 2031, 2041, and 2051 horizon years. The EMME model uses land uses forecasts which are currently being refined by the Region's Official Plan Review and Municipal Comprehensive Review (MCR).

The Region, in consultation with the Town of Caledon, City of Brampton, and City of Mississauga, is in the process of allocating the 2051 Peel targets of 2.280 million people and 2.070 million jobs through a Land Needs Assessment which determines the amount of land required to accommodate future population and employment growth. Six different growth scenarios were evaluated, and a preferred growth scenario was chosen called "Scenario 5 - No GTA West" scenario. On September 23, 2021, Regional staff sought authorization from Regional Council to proceed with the next steps of the public engagement process for the draft Regional Official Plan Amendment which included proceeding with the "Scenario 5 – No GTA West" growth scenario. These next steps include Statutory Open Houses and a Public Meeting. Regional Council carried this recommendation (Resolution Number 2021-061).

Regional staff retained Paradigm Solutions Ltd. to undertake the Transportation Technical Study for the Settlement Area Boundary Expansion Study, which was an integral component of the Land Needs Assessment. As a result of Regional Council's resolution, Paradigm Solutions Ltd. updated the Region's 2051 EMME model to reflect the "Scenario 5 – No GTA West" scenario. Burnside received this updated EMME model on November 11, 2021.

The Region's growth allocations can still be further refined as a part of the public engagement process. However due to the timing of the MMTMP and Chinguacousy Road Class EA, Burnside is using the land use assumptions received on November 11, 2021.

Burnside reviewed the model's network to ensure it was consistent with future planned improvements. This letter outlines the network refinements made to the EMME model received. These network refinements can be categorized in four categories:

- Lane modifications to reflect planned and proposed improvements based on previous transportation studies,
- Lane capacity changes to reflect an urbanized environment within the SABE,
- Road widenings as a result of the GTA West which, at the time of writing this letter, will be incorporated in the Town's 2021 Multi-Modal Transportation Master Plan, and
- Network coding errors.

This updated network will be used to inform the Caledon Multi-Modal Transportation Master Plan (MMTMP) and the Needs and Justification traffic study for the Chinguacousy Road Class Environmental Assessment (EA) study.

## **1.0 Future 2031 and 2041 Model Update**

The original provision of the 2011, 2031 and 2041 models from Peel Region use the 2006 Transportation Tomorrow Survey (TTS) zone system. The 2051 model uses a more disaggregated zone system developed by Regional staff. The latest 2031, 2041, and 2051 population and employment forecasts were provided for this disaggregated zone system, and accounts for growth allocated in the Settlement Area Boundary Expansion (SABE) lands, Mayfield West Secondary Plan Phase 2 Stage 2 area, and the Bolton Residential Expansion Study (BRES) area. Therefore, to ensure the latest planned growth allocations are reflected in the future horizon models, the 2031 and 2041 models were updated to use the same disaggregated zone system as the 2051 model.

## **2.0 Future Road Improvements**

Future road improvements as summarized in **Table 1** were identified for the 2031 and 2041 horizon years based on previous transportation studies. A network review was conducted to ensure these future improvements are included in the EMME network. The model was updated to include the new Spine Road, along with the future widening along McLaughlin Road and Chinguacousy Road, which were not included as part of the original model provided.

**Table 1: Future Road Improvements**

Road	From	To	Status <sup>1</sup>	Improvement	Source <sup>2</sup>
<b>By 2031</b>					
Spine Rd	Chinguacousy Rd	McLaughlin Rd	Committed	New Road (3-lanes)	Caledon TMP (2017) & MWP2SP TMP (2018) & Caledon DC Study (2019)
	McLaughlin Rd	Hurontario St	Committed	New Road (4-lanes)	Caledon TMP (2017) & MWP2SP TMP (2018) & Caledon DC Study (2019)
McLaughlin Rd	Mayfield Rd	Mayfield West Phase 2 Limit	Committed	Widening to 4-lanes	Caledon TMP (2017) & MWP2SP TMP (2018) & Caledon DC Study (2019)
	Mayfield West Phase 2 Limit	Old School Rd	Planned	Widening to 4-lanes	Caledon TMP (2017)
Simpson Rd <sup>3</sup>	Mayfield Rd	George Bolton Pkwy	Planned	Extension (2-lanes)	Caledon TMP (2017) & Bolton TMP (2015)
Albion Vaughan Rd	Mayfield Rd	King St	Committed	Widening to 4-lanes	Caledon TMP (2017) & Bolton TMP (2015) & Caledon DC Study (2019)
George Bolton Pkwy Extension <sup>3</sup>	Highway 50	Industrial Rd	Committed	Extension (2-lanes)	Caledon TMP (2017) & Bolton TMP (2015) & Caledon DC Study (2019)
Chinguacousy Rd	Mayfield Rd	Spine Rd	Committed	Widening to 4-lanes	Caledon TMP (2017) & MWP2SP TMP (2018) & Caledon DC Study (2019)
	Spine Rd	North Limits	Planned	Widening to 4-lanes	Caledon TMP (2017)
Hwy 50 (Queen St)	South of King St	Hickman St	Planned	Narrowing to 2-lanes	Bolton TMP (2015)
Mayfield Rd	Airport Rd	The Gore Rd	Committed	Widening to 4-lanes	Peel Region DC Study (2020)
	Hurontario St	Chinguacousy	Committed	Widening to 6-lanes	Peel Region LRTP (2019) & Peel Region DC Study (2020)
	The Gore Rd	Coleraine Dr	Committed	Widening to 4-lanes	Bolton TMP (2015) & Peel Region DC Study (2020)
	Chinguacousy Rd	Mississauga Rd	Committed	Widening to 4-lanes	Peel Region LRTP (2019) & Peel Region DC Study (2020)
	Dixie Rd	Bramalea Rd	Committed	Widening to 6-lanes	Peel Region LRTP (2019) & Peel Region DC Study (2020)
	Mississauga Rd	Winston Churchill Blvd	Committed	Widening to 4-lanes	Peel Region LRTP (2019) & Peel Region DC Study (2020)
	Heart Lake Rd	Hurontario St	Committed	Widening to 6-lanes	Peel Region LRTP (2019) & Peel Region DC Study (2020)
	Airport Rd	Clarkway Dr (west of Humber Station Road)	Committed	Widening to 6-lanes	Bolton TMP (2015) & Peel Region DC Study (2020)
	Albion Vaughan Rd	The Gore Rd	Planned	Widening to 4-lanes	Bolton TMP (2015)
	Coleraine Dr	Hwy 50 (Queen St)	Committed	Widening to 4-lanes	Peel Region LRTP (2019) & Peel Budget (2019)
King St Realignment	King St	Emil Kolb Pkwy	Planned	New Road (2-lanes)	Bolton TMP (2015)
Queensgate Blvd	Hwy 50 (Queen St)	Albion Vaughan Rd	Committed	Lane reduction to 3-lanes	Caledon DC Study (2019)
Airport Rd	1 km North of Mayfield Rd	King St	Committed	Widening to 5-lanes	Peel Region LRTP (2019) & Peel Budget (2019) & Peel Region DC Study (2020)
Dixie Rd	Mayfield Rd	2 km North of Mayfield Rd	Committed	Widening to 5-lanes	Peel Region LRTP (2019) & Peel Budget (2019)
Coolihans Sideroad <sup>3</sup>	-	-	Planned	Closure	Ministry of Transportation (MTO) Highway 9 / Peel Road 8 (The Gore Road) Environmental Study Report (2019)
<b>By 2041</b>					
The Gore Rd	Mayfield Rd	Healey Rd	Proposed	Widening to 4-lanes	Peel Region LRTP (2019)
Mayfield Rd	Clarkway Dr	Coleraine Dr	Proposed	Widening to 6-lanes	Peel Region LRTP (2019)
	West of Mississauga Rd	Chinguacousy Rd	Committed	Widening to 6-lanes	Peel Region LRTP (2019) & Peel Budget (2019)
Mississauga Rd	Mayfield Rd	Old School Rd	Proposed	Widening to 4-lanes	Peel Region LRTP (2019)

Notes: 1. Proposed improvements refer to projects that are currently undergoing studies, planned improvements refer to those with approved studies but are not budgeted, and committed improvements refer to projects that have been budgeted as part of the Peel Region or Caledon capital plan or development charges study.

2. TMP – Transportation Master Plan; MWP2SP – Mayfield West Phase 2 Secondary Plan; DC – Development Charges; LRTP – Long Range Transportation Plan

3. Minor road – too disaggregate to be included in the EMME network.

### 3.0 Lane Capacity Changes

Significant population and employment growth has been allocated for the Town of Caledon in the Mayfield West Secondary Plan, Bolton Residential Expansion Study (BRES) and Settlement Area Boundary Expansion (SABE) areas. It is expected that these areas will transition to a more urbanized environment given the level of intensification required to accommodate growth. Therefore, lane capacities within growth areas should be adjusted under future conditions to account for travel friction / congestion (i.e., as a result of more accesses along the corridor, for example).

In the original model, most of the lane capacities for roads within the Town were coded at 1,000 vehicles per lane per direction (vplpd). Most urbanized roads in the neighbouring municipality of Brampton were coded at 900 vplpd. Therefore, the lane capacities of the road segments listed in **Table 2** were adjusted to better align with growth plans and buildout of settlement areas.

Note that under baseline conditions, the lane capacity of Duffy's Lane was also increased from 900 to 1,000 vplpd. It appears that the lane capacity was reduced originally to account for the greater proportion of truck traffic using this road segment. However, with the Emil Kolb Parkway ("BAR") constructed, most of these trucks would be taking this route instead.

**Table 2: Lane Capacity Changes**

Road	From	To	Lane Capacity (Before)	Lane Capacity (Adjusted)
Base Condition				
Duffy's Lane	Emil Kolb Parkway	Old Church Road	900	1000
By 2031 <sup>1</sup>				
McLaughlin Road	Mayfield Road	Old School Road		
Kennedy Road	Mayfield Road	Old School Road		
Spine Road	Chinguacousy Road	Huronario Street		
Heart Lake Road	Mayfield Road	Old School Road		
Coleraine Drive	Mayfield Road	King Street		
Queen Street	Mayfield Road	George Bolton Parkway		
Columbia Way	Queen Street	Caledon King Townline		
Albion Vaughan Road	Mayfield Road	King Street		
King Street	Evans Ridge	Caledon King Townline		

By 2051 <sup>2</sup>			1000	900
Mississauga Road	Mayfield Road	Old School Road		
Creditview Road	Mayfield Road	Old School Road		
Chinguacousy Road	Mayfield Road	Old School Road		
Kennedy Road	Old School Road	King Street		
Bramalea Road	Mayfield Road	Old School Road		
Torbram Road	Mayfield Road	King Street		
Airport Road	Mayfield Road	King Street		
Innis Lake Road	Mayfield Road	King Street		
Centreville Creek Road	Mayfield Road	Healey Road		
The Gore Road	Mayfield Road	Castlederg Sideroad		
Humber Station Road	Mayfield Road	King Street		

Notes: 1. 2031 lane capacity changes account for the urbanization of the roads within the Mayfield West Secondary Plan and Bolton Residential Expansion Study (BRES) areas.  
 2. 2051 lane capacity changes account for the urbanization of roads within the Settlement Area Boundary Expansion (SABE) lands.

## 4.0 GTA West Scenario

With the construction of the GTA West, it is expected that corridors with an interchange will be widened to 4-lanes to provide better connectivity to the freeway network and added capacity. This is consistent with the draft recommendations identified as part of the MMTMP. These lane widening changes are summarized in **Table 3**, and were incorporated in all of the future horizon year scenarios with the GTA West (i.e., 2031, 2041 and 2051).

Note that some of the widenings have already been accounted for as part of future road improvements (see **Table 1**), and therefore are also included in the scenarios without the GTA West.

**Table 3: Lane Widening Changes**

Road Widened to 4-Lanes	From	To	Included in	
			No GTA West Scenario	With GTA West Scenario
Chinguacousy Road	Mayfield Road	King Street	Yes	Yes
Bramalea Road	Mayfield Road	King Street	No	Yes
Airport Road	Mayfield Road	King Street	Yes	Yes
The Gore Road	Mayfield Road	Healey Road	Yes	Yes
Humber Station Road	Mayfield Road	Healey Road	No	Yes

It was noted that the Humber Station Road interchange was not coded in the original network and was instead coded as an interchange that connects to Mayfield Road via an extension of the future Arterial Road ("A2") in Brampton. The network was adjusted to reflect the preferred route alignment of GTA West (as of August 2020), whereby a parclo interchange is proposed at Humber Station Road, just north of Mayfield Road. The GTA West preferred alignment is shown in **Attachment 1**.

## 5.0 Additional Network Refinements

A few network inconsistencies were noted below and corrected accordingly.

- The northbound to westbound on-ramp at The Gore Road interchange for GTA West was originally coded with a turn restriction. This restriction was removed in the updated model to allow for northbound to westbound access at The Gore Road interchange.
- George Bolton Parkway originally had two overlapping links coded on top of one another, one of which did not connect to the centroid connector. This link was removed for redundancy.
- As noted in the previous section, the GTA West interchange at A2 was removed and re-coded at Humber Station Road.

Should you require clarification of any of the above please contact either of the undersigned.

Yours truly,

R.J. Burnside & Associates Limited



Other than by the addressee, copying or distribution of this document, in whole or in part, is not permitted without the express written consent of R.J. Burnside & Associates Limited.

051561\_Caledon EMME Model Documentation  
08/02/2022 5:50 PM



[THE DIFFERENCE IS OUR PEOPLE]

Attachment 1

---

**Attachment 1**

**GTA West Preferred Alignment (August 2020)**

**DRAFT**

## PREFERRED ROUTE ANNOUNCEMENT

## GTA WEST STUDY



The Greater Toronto Area (GTA) West Transportation Corridor Route Planning and Environmental Assessment Study is focusing on the planning and preliminary design of a new multimodal transportation corridor that includes a 400-series highway, transitway, and potential goods movement priority features. Public Information Centre #2 (PIC #2), held in September/October 2019, presented the draft Technically Preferred Route and draft 2019 Focused Analysis Area for comment.

The draft Technically Preferred Route presented at PIC #2 has been superseded by the Preferred Route. **The Preferred Route** map illustrates the route and interchange locations for the GTA West multimodal transportation corridor that will be developed to a preliminary design level of detail over the next 2 years. The Preferred Route map provides information on where changes have been made to the route based on the consideration of feedback from PIC #2, land use and environmental information.

## TIMELINE

## WINTER 2019 - SUMMER 2020

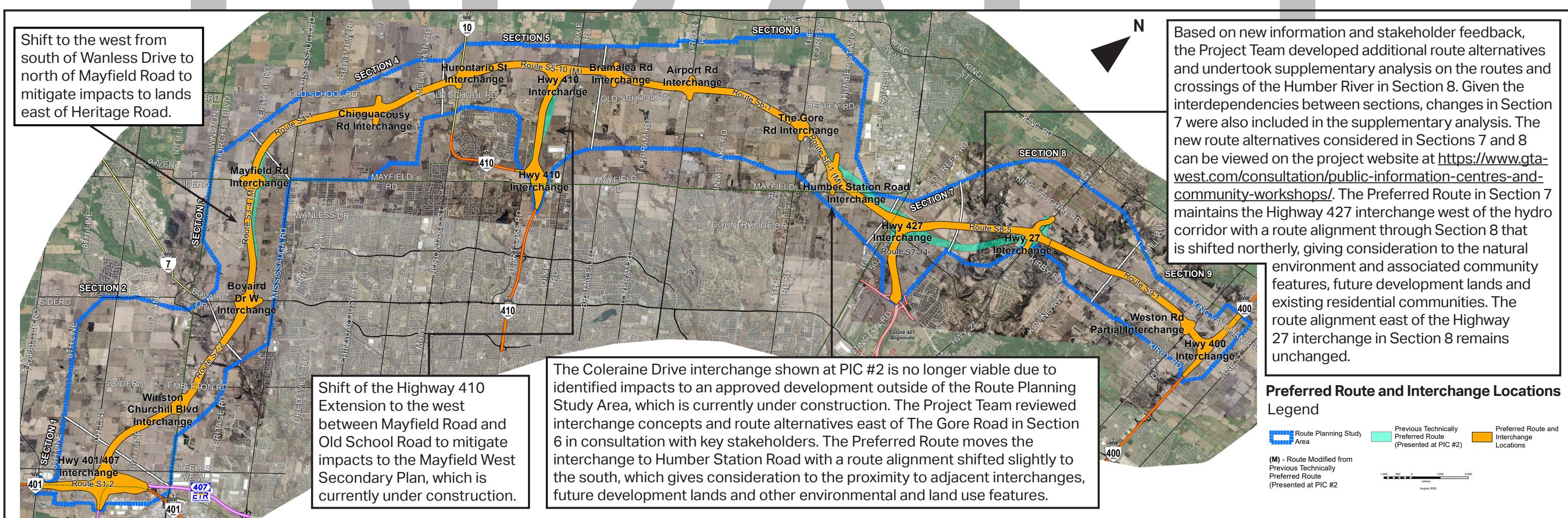
The Project Team reviewed feedback from PIC #2 and worked diligently with advisory groups, municipal staff, agencies and other stakeholders to confirm the Preferred Route and associated 2020 Focused Analysis Area for the GTA West multimodal transportation corridor.

## 2020 - 2021

The Project Team will be undertaking fieldwork on properties potentially impacted by the Preferred Route to document existing environmental and engineering conditions.

## 2020 - 2022

The Project Team will develop the preliminary design of the GTA West multimodal transportation corridor. The Project Team will present the preliminary design, including property impacts and mitigation measures, at PIC #3 for public review and comment. PIC #3 is anticipated to be held in Fall/Winter 2021.





[THE DIFFERENCE IS OUR PEOPLE]

---

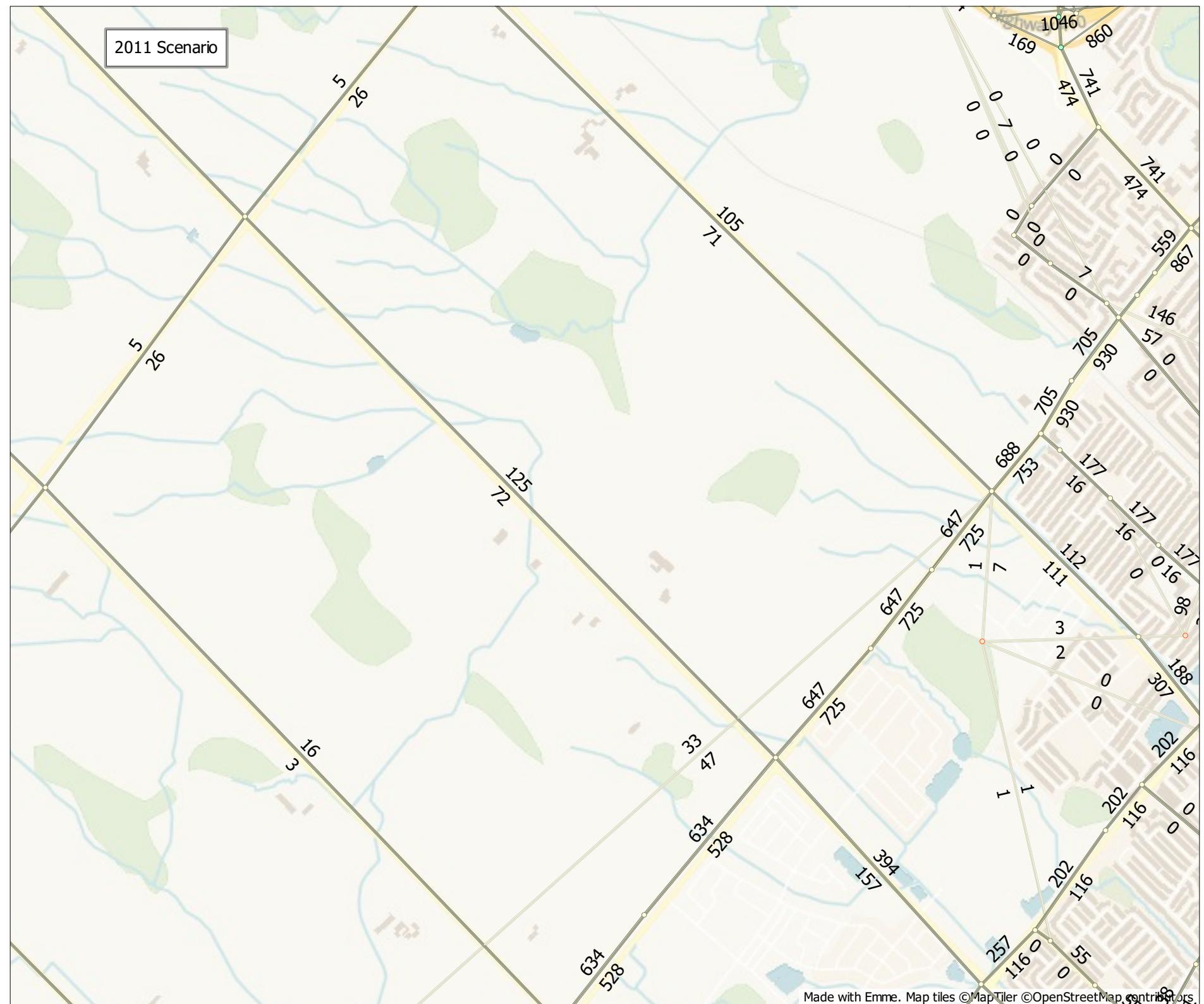
## Appendix C

### EMME Volume Plots

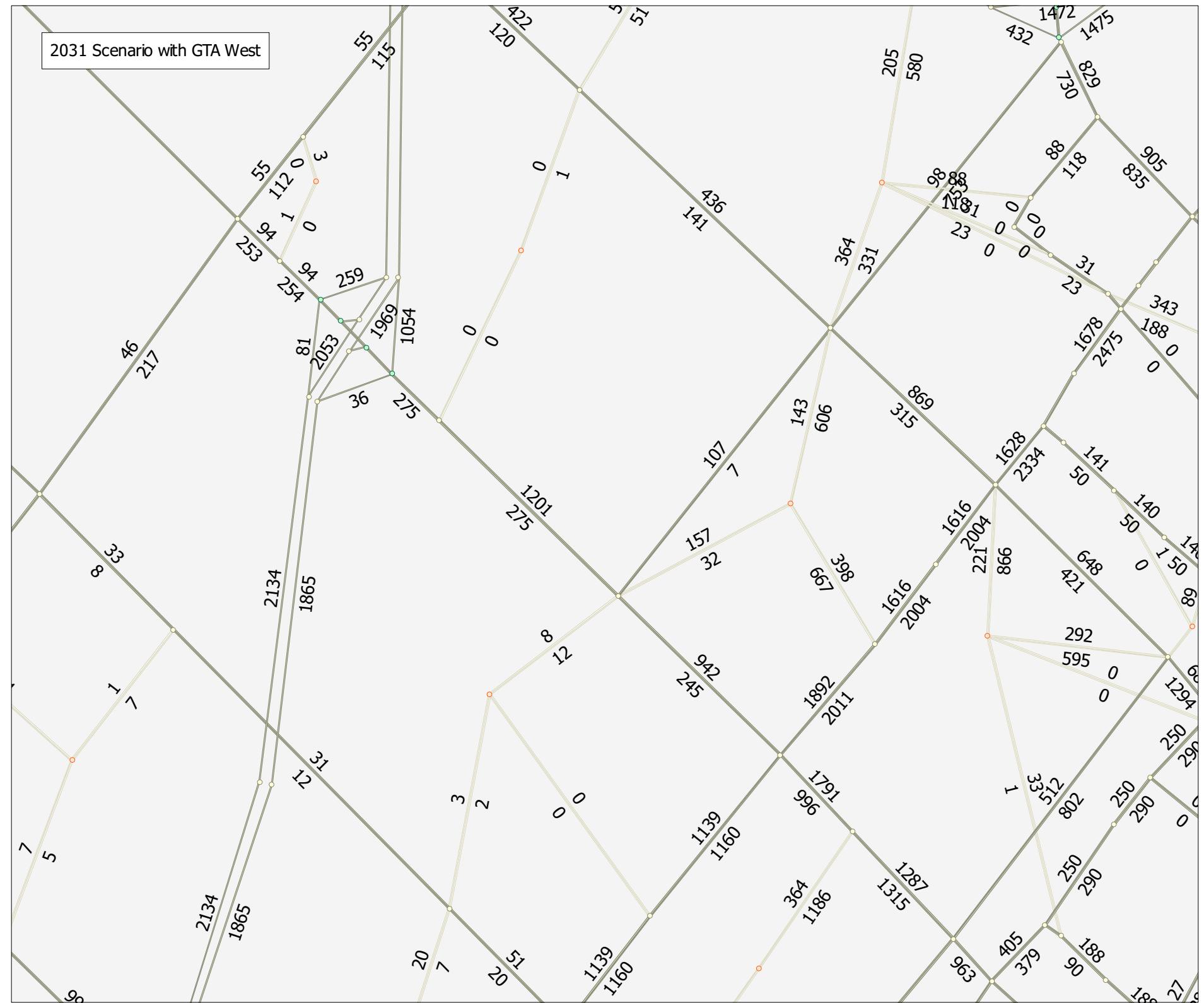
# DRAFT

Appendix C

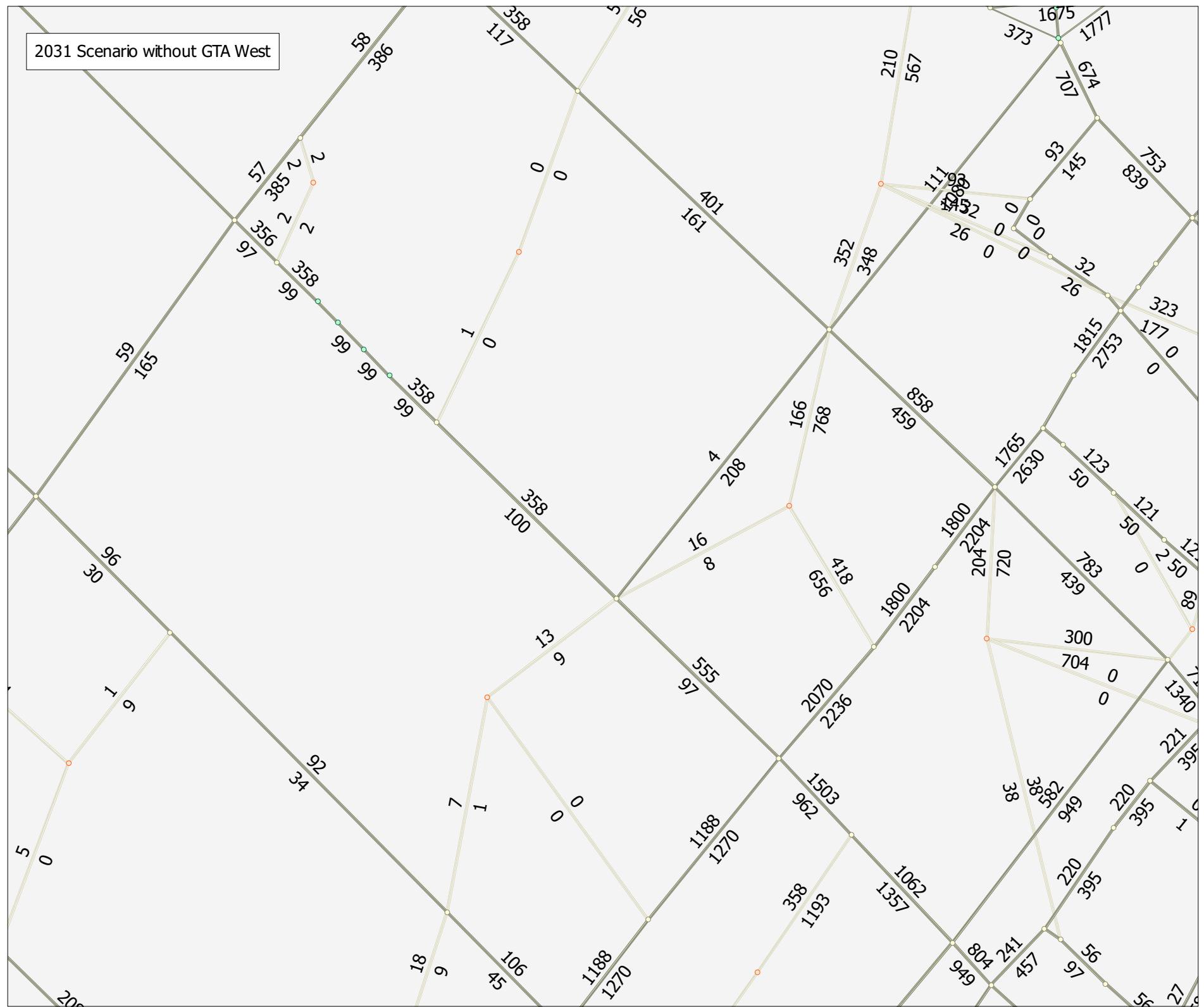
## 2011 Scenario



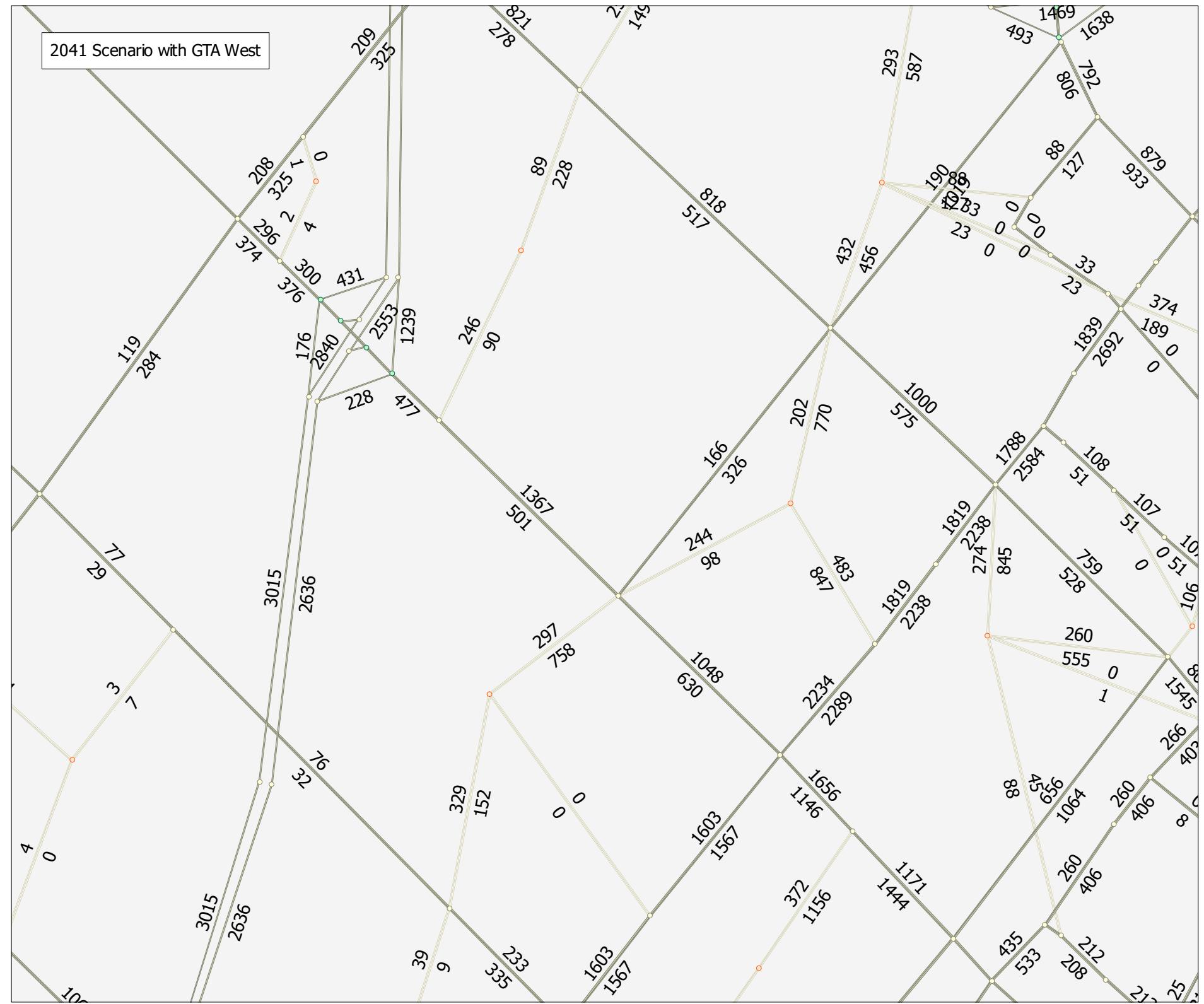
2031 Scenario with GTA West



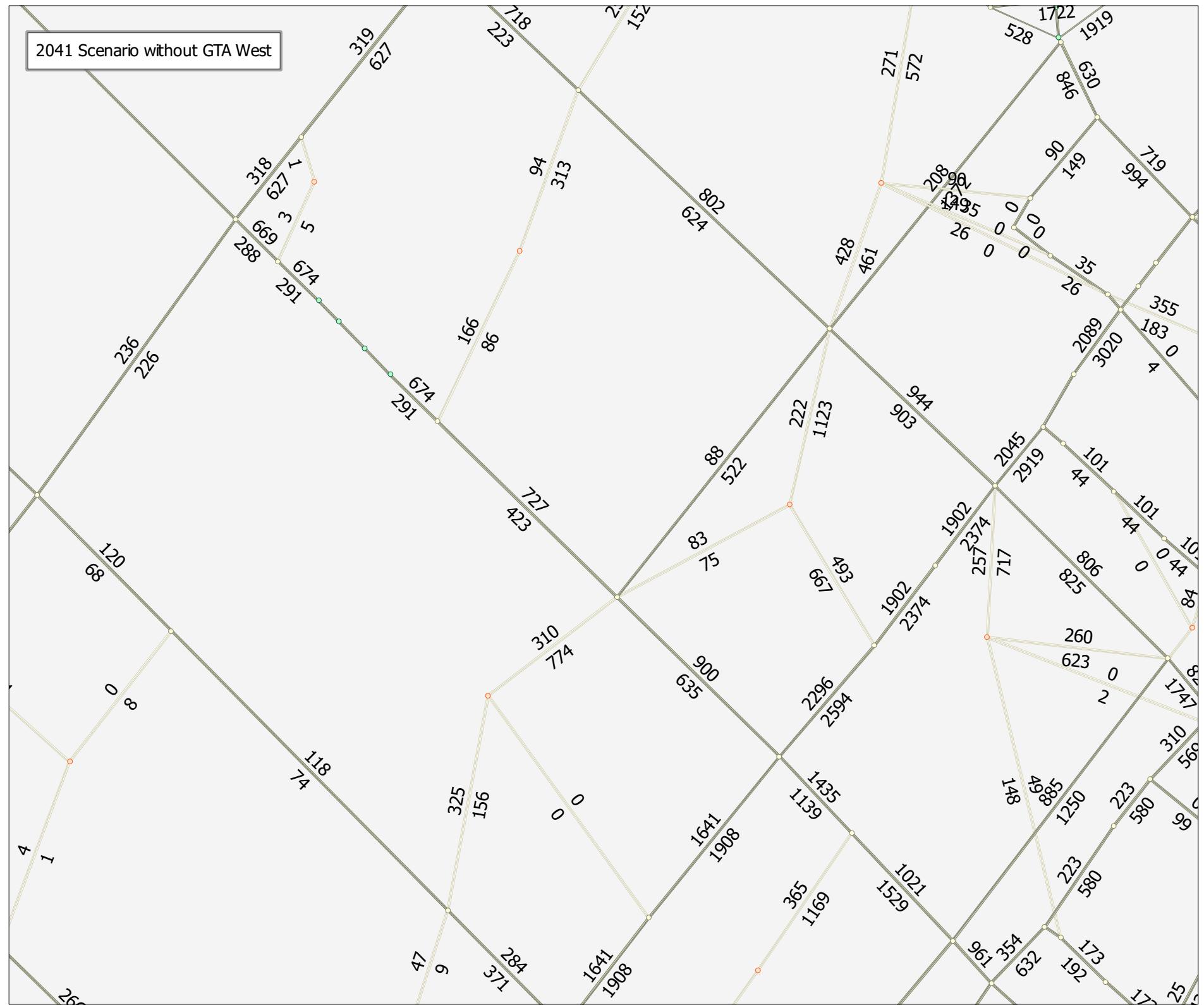
2031 Scenario without GTA West



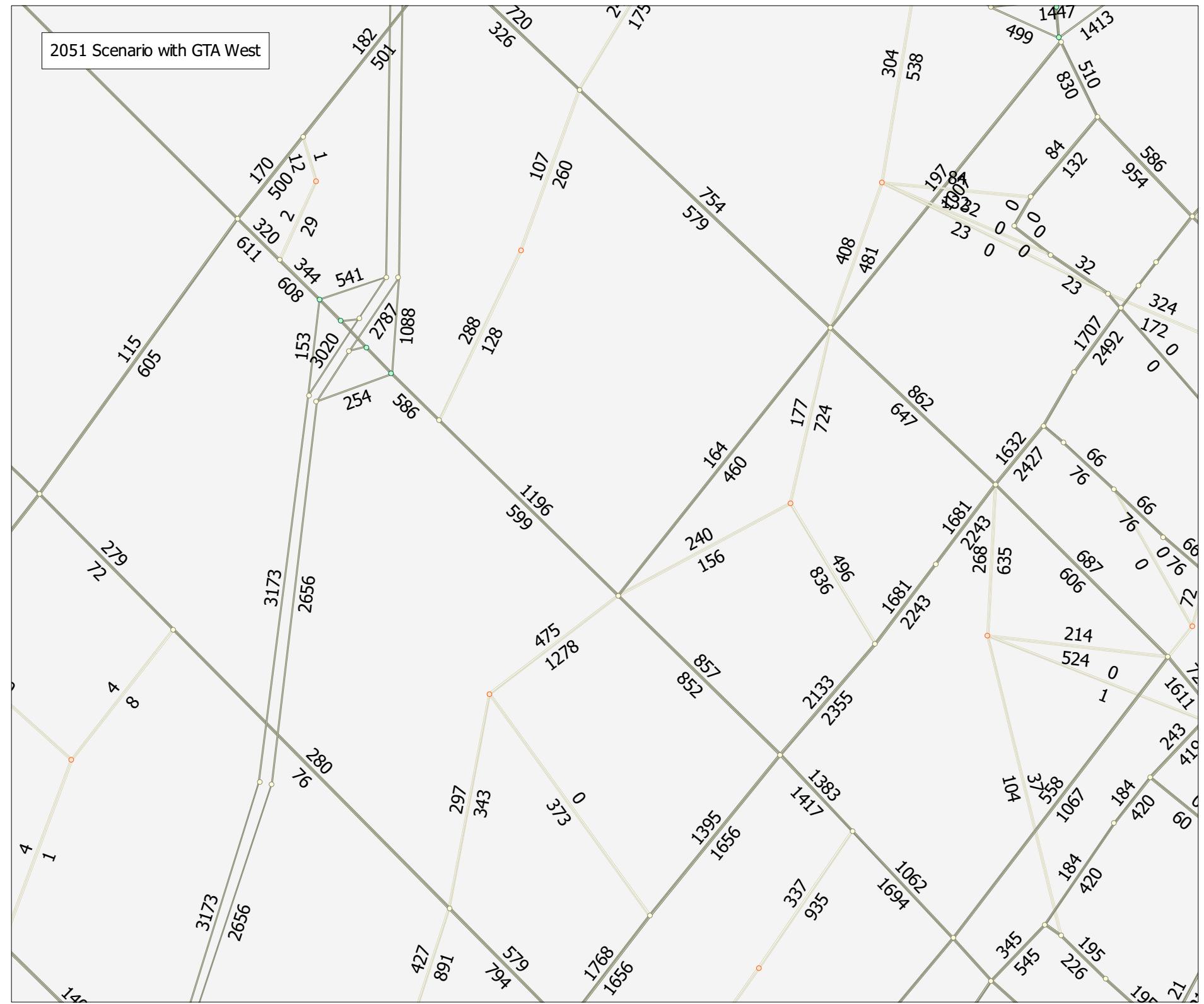
2041 Scenario with GTA West



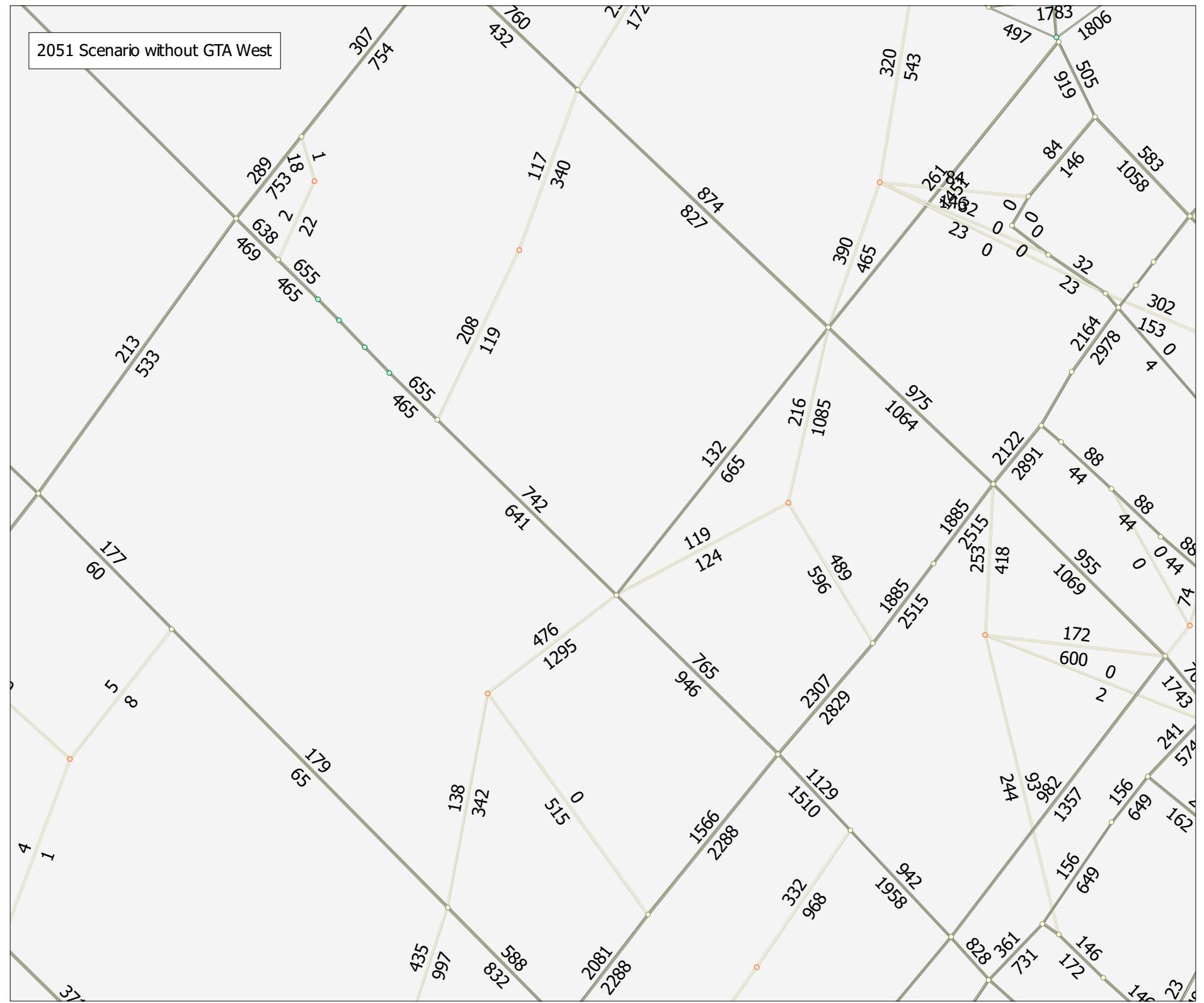
2041 Scenario without GTA West



2051 Scenario with GTA West



## 2051 Scenario without GTA West





[THE DIFFERENCE IS OUR PEOPLE]

---

## Appendix D

### Signal Timing Data

# DRAFT

Traffic Signal Timing Parameters											
Database Date		December 17, 2021				Prepared Date		December 20, 2021			
Database Rev		MaxView				Completed By		TF			
Timing Card / Field rev		-				Checked By		SJ			
Location	Mayfield Road & Chinguacousy Road										
Phase #	Street Name - Direction	Vehicle Minimum (s)	Pedestrian Minimum (s)		Amber (s)	All Red (s)	TIME PERIOD (s)				
			WALK	FDWALK			MAX 1	MAX 2	MAX 3		
1	Not In Use	-	-	-	-	-	-	-	-		
2	Mayfield Road - EB	12.0	12.0	5.0	4.6	2.0	46.6 (min)	61.6 (min)	46.6 (min)		
3	Not In Use	-	-	-	-	-	-	-	-		
4	Chinguacousy Road - NB	12.0	12.0	5.0	4.6	2.0	26.6 (max)	26.6 (max)	31.6 (max)		
5	Not In Use	-	-	-	-	-	-	-	-		
6	Mayfield Road - WB	12.0	12.0	5.0	4.6	2.0	46.6 (min)	61.6 (min)	46.6 (min)		
7	Not In Use	-	-	-	-	-	-	-	-		
8	Chinguacousy Road - SB	12.0	12.0	5.0	4.6	2.0	26.6 (max)	26.6 (max)	31.6 (max)		
System Control											
Yes					TIME (M-F)	PEAK	CYCLE LENGTH (s)	OFFSET (s)			
					7:00 - 9:00 (MAX 2)	AM	0	0			
Semi-Actuated Mode					(MAX 1)	OFF	0	0			
Yes					15:30 - 19:00 (MAX 3)	PM	0	0			



[THE DIFFERENCE IS OUR PEOPLE]

---

## Appendix E

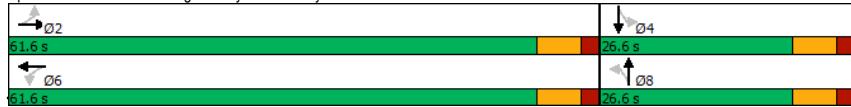
### Existing Conditions Synchro Reports

# DRAFT

Timings  
1: Chinguacousy Road & Mayfield Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	→	↔	←	↔	↑	↓	↔
Traffic Volume (vph)	5	647	158	492	30	72	11	170
Future Volume (vph)	5	647	158	492	30	72	11	170
Lane Group Flow (vph)	0	821	0	744	0	219	0	217
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	2		6		8		4	
Permitted Phases	2	2	6	6	8	8	4	4
Detector Phase								
Switch Phase								
Minimum Initial (s)	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6
Total Split (s)	61.6	61.6	61.6	61.6	26.6	26.6	26.6	26.6
Total Split (%)	69.8%	69.8%	69.8%	69.8%	30.2%	30.2%	30.2%	30.2%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.6		6.6		6.6		6.6
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.73		1.09		0.57		0.56	
Control Delay	16.2		79.8		30.4		36.1	
Queue Delay	0.0		0.0		0.0		0.0	
Total Delay	16.2		79.8		30.4		36.1	
Queue Length 50th (m)	85.6		-143.1		25.7		32.1	
Queue Length 95th (m)	124.5		#202.5		46.7		52.6	
Internal Link Dist (m)	324.8		438.2		224.1		3051.6	
Turn Bay Length (m)								
Base Capacity (vph)	1122		685		382		389	
Starvation Cap Reductn	0		0		0		0	
Spillback Cap Reductn	0		0		0		0	
Storage Cap Reductn	0		0		0		0	
Reduced v/c Ratio	0.73		1.09		0.57		0.56	
Intersection Summary								
Cycle Length: 88.2								
Actuated Cycle Length: 88.2								
Natural Cycle: 90								
Control Type: Semi Act-Uncoord								
~ Volume exceeds capacity, queue is theoretically infinite.								
Queue shown is maximum after two cycles.								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 1: Chinguacousy Road & Mayfield Road



051561\_Chinguacousy EA\_Existing.syn  
R.J. Burnside & Associates Limited

Existing AM

HCM Signalized Intersection Capacity Analysis  
1: Chinguacousy Road & Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔			↔			↔			↔		
Traffic Volume (vph)	5	647	70	158	492	4	30	72	91	11	170	10
Future Volume (vph)	5	647	70	158	492	4	30	72	91	11	170	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6											6.6
Lane Util. Factor	1.00											1.00
Frt	0.99											0.99
Flt Protected	1.00											1.00
Satd. Flow (prot)	1801											1750
Flt Permitted	1.00											0.97
Satd. Flow (perm)	1793											1708
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	6	735	80	180	559	5	34	82	103	12	193	11
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	0	2	0	0
Lane Group Flow (vph)	0	816	0	0	744	0	0	183	0	0	215	0
Heavy Vehicles (%)	20%	5%	6%	10%	9%	25%	30%	3%	2%	44%	4%	50%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	2		6		8		4					
Permitted Phases	2		6		8		4					
Actuated Green, G (s)	55.0		55.0		20.0		20.0					
Effective Green, g (s)	55.0		55.0		20.0		20.0					
Actuated g/C Ratio	0.62		0.62		0.23		0.23					
Clearance Time (s)	6.6		6.6		6.6		6.6					
Vehicle Extension (s)	3.0		3.0		3.0		3.0					
Lane Grp Cap (vph)	1118		685		346		387					
v/s Ratio Prot	0.46		c0.68		0.12		c0.13					
v/s Ratio Perm	0.46		c0.68		0.12		c0.13					
v/c Ratio	0.73		1.09		0.53		0.55					
Uniform Delay, d1	11.5		16.6		30.0		30.2					
Progression Factor	1.00		1.00		1.00		1.00					
Incremental Delay, d2	2.5		59.9		5.7		5.6					
Delay (s)	14.0		76.5		35.6		35.8					
Level of Service	B		E		D		D					
Approach Delay (s)	14.0		76.5		35.6		35.8					
Approach LOS	B		E		D		D					
Intersection Summary												
HCM 2000 Control Delay	42.0		HCM 2000 Level of Service		D							
HCM 2000 Volume to Capacity ratio	0.94											
Actuated Cycle Length (s)	88.2		Sum of lost time (s)		13.2							
Intersection Capacity Utilization	110.2%		ICU Level of Service		H							
Analysis Period (min)	15											
c Critical Lane Group												

051561\_Chinguacousy EA\_Existing.syn  
R.J. Burnside & Associates Limited

Existing AM

Synchro 11 Report  
03/16/2022 - Page 2

HCM Unsignalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

Existing AM												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	
Traffic Volume (vph)	6	149	14	23	66	2	7	55	19	7	154	1
Future Volume (vph)	6	149	14	23	66	2	7	55	19	7	154	1
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
Hourly flow rate (vph)	7	162	15	25	72	2	8	60	21	8	167	1
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	184	99	89	176								
Volume Left (vph)	7	25	8	8								
Volume Right (vph)	15	2	21	1								
Hadj (s)	0.02	0.12	0.13	0.04								
Departure Headway (s)	4.7	4.9	5.0	4.8								
Degree Utilization, x	0.24	0.14	0.12	0.23								
Capacity (veh/h)	715	677	673	707								
Control Delay (s)	9.2	8.7	8.7	9.2								
Approach Delay (s)	9.2	8.7	8.7	9.2								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay					9.0							
Level of Service					A							
Intersection Capacity Utilization				31.0%								
Analysis Period (min)				15								
ICU Level of Service												

DRAFT

## HCM 6th AWSC

## 2: Chinguacousy Road &amp; Old School Road

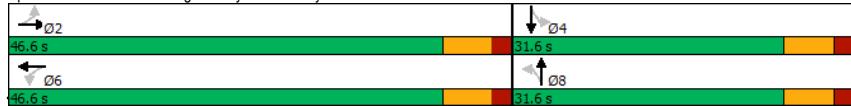
Existing AM

Intersection											
Intersection Delay, s/veh 9.3											
Intersection LOS A											
<b>Movement</b>											
E BL	E BT	E BR	W BL	W BT	W BR	N BL	N BT	N BR	S BL	S BT	S BR
Lane Configurations											
Traffic Vol, veh/h	6	149	14	23	66	2	7	55	19	7	154
Future Vol, veh/h	6	149	14	23	66	2	7	55	19	7	154
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
Heavy Vehicles, %	0	1	33	0	7	0	100	9	0	0	2
Mvmt Flow	7	162	15	25	72	2	8	60	21	8	167
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1
<b>Approach</b>											
Opposing Approach	WB		WB		NB		SB		NB		
Opposing Lanes	1		1		1		1		1		
Conflicting Approach Left	SB		NB		EB		WB				
Conflicting Lanes Left	1		1		1		1		1		
Conflicting Approach Right	NB		SB		WB		EB				
Conflicting Lanes Right	1		1		1		1		1		
HCM Control Delay	9.2		8.7		10.6		9.2				
HCM LOS	A		A		B		A				
<b>Lane</b>											
	NBLn1	E BLn1	W BLn1	S BLn1							
Vol Left, %	9%	4%	25%	4%							
Vol Thru, %	68%	88%	73%	95%							
Vol Right, %	23%	8%	2%	1%							
Sign Control	Stop	Stop	Stop	Stop							
Traffic Vol by Lane	81	169	91	162							
LT Vol	7	6	23	7							
Through Vol	55	149	66	154							
RT Vol	19	14	2	1							
Lane Flow Rate	88	184	99	176							
Geometry Grp	1	1	1	1							
Degree of Util (X)	0.156	0.239	0.134	0.231							
Departure Headway (Hd)	6.375	4.684	4.866	4.721							
Convergence, Y/N	Yes	Yes	Yes	Yes							
Cap	561	764	733	757							
Service Time	4.437	2.73	2.919	2.774							
HCM Lane V/C Ratio	0.157	0.241	0.135	0.232							
HCM Control Delay	10.6	9.2	8.7	9.2							
HCM Lane LOS	B	A	A	A							
HCM 95th-tile Q	0.5	0.9	0.5	0.9							

Timings  
1: Chinguacousy Road & Mayfield Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	→	→	←	←	↑	↓	↑	↓
Traffic Volume (vph)	7	551	187	597	54	145	5	61
Future Volume (vph)	7	551	187	597	54	145	5	61
Lane Group Flow (vph)	0	620	0	835	0	359	0	73
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	2		6	8	8	4	4	
Permitted Phases	2	2	6	6	8	8	4	4
Detector Phase								
Switch Phase								
Minimum Initial (s)	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6
Total Split (s)	46.6	46.6	46.6	46.6	31.6	31.6	31.6	31.6
Total Split (%)	59.6%	59.6%	59.6%	59.6%	40.4%	40.4%	40.4%	40.4%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.67		1.30		0.66		0.13	
Control Delay	18.6		168.6		26.3		18.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.6		168.6		26.3		18.8	
Queue Length 50th (m)	63.7		~162.5		38.8		7.2	
Queue Length 95th (m)	99.1		#229.2		66.9		16.0	
Internal Link Dist (m)	324.8		438.2		224.1		3051.6	
Turn Bay Length (m)								
Base Capacity (vph)	922		642		547		578	
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67		1.30		0.66		0.13	
Intersection Summary								
Cycle Length: 78.2								
Actuated Cycle Length: 78.2								
Natural Cycle: 90								
Control Type: Semi Act-Uncoord								
~ Volume exceeds capacity, queue is theoretically infinite.								
Queue shown is maximum after two cycles.								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 1: Chinguacousy Road & Mayfield Road



051561\_Chinguacousy EA\_Existing.syn  
R.J. Burnside & Associates Limited

Existing PM

HCM Signalized Intersection Capacity Analysis  
1: Chinguacousy Road & Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	→			→			→			→		
Traffic Volume (vph)	7	551	37	187	597	17	54	145	146	5	61	4
Future Volume (vph)	7	551	37	187	597	17	54	145	146	5	61	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6											6.6
Lane Util. Factor	1.00											1.00
Frt	0.99											0.99
Flt Protected	1.00											1.00
Satd. Flow (prot)	1814											1848
Flt Permitted	0.99											0.97
Satd. Flow (perm)	1798											1801
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	7	574	39	195	622	18	56	151	152	5	64	4
RTOR Reduction (vph)	0	3	0	0	1	0	0	34	0	0	3	0
Lane Group Flow (vph)	0	617	0	0	834	0	0	325	0	0	70	0
Heavy Vehicles (%)	0%	5%	5%	1%	4%	0%	7%	4%	7%	17%	1%	14%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	2		6		8		4					
Permitted Phases	2		6		8		4					
Actuated Green, G (s)	40.0		40.0		25.0		25.0					
Effective Green, g (s)	40.0		40.0		25.0		25.0					
Actuated g/C Ratio	0.51		0.51		0.32		0.32					
Clearance Time (s)	6.6		6.6		6.6		6.6					
Vehicle Extension (s)	3.0		3.0		3.0		3.0					
Lane Grp Cap (vph)	919		641		513		575					
v/s Ratio Prot												
v/s Ratio Perm	0.34		c0.66		c0.20		0.04					
v/c Ratio	0.67		1.30		0.63		0.12					
Uniform Delay, d1	14.2		19.1		22.7		18.8					
Progression Factor	1.00		1.00		1.00		1.00					
Incremental Delay, d2	1.9		146.7		5.9		0.4					
Delay (s)	16.2		165.8		28.5		19.3					
Level of Service	B		F		C		B					
Approach Delay (s)	16.2		165.8		28.5		19.3					
Approach LOS	B		F		C		B					
Intersection Summary												
HCM 2000 Control Delay	84.9		HCM 2000 Level of Service		F							
HCM 2000 Volume to Capacity ratio	1.04											
Actuated Cycle Length (s)	78.2		Sum of lost time (s)		13.2							
Intersection Capacity Utilization	117.1%		ICU Level of Service		H							
Analysis Period (min)	15											
c Critical Lane Group												

051561\_Chinguacousy EA\_Existing.syn  
R.J. Burnside & Associates Limited

Existing PM

Synchro 11 Report  
03/16/2022 - Page 2

HCM Unsignalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

Existing PM												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	
Traffic Volume (vph)	5	71	3	25	196	10	8	127	34	2	42	2
Future Volume (vph)	5	71	3	25	196	10	8	127	34	2	42	2
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
Hourly flow rate (vph)	5	77	3	27	213	11	9	138	37	2	46	2
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	85	251	184	50								
Volume Left (vph)	5	27	9	2								
Volume Right (vph)	3	11	37	2								
Hadj (s)	-0.01	0.04	-0.09	0.11								
Departure Headway (s)	4.8	4.6	4.7	5.1								
Degree Utilization, x	0.11	0.32	0.24	0.07								
Capacity (veh/h)	694	736	718	645								
Control Delay (s)	8.4	9.8	9.2	8.5								
Approach Delay (s)	8.4	9.8	9.2	8.5								
Approach LOS	A	A	A	A								
<b>Intersection Summary</b>												
Delay					9.3							
Level of Service					A							
Intersection Capacity Utilization				37.1%								
Analysis Period (min)				15								

## HCM 6th AWSC

## 2: Chinguacousy Road &amp; Old School Road

Existing PM

Intersection												
Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	71	3	25	196	10	8	127	34	2	42	2
Future Vol, veh/h	5	71	3	25	196	10	8	127	34	2	42	2
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
Heavy Vehicles, %	0	0	0	18	1	0	0	2	0	0	8	0
Mvmt Flow	5	77	3	27	213	11	9	138	37	2	46	2
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB		WB		NB		SB					
Opposing Approach	WB		EB		SB		NB					
Opposing Lanes	1		1		1		1					
Conflicting Approach Left	SB		NB		EB		WB					
Conflicting Lanes Left	1		1		1		1					
Conflicting Approach Right	NB		SB		WB		EB					
Conflicting Lanes Right	1		1		1		1					
HCM Control Delay	8.4		10.4		9.2		8.4					
HCM LOS	A		B		A		A					
Lane	NBLn1	EBLn1	WBLn1	SBLn1								
Vol Left, %	5%	6%	11%	4%								
Vol Thru, %	75%	90%	85%	91%								
Vol Right, %	20%	4%	4%	4%								
Sign Control	Stop	Stop	Stop	Stop								
Traffic Vol by Lane	169	79	231	46								
LT Vol	8	5	25	2								
Through Vol	127	71	196	42								
RT Vol	34	3	10	2								
Lane Flow Rate	184	86	251	50								
Geometry Grp	1	1	1	1								
Degree of Util (X)	0.239	0.114	0.339	0.069								
Departure Headway (Hd)	4.68	4.763	4.864	4.944								
Convergence, Y/N	Yes	Yes	Yes	Yes								
Cap	764	749	738	721								
Service Time	2.723	2.815	2.908	2.999								
HCM Lane V/C Ratio	0.241	0.115	0.34	0.069								
HCM Control Delay	9.2	8.4	10.4	8.4								
HCM Lane LOS	A	A	B	A								
HCM 95th-tile Q	0.9	0.4	1.5	0.2								



BURN<sup>■</sup>SIDE

[THE DIFFERENCE IS OUR PEOPLE]

---

## Appendix F

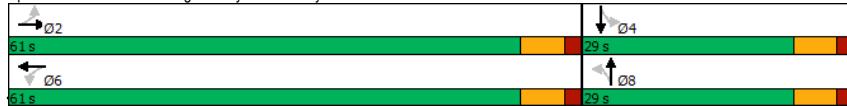
### 2031 Traffic Operations Synchro Reports

DRAFT

Timings  
1: Chinguacousy Road & Mayfield Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑↓	↑	↑	↑↓	↑	↑↓
Traffic Volume (vph)	8	1077	337	1049	64	154	23	363
Future Volume (vph)	8	1077	337	1049	64	154	23	363
Lane Group Flow (vph)	9	1357	383	1202	73	395	26	437
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	2		6		8		4	
Permitted Phases	2	2	6	6	8	8	4	4
Detector Phase								
Switch Phase								
Minimum Initial (s)	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6
Total Split (s)	61.0	61.0	61.0	61.0	29.0	29.0	29.0	29.0
Total Split (%)	67.8%	67.8%	67.8%	67.8%	32.2%	32.2%	32.2%	32.2%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.05	0.65	1.36	0.41	0.47	0.83	0.33	0.51
Control Delay	8.1	13.3	204.4	9.9	40.3	42.9	41.3	31.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.1	13.3	204.4	9.9	40.3	42.9	41.3	31.2
Queue Length 50th (m)	0.6	72.5	~45.2	36.6	10.7	54.3	3.7	33.7
Queue Length 95th (m)	2.5	89.5	#45.6	44.0	24.1	#96.6	11.7	46.9
Internal Link Dist (m)	324.8	438.2		224.1		938.0		
Turn Bay Length (m)	100.0	100.0		100.0		100.0		
Base Capacity (vph)	195	2076	282	2902	156	477	78	850
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.65	1.36	0.41	0.47	0.83	0.33	0.51
Intersection Summary								
Cycle Length: 90								
Actuated Cycle Length: 90								
Natural Cycle: 90								
Control Type: Semi Act-Uncoord								
~ Volume exceeds capacity, queue is theoretically infinite.								
Queue shown is maximum after two cycles.								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 1: Chinguacousy Road & Mayfield Road



051561\_Chinguacousy EA\_2031 No GTAW.syn  
R.J. Burnside & Associates Limited

FUT 2031 AM (No GTA W)

HCM Signalized Intersection Capacity Analysis

FUT 2031 AM (No GTA W)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑↓	↑	↑↓	↑	↑	↑↓	↑	↑↓	↑	↑↓
Traffic Volume (vph)	8	1077	117	337	1049	9	64	154	194	23	363	21
Future Volume (vph)	8	1077	117	337	1049	9	64	154	194	23	363	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.95	0.97	0.91	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Fr <sub>t</sub>	1.00	0.99	1.00	1.00	1.00	1.00	0.92	1.00	0.99	1.00	0.99	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1521	3422		3219	4800		1404	1719		1267	3398	
Flt Permitted	0.20	1.00	0.14	1.00	0.42	1.00	0.24	1.00	0.24	1.00	0.24	1.00
Satd. Flow (perm)	323	3422		469	4800		628	1719		315	3398	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	9	1224	133	383	1192	10	73	175	220	26	412	24
RTOR Reduction (vph)	0	9	0	0	1	0	0	50	0	0	5	0
Lane Group Flow (vph)	9	1348	0	383	1201	0	73	345	0	26	432	0
Heavy Vehicles (%)	20%	5%	6%	10%	9%	25%	30%	3%	2%	44%	4%	50%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	2		6		8		4					
Permitted Phases	2		6		8		4					
Actuated Green, G (s)	54.4	54.4	54.4	54.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4
Effective Green, g (s)	54.4	54.4	54.4	54.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4
Actuated g/C Ratio	0.60	0.60	0.60	0.60	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	195	2068	283	2901	156	427	78	845				
v/s Ratio Prot	0.39		0.25		c0.20		0.13					
v/s Ratio Perm	0.03		c0.82		0.12		0.08					
v/c Ratio	0.05	0.65	1.35	0.41	0.47	0.81	0.33	0.51				
Uniform Delay, d1	7.2	11.6	17.8	9.4	28.7	31.8	27.7	29.1				
Progression 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
Incremental Delay, d2	0.1	0.7	180.5	0.1	9.8	15.0	11.1	2.2				
Delay (s)	7.3	12.4	198.3	9.5	38.5	46.8	38.8	31.3				
Level of Service	A	B	F	A	D	D	D	C				
Approach Delay (s)	12.3			55.1		45.5		31.7				
Approach LOS	B		E		D		C					
Intersection Summary												
HCM 2000 Control Delay	36.1											
HCM 2000 Volume to Capacity ratio	1.19											
Actuated Cycle Length (s)	90.0											
Intersection Capacity Utilization	95.5%											
Analysis Period (min)	15											
c Critical Lane Group												

Synchro 11 Report  
08/11/2022 - Page 1

051561\_Chinguacousy EA\_2031 No GTAW.syn  
R.J. Burnside & Associates Limited

Synchro 11 Report  
08/11/2022 - Page 2

HCM Unsignalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

FUT 2031 AM (No GTA W)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control												
Traffic Volume (vph)	18	457	43	71	202	6	15	117	41	15	328	2
Future Volume (vph)	18	457	43	71	202	6	15	117	41	15	328	2
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
Hourly flow rate (vph)	20	497	47	77	220	7	16	127	45	16	357	2
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	564	304	188	375								
Volume Left (vph)	20	77	16	16								
Volume Right (vph)	47	7	45	2								
Hadj (s)	0.02	0.12	0.12	0.04								
Departure Headway (s)	7.1	7.7	8.3	7.5								
Degree Utilization, x	1.12	0.65	0.43	0.78								
Capacity (veh/h)	488	444	394	467								
Control Delay (s)	102.1	23.9	17.5	32.4								
Approach Delay (s)	102.1	23.9	17.5	32.4								
Approach LOS	F	C	C	D								
Intersection Summary												
Delay		56.1										
Level of Service		F										
Intersection Capacity Utilization		72.6%		ICU Level of Service								
Analysis Period (min)		15										

HCM Unsignalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

FUT 2031 AM (No GTA W)

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (Veh/h)	90	113	281	84	105	382
Future Volume (Veh/h)	90	113	281	84	105	382
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	98	123	305	91	114	415
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	948	305		396		
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	948	305		396		
tC, single (s)	6.4	6.2		4.1		
tC, 2 stage (s)						
fF (s)	3.5	3.3		2.2		
p0 queue free %	62	83		90		
cM capacity (veh/h)	261	735		1163		
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	98	123	305	91	114	415
Volume Left	98	0	0	0	114	0
Volume Right	0	123	0	91	0	0
cSH	261	735	1700	1700	1163	1700
Volume to Capacity	0.38	0.17	0.18	0.05	0.10	0.24
Queue Length 95th (m)	12.7	4.5	0.0	0.0	2.5	0.0
Control Delay (s)	26.8	10.9	0.0	0.0	8.4	0.0
Lane LOS	D	B		A		
Approach Delay (s)	18.0		0.0		1.8	
Approach LOS	C					
Intersection Summary						
Average Delay		4.3				
Intersection Capacity Utilization		35.6%		ICU Level of Service		A
Analysis Period (min)		15				

## HCM 6th AWSC

2: Chinguacousy Road &amp; Old School Road

FUT 2031 AM (No GTA W)

Intersection

Intersection Delay, s/veh 60.5  
 Intersection LOS F

Movement

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	457	43	71	202	6	15	117	41	15	328	2
Future Vol, veh/h	18	457	43	71	202	6	15	117	41	15	328	2
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
Heavy Vehicles, %	0	1	33	0	7	0	100	9	0	0	2	0
Mvmt Flow	20	497	47	77	220	7	16	127	45	16	357	2
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	107.9	25.8	23.8	35.8
HCM LOS	F	D	C	E

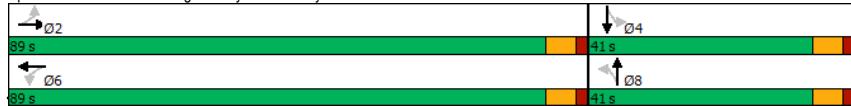
Lane

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	9%	3%	25%	4%
Vol Thru, %	68%	88%	72%	95%
Vol Right, %	24%	8%	2%	1%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	173	518	279	345
LT Vol	15	18	71	15
Through Vol	117	457	202	328
RT Vol	41	43	6	2
Lane Flow Rate	188	563	303	375
Geometry Grp	1	1	1	1
Degree of Util (X)	0.511	1.132	0.659	0.795
Departure Headway (Hd)	10.387	7.235	8.247	8.091
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	350	501	440	450
Service Time	8.387	5.316	6.247	6.091
HCM Lane V/C Ratio	0.537	1.124	0.689	0.833
HCM Control Delay	23.8	107.9	25.8	35.8
HCM Lane LOS	C	F	D	E
HCM 95th-tile Q	2.8	19.1	4.6	7.2

Timings  
1: Chinguacousy Road & Mayfield Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑↓	↑	↑	↑↓	↑	↓
Traffic Volume (vph)	12	917	399	1273	115	309	11	130
Future Volume (vph)	12	917	399	1273	115	309	11	130
Lane Group Flow (vph)	13	1020	416	1364	120	646	11	144
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	2		6		8		8	4
Permitted Phases	2	2	6	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6
Total Split (s)	89.0	89.0	89.0	89.0	41.0	41.0	41.0	41.0
Total Split (%)	68.5%	68.5%	68.5%	68.5%	31.5%	31.5%	31.5%	31.5%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.08	0.51	0.87	0.47	0.33	1.21	0.20	0.13
Control Delay	10.6	14.6	40.0	13.8	39.2	144.8	47.6	32.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.6	14.6	40.0	13.8	39.2	144.8	47.6	32.6
Queue Length 50th (m)	1.2	66.3	38.0	59.9	23.6	~196.7	2.1	13.4
Queue Length 95th (m)	4.1	80.7	#74.9	69.5	43.9	#283.5	8.4	23.1
Internal Link Dist (m)	324.8		438.2		224.1		938.0	
Turn Bay Length (m)	100.0		100.0		100.0		100.0	
Base Capacity (vph)	214	2496	596	3644	359	535	56	1077
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.41	0.70	0.37	0.33	1.21	0.20	0.13
Intersection Summary								
Cycle Length: 130								
Actuated Cycle Length: 116.2								
Natural Cycle: 90								
Control Type: Semi Act-Uncoord								
~ Volume exceeds capacity, queue is theoretically infinite.								
Queue shown is maximum after two cycles.								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 1: Chinguacousy Road & Mayfield Road



FUT 2031 PM (No GTA W)

HCM Signalized Intersection Capacity Analysis

FUT 2031 PM (No GTA W)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBL	SBR
Lane Configurations	↑	↑↓	↑	↑↓	↑	↑↓	↑	↑	↑	↑↓	↑	↑↓
Traffic Volume (vph)	12	917	62	399	1273	36	115	309	311	11	130	9
Future Volume (vph)	12	917	62	399	1273	36	115	309	311	11	130	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.95	0.97	0.91	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95
FrT	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.92	1.00	1.00	0.99	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	3443	3506	5027	1706	1684	1560	3552				
Flt Permitted	0.15	1.00	0.22	1.00	0.66	1.00	0.11	1.00				
Satd. Flow (perm)	296	3443	823	5027	1186	1684	187	3552				
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	12	955	65	416	1326	38	120	322	324	11	135	9
RTOR Reduction (vph)	0	4	0	0	3	0	0	26	0	0	3	0
Lane Group Flow (vph)	13	1016	0	416	1361	0	120	620	0	11	141	0
Heavy Vehicles (%)	0%	5%	5%	1%	4%	0%	7%	4%	7%	17%	1%	14%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	2		6		8		4					
Permitted Phases												
Actuated Green, G (s)	67.5	67.5	67.5	67.5	35.1	35.1	35.1	35.1	35.1	35.1	35.1	35.1
Effective Green, g (s)	67.5	67.5	67.5	67.5	35.1	35.1	35.1	35.1	35.1	35.1	35.1	35.1
Actuated g/C Ratio	0.58	0.58	0.58	0.58	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	172	2006	479	2930	359	510	56	1076				
v/s Ratio Prot	0.30		0.27		c0.37		0.04					
v/s Ratio Perm	0.04		c0.51		0.10		0.06					
v/c Ratio	0.08	0.51	0.87	0.46	0.33	1.21	0.20	0.13				
Uniform Delay, d1	10.5	14.3	20.4	13.8	31.3	40.3	29.9	29.3				
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Incremental Delay, d2	0.2	0.2	15.3	0.1	2.5	113.6	7.7	0.3				
Delay (s)	10.7	14.5	35.7	13.9	33.8	154.0	37.6	29.5				
Level of Service	B	B	D	B	C	F	D	C				
Approach Delay (s)	14.4		19.0		135.1		30.1					
Approach LOS	B		B		F		C					

Intersection Summary

HCM 2000 Control Delay 42.0 HCM 2000 Level of Service D

HCM 2000 Volume to Capacity ratio 0.99

Actuated Cycle Length (s) 115.8 Sum of lost time (s) 13.2

Intersection Capacity Utilization 106.0% ICU Level of Service G

Analysis Period (min) 15

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

FUT 2031 PM (No GTA W)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	15	218	9	77	601	31	17	271	73	4	90	4
Future Volume (vph)	15	218	9	77	601	31	17	271	73	4	90	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
Hourly flow rate (vph)	16	237	10	84	653	34	18	295	79	4	98	4
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	263	771	392	106								
Volume Left (vph)	16	84	18	4								
Volume Right (vph)	10	34	79	4								
Hadj (s)	-0.01	0.04	-0.09	0.11								
Departure Headway (s)	6.9	6.4	6.7	7.9								
Degree Utilization, x	0.51	1.37	0.73	0.23								
Capacity (veh/h)	491	557	520	403								
Control Delay (s)	16.9	197.2	26.0	13.2								
Approach Delay (s)	16.9	197.2	26.0	13.2								
Approach LOS	C	F	D	B								
Intersection Summary												
Delay		109.7										
Level of Service		F										
Intersection Capacity Utilization		85.9%		ICU Level of Service			E					
Analysis Period (min)		15										

HCM Unsignalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

FUT 2031 PM (No GTA W)

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (Veh/h)	38	193	372	152	108	311
Future Volume (Veh/h)	38	193	372	152	108	311
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	41	210	404	165	117	338
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	976	404		569		
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	976	404		569		
tC, single (s)	6.4	6.2		4.1		
tC, 2 stage (s)						
fF (s)	3.5	3.3		2.2		
p0 queue free %	83	68		88		
cM capacity (veh/h)	246	647		1003		
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	41	210	404	165	117	338
Volume Left	41	0	0	0	117	0
Volume Right	0	210	0	165	0	0
cSH	246	647	1700	1700	1003	1700
Volume to Capacity	0.17	0.32	0.24	0.10	0.12	0.20
Queue Length 95th (m)	4.5	10.7	0.0	0.0	3.0	0.0
Control Delay (s)	22.5	13.2	0.0	0.0	9.1	0.0
Lane LOS	C	B		A		
Approach Delay (s)	14.7		0.0		2.3	
Approach LOS	B					
Intersection Summary						
Average Delay		3.7				
Intersection Capacity Utilization		38.9%		ICU Level of Service		A
Analysis Period (min)		15				

## HCM 6th AWSC

2: Chinguacousy Road &amp; Old School Road

FUT 2031 PM (No GTA W)

Intersection

Intersection Delay, s/veh 118.7

Intersection LOS F

Movement

	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	218	9	77	601	31	17	271	73	4	90	4
Future Vol, veh/h	15	218	9	77	601	31	17	271	73	4	90	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
Heavy Vehicles, %	0	0	0	18	1	0	0	2	0	0	8	0
Mvmt Flow	16	237	10	84	653	34	18	295	79	4	98	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach

	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	18.1	213.5	28.1	14.4
HCM LOS	C	F	D	B

Lane

	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	6%	11%	4%
Vol Thru, %	75%	90%	85%	92%
Vol Right, %	20%	4%	4%	4%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	361	242	709	98
LT Vol	17	15	77	4
Through Vol	271	218	601	90
RT Vol	73	9	31	4
Lane Flow Rate	392	263	771	107
Geometry Grp	1	1	1	1
Degree of Util (X)	0.726	0.502	1.407	0.227
Departure Headway (Hd)	7.57	7.623	6.572	8.837
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	483	476	555	409
Service Time	5.57	5.623	4.669	6.837
HCM Lane V/C Ratio	0.812	0.553	1.389	0.262
HCM Control Delay	28.1	18.1	213.5	14.4
HCM Lane LOS	D	C	F	B
HCM 95th-tile Q	5.8	2.8	35.5	0.9



[THE DIFFERENCE IS OUR PEOPLE]

---

## Appendix G

### 2041 Traffic Operations Synchro Reports

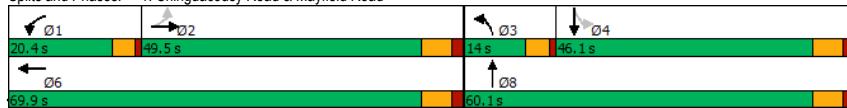
# DRAFT

Timings  
1: Chinguacousy Road & Mayfield Road

FUT 2041 AM (GTA W))

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	↑↑↑	↑	↑↑↑	↑	↑↑↑	↑	↑↑↑
Traffic Volume (vph)	9	1277	329	1025	156	376	58	887
Future Volume (vph)	9	1277	329	1025	156	376	58	887
Lane Group Flow (vph)	10	1608	374	1175	177	966	66	1067
Turn Type	Perm	NA	Prot	NA	Prot	NA	Perm	NA
Protected Phases	2	1	6	3	8	4	4	
Permitted Phases	2	2	1	6	3	8	4	4
Switch Phase								
Minimum Initial (s)	12.0	12.0	5.0	12.0	5.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	9.5	23.6	9.5	23.6	23.6	23.6
Total Split (s)	49.5	49.5	20.4	69.9	14.0	60.1	46.1	46.1
Total Split (%)	38.1%	38.1%	15.7%	53.8%	10.8%	46.2%	35.5%	35.5%
Yellow Time (s)	4.6	4.6	3.5	4.6	3.5	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6
Lead/Lag	Lag	Lag	Lead	Lead	Lag	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	None	Max	Max	Max
v/c Ratio	0.08	0.99	0.95	0.50	0.89	0.46	0.57	1.03
Control Delay	32.4	61.9	91.3	23.6	99.9	19.3	60.4	80.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.4	61.9	91.3	23.6	99.9	19.3	60.4	80.0
Queue Length 50th (m)	1.8	148.3	49.7	72.9	23.6	44.2	14.3	-153.3
Queue Length 95th (m)	6.2	#175.4	#76.5	83.2	#43.1	54.2	#33.2	#187.7
Internal Link Dist (m)	324.8	438.2		224.1		938.0		
Turn Bay Length (m)	100.0	100.0		100.0		100.0		
Base Capacity (vph)	121	1632	393	2338	199	2104	115	1036
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.99	0.95	0.50	0.89	0.46	0.57	1.03
<b>Intersection Summary</b>								
Cycle Length: 130								
Actuated Cycle Length: 130								
Natural Cycle: 130								
Control Type: Semi Act-Uncoord								
~ Volume exceeds capacity, queue is theoretically infinite.								
Queue shown is maximum after two cycles.								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 1: Chinguacousy Road & Mayfield Road



051561\_Chinguacousy EA\_2041 GTAW.syn  
R.J. Burnside & Associates Limited

Synchro 11 Report  
03/28/2022 - Page 1

HCM Signalized Intersection Capacity Analysis  
1: Chinguacousy Road & Mayfield Road

FUT 2041 AM (GTA W))

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑↑↑	↑	↑↑↑	↑	↑↑↑				
Traffic Volume (vph)	9	1277	138	329	1025	9	156	376	474	58	887	52
Future Volume (vph)	9	1277	138	329	1025	9	156	376	474	58	887	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		4.5	6.6		4.5	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.91		0.97	0.91		0.97	0.91		1.00	0.95	
Fr <sub>t</sub>	1.00	0.99		1.00	1.00		1.00	0.92		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1521	4917		3219	4799		2724	4691		1267	3398	
Flt Permitted	0.23	1.00		0.95	1.00		0.95	1.00		0.28	1.00	
Satd. Flow (perm)	366	4917		3219	4799		2724	4691		379	3398	
Peak-hour factor, PHF	0.88	0.88		0.88	0.88		0.88	0.88		0.88	0.88	
Adj. Flow (vph)	10	1451	157	374	1165	10	177	427	539	66	1008	59
RTOR Reduction (vph)	0	10	0	0	1	0	0	0	175	0	0	3
Lane Group Flow (vph)	10	1598	0	374	1174	0	177	791	0	66	1064	0
Heavy Vehicles (%)	20%	5%	6%	10%	9%	25%	30%	3%	2%	44%	4%	50%
Turn Type	Perm	NA	Prot	NA	Prot	NA	Prot	NA	Perm	NA		
Protected Phases	2		1	6		3	8				4	
Permitted Phases		2										
Actuated Green, G (s)	42.9	42.9		15.9	63.3		9.5	53.5		39.5	39.5	
Effective Green, g (s)	42.9	42.9		15.9	63.3		9.5	53.5		39.5	39.5	
Actuated g/C Ratio	0.33	0.33		0.12	0.49		0.07	0.41		0.30	0.30	
Clearance Time (s)	6.6	6.6		4.5	6.6		4.5	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	120	1622		393	2336		199	1930		115	1032	
v/s Ratio Prot	c0.32		c0.12	0.24		c0.06	0.17			c0.31		
v/s Ratio Perm	0.03									0.17		
v/c Ratio	0.08	0.99		0.95	0.50		0.89	0.41		0.57	1.03	
Uniform Delay, d <sub>1</sub>	30.0	43.2		56.7	22.7		59.7	27.1		38.2	45.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d <sub>2</sub>	0.3	18.7		33.0	0.2		34.7	0.6		19.2	36.1	
Delay (s)	30.3	62.0		89.6	22.8		94.4	27.7		57.3	81.4	
Level of Service	C	E	F	C	F	C	F	C	E	F		
Approach Delay (s)	61.8			39.0			38.0			80.0		
Approach LOS	E		D			D			D		E	
<b>Intersection Summary</b>												
HCM 2000 Control Delay	54.1											D
HCM 2000 Volume to Capacity ratio	0.99											
Actuated Cycle Length (s)	130.0											22.2
Intersection Capacity Utilization	86.3%											E
Analysis Period (min)	15											
c Critical Lane Group												

051561\_Chinguacousy EA\_2041 GTAW.syn  
R.J. Burnside & Associates Limited

Synchro 11 Report  
03/28/2022 - Page 2

Timings  
2: Chinguacousy Road & Old School Road

FUT 2041 AM (GTA W))

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	↓	↑	↓	↑	↓	↑	↓
Traffic Volume (vph)	20	505	78	223	36	288	36	804
Future Volume (vph)	20	505	78	223	36	288	36	804
Lane Group Flow (vph)	22	600	85	250	39	421	39	879
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6	
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.05	0.85	0.49	0.36	0.41	0.30	0.10	0.60
Control Delay	8.8	26.9	21.7	11.2	27.9	7.3	9.3	12.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.8	26.9	21.7	11.2	27.9	7.3	9.3	12.4
Queue Length 50th (m)	1.0	38.6	4.7	12.7	2.1	8.1	1.8	27.1
Queue Length 95th (m)	3.9	#86.1	#18.5	25.2	#12.3	15.1	6.0	41.3
Internal Link Dist (m)	414.1	424.5		2089.6		405.3		
Turn Bay Length (m)	100.0	100.0		100.0		100.0		
Base Capacity (vph)	478	760	190	740	96	1420	400	1474
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.79	0.45	0.34	0.41	0.30	0.10	0.60
Intersection Summary								
Cycle Length: 45								
Actuated Cycle Length: 43.8								
Natural Cycle: 45								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 2: Chinguacousy Road & Old School Road



HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

FUT 2041 AM (GTA W))

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↓	↑	↓	↑	↓	↑	↓	↑	↓	↑	↓
Traffic Volume (vph)	20	505	47	78	223	7	36	288	99	36	804	5
Future Volume (vph)	20	505	47	78	223	7	36	288	99	36	804	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00
Fr <sub>t</sub>	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1829	1825	1791	913	3290	1825	3576				
Flt Permitted	0.60	1.00	0.24	1.00	0.24	1.00	0.51	1.00				
Satd. Flow (perm)	1160	1829	460	1791	235	3290	972	3576				
Peak-hour factor, PHF	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)	22	549	51	85	242	8	39	313	108	39	874	5
RTOR Reduction (vph)	0	7	0	0	2	0	0	64	0	0	1	0
Lane Group Flow (vph)	22	593	0	85	248	0	39	357	0	39	878	0
Heavy Vehicles (%)	0%	1%	33%	0%	7%	0%	100%	9%	0%	0%	2%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	16.7	16.7	16.7	16.7	16.7	16.7	18.0	18.0	18.0	18.0	18.0	18.0
Effective Green, g (s)	16.7	16.7	16.7	16.7	16.7	16.7	18.0	18.0	18.0	18.0	18.0	18.0
Actuated g/C Ratio	0.38	0.38	0.38	0.38	0.38	0.38	0.41	0.41	0.41	0.41	0.41	0.41
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	443	698	175	684	96	1355	400	1472				
v/s Ratio Prot	c0.32		0.14		0.11		c0.25					
v/s Ratio Perm	0.02		0.18		0.17		0.04					
v/c Ratio	0.05	0.85	0.49	0.36	0.41	0.26	0.10	0.60				
Uniform Delay, d1	8.5	12.3	10.2	9.7	9.1	8.5	7.9	10.0				
Progression 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
Incremental Delay, d2	0.0	9.5	2.1	0.3	12.3	0.5	0.5	1.8				
Delay (s)	8.5	21.8	12.4	10.0	21.3	9.0	8.4	11.8				
Level of Service	A	C	B	B	C	A	A	B				
Approach Delay (s)	21.3		10.6		10.0		11.7					
Approach LOS	C		B		B		B					
Intersection Summary												
HCM 2000 Control Delay	13.8											
HCM 2000 Volume to Capacity ratio	0.72											
Actuated Cycle Length (s)	43.7											
Intersection Capacity Utilization	74.9%											
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

FUT 2041 AM (GTA W)

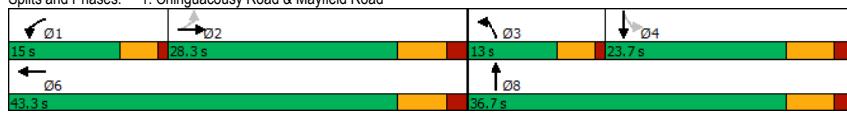
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations	↓	↑	↑	↓	↑	↓		
Traffic Volume (veh/h)	110	138	528	102	128	967		
Future Volume (Veh/h)	110	138	528	102	128	967		
Sign Control	Stop	Free	Free					
Grade	0%	0%	0%					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly flow rate (vph)	120	150	574	111	139	1051		
Pedestrians								
Lane Width (m)								
Walking Speed (m/s)								
Percent Blockage								
Right turn flare (veh)								
Median type		None		None				
Median storage veh)								
Upstream signal (m)								
pX, platoon unblocked								
vC, conflicting volume	1378	287		685				
VC1, stage 1 conf vol								
VC2, stage 2 conf vol								
VCu, unblocked vol	1378	287		685				
tC, single (s)	6.8	6.9		4.1				
tC, 2 stage (s)								
tf (s)	3.5	3.3		2.2				
p0 queue free %	0	79		85				
cm capacity (veh/h)	115	710		904				
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	120	150	287	287	111	139	526	526
Volume Left	120	0	0	0	0	139	0	0
Volume Right	0	150	0	0	111	0	0	0
CSH	115	710	1700	1700	1700	904	1700	1700
Volume to Capacity	1.04	0.21	0.17	0.17	0.07	0.15	0.31	0.31
Queue Length 95th (m)	53.4	6.0	0.0	0.0	0.0	4.1	0.0	0.0
Control Delay (s)	167.7	11.4	0.0	0.0	0.0	9.7	0.0	0.0
Lane LOS	F	B		A				
Approach Delay (s)	80.9		0.0			1.1		
Approach LOS	F							
Intersection Summary								
Average Delay		10.8						
Intersection Capacity Utilization	39.5%		ICU Level of Service		A			
Analysis Period (min)	15							

## Timings

### 1: Chinguacousy Road & Mayfield Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	↑↑↑	↑↑	↑↑↑	↑↑	↑↑↑	↑↑	↑↑
Traffic Volume (vph)	13	1087	390	1244	282	757	26	319
Future Volume (vph)	13	1087	390	1244	282	757	26	319
Lane Group Flow (vph)	14	1208	406	1332	294	1583	27	355
Turn Type	Perm	NA	Prot	NA	Prot	NA	Perm	NA
Protected Phases	2	1	6	3	8	4	4	
Permitted Phases	2	2	1	6	3	8	4	4
Switch Phase								
Minimum Initial (s)	12.0	12.0	5.0	12.0	5.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	9.5	23.6	9.5	23.6	23.6	23.6
Total Split (s)	28.3	28.3	15.0	43.3	13.0	36.7	23.7	23.7
Total Split (%)	35.4%	35.4%	18.8%	54.1%	16.3%	45.9%	29.6%	29.6%
Yellow Time (s)	4.6	4.6	3.5	4.6	3.5	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.6	6.6	4.5	6.6	4.5	6.6	6.6	
Lead/Lag	Lag	Lag	Lead	Lead	Lag	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	None	Max	Max	
v/c Ratio	0.14	0.89	0.88	0.58	0.84	1.00dr	0.33	0.46
Control Delay	26.3	37.9	56.8	17.1	57.3	21.1	39.2	29.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	26.3	37.9	56.8	17.1	57.3	21.1	39.2	29.1
Queue Length 50th (m)	1.6	63.9	31.7	52.0	22.9	60.9	3.5	24.3
Queue Length 95th (m)	6.4	#88.6	#55.4	65.0	#42.8	79.4	11.4	36.7
Internal Link Dist (m)	324.8		438.2		224.1		938.0	
Turn Bay Length (m)	100.0		100.0		100.0			
Base Capacity (vph)	101	1352	460	2310	351	1953	82	764
Starvation Cap Reductn	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.14	0.89	0.88	0.58	0.84	0.81	0.33	0.46
<b>Intersection Summary</b>								
Cycle Length:	80							
Actuated Cycle Length: 80								
Natural Cycle: 80								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								
dr Defacto Right Lane. Recode with 1 though lane as a right lane.								

Splits and Phases: 1: Chinguacousy Road & Mayfield Road



## HCM Signalized Intersection Capacity Analysis

### 1: Chinguacousy Road & Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR
Lane Configurations	↑	↑↑↑	↑↑	↑↑↑	↑↑	↑↑↑	↑↑	↑↑			
Traffic Volume (vph)	13	1087	73	390	1244	35	282	757	762	26	319
Future Volume (vph)	13	1087	73	390	1244	35	282	757	762	26	319
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		4.5	6.6		4.5	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91		0.97	0.91		0.97	0.91	1.00	0.95	
Frt	1.00	0.99		1.00	1.00		1.00	0.92	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1825	4948		3506	5028		3309	4597	1560	3549	
Flt Permitted	0.19	1.00		0.95	1.00		0.95	1.00	0.23	1.00	
Satd. Flow (perm)	372	4948		3506	5028		3309	4597	384	3549	
Peak-hour factor, PHF	0.96	0.96		0.96	0.96		0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	14	1132		76	406		1296	36	294	789	794
RTOR Reduction (vph)	0	9		0	0		4	0	0	223	0
Lane Group Flow (vph)	14	1199		0	406		1328	0	294	1360	0
Heavy Vehicles (%)	0%	5%		5%	1%		4%	0%	7%	4%	7%
Turn Type	Perm	NA		Prot	NA		Prot	NA	Perm	NA	
Protected Phases	2			1	6		3	8		4	
Permitted Phases		2									
Actuated Green, G (s)	21.7	21.7		10.5	36.7		8.5	30.1	17.1	17.1	
Effective Green, g (s)	21.7	21.7		10.5	36.7		8.5	30.1	17.1	17.1	
Actuated g/C Ratio	0.27	0.27		0.13	0.46		0.11	0.38	0.21	0.21	
Clearance Time (s)	6.6	6.6		4.5	6.6		4.5	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	100	1342		460	2306		351	1729	82	758	
v/s Ratio Prot	c0.24			c0.12	0.26		0.09	c0.30		0.10	
v/s Ratio Perm	0.04									0.07	
v/c Ratio	0.14	0.89		0.88	0.58		0.84	1.00dr	0.33	0.46	
Uniform Delay, d1	22.1	28.0		34.1	15.9		35.1	22.1	26.6	27.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.6	7.9		17.8	0.4		15.8	3.7	10.4	2.0	
Delay (s)	22.7	36.0		51.9	16.3		50.9	25.8	37.0	29.4	
Level of Service	C	D		D	B		D	C	D	C	
Approach Delay (s)	35.8			24.6			29.7		30.0		
Approach LOS	D			C			C		C		

### Intersection Summary

HCM 2000 Control Delay	29.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	22.2
Intersection Capacity Utilization	98.6%	ICU Level of Service	F
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

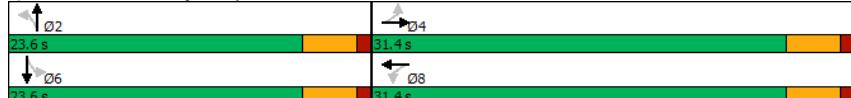
c Critical Lane Group

Timings  
2: Chinguacousy Road & Old School Road

FUT 2041 PM (GTA W)

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	↓	↑	↓	↑	↓	↑	↓
Traffic Volume (vph)	17	241	85	664	42	663	11	219
Future Volume (vph)	17	241	85	664	42	663	11	219
Lane Group Flow (vph)	18	273	92	759	46	913	12	250
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6	
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	31.4	31.4	31.4	31.4	23.6	23.6	23.6	23.6
Total Split (%)	57.1%	57.1%	57.1%	57.1%	42.9%	42.9%	42.9%	42.9%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.12	0.31	0.21	0.87	0.11	0.69	0.08	0.20
Control Delay	10.2	9.6	9.6	25.8	13.1	16.9	14.0	12.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	9.6	9.6	25.8	13.1	16.9	14.0	12.3
Queue Length 50th (m)	0.9	14.5	4.8	58.5	3.0	37.5	0.8	8.5
Queue Length 95th (m)	4.0	26.7	11.7	#118.6	8.6	55.6	3.8	15.3
Internal Link Dist (m)	414.1		424.5		2089.6		405.3	
Turn Bay Length (m)	100.0		100.0		100.0		100.0	
Base Capacity (vph)	165	991	487	982	422	1322	146	1245
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.28	0.19	0.77	0.11	0.69	0.08	0.20
Intersection Summary								
Cycle Length: 55								
Actuated Cycle Length: 52.2								
Natural Cycle: 55								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 2: Chinguacousy Road & Old School Road



HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

FUT 2041 PM (GTA W)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↓	↑	↓	↑	↓	↑	↓	↑	↓	↑	↓
Traffic Volume (vph)	17	241	10	85	664	34	42	663	177	11	219	11
Future Volume (vph)	17	241	10	85	664	34	42	663	177	11	219	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00
Fr <sub>t</sub>	1.00	0.99	1.00	0.99	1.00	0.99	1.00	0.97	1.00	0.99	1.00	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1910	1547	1889	1825	1889	1825	1889	1825	1889	1825	1889
Flt Permitted	0.17	1.00	0.58	1.00	0.60	1.00	0.21	1.00	0.21	1.00	0.21	1.00
Satd. Flow (perm)	320	1910	941	1889	1147	3480	400	3367	1147	3480	400	3367
Peak-hour factor, PHF	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)	18	262	11	92	722	37	46	721	192	12	238	12
RTOR Reduction (vph)	0	3	0	0	4	0	0	42	0	0	6	0
Lane Group Flow (vph)	18	270	0	92	755	0	46	871	0	12	244	0
Heavy Vehicles (%)	0%	0%	0%	18%	1%	0%	0%	2%	0%	0%	8%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	24.0	24.0	24.0	24.0	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
Effective Green, g (s)	24.0	24.0	24.0	24.0	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
Actuated g/C Ratio	0.46	0.46	0.46	0.46	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	147	878	432	868	421	1280	147	1238				
v/s Ratio Prot	0.14		c0.40		c0.25		0.07					
v/s Ratio Perm	0.06		0.10		0.04		0.03					
v/c Ratio	0.12	0.31	0.21	0.87	0.11	0.68	0.08	0.20				
Uniform Delay, d1	8.1	8.9	8.4	12.7	10.9	13.9	10.8	11.2				
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Incremental Delay, d2	0.4	0.2	0.2	9.5	0.5	2.9	1.1	0.4				
Delay (s)	8.4	9.1	8.7	22.2	11.4	16.8	11.8	11.6				
Level of Service	A	A	A	C	B	B	B	B				
Approach Delay (s)	9.0		20.7		16.6		11.6					
Approach LOS	A		C		B		B	B				
Intersection Summary												
HCM 2000 Control Delay	16.6		HCM 2000 Level of Service		B							
HCM 2000 Volume to Capacity ratio	0.79											
Actuated Cycle Length (s)	52.2		Sum of lost time (s)		9.0							
Intersection Capacity Utilization	84.3%		ICU Level of Service		E							
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

FUT 2041 PM (GTA W)

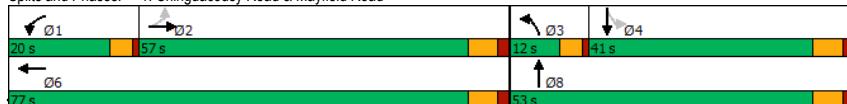
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations	↖ ↗ ↘ ↗ ↙ ↘	↖ ↗ ↘ ↗ ↙ ↘	↑ ↗ ↘ ↗ ↙ ↘	↖ ↗ ↘ ↗ ↙ ↘	↖ ↗ ↘ ↗ ↙ ↘	↑ ↗ ↘ ↗ ↙ ↘		
Traffic Volume (veh/h)	46	235	823	185	132	564		
Future Volume (Veh/h)	46	235	823	185	132	564		
Sign Control	Stop	Free	Free					
Grade	0%	0%	0%					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly flow rate (vph)	50	255	895	201	143	613		
Pedestrians								
Lane Width (m)								
Walking Speed (m/s)								
Percent Blockage								
Right turn flare (veh)								
Median type		None		None				
Median storage veh)								
Upstream signal (m)								
pX, platoon unblocked								
vC, conflicting volume	1488	448		1096				
VC1, stage 1 conf vol								
VC2, stage 2 conf vol								
VCu, unblocked vol	1488	448		1096				
tC, single (s)	6.8	6.9		4.1				
tC, 2 stage (s)								
tf (s)	3.5	3.3		2.2				
p0 queue free %	44	54		77				
CM capacity (veh/h)	89	559		633				
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	50	255	448	448	201	143	306	306
Volume Left	50	0	0	0	0	143	0	0
Volume Right	0	255	0	0	201	0	0	0
CSH	89	559	1700	1700	1700	633	1700	1700
Volume to Capacity	0.56	0.46	0.26	0.26	0.12	0.23	0.18	0.18
Queue Length 95th (m)	19.2	18.0	0.0	0.0	0.0	6.6	0.0	0.0
Control Delay (s)	88.1	16.7	0.0	0.0	0.0	12.3	0.0	0.0
Lane LOS	F	C		B				
Approach Delay (s)	28.4		0.0		2.3			
Approach LOS	D							
Intersection Summary								
Average Delay		4.8						
Intersection Capacity Utilization	44.0%		ICU Level of Service		A			
Analysis Period (min)	15							

## Timings

## 1: Chinguacousy Road &amp; Mayfield Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	↑↑↑	↑↑	↑↑↑	↑↑	↑↑↑	↑↑	↑↑
Traffic Volume (vph)	12	1594	372	1159	152	365	54	859
Future Volume (vph)	12	1594	372	1159	152	365	54	859
Lane Group Flow (vph)	14	2008	423	1328	173	937	61	1033
Turn Type	Perm	NA	Prot	NA	Prot	NA	Perm	NA
Protected Phases	2	1	6	3	8	4	4	
Permitted Phases	2	2	1	6	3	8	4	4
Switch Phase								
Minimum Initial (s)	12.0	12.0	5.0	12.0	5.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	9.5	23.6	9.5	23.6	23.6	23.6
Total Split (s)	57.0	57.0	20.0	77.0	12.0	53.0	41.0	41.0
Total Split (%)	43.8%	43.8%	15.4%	59.2%	9.2%	40.8%	31.5%	31.5%
Yellow Time (s)	4.6	4.6	3.5	4.6	3.5	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.6	6.6	4.5	6.6	4.5	6.6	6.6	
Lead/Lag	Lag	Lag	Lead	Lead	Lag	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	None	Max	Max	
v/c Ratio	0.12	1.05	1.10	0.51	1.10	0.51	0.61	1.15
Control Delay	28.8	73.1	129.1	19.7	156.8	24.2	69.6	121.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	28.8	73.1	129.1	19.7	156.8	24.2	69.6	121.3
Queue Length 50th (m)	2.3	-203.9	-63.4	76.0	-25.9	49.4	13.8	-163.1
Queue Length 95th (m)	7.1	#223.7	#92.4	85.7	#47.8	60.5	#34.0	#197.5
Internal Link Dist (m)	324.8		438.2		224.1		938.0	
Turn Bay Length (m)	100.0		100.0		100.0			
Base Capacity (vph)	120	1915	383	2600	157	1839	100	902
Starvation Cap Reductn	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.12	1.05	1.10	0.51	1.10	0.51	0.61	1.15
<b>Intersection Summary</b>								
Cycle Length: 130								
Actuated Cycle Length: 130								
Natural Cycle: 130								
Control Type: Semi Act-Uncoord								
~ Volume exceeds capacity, queue is theoretically infinite.								
Queue shown is maximum after two cycles.								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 1: Chinguacousy Road &amp; Mayfield Road



051561\_Chinguacousy EA\_2041 No GTAW.syn  
R.J. Burnside & Associates Limited

## FUT 2041 AM (No GTA W))

## HCM Signalized Intersection Capacity Analysis

## 1: Chinguacousy Road &amp; Mayfield Road

## FUT 2041 AM (No GTA W))

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑↑	↑↑↑	↑↑	↑↑↑	↑↑	↑↑				
Traffic Volume (vph)	12	1594	173	372	1159	10	152	365	459	54	859	50
Future Volume (vph)	12	1594	173	372	1159	10	152	365	459	54	859	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		4.5	6.6		4.5	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.91		0.97	0.91		0.97	0.91		1.00	0.95	
Frt	1.00	0.99		1.00	1.00		1.00	0.92		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1521	4917		3219	4800		2724	4692		1267	3398	
Flt Permitted	0.19	1.00		0.95	1.00		0.95	1.00		0.28	1.00	
Satd. Flow (perm)	311	4917		3219	4800		2724	4692		378	3398	
Peak-hour factor, PHF	0.88	0.88		0.88	0.88		0.88	0.88		0.88	0.88	
Adj. Flow (vph)	14	1811	197	423	1317	11	173	415	522	61	976	57
RTOR Reduction (vph)	0	10	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	14	1998	0	423	1328	0	173	771	0	61	1030	0
Heavy Vehicles (%)	20%	5%	6%	10%	9%	25%	30%	3%	2%	44%	4%	50%
Turn Type	Perm	NA	Prot	NA	Prot	NA	Prot	NA	Perm	NA		
Protected Phases	2		1	6		3	8			4		
Permitted Phases		2										
Actuated Green, G (s)	50.4	50.4		15.5	70.4		7.5	46.4		34.4	34.4	
Effective Green, g (s)	50.4	50.4		15.5	70.4		7.5	46.4		34.4	34.4	
Actuated g/C Ratio	0.39	0.39		0.12	0.54		0.06	0.36		0.26	0.26	
Clearance Time (s)	6.6	6.6		4.5	6.6		4.5	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	120	1906		383	2599		157	1674		100	899	
v/s Ratio Prot	c0.41		c0.13	0.28		c0.06	0.16			c0.30		
v/s Ratio Perm	0.04									0.16		
v/c Ratio	0.12	1.05		1.10	0.51		1.10	0.46		0.61	1.15	
Uniform Delay, d1	25.5	39.8		57.2	18.9		61.2	32.2		41.9	47.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	34.5		77.2	0.2		101.7	0.9		24.7	78.7	
Delay (s)	26.0	74.3		134.5	19.1		163.0	33.1		66.6	126.5	
Level of Service	C	E		F	B		F	C		E	F	
Approach Delay (s)	74.0			46.9			53.3			123.2		
Approach LOS	E			D			D			F		
<b>Intersection Summary</b>												
HCM 2000 Control Delay	71.2											E
HCM 2000 Volume to Capacity ratio	1.09											
Actuated Cycle Length (s)	130.0											22.2
Intersection Capacity Utilization	93.4%											F
Analysis Period (min)	15											
c Critical Lane Group												

051561\_Chinguacousy EA\_2041 No GTAW.syn  
R.J. Burnside & Associates Limited

Synchro 11 Report  
03/28/2022 - Page 2

Timings  
2: Chinguacousy Road & Old School Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑	←	↑	→	↑	↓
Traffic Volume (vph)	20	505	78	223	36	277	36	777
Future Volume (vph)	20	505	78	223	36	277	36	777
Lane Group Flow (vph)	22	600	85	250	39	406	39	850
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6	
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.05	0.85	0.49	0.36	0.38	0.29	0.10	0.58
Control Delay	8.8	26.9	21.7	11.2	24.8	7.2	9.3	12.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.8	26.9	21.7	11.2	24.8	7.2	9.3	12.2
Queue Length 50th (m)	1.0	38.6	4.7	12.7	2.1	7.7	1.8	26.0
Queue Length 95th (m)	3.9	#86.1	#18.5	25.2	#11.8	14.6	6.0	39.5
Internal Link Dist (m)	414.1	424.5		2089.6		405.3		
Turn Bay Length (m)	100.0	100.0		100.0		100.0		
Base Capacity (vph)	478	760	190	740	102	1417	406	1475
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.79	0.45	0.34	0.38	0.29	0.10	0.58
Intersection Summary								
Cycle Length: 45								
Actuated Cycle Length: 43.8								
Natural Cycle: 45								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 2: Chinguacousy Road & Old School Road



HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑	←	↑	→	↑	↓				
Traffic Volume (vph)	20	505	47	78	223	7	36	277	36	777	5	
Future Volume (vph)	20	505	47	78	223	7	36	277	36	777	5	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	
Frt	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	
Satd. Flow (prot)	1825	1829	1825	1791	913	3289	1825	3576				
Flt Permitted	0.60	1.00	0.24	1.00	0.26	1.00	0.51	1.00				
Satd. Flow (perm)	1160	1829	460	1791	248	3289	986	3576				
Peak-hour factor, PHF	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)	22	549	51	85	242	8	39	301	105	39	845	5
RTOR Reduction (vph)	0	7	0	0	2	0	0	62	0	0	1	0
Lane Group Flow (vph)	22	593	0	85	248	0	39	344	0	39	849	0
Heavy Vehicles (%)	0%	1%	33%	0%	7%	0%	100%	9%	0%	0%	2%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	16.7	16.7	16.7	16.7	16.7	16.7	18.0	18.0	18.0	18.0	18.0	
Effective Green, g (s)	16.7	16.7	16.7	16.7	16.7	16.7	18.0	18.0	18.0	18.0	18.0	
Actuated g/C Ratio	0.38	0.38	0.38	0.38	0.38	0.38	0.41	0.41	0.41	0.41	0.41	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	443	698	175	684	102	1354	406	1472				
v/s Ratio Prot	c0.32		0.14		0.10		c0.24					
v/s Ratio Perm	0.02		0.18		0.16		0.04					
v/c Ratio	0.05	0.85	0.49	0.36	0.38	0.25	0.10	0.58				
Uniform Delay, d1	8.5	12.3	10.2	9.7	9.0	8.4	7.9	9.9				
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Incremental Delay, d2	0.0	9.5	2.1	0.3	10.5	0.5	0.5	1.7				
Delay (s)	8.5	21.8	12.4	10.0	19.5	8.9	8.3	11.6				
Level of Service	A	C	B	B	B	A	A	B				
Approach Delay (s)	21.3		10.6		9.8		11.4					
Approach LOS	C		B		A		B					
Intersection Summary												
HCM 2000 Control Delay	13.7											
HCM 2000 Volume to Capacity ratio	0.71											
Actuated Cycle Length (s)	43.7											
Intersection Capacity Utilization	74.6%											
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

FUT 2041 AM (No GTA W)

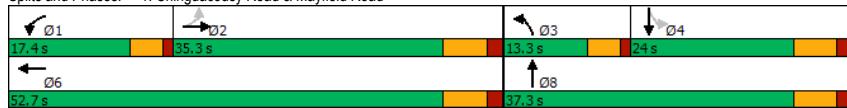
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations								
Traffic Volume (veh/h)	110	138	521	102	128	933		
Future Volume (Veh/h)	110	138	521	102	128	933		
Sign Control	Stop	Free	Free					
Grade	0%	0%	0%					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly flow rate (vph)	120	150	566	111	139	1014		
Pedestrians								
Lane Width (m)								
Walking Speed (m/s)								
Percent Blockage								
Right turn flare (veh)								
Median type		None		None				
Median storage veh)								
Upstream signal (m)								
pX, platoon unblocked								
vC, conflicting volume	1351	283		677				
VC1, stage 1 conf vol								
VC2, stage 2 conf vol								
VCu, unblocked vol	1351	283		677				
tC, single (s)	6.8	6.9		4.1				
tC, 2 stage (s)								
tf (s)	3.5	3.3		2.2				
p0 queue free %	0	79		85				
cm capacity (veh/h)	120	714		911				
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	120	150	283	283	111	139	507	507
Volume Left	120	0	0	0	0	139	0	0
Volume Right	0	150	0	0	111	0	0	0
CSH	120	714	1700	1700	1700	911	1700	1700
Volume to Capacity	1.00	0.21	0.17	0.17	0.07	0.15	0.30	0.30
Queue Length 95th (m)	51.0	6.0	0.0	0.0	0.0	4.1	0.0	0.0
Control Delay (s)	151.6	11.4	0.0	0.0	0.0	9.7	0.0	0.0
Lane LOS	F	B		A				
Approach Delay (s)	73.7	0.0		1.2				
Approach LOS	F							
Intersection Summary								
Average Delay		10.1						
Intersection Capacity Utilization	38.6%		ICU Level of Service		A			
Analysis Period (min)	15							

## Timings

1: Chinguacousy Road &amp; Mayfield Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	↑↑↑	↑	↑↑↑	↑	↑↑↑	↑	↑↑↑
Traffic Volume (vph)	18	1357	441	1406	272	732	26	308
Future Volume (vph)	18	1357	441	1406	272	732	26	308
Lane Group Flow (vph)	19	1510	459	1507	283	1530	27	343
Turn Type	Perm	NA	Prot	NA	Prot	NA	Perm	NA
Protected Phases	2	1	6	3	8	4	4	
Permitted Phases	2	2	1	6	3	8	4	4
Switch Phase								
Minimum Initial (s)	12.0	12.0	5.0	12.0	5.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	9.5	23.6	9.5	23.6	23.6	23.6
Total Split (s)	35.3	35.3	17.4	52.7	13.3	37.3	24.0	24.0
Total Split (%)	39.2%	39.2%	19.3%	58.6%	14.8%	41.4%	26.7%	26.7%
Yellow Time (s)	4.6	4.6	3.5	4.6	3.5	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.6	6.6	4.5	6.6	4.5	6.6	6.6	
Lead/Lag	Lag	Lag	Lead	Lead	Lag	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	None	Max	Max	
v/c Ratio	0.19	0.95	0.91	0.58	0.88	1.06dr	0.37	0.50
Control Delay	28.4	44.4	63.0	16.4	68.2	28.3	47.7	34.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	28.4	44.4	63.0	16.4	68.2	28.3	47.7	34.6
Queue Length 50th (m)	2.4	92.1	40.8	62.8	25.3	73.4	4.1	27.5
Queue Length 95th (m)	8.3	#123.6	#67.9	76.3	#46.8	93.0	12.7	40.6
Internal Link Dist (m)	324.8		438.2		224.1		938.0	
Turn Bay Length (m)	100.0		100.0		100.0			
Base Capacity (vph)	98	1585	502	2578	323	1770	73	691
Starvation Cap Reductn	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.19	0.95	0.91	0.58	0.88	0.86	0.37	0.50
<b>Intersection Summary</b>								
Cycle Length: 90								
Actuated Cycle Length: 90								
Natural Cycle: 90								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								
dr Defacto Right Lane. Recode with 1 though lane as a right lane.								

Splits and Phases: 1: Chinguacousy Road &amp; Mayfield Road



## HCM Signalized Intersection Capacity Analysis

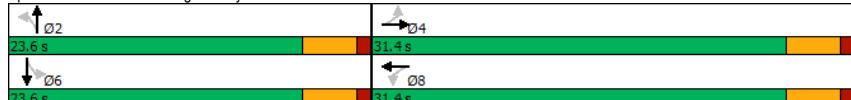
1: Chinguacousy Road &amp; Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑↑↑	↑	↑↑↑	↑	↑↑↑	↑	↑↑↑	
Traffic Volume (vph)	18	1357	92	441	1406	40	272	732	736	26	308
Future Volume (vph)	18	1357	92	441	1406	40	272	732	736	26	308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		4.5	6.6		4.5	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91		0.97	0.91		0.97	0.91	1.00	0.95	
Frt	1.00	0.99		1.00	1.00		1.00	0.92	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1825	4947		3506	5027		3309	4597	1560	3550	
Flt Permitted	0.16	1.00		0.95	1.00		0.95	1.00	0.23	1.00	
Satd. Flow (perm)	309	4947		3506	5027		3309	4597	377	3550	
Peak-hour factor, PHF	0.96	0.96		0.96	0.96		0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	19	1414		96	459		1465	42	283	762	767
RTOR Reduction (vph)	0	8		0	0		3	0	0	202	0
Lane Group Flow (vph)	19	1502		0	459		1504	0	283	1328	0
Heavy Vehicles (%)	0%	5%		5%	1%		4%	0%	7%	4%	7%
Turn Type	Perm	NA		Prot	NA		Prot	NA	Perm	NA	
Protected Phases	2			1	6		3	8		4	
Permitted Phases		2									
Actuated Green, G (s)	28.7	28.7		12.9	46.1		8.8	30.7	17.4	17.4	
Effective Green, g (s)	28.7	28.7		12.9	46.1		8.8	30.7	17.4	17.4	
Actuated g/C Ratio	0.32	0.32		0.14	0.51		0.10	0.34	0.19	0.19	
Clearance Time (s)	6.6	6.6		4.5	6.6		4.5	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	98	1577		502	2574		323	1568	72	686	
v/s Ratio Prot	c0.30			c0.13	0.30		0.09	c0.29	0.10		
v/s Ratio Perm	0.06								0.07		
v/c Ratio	0.19	0.95		0.91	0.58		0.88	1.06dr	0.38	0.49	
Uniform Delay, d1	22.3	30.0		38.0	15.3		40.1	27.5	31.6	32.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.0	13.0		21.2	0.3		22.3	5.9	14.3	2.5	
Delay (s)	23.2	43.0		59.2	15.6		62.4	33.3	45.8	34.9	
Level of Service	C	D		E	B		E	C	D	C	
Approach Delay (s)	42.8			25.8			37.9		35.7		
Approach LOS	D			C			D		D		
<b>Intersection Summary</b>											
HCM 2000 Control Delay	34.9										C
HCM 2000 Volume to Capacity ratio	0.96										
Actuated Cycle Length (s)	90.0										22.2
Intersection Capacity Utilization	101.8%										G
Analysis Period (min)	15										
dr Defacto Right Lane. Recode with 1 though lane as a right lane.											
c Critical Lane Group											

Timings  
2: Chinguacousy Road & Old School Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓
Traffic Volume (vph)	17	241	85	664	40	642	9	213
Future Volume (vph)	17	241	85	664	40	642	9	213
Lane Group Flow (vph)	18	273	92	759	43	886	10	242
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6	
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	31.4	31.4	31.4	31.4	23.6	23.6	23.6	23.6
Total Split (%)	57.1%	57.1%	57.1%	57.1%	42.9%	42.9%	42.9%	42.9%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.12	0.31	0.21	0.87	0.10	0.67	0.07	0.19
Control Delay	10.2	9.6	9.6	25.8	13.0	16.5	13.7	12.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	9.6	9.6	25.8	13.0	16.5	13.7	12.2
Queue Length 50th (m)	0.9	14.5	4.8	58.5	2.8	35.9	0.7	8.3
Queue Length 95th (m)	4.0	26.7	11.7	#118.6	8.2	53.3	3.4	14.8
Internal Link Dist (m)	414.1		424.5		2089.6		405.3	
Turn Bay Length (m)	100.0		100.0		100.0		100.0	
Base Capacity (vph)	165	991	487	982	425	1322	146	1245
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.28	0.19	0.77	0.10	0.67	0.07	0.19
Intersection Summary								
Cycle Length: 55								
Actuated Cycle Length: 52.2								
Natural Cycle: 55								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 2: Chinguacousy Road & Old School Road



HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓	↑	↓	↑	↓
Traffic Volume (vph)	17	241	10	85	664	34	40	642	173	9	213	9
Future Volume (vph)	17	241	10	85	664	34	40	642	173	9	213	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00
Frt	1.00	0.99	1.00	0.99	1.00	0.97	1.00	0.97	1.00	0.99	1.00	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1910	1547	1889	1825	1889	1825	1889	1825	1889	1825	1889
Flt Permitted	0.17	1.00	0.58	1.00	0.60	1.00	0.21	1.00	0.21	1.00	0.21	1.00
Satd. Flow (perm)	320	1910	941	1889	1155	1889	400	1889	400	1889	400	1889
Peak-hour factor, PHF	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)	18	262	11	92	722	37	43	698	188	10	232	10
RTOR Reduction (vph)	0	3	0	0	4	0	0	43	0	0	6	0
Lane Group Flow (vph)	18	270	0	92	755	0	43	843	0	10	236	0
Heavy Vehicles (%)	0%	0%	0%	18%	1%	0%	0%	2%	0%	0%	8%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	24.0	24.0	24.0	24.0	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
Effective Green, g (s)	24.0	24.0	24.0	24.0	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
Actuated g/C Ratio	0.46	0.46	0.46	0.46	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	147	878	432	868	424	1279	147	1279				
v/s Ratio Prot	0.14		c0.40		c0.24		0.07					
v/s Ratio Perm	0.06		0.10		0.04		0.02					
v/c Ratio	0.12	0.31	0.21	0.87	0.10	0.66	0.07	0.19				
Uniform Delay, d1	8.1	8.9	8.4	12.7	10.8	13.8	10.7	11.2				
Progression 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
Incremental Delay, d2	0.4	0.2	0.2	9.5	0.5	2.7	0.9	0.3				
Delay (s)	8.4	9.1	8.7	22.2	11.3	16.4	11.6	11.6				
Level of Service	A	A	A	C	B	B	B	B				
Approach Delay (s)	9.0		20.7		16.2		11.6					
Approach LOS	A		C		B		B					
Intersection Summary												
HCM 2000 Control Delay	16.5											
HCM 2000 Volume to Capacity ratio	0.78											
Actuated Cycle Length (s)	52.2											
Intersection Capacity Utilization	83.6%											
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

FUT 2041 PM (No GTA W)

Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations	↖ ↗ ↘ ↗ ↙ ↘	↖ ↗ ↘ ↗ ↙ ↘	↑ ↗ ↘ ↗ ↙ ↘	↖ ↗ ↘ ↗ ↙ ↘	↖ ↗ ↘ ↗ ↙ ↘	↑ ↗ ↘ ↗ ↙ ↘		
Traffic Volume (veh/h)	46	235	808	185	132	552		
Future Volume (Veh/h)	46	235	808	185	132	552		
Sign Control	Stop	Free	Free					
Grade	0%	0%	0%					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly flow rate (vph)	50	255	878	201	143	600		
Pedestrians								
Lane Width (m)								
Walking Speed (m/s)								
Percent Blockage								
Right turn flare (veh)								
Median type		None		None				
Median storage veh)								
Upstream signal (m)								
pX, platoon unblocked								
vC, conflicting volume	1464	439		1079				
VC1, stage 1 conf vol								
VC2, stage 2 conf vol								
VCu, unblocked vol	1464	439		1079				
tC, single (s)	6.8	6.9		4.1				
tC, 2 stage (s)								
tf (s)	3.5	3.3		2.2				
p0 queue free %	46	55		78				
cm capacity (veh/h)	93	566		642				
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	50	255	439	439	201	143	300	300
Volume Left	50	0	0	0	0	143	0	0
Volume Right	0	255	0	0	201	0	0	0
CSH	93	566	1700	1700	1700	642	1700	1700
Volume to Capacity	0.54	0.45	0.26	0.26	0.12	0.22	0.18	0.18
Queue Length 95th (m)	18.4	17.7	0.0	0.0	0.0	6.4	0.0	0.0
Control Delay (s)	82.3	16.5	0.0	0.0	0.0	12.2	0.0	0.0
Lane LOS	F	C		B				
Approach Delay (s)	27.3		0.0		2.3			
Approach LOS	D							
Intersection Summary								
Average Delay		4.7						
Intersection Capacity Utilization	43.6%		ICU Level of Service		A			
Analysis Period (min)	15							



[ THE DIFFERENCE IS OUR PEOPLE ]

---

## Appendix H

### 2051 Traffic Operations Synchro Reports

# DRAFT

Appendix H

## Timings

### 1: Chinguacousy Road & Mayfield Road

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑	↑	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑
Traffic Volume (vph)	9	1342	145	346	1077	164	395	498	61	932	55
Future Volume (vph)	9	1342	145	346	1077	164	395	498	61	932	55
Lane Group Flow (vph)	10	1525	165	393	1234	186	449	566	69	1059	63
Turn Type	Perm	NA	Perm	Prot	NA	Prot	NA	Perm	Perm	NA	Perm
Protected Phases	2			1	6	3	8	8	4	4	4
Permitted Phases	2	2	2	1	6	3	8	8	4	4	4
Detector Phase											
Switch Phase											
Minimum Initial (s)	12.0	12.0	12.0	5.0	12.0	5.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	23.6	9.5	23.6	9.5	23.6	23.6	23.6	23.6	23.6
Total Split (s)	47.4	47.4	47.4	21.4	68.8	14.4	61.2	61.2	46.8	46.8	46.8
Total Split (%)	36.5%	36.5%	36.5%	16.5%	52.9%	11.1%	47.1%	36.0%	36.0%	36.0%	36.0%
Yellow Time (s)	4.6	4.6	4.6	3.5	4.6	3.5	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max
v/c Ratio	0.09	0.97	0.28	0.94	0.54	0.90	0.21	0.66	0.35	0.98	0.15
Control Delay	34.6	61.3	5.9	87.3	24.9	100.1	24.3	16.4	40.9	66.6	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.6	61.3	5.9	87.3	24.9	100.1	24.3	16.4	40.9	66.6	1.9
Queue Length 50th (m)	1.8	141.3	0.0	52.2	79.3	24.7	26.4	49.6	13.7	141.1	0.0
Queue Length 95th (m)	6.4	#166.7	14.4	#78.9	89.9	#45.0	33.5	84.3	27.2	#178.5	1.8
Internal Link Dist (m)	324.8			438.2		224.1				938.0	
Turn Bay Length (m)	100.0		100.0		100.0		100.0		100.0		100.0
Base Capacity (vph)	107	1567	596	418	2297	207	2138	858	199	1085	409
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.97	0.28	0.94	0.54	0.90	0.21	0.66	0.35	0.98	0.15
<b>Intersection Summary</b>											
Cycle Length: 130											
Actuated Cycle Length: 130											
Natural Cycle: 120											
Control Type: Semi Act-Uncoord											
# 95th percentile volume exceeds capacity, queue may be longer.											
Queue shown is maximum after two cycles.											
<b>Splits and Phases:</b> 1: Chinguacousy Road & Mayfield Road											

## HCM Signalized Intersection Capacity Analysis

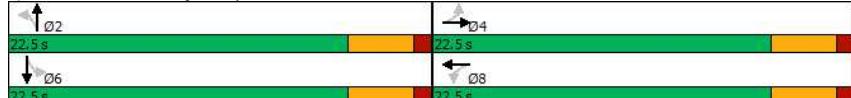
### 1: Chinguacousy Road & Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑	↑	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑
Traffic Volume (vph)	9	1342	145	346	1077	164	395	498	61	932	55	
Future Volume (vph)	9	1342	145	346	1077	164	395	498	61	932	55	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	0.97	0.91	1.00	1.00	0.95	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1521	4995	1541	3219	4800		2724	5092	1601	1267	3510	1089
Flt Permitted	0.21	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	344	4995	1541	3219	4800		2724	5092	1601	645	3510	1089
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	10	1525	165	393	1224	10	186	449	566	69	1059	62
RTOR Reduction (vph)	0	0	113	0	1	0	0	0	186	0	0	44
Lane Group Flow (vph)	10	1525	52	393	1233	0	186	449	380	69	1059	19
Heavy Vehicles (%)	20%	5%	6%	10%	9%	25%	30%	3%	24%	4%	50%	
Turn Type	Perm	NA	Perm	Prot	NA	Prot	NA	Perm	Perm	NA	Perm	
Protected Phases	2		1	6		3	8		8	4	4	
Permitted Phases												
Actuated Green, G (s)	40.8	40.8	40.8	16.9	62.2		9.9	54.6	54.6	40.2	40.2	
Effective Green, g (s)	40.8	40.8	40.8	16.9	62.2		9.9	54.6	54.6	40.2	40.2	
Actuated g/C Ratio	0.31	0.31	0.31	0.13	0.48		0.08	0.42	0.42	0.31	0.31	
Clearance Time (s)	6.6	6.6	6.6	4.5	6.6		4.5	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	107	1567	483	418	2296		207	2138	672	199	1085	336
v/s Ratio Prot	c0.31		c0.12	0.26			c0.07	0.09		c0.30		
v/s Ratio Perm	0.03		0.03							0.24	0.11	0.02
v/c Ratio	0.09	0.97	0.11	0.94	0.54		0.90	0.21	0.57	0.35	0.98	0.06
Uniform Delay, d1	31.5	44.1	31.7	56.0	23.8		59.6	24.0	28.7	34.7	44.4	31.6
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	16.7	0.1	29.3	0.2		35.6	0.2	3.4	4.7	22.1	0.3
Delay (s)	31.9	60.7	31.8	85.3	24.0		95.2	24.2	32.1	39.5	66.6	31.9
Level of Service	C	E	C	F	C		F	C	C	D	E	C
Approach Delay (s)	57.7						38.8			38.9		63.2
Approach LOS	E						D			D		E
<b>Intersection Summary</b>												
HCM 2000 Control Delay	49.5											D
HCM 2000 Volume to Capacity ratio	0.96											
Actuated Cycle Length (s)	130.0											22.2
Intersection Capacity Utilization	84.7%											E
Analysis Period (min)	15											
c Critical Lane Group												

Timings  
2: Chinguacousy Road & Old School Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓
Traffic Volume (vph)	22	558	86	246	38	303	38	845
Future Volume (vph)	22	558	86	246	38	303	38	845
Lane Group Flow (vph)	24	664	93	276	41	442	41	923
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6	
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.06	0.91	0.54	0.39	0.48	0.32	0.11	0.64
Control Delay	8.8	34.1	26.1	11.5	35.7	7.5	9.4	13.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.8	34.1	26.1	11.5	35.7	7.5	9.4	13.3
Queue Length 50th (m)	1.1	45.2	5.2	14.2	2.3	8.5	1.9	28.9
Queue Length 95th (m)	4.1	#99.7	#21.5	27.8	#13.8	15.8	6.2	44.0
Internal Link Dist (m)	414.1	424.5		2089.6		405.3		
Turn Bay Length (m)	100.0	100.0		100.0		100.0		
Base Capacity (vph)	448	747	178	726	86	1398	385	1446
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.89	0.52	0.38	0.48	0.32	0.11	0.64
Intersection Summary								
Cycle Length: 45								
Actuated Cycle Length: 44.5								
Natural Cycle: 45								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 2: Chinguacousy Road & Old School Road



HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓	↑	↓	↑	↓
Traffic Volume (vph)	22	558	52	86	246	8	38	303	104	38	845	5
Future Volume (vph)	22	558	52	86	246	8	38	303	104	38	845	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00
Frt	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1828	1825	1790	913	3290	1825	3576				
Flt Permitted	0.58	1.00	0.23	1.00	0.22	1.00	0.50	1.00	0.29	1.00	0.29	1.00
Satd. Flow (perm)	1108	1828	439	1790	213	3290	952	3576				
Peak-hour factor, PHF	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)	24	607	57	93	267	9	41	329	113	41	918	5
RTOR Reduction (vph)	0	8	0	0	2	0	0	67	0	0	1	0
Lane Group Flow (vph)	24	656	0	93	274	0	41	375	0	41	922	0
Heavy Vehicles (%)	0%	1%	33%	0%	7%	0%	100%	9%	0%	0%	2%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	17.5	17.5	17.5	17.5	17.5	17.5	18.0	18.0	18.0	18.0	18.0	18.0
Effective Green, g (s)	17.5	17.5	17.5	17.5	17.5	17.5	18.0	18.0	18.0	18.0	18.0	18.0
Actuated g/C Ratio	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.40	0.40	0.40	0.40	0.40
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	435	718	172	703	86	1330	385	1446				
v/s Ratio Prot	c0.36		0.15		0.11		c0.26					
v/s Ratio Perm	0.02		0.21		0.19		0.04					
v/c Ratio	0.06	0.91	0.54	0.39	0.48	0.28	0.11	0.64				
Uniform Delay, d1	8.4	12.8	10.4	9.7	9.8	8.9	8.2	10.6				
Progression 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
Incremental Delay, d2	0.1	16.1	3.4	0.4	17.7	0.5	0.6	2.2				
Delay (s)	8.4	28.9	13.8	10.0	27.5	9.4	8.8	12.8				
Level of Service	A	C	B	B	C	A	A	B				
Approach Delay (s)	28.2		11.0		11.0		11.0		12.6			
Approach LOS	C		B		B		B		B			
Intersection Summary												
HCM 2000 Control Delay	16.3											
HCM 2000 Volume to Capacity ratio	0.77											
Actuated Cycle Length (s)	44.5											
Intersection Capacity Utilization	80.0%											
Analysis Period (min)	15											
c Critical Lane Group												

Timings  
3: Chinguacousy Road & Spine Road

FUT 2051 AM (GTA W))

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	134	168	525	124	156	994
Future Volume (vph)	134	168	525	124	156	994
Lane Group Flow (vph)	146	183	571	135	170	1080
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
v/c Ratio	0.36	0.37	0.26	0.13	0.34	0.50
Control Delay	13.9	5.5	5.4	1.9	8.6	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.9	5.5	5.4	1.9	8.6	6.9
Queue Length 50th (m)	7.0	0.7	8.4	0.0	5.1	19.1
Queue Length 95th (m)	16.1	9.5	17.4	4.9	16.8	37.2
Internal Link Dist (m)	108.0		938.0		2089.6	
Turn Bay Length (m)				100.0	100.0	
Base Capacity (vph)	890	880	2159	1019	496	2159
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.21	0.26	0.13	0.34	0.50
Intersection Summary						
Cycle Length: 45						
Actuated Cycle Length: 36.2						
Natural Cycle: 45						
Control Type: Semi Act-Uncoord						
Splits and Phases: 3: Chinguacousy Road & Spine Road						

HCM Signalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

FUT 2051 AM (GTA W))

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	134	168	525	124	156	994
Future Volume (vph)	134	168	525	124	156	994
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
FrI	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	3579	1601	1789	3579
Flt Permitted	0.95	1.00	1.00	1.00	0.44	1.00
Satd. Flow (perm)	1789	1601	3579	1601	824	3579
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	146	183	571	135	170	1080
RTOR Reduction (vph)	0	135	0	59	0	0
Lane Group Flow (vph)	146	48	571	76	170	1080
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Actuated Green, G (s)	7.1	7.1	21.0	21.0	21.0	21.0
Effective Green, g (s)	7.1	7.1	21.0	21.0	21.0	21.0
Actuated g/C Ratio	0.19	0.19	0.57	0.57	0.57	0.57
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	342	306	2025	906	466	2025
v/s Ratio Prot	c0.08		0.16		c0.30	
v/s Ratio Perm		0.03		0.05	0.21	
v/c Ratio	0.43	0.16	0.28	0.08	0.36	0.53
Uniform Delay, d1	13.2	12.5	4.2	3.7	4.4	5.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.2	0.3	0.2	2.2	1.0
Delay (s)	14.1	12.7	4.5	3.9	6.6	6.0
Level of Service	B	B	A	A	A	A
Approach Delay (s)	13.3		4.4		6.1	
Approach LOS	B		A		A	
Intersection Summary						
HCM 2000 Control Delay			6.6		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.51			
Actuated Cycle Length (s)			37.1		Sum of lost time (s)	9.0
Intersection Capacity Utilization			42.4%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

## Timings

### 1: Chinguacousy Road & Mayfield Road

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑
Traffic Volume (vph)	14	1143	77	410	1308	296	796	801	27	335	23
Future Volume (vph)	14	1143	77	410	1308	296	796	801	27	335	23
Lane Group Flow (vph)	15	1191	80	427	1402	308	829	834	28	349	24
Turn Type	Perm	NA	Perm	Prot	NA	Prot	NA	Perm	Perm	NA	Perm
Protected Phases	2			1	6	3	8	8	4	4	4
Permitted Phases	2	2	2	1	6	3	8	8	4	4	4
Detector Phase											
Switch Phase											
Minimum Initial (s)	12.0	12.0	12.0	5.0	12.0	5.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	23.6	9.5	23.6	9.5	23.6	23.6	23.6	23.6	23.6
Total Split (s)	30.0	30.0	30.0	16.6	46.6	18.4	43.4	43.4	25.0	25.0	25.0
Total Split (%)	33.3%	33.3%	33.3%	18.4%	51.8%	20.4%	48.2%	48.2%	27.8%	27.8%	27.8%
Yellow Time (s)	4.6	4.6	4.6	3.5	4.6	3.5	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes							
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max
v/c Ratio	0.17	0.92	0.15	0.91	0.63	0.66	0.40	0.99	0.24	0.44	0.06
Control Delay	31.4	44.8	0.6	63.5	20.7	43.9	19.5	44.7	36.1	32.9	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.4	44.8	0.6	63.5	20.7	43.9	19.5	44.7	36.1	32.9	0.3
Queue Length 50th (m)	2.0	73.3	0.0	38.0	65.8	26.0	36.1	91.1	4.1	28.0	0.0
Queue Length 95th (m)	7.5	#99.2	0.4	#64.1	80.5	38.9	46.4	#177.1	12.1	41.2	0.0
Internal Link Dist (m)	324.8			438.2		224.1			938.0		
Turn Bay Length (m)	100.0		100.0		100.0		100.0		100.0		100.0
Base Capacity (vph)	89	1298	517	471	2238	511	2062	844	117	789	432
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.92	0.15	0.91	0.63	0.60	0.40	0.99	0.24	0.44	0.06
<b>Intersection Summary</b>											
Cycle Length: 90											
Actuated Cycle Length: 90											
Natural Cycle: 90											
Control Type: Semi Act-Uncoord											
# 95th percentile volume exceeds capacity, queue may be longer.											
Queue shown is maximum after two cycles.											

Splits and Phases: 1: Chinguacousy Road & Mayfield Road



## HCM Signalized Intersection Capacity Analysis

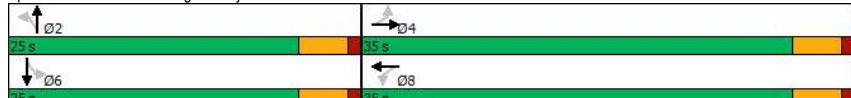
### 1: Chinguacousy Road & Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑
Traffic Volume (vph)	14	1143	77	410	1308	296	796	801	27	335	23	23
Future Volume (vph)	14	1143	77	410	1308	296	796	801	27	335	23	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	0.97	0.91	1.00	1.00	0.95	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1825	4995	1555	3506	5027		3309	5043	1526	1560	3614	1432
Flt Permitted	0.18	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	346	4995	1555	3506	5027		3309	5043	1526	1538	3614	1432
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	15	1191	80	427	1362	39	308	829	834	28	349	24
RTOR Reduction (vph)	0	0	59	0	3	0	0	0	0	0	0	19
Lane Group Flow (vph)	15	1191	21	427	1399	0	308	829	614	28	349	5
Heavy Vehicles (%)	0%	5%	5%	1%	4%	0%	7%	4%	7%	17%	1%	14%
Turn Type	Perm	NA	Perm	Prot	NA	Prot	NA	Perm	Perm	NA	Perm	NA
Protected Phases	2		1	6			3	8		4	4	4
Permitted Phases	2		2						8	4		4
Actuated Green, G (s)	23.4	23.4	23.4	12.1	40.0		12.6	36.8	36.8	19.7	19.7	19.7
Effective Green, g (s)	23.4	23.4	23.4	12.1	40.0		12.6	36.8	36.8	19.7	19.7	19.7
Actuated g/C Ratio	0.26	0.26	0.26	0.13	0.44		0.14	0.41	0.41	0.22	0.22	0.22
Clearance Time (s)	6.6	6.6	6.6	4.5	6.6		4.5	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	89	1298	404	471	2234		463	2062	623	117	791	313
v/s Ratio Prot	c0.24		c0.12	0.28			0.09	0.16		0.10		
v/s Ratio Perm	0.04		0.01						0.40	0.05		0.00
v/c Ratio	0.17	0.92	0.05	0.91	0.63		0.67	0.40	0.98	0.24	0.44	0.02
Uniform Delay, d1	25.8	32.4	25.0	38.4	19.2		36.7	18.8	26.3	29.0	30.4	27.6
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	10.3	0.1	20.8	0.6		3.6	0.6	32.5	4.8	1.8	0.1
Delay (s)	26.7	42.7	25.0	59.2	19.8		40.3	19.4	58.8	33.7	32.2	27.7
Level of Service	C	D	C	E	B		D	B	E	C	C	C
Approach Delay (s)	41.4						29.0			39.4		32.0
Approach LOS	D		C				D			C		
<b>Intersection Summary</b>												
HCM 2000 Control Delay							35.8					D
HCM 2000 Volume to Capacity ratio							1.01					
Actuated Cycle Length (s)							90.0			Sum of lost time (s)		22.2
Intersection Capacity Utilization							98.2%			ICU Level of Service		F
Analysis Period (min)							15					
c Critical Lane Group												

Timings  
2: Chinguacousy Road & Old School Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓
Traffic Volume (vph)	19	266	94	733	44	697	12	230
Future Volume (vph)	19	266	94	733	44	697	12	230
Lane Group Flow (vph)	21	301	102	838	48	960	13	263
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6	
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	35.0	35.0	35.0	35.0	25.0	25.0	25.0	25.0
Total Split (%)	58.3%	58.3%	58.3%	58.3%	41.7%	41.7%	41.7%	41.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.16	0.32	0.23	0.90	0.12	0.76	0.10	0.22
Control Delay	11.6	9.8	10.0	28.8	14.6	20.8	15.9	13.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.6	9.8	10.0	28.8	14.6	20.8	15.9	13.9
Queue Length 50th (m)	1.1	17.4	5.7	74.0	3.6	45.6	1.0	10.2
Queue Length 95th (m)	4.8	30.6	13.5	#143.6	9.7	65.8	4.4	17.5
Internal Link Dist (m)	414.1		424.5		2089.6		405.3	
Turn Bay Length (m)	100.0		100.0		100.0		100.0	
Base Capacity (vph)	141	1009	469	999	400	1271	132	1199
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.30	0.22	0.84	0.12	0.76	0.10	0.22
Intersection Summary								
Cycle Length: 60								
Actuated Cycle Length: 58.1								
Natural Cycle: 60								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 2: Chinguacousy Road & Old School Road



HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

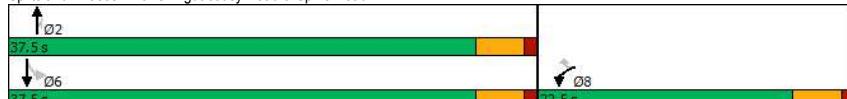
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑	↓	↑	↓	↑	↓	↑	↓	↑	↓
Traffic Volume (vph)	19	266	11	94	733	38	44	697	186	12	230	12
Future Volume (vph)	19	266	11	94	733	38	44	697	186	12	230	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95
Frt	1.00	0.99	1.00	0.99	1.00	0.97	1.00	0.99	1.00	0.99	1.00	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1910	1547	1889	1825	3480	1825	3367	1825	3480	1825	3367
Flt Permitted	0.14	1.00	0.55	1.00	0.59	1.00	0.19	1.00	0.20	1.00	0.19	1.00
Satd. Flow (perm)	270	1910	891	1889	1132	3480	373	3367	373	3480	373	3367
Peak-hour factor, PHF	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)	21	289	12	102	797	41	48	758	202	13	250	13
RTOR Reduction (vph)	0	3	0	0	3	0	0	39	0	0	6	0
Lane Group Flow (vph)	21	298	0	102	835	0	48	921	0	13	257	0
Heavy Vehicles (%)	0%	0%	0%	18%	1%	0%	0%	2%	0%	0%	8%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	28.5	28.5	28.5	28.5	28.5	28.5	20.6	20.6	20.6	20.6	20.6	20.6
Effective Green, g (s)	28.5	28.5	28.5	28.5	28.5	28.5	20.6	20.6	20.6	20.6	20.6	20.6
Actuated g/C Ratio	0.49	0.49	0.49	0.49	0.49	0.49	0.35	0.35	0.35	0.35	0.35	0.35
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	132	936	437	926	401	1233	132	1193				
v/s Ratio Prot	0.16		c0.44		c0.26		0.08					
v/s Ratio Perm	0.08		0.11		0.04		0.12					
v/c Ratio	0.16	0.32	0.23	0.90	0.12	0.75	0.10	0.22				
Uniform Delay, d1	8.2	8.9	8.5	13.5	12.6	16.5	12.5	13.1				
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Incremental Delay, d2	0.6	0.2	0.3	11.8	0.6	4.2	1.5	0.4				
Delay (s)	8.7	9.1	8.8	25.3	13.2	20.6	14.0	13.5				
Level of Service	A	A	A	C	B	C	B	B				
Approach Delay (s)	9.1		23.5		20.3		13.5					
Approach LOS	A		C		C		B					
Intersection Summary												
HCM 2000 Control Delay	19.3											
HCM 2000 Volume to Capacity ratio	0.84											
Actuated Cycle Length (s)	58.1											
Intersection Capacity Utilization	89.4%											
Analysis Period (min)	15											
c Critical Lane Group												

## Timings

### 3: Chinguacousy Road & Spine Road

	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	56	286	824	226	161	572
Future Volume (vph)	56	286	824	226	161	572
Lane Group Flow (vph)	61	311	896	246	175	622
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	37.5	37.5	37.5	37.5
Total Split (%)	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
v/c Ratio	0.16	0.71	0.40	0.23	0.51	0.28
Control Delay	17.3	20.3	6.7	1.6	14.6	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.3	20.3	6.7	1.6	14.6	5.9
Queue Length 50th (m)	4.8	15.8	19.6	0.0	8.0	12.4
Queue Length 95th (m)	12.0	36.3	39.5	7.6	#33.8	25.8
Internal Link Dist (m)	108.0		938.0		2089.6	
Turn Bay Length (m)			100.0	100.0		
Base Capacity (vph)	585	609	2231	1091	341	2231
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.51	0.40	0.23	0.51	0.28
Intersection Summary						
Cycle Length: 60						
Actuated Cycle Length: 55.2						
Natural Cycle: 60						
Control Type: Semi Act-Uncoord						
# 95th percentile volume exceeds capacity, queue may be longer.						
Queue shown is maximum after two cycles.						

Splits and Phases: 3: Chinguacousy Road & Spine Road



## HCM Signalized Intersection Capacity Analysis

### 3: Chinguacousy Road & Spine Road

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	56	286	824	226	161	572
Future Volume (vph)	56	286	824	226	161	572
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	3579	1601	1789	3579
Flt Permitted	0.95	1.00	1.00	1.00	0.29	1.00
Satd. Flow (perm)	1789	1601	3579	1601	548	3579
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	311	896	246	175	622
RTOR Reduction (vph)	0	100	0	93	0	0
Lane Group Flow (vph)	61	211	896	153	175	622
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Actuated Green, G (s)	11.8	11.8	34.4	34.4	34.4	34.4
Effective Green, g (s)	11.8	11.8	34.4	34.4	34.4	34.4
Actuated g/C Ratio	0.21	0.21	0.62	0.62	0.62	0.62
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	382	342	2230	997	341	2230
v/s Ratio Prot	0.03		0.25		0.17	
v/s Ratio Perm	c0.13		0.10		c0.32	
v/c Ratio	0.16	0.62	0.40	0.15	0.51	0.28
Uniform Delay, d1	17.7	19.7	5.2	4.3	5.8	4.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	3.3	0.5	0.3	5.4	0.3
Delay (s)	17.9	23.0	5.8	4.7	11.2	5.1
Level of Service	B	C	A	A	B	A
Approach Delay (s)	22.1		5.5		6.4	
Approach LOS	C		A		A	
Intersection Summary						
HCM 2000 Control Delay		8.5				
HCM 2000 Volume to Capacity ratio		0.54				
Actuated Cycle Length (s)		55.2				
Intersection Capacity Utilization		48.0%				
Analysis Period (min)		15				
c Critical Lane Group						

## Timings

## 1: Chinguacousy Road &amp; Mayfield Road

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑
Traffic Volume (vph)	13	1675	182	391	1218	168	403	507	60	949	55
Future Volume (vph)	13	1675	182	391	1218	168	403	507	60	949	55
Lane Group Flow (vph)	15	1903	207	444	1397	191	458	576	68	1078	63
Turn Type	Perm	NA	Perm	Prot	NA	Prot	NA	Perm	Perm	NA	Perm
Protected Phases	2		2	1	6	3	8	8	4	4	4
Permitted Phases	2	2	2	1	6	3	8	8	4	4	4
Detector Phase	2	2	2	1	6	3	8	8	4	4	4
Switch Phase											
Minimum Initial (s)	12.0	12.0	12.0	5.0	12.0	5.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	23.6	9.5	23.6	9.5	23.6	23.6	23.6	23.6	23.6
Total Split (s)	62.0	62.0	62.0	24.1	86.1	13.9	63.9	63.9	50.0	50.0	50.0
Total Split (%)	41.3%	41.3%	41.3%	16.1%	57.4%	9.3%	42.6%	42.6%	33.3%	33.3%	33.3%
Yellow Time (s)	4.6	4.6	4.6	3.5	4.6	3.5	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	4.5	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max
v/c Ratio	0.14	1.03	0.31	1.06	0.55	1.12	0.24	0.73	0.37	1.06	0.17
Control Delay	35.8	75.6	11.4	120.4	24.4	166.6	31.9	25.3	49.5	96.5	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.8	75.6	11.4	120.4	24.4	166.6	31.9	25.3	49.5	96.5	3.5
Queue Length 50th (m)	3.0	-221.5	11.5	-74.2	98.2	-33.6	33.7	77.4	16.2	-185.0	0.0
Queue Length 95th (m)	8.7	#239.7	28.9	#104.7	108.1	#57.4	41.7	117.8	30.8	#218.8	4.3
Internal Link Dist (m)		324.8		438.2		224.1		938.0			
Turn Bay Length (m)	100.0		100.0		100.0		100.0		100.0		
Base Capacity (vph)	107	1844	662	420	2544	170	1945	788	184	1015	380
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	1.03	0.31	1.06	0.55	1.12	0.24	0.73	0.37	1.06	0.17

## Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 150

Natural Cycle: 150

Control Type: Semi Act-Uncoord

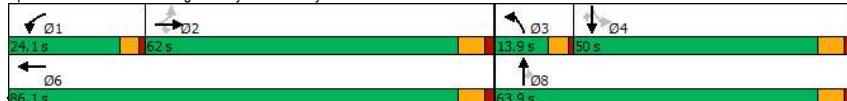
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

## Splits and Phases: 1: Chinguacousy Road &amp; Mayfield Road



## FUT 2051 AM (No GTA W))

## HCM Signalized Intersection Capacity Analysis

## 1: Chinguacousy Road &amp; Mayfield Road

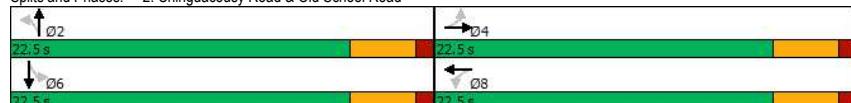
## FUT 2051 AM (No GTA W))

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑
Traffic Volume (vph)	13	1675	182	391	1218	168	403	507	60	949	55	55
Future Volume (vph)	13	1675	182	391	1218	168	403	507	60	949	55	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	0.97	0.91	1.00	1.00	0.95	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1521	4995	1541	3219	4798	2724	5092	1601	1267	3510	1089	1089
Flt Permitted	0.18	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	290	4995	1541	3219	4798	2724	5092	1601	1267	3510	1089	1089
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	15	1903	207	444	1384	12	191	458	576	68	1078	62
RTOR Reduction (vph)	0	0	93	0	0	0	0	0	0	0	0	45
Lane Group Flow (vph)	15	1903	114	444	1397	0	191	458	399	68	1078	18
Heavy Vehicles (%)	20%	5%	6%	10%	9%	25%	30%	3%	2%	44%	4%	50%
Turn Type	Perm	NA	Perm	Prot	NA	Prot	NA	Perm	Perm	NA	Perm	4
Protected Phases	2		2	1	6		3	8	4	4	4	4
Permitted Phases	2		2	2					8	4	4	4
Actuated Green, G (s)	55.4	55.4	55.4	19.6	79.5	9.4	57.3	57.3	43.4	43.4	43.4	43.4
Effective Green, g (s)	55.4	55.4	55.4	19.6	79.5	9.4	57.3	57.3	43.4	43.4	43.4	43.4
Actuated g/C Ratio	0.37	0.37	0.37	0.13	0.53	0.06	0.38	0.38	0.29	0.29	0.29	0.29
Clearance Time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	107	1844	569	420	2542	170	1945	611	184	1015	315	315
v/s Ratio Prot	c0.38		c0.14	0.29		c0.07	0.09		c0.31			
v/s Ratio Perm	0.05		0.07				0.25	0.11		0.02		
v/c Ratio	0.14	1.03	0.20	1.06	0.55	1.12	0.24	0.65	0.37	1.06	0.06	
Uniform Delay, d1	31.5	47.3	32.2	65.2	23.4	70.3	31.5	38.2	42.4	53.3	38.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.6	29.7	0.2	59.8	0.2	106.1	0.3	5.4	5.6	46.3	0.4	
Delay (s)	32.1	77.0	32.4	125.0	23.6	176.4	31.8	43.5	48.0	99.6	38.9	
Level of Service	C	E	C	F	C	F	C	D	D	F		
Approach Delay (s)	72.3				48.1			59.8		93.5		
Approach LOS	E		D				E			F		

Timings  
2: Chinguacousy Road & Old School Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓
Traffic Volume (vph)	22	558	86	246	40	306	40	858
Future Volume (vph)	22	558	86	246	40	306	40	858
Lane Group Flow (vph)	24	664	93	276	43	449	43	940
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6	
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.06	0.91	0.54	0.39	0.50	0.32	0.11	0.65
Control Delay	8.8	34.1	26.1	11.5	37.8	7.5	9.5	13.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.8	34.1	26.1	11.5	37.8	7.5	9.5	13.4
Queue Length 50th (m)	1.1	45.2	5.2	14.2	2.4	8.6	2.0	29.7
Queue Length 95th (m)	4.1	#99.7	#21.5	27.8	#14.3	16.1	6.4	44.9
Internal Link Dist (m)	414.1	424.5		2089.6		405.3		
Turn Bay Length (m)	100.0	100.0		100.0		100.0		
Base Capacity (vph)	448	747	178	726	86	1398	382	1447
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.89	0.52	0.38	0.50	0.32	0.11	0.65
Intersection Summary								
Cycle Length: 45								
Actuated Cycle Length: 44.5								
Natural Cycle: 45								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 2: Chinguacousy Road & Old School Road

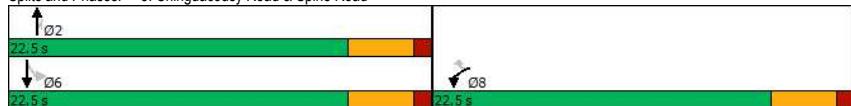


HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓	↑	↓	↑	↓
Traffic Volume (vph)	22	558	52	86	246	8	40	306	107	40	858	6
Future Volume (vph)	22	558	52	86	246	8	40	306	107	40	858	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
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	0.95
Frt	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1828	1825	1790	913	3289	1825	3575				
Flt Permitted	0.58	1.00	0.23	1.00	0.22	1.00	0.49	1.00	0.29	1.00	0.49	1.00
Satd. Flow (perm)	1108	1828	439	1790	213	3289	946	3575				
Peak-hour factor, PHF	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)	24	607	57	93	267	9	43	333	116	43	933	7
RTOR Reduction (vph)	0	8	0	0	2	0	0	69	0	0	1	0
Lane Group Flow (vph)	24	656	0	93	274	0	43	380	0	43	939	0
Heavy Vehicles (%)	0%	1%	33%	0%	7%	0%	100%	9%	0%	0%	2%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	17.5	17.5	17.5	17.5	17.5	17.5	18.0	18.0	18.0	18.0	18.0	18.0
Effective Green, g (s)	17.5	17.5	17.5	17.5	17.5	17.5	18.0	18.0	18.0	18.0	18.0	18.0
Actuated g/C Ratio	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.40	0.40	0.40	0.40	0.40
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	435	718	172	703	86	1330	382	1446				
v/s Ratio Prot	c0.36		0.15		0.12		c0.26					
v/s Ratio Perm	0.02		0.21		0.20		0.05					
v/c Ratio	0.06	0.91	0.54	0.39	0.50	0.29	0.11	0.65				
Uniform Delay, d1	8.4	12.8	10.4	9.7	9.9	8.9	8.3	10.7				
Progression 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
Incremental Delay, d2	0.1	16.1	3.4	0.4	19.3	0.5	0.6	2.3				
Delay (s)	8.4	28.9	13.8	10.0	29.2	9.5	8.9	13.0				
Level of Service	A	C	B	B	C	A	A	B				
Approach Delay (s)	28.2		11.0		11.2		12.8					
Approach LOS	C		B		B		B					
Intersection Summary												
HCM 2000 Control Delay	16.4											
HCM 2000 Volume to Capacity ratio	0.78											
Actuated Cycle Length (s)	44.5											
Intersection Capacity Utilization	80.4%											
Analysis Period (min)	15											
c Critical Lane Group												

Timings  
3: Chinguacousy Road & Spine Road

FUT 2051 AM (No GTA W))

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	134	168	539	124	156	1010
Future Volume (vph)	134	168	539	124	156	1010
Lane Group Flow (vph)	146	183	586	135	170	1098
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
v/c Ratio	0.36	0.38	0.27	0.13	0.35	0.51
Control Delay	13.9	5.9	5.4	1.9	8.7	7.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.9	5.9	5.4	1.9	8.7	7.0
Queue Length 50th (m)	7.0	1.1	8.6	0.0	5.0	19.5
Queue Length 95th (m)	16.1	9.9	17.8	4.9	17.0	38.0
Internal Link Dist (m)	108.0		938.0		2089.6	
Turn Bay Length (m)			100.0	100.0		
Base Capacity (vph)	890	876	2159	1019	490	2159
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.21	0.27	0.13	0.35	0.51
<b>Intersection Summary</b>						
Cycle Length: 45						
Actuated Cycle Length: 36.2						
Natural Cycle: 45						
Control Type: Semi Act-Uncoord						
Splits and Phases: 3: Chinguacousy Road & Spine Road						
						

HCM Signalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

FUT 2051 AM (No GTA W))

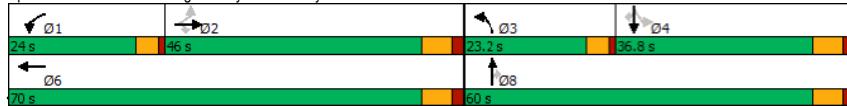
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	134	168	539	124	156	1010
Future Volume (vph)	134	168	539	124	156	1010
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
FrI	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	3579	1601	1789	3579
Flt Permitted	0.95	1.00	1.00	1.00	0.43	1.00
Satd. Flow (perm)	1789	1601	3579	1601	812	3579
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	146	183	586	135	170	1098
RTOR Reduction (vph)	0	129	0	59	0	0
Lane Group Flow (vph)	146	54	586	76	170	1098
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Actuated Green, G (s)	7.1	7.1	21.0	21.0	21.0	21.0
Effective Green, g (s)	7.1	7.1	21.0	21.0	21.0	21.0
Actuated g/C Ratio	0.19	0.19	0.57	0.57	0.57	0.57
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	342	306	2025	906	459	2025
v/s Ratio Prot	c0.08		0.16		c0.31	
v/s Ratio Perm		0.03		0.05	0.21	
v/c Ratio	0.43	0.18	0.29	0.08	0.37	0.54
Uniform Delay, d1	13.2	12.6	4.2	3.7	4.4	5.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.3	0.4	0.2	2.3	1.0
Delay (s)	14.1	12.8	4.5	3.9	6.7	6.1
Level of Service	B	B	A	A	A	A
Approach Delay (s)	13.4		4.4		6.2	
Approach LOS	B		A		A	
<b>Intersection Summary</b>						
HCM 2000 Control Delay		6.6				
HCM 2000 Volume to Capacity ratio		0.51				
Actuated Cycle Length (s)		37.1				
Intersection Capacity Utilization		42.8%				
Analysis Period (min)		15				
c Critical Lane Group						

## Timings

### 1: Chinguacousy Road & Mayfield Road

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑	↑	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑
Traffic Volume (vph)	19	1426	97	464	1478	300	809	813	29	340	23
Future Volume (vph)	19	1426	97	464	1478	300	809	813	29	340	23
Lane Group Flow (vph)	20	1485	101	483	1584	313	843	847	30	354	24
Turn Type	Perm	NA	Perm	Prot	NA	Prot	NA	Perm	Perm	NA	Perm
Protected Phases	2		1	6	3	8		8	4		4
Permitted Phases	2	2	2	1	6	3	8	8	4	4	4
Detector Phase											
Switch Phase											
Minimum Initial (s)	12.0	12.0	12.0	5.0	12.0	5.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	23.6	9.5	23.6	9.5	23.6	23.6	23.6	23.6	23.6
Total Split (s)	46.0	46.0	46.0	24.0	70.0	23.2	60.0	60.0	36.8	36.8	36.8
Total Split (%)	35.4%	35.4%	35.4%	18.5%	53.8%	17.8%	46.2%	46.2%	28.3%	28.3%	28.3%
Yellow Time (s)	4.6	4.6	4.6	3.5	4.6	3.5	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	4.5	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max
v/c Ratio	0.24	0.98	0.19	0.92	0.65	0.74	0.41	1.01	0.23	0.40	0.06
Control Delay	43.2	63.9	6.3	78.8	26.4	65.3	27.8	55.4	45.8	42.8	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.2	63.9	6.3	78.8	26.4	65.3	27.8	55.4	45.8	42.8	0.3
Queue Length 50th (m)	3.9	138.3	0.0	63.6	108.1	40.0	55.2	-156.6	6.2	40.4	0.0
Queue Length 95th (m)	11.7	#171.5	11.7	#94.1	124.0	54.9	66.8	#245.5	15.7	55.6	0.0
Internal Link Dist (m)	324.8			438.2		224.1			938.0		
Turn Bay Length (m)	100.0		100.0		100.0		100.0		100.0		
Base Capacity (vph)	83	1514	545	525	2455	475	2072	840	131	896	435
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.98	0.19	0.92	0.65	0.66	0.41	1.01	0.23	0.40	0.06
<b>Intersection Summary</b>											
Cycle Length: 130											
Actuated Cycle Length: 129.9											
Natural Cycle: 100											
Control Type: Semi Act-Uncoord											
~ Volume exceeds capacity, queue is theoretically infinite.											
Queue shown is maximum after two cycles.											
# 95th percentile volume exceeds capacity, queue may be longer.											
Queue shown is maximum after two cycles.											

Splits and Phases: 1: Chinguacousy Road & Mayfield Road



051561\_Chinguacousy EA\_2051 No GTAW.syn  
R.J. Burnside & Associates Limited

Synchro 11 Report  
03/18/2022 - Page 1

## HCM Signalized Intersection Capacity Analysis

### 1: Chinguacousy Road & Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR
Lane Configurations	↑	↑↑	↑	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑
Traffic Volume (vph)	19	1426	97	464	1478	42	300	809	813	29	340
Future Volume (vph)	19	1426	97	464	1478	42	300	809	813	29	340
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	0.97	0.91	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1825	4995	1555	3506	5027		3309	5043	1526	1560	3614
Flt Permitted	0.14	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.32	1.00	1.00
Satd. Flow (perm)	276	4995	1555	3506	5027		3309	5043	1526	530	3614
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	20	1485	101	483	1540	44	312	843	847	30	354
RTOR Reduction (vph)	0	0	70	0	2	0	0	0	213	0	18
Lane Group Flow (vph)	20	1485	31	483	1582	0	313	843	634	30	354
Heavy Vehicles (%)	0%	5%	5%	1%	4%	0%	7%	4%	17%	1%	14%
Turn Type	Perm	NA	Perm	Prot	NA	Prot	NA	Perm	Perm	NA	Perm
Protected Phases	2		1	6			3	8		4	
Permitted Phases				2					8	4	
Actuated Green, G (s)	39.4	39.4	39.4	19.4	63.3		16.7	53.4	32.2	32.2	32.2
Effective Green, g (s)	39.4	39.4	39.4	19.4	63.3		16.7	53.4	32.2	32.2	32.2
Actuated g/C Ratio	0.30	0.30	0.30	0.15	0.49		0.13	0.41	0.25	0.25	0.25
Clearance Time (s)	6.6	6.6	6.6	4.5	6.6		4.5	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	83	1515	471	523	2449		425	2073	627	131	895
v/s Ratio Prot	c0.30		c0.14	0.31			0.09	0.17		0.10	
v/s Ratio Perm	0.07		0.02						c0.42	0.06	0.00
v/c Ratio	0.24	0.98	0.07	0.92	0.65		0.74	0.41	1.01	0.23	0.40
Uniform Delay, d1	34.0	44.9	32.2	54.5	24.9		54.5	27.0	38.2	39.0	40.7
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5	18.5	0.1	22.1	0.6		6.5	0.6	38.7	4.0	1.3
Delay (s)	35.5	63.4	32.2	76.6	25.5		61.0	27.6	76.9	43.0	42.0
Level of Service	D	E	C	E	C		E	C	E	D	D
Approach Delay (s)	61.1				37.4				53.7		41.8
Approach LOS	E			D			D		D		D

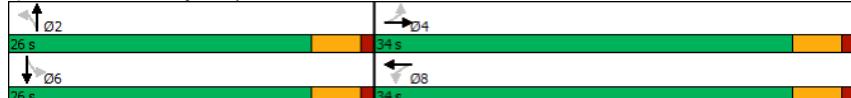
051561\_Chinguacousy EA\_2051 No GTAW.syn  
R.J. Burnside & Associates Limited

Synchro 11 Report  
03/18/2022 - Page 2

Timings  
2: Chinguacousy Road & Old School Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓
Traffic Volume (vph)	19	266	94	733	44	709	10	235
Future Volume (vph)	19	266	94	733	44	709	10	235
Lane Group Flow (vph)	21	301	102	838	48	979	11	266
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6	
Permitted Phases	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	34.0	34.0	34.0	34.0	26.0	26.0	26.0	26.0
Total Split (%)	56.7%	56.7%	56.7%	56.7%	43.3%	43.3%	43.3%	43.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.16	0.33	0.24	0.92	0.12	0.74	0.08	0.21
Control Delay	12.2	10.4	10.7	32.3	13.9	19.7	14.9	13.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.2	10.4	10.7	32.3	13.9	19.7	14.9	13.4
Queue Length 50th (m)	1.2	18.2	6.0	77.2	3.5	45.5	0.8	10.1
Queue Length 95th (m)	5.0	31.9	14.1	#147.6	9.4	65.4	3.8	17.3
Internal Link Dist (m)	414.1		424.5		2089.6		405.3	
Turn Bay Length (m)	100.0		100.0		100.0		100.0	
Base Capacity (vph)	137	963	444	954	414	1316	130	1241
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.31	0.23	0.88	0.12	0.74	0.08	0.21
Intersection Summary								
Cycle Length: 60								
Actuated Cycle Length: 58.7								
Natural Cycle: 60								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 2: Chinguacousy Road & Old School Road



HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓	↑	↓	↑	↓
Traffic Volume (vph)	19	266	11	94	733	38	44	709	191	10	235	10
Future Volume (vph)	19	266	11	94	733	38	44	709	191	10	235	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00
Frt	1.00	0.99	1.00	0.99	1.00	0.97	1.00	0.99	1.00	0.99	1.00	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1910	1547	1889	1825	3479	1825	3479	1825	3479	1825	3369
Flt Permitted	0.14	1.00	0.54	1.00	0.59	1.00	0.19	1.00	0.19	1.00	0.19	1.00
Satd. Flow (perm)	272	1910	885	1889	1129	3479	357	3479	357	3479	357	3369
Peak-hour factor, PHF	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)	21	289	12	102	797	41	48	771	208	11	255	11
RTOR Reduction (vph)	0	3	0	0	3	0	0	40	0	0	5	0
Lane Group Flow (vph)	21	298	0	102	835	0	48	939	0	11	261	0
Heavy Vehicles (%)	0%	0%	0%	18%	1%	0%	0%	2%	0%	0%	8%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	28.2	28.2	28.2	28.2	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5
Effective Green, g (s)	28.2	28.2	28.2	28.2	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5
Actuated g/C Ratio	0.48	0.48	0.48	0.48	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	130	917	425	907	413	1274	130	1233				
v/s Ratio Prot	0.16		c0.44		c0.27		0.08					
v/s Ratio Perm	0.08		0.12		0.04		0.12					
v/c Ratio	0.16	0.33	0.24	0.92	0.12	0.74	0.08	0.21				
Uniform Delay, d1	8.6	9.4	9.0	14.2	12.3	16.1	12.2	12.8				
Progression 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
Incremental Delay, d2	0.6	0.2	0.3	14.3	0.6	3.8	1.3	0.4				
Delay (s)	9.2	9.6	9.3	28.5	12.9	20.0	13.4	13.2				
Level of Service	A	A	A	C	B	B	B	B				
Approach Delay (s)	9.6		26.4		19.7		13.2					
Approach LOS	A		C		B		B					
Intersection Summary												
HCM 2000 Control Delay	20.2		HCM 2000 Level of Service		C							
HCM 2000 Volume to Capacity ratio	0.84											
Actuated Cycle Length (s)	58.7		Sum of lost time (s)		9.0							
Intersection Capacity Utilization	89.9%		ICU Level of Service		E							
Analysis Period (min)	15											
c Critical Lane Group												

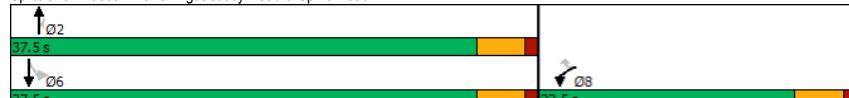
Timings  
3: Chinguacousy Road & Spine Road

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	56	286	847	226	161	579
Future Volume (vph)	56	286	847	226	161	579
Lane Group Flow (vph)	61	311	921	246	175	629
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	37.5	37.5	37.5	37.5
Total Split (%)	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
v/c Ratio	0.16	0.71	0.41	0.23	0.53	0.28
Control Delay	17.2	21.0	6.8	1.6	16.0	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.2	21.0	6.8	1.6	16.0	6.0
Queue Length 50th (m)	4.8	16.6	20.8	0.0	8.4	12.8
Queue Length 95th (m)	12.0	37.3	41.0	7.6	#39.0	26.2
Internal Link Dist (m)	108.0		938.0		2089.6	
Turn Bay Length (m)			100.0	100.0		
Base Capacity (vph)	582	601	2222	1087	328	2222
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.52	0.41	0.23	0.53	0.28

Intersection Summary

Cycle Length: 60  
Actuated Cycle Length: 55.4  
Natural Cycle: 60  
Control Type: Semi Act-Uncoord  
# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

Splits and Phases: 3: Chinguacousy Road & Spine Road



HCM Signalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	56	286	847	226	161	579
Future Volume (vph)	56	286	847	226	161	579
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	3579	1601	1789	3579
Flt Permitted	0.95	1.00	1.00	1.00	0.28	1.00
Satd. Flow (perm)	1789	1601	3579	1601	529	3579
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	311	921	246	175	629
RTOR Reduction (vph)	0	93	0	93	0	0
Lane Group Flow (vph)	61	218	921	153	175	629
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Actuated Green, G (s)	12.0	12.0	34.4	34.4	34.4	34.4
Effective Green, g (s)	12.0	12.0	34.4	34.4	34.4	34.4
Actuated g/C Ratio	0.22	0.22	0.62	0.62	0.62	0.62
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	387	346	2222	994	328	2222
v/s Ratio Prot	0.03		0.26		0.18	
v/s Ratio Perm	c0.14		0.10		c0.33	
v/c Ratio	0.16	0.63	0.41	0.15	0.53	0.28
Uniform Delay, d1	17.6	19.7	5.4	4.4	6.0	4.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	3.6	0.6	0.3	6.1	0.3
Delay (s)	17.8	23.2	5.9	4.7	12.1	5.1
Level of Service	B	C	A	A	B	A
Approach Delay (s)	22.4		5.7		6.7	
Approach LOS	C		A		A	

Intersection Summary

HCM 2000 Control Delay 8.7 HCM 2000 Level of Service A  
HCM 2000 Volume to Capacity ratio 0.56  
Actuated Cycle Length (s) 55.4 Sum of lost time (s) 9.0  
Intersection Capacity Utilization 48.6% ICU Level of Service A  
Analysis Period (min) 15

c Critical Lane Group



[THE DIFFERENCE IS OUR PEOPLE]

---

## Appendix I

### Improved Traffic Operations Synchro Reports

# DRAFT

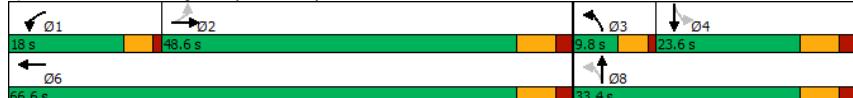
Appendix I

Timings  
1: Chinguacousy Road & Mayfield Road

FUT 2031 AM (No GTA W) Alt B

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	↑↓	↑↓	↑↓↑↓	↑	↑↓	↑↓	↑↓↑↓
Traffic Volume (vph)	8	1077	337	1049	64	154	23	363
Future Volume (vph)	8	1077	337	1049	64	154	23	363
Lane Group Flow (vph)	9	1357	383	1202	73	395	26	437
Turn Type	Perm	NA	Prot	NA	pm+pt	NA	Perm	NA
Protected Phases	2	1	6	3	8	4	4	
Permitted Phases	2	2	1	6	3	8	4	4
Detector Phase								
Switch Phase								
Minimum Initial (s)	12.0	12.0	5.0	12.0	5.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	9.5	23.6	9.5	23.6	23.6	23.6
Total Split (s)	48.6	48.6	18.0	66.6	9.8	33.4	23.6	23.6
Total Split (%)	48.6%	48.6%	18.0%	66.6%	9.8%	33.4%	23.6%	23.6%
Yellow Time (s)	4.6	4.6	3.5	4.6	3.5	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.6	6.6	4.5	6.6	4.5	6.6	6.6	
Lead/Lag	Lag	Lag	Lead	Lead	Lag	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	None	Max	Max	
v/c Ratio	0.06	0.95	0.88	0.42	0.41	0.38	0.20	0.67
Control Delay	18.9	42.5	64.6	11.3	34.6	13.9	40.3	43.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	18.9	42.5	64.6	11.3	34.6	13.9	40.3	43.7
Queue Length 50th (m)	1.0	128.5	38.0	42.0	10.6	13.8	4.4	42.3
Queue Length 95th (m)	4.1	#168.3	#60.5	49.8	21.1	24.9	12.1	57.5
Internal Link Dist (m)	324.8		438.2		224.1		938.0	
Turn Bay Length (m)	100.0		100.0		100.0			
Base Capacity (vph)	150	1453	437	2899	176	1040	132	653
Starvation Cap Reductn	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.06	0.93	0.88	0.41	0.41	0.38	0.20	0.67
<b>Intersection Summary</b>								
Cycle Length: 100								
Actuated Cycle Length: 99.4								
Natural Cycle: 90								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 1: Chinguacousy Road & Mayfield Road



HCM Signalized Intersection Capacity Analysis  
1: Chinguacousy Road & Mayfield Road

FUT 2031 AM (No GTA W) Alt B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↓	↑↓	↑↓↑↓	↑	↑↓	↑↓	↑↓↑↓				
Traffic Volume (vph)	8	1077	117	337	1049	9	64	154	194	23	363	21
Future Volume (vph)	8	1077	117	337	1049	9	64	154	194	23	363	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6			4.5	6.6	4.5	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	0.95			0.97	0.91	1.00	0.95	1.00	0.95	1.00	
Fr <sub>t</sub>	1.00	0.99			1.00	1.00	1.00	0.92	1.00	0.99		
Flt Protected	0.95	1.00			0.95	1.00			0.95	1.00		
Satd. Flow (prot)	1521	3422			3219	4800			1404	3265	1267	3398
Flt Permitted	0.22	1.00			0.95	1.00			0.29	1.00	0.52	1.00
Satd. Flow (perm)	356	3422			3219	4800			429	3265	692	3398
Peak-hour factor, PHF	0.88	0.88			0.88	0.88			0.88	0.88	0.88	0.88
Adj. Flow (vph)	9	1224	133	383	1192	10	73	175	220	26	412	24
RTOR Reduction (vph)	0	8	0	0	1	0	0	0	159	0	0	4
Lane Group Flow (vph)	9	1349	0	0	383	1201	0	73	236	0	26	433
Heavy Vehicles (%)	20%	5%	6%	10%	9%	25%	30%	3%	2%	44%	4%	50%
Turn Type	Perm	NA	Prot	NA	pm+pt	NA	Perm	NA				
Protected Phases	2		1	6			8			4		
Permitted Phases		2										
Actuated Green, G (s)	41.4	41.4			13.5	59.4			27.7	27.7	19.0	19.0
Effective Green, g (s)	41.4	41.4			13.5	59.4			27.7	27.7	19.0	19.0
Actuated g/C Ratio	0.41	0.41			0.13	0.59			0.28	0.28	0.19	0.19
Clearance Time (s)	6.6	6.6			4.5	6.6			4.5	6.6	6.6	6.6
Vehicle Extension (s)	3.0	3.0			3.0	3.0			3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	146	1412			433	2842			159	901	131	643
v/s Ratio Prot	c0.39		c0.12	0.25			c0.02	0.07			c0.13	
v/s Ratio Perm	0.03						0.11				0.04	
v/c Ratio	0.06	0.96			0.88	0.42			0.46	0.26	0.20	0.67
Uniform Delay, d <sub>1</sub>	17.7	28.6			42.6	11.1			28.2	28.3	34.2	37.8
Progression Factor	1.00	1.00			1.00	1.00			1.00	1.00	1.00	1.00
Incremental Delay, d <sub>2</sub>	0.2	14.5			18.9	0.1			2.1	0.7	3.4	5.6
Delay (s)	17.9	43.1			61.5	11.2			30.3	29.0	37.6	43.3
Level of Service	B	D	E	B	C	C	C	C	D	D		
Approach Delay (s)	42.9				23.4				29.2		43.0	
Approach LOS	D		C		C				C		D	
<b>Intersection Summary</b>												
HCM 2000 Control Delay	33.3											C
HCM 2000 Volume to Capacity ratio	0.85											
Actuated Cycle Length (s)	100.3											22.2
Intersection Capacity Utilization	83.9%											E
Analysis Period (min)	15											
c Critical Lane Group												

Timings  
2: Chinguacousy Road & Old School Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑	←	↑	→	↑	↓
Traffic Volume (vph)	18	457	71	202	15	117	15	328
Future Volume (vph)	18	457	71	202	15	117	15	328
Lane Group Flow (vph)	20	544	77	227	16	172	16	359
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		2	
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	26.0	26.0	26.0	26.0	24.0	24.0	24.0	24.0
Total Split (%)	52.0%	52.0%	52.0%	52.0%	48.0%	48.0%	48.0%	48.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.04	0.78	0.42	0.33	0.08	0.23	0.03	0.45
Control Delay	8.7	21.0	18.3	11.2	10.9	8.6	9.6	12.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.7	21.0	18.3	11.2	10.9	8.6	9.6	12.8
Queue Length 50th (m)	1.0	35.9	4.4	12.1	0.8	6.7	0.8	20.9
Queue Length 95th (m)	3.8	63.8	13.5	23.6	3.9	17.2	3.6	41.3
Internal Link Dist (m)	414.1		424.5		2089.6		405.3	
Turn Bay Length (m)	100.0		100.0		100.0		100.0	
Base Capacity (vph)	555	863	227	841	199	760	530	801
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.63	0.34	0.27	0.08	0.23	0.03	0.45
Intersection Summary								
Cycle Length: 50								
Actuated Cycle Length: 46.2								
Natural Cycle: 50								
Control Type: Semi Act-Uncoord								
Splits and Phases: 2: Chinguacousy Road & Old School Road								
	↑ Ø2		→ Ø4					
24 s		25 s						
	↓ Ø6		← Ø8					
24 s		26 s						

HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑	←	↑	→	↑	↓				
Traffic Volume (vph)	18	457	43	71	202	6	15	117	41	15	328	2
Future Volume (vph)	18	457	43	71	202	6	15	117	41	15	328	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
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	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1827	1825	1791	913	1731	1825	1882				
Flt Permitted	0.62	1.00	0.25	1.00	0.49	1.00	0.65	1.00	0.65	1.00	0.65	1.00
Satd. Flow (perm)	1185	1827	484	1791	469	1731	1246	1882				
Peak-hour factor, PHF	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)	20	497	47	77	220	7	16	127	45	16	357	2
RTOR Reduction (vph)	0	7	0	0	2	0	0	24	0	0	1	0
Lane Group Flow (vph)	20	537	0	77	225	0	16	148	0	16	358	0
Heavy Vehicles (%)	0%	1%	33%	0%	7%	0%	100%	9%	0%	0%	2%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	17.5	17.5	17.5	17.5	19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.7
Effective Green, g (s)	17.5	17.5	17.5	17.5	19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.7
Actuated g/C Ratio	0.38	0.38	0.38	0.38	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	448	692	183	678	199	738	531	802				
v/s Ratio Prot	c0.29		0.13		0.09		c0.19					
v/s Ratio Perm	0.02		0.16		0.03		0.01					
v/c Ratio	0.04	0.78	0.42	0.33	0.08	0.20	0.03	0.45				
Uniform Delay, d1	9.1	12.6	10.6	10.2	7.9	8.3	7.7	9.4				
Progression 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
Incremental Delay, d2	0.0	5.4	1.6	0.3	0.8	0.6	0.1	1.8				
Delay (s)	9.1	18.1	12.2	10.5	8.7	8.9	7.8	11.2				
Level of Service	A	B	B	B	A	A	A	B				
Approach Delay (s)		17.7			10.9		8.9		11.0			
Approach LOS		B			B		A		B			
Intersection Summary												
HCM 2000 Control Delay					13.4							
HCM 2000 Volume to Capacity ratio					0.60							
Actuated Cycle Length (s)					46.2							
Intersection Capacity Utilization					59.5%							
Analysis Period (min)					15							
c Critical Lane Group												

## HCM Unsignalized Intersection Capacity Analysis 3: Chinguacousy Road & Spine Road

FUT 2031 AM (No GTA W) Improved

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (veh/h)	90	113	281	84	105	382
Future Volume (Veh/h)	90	113	281	84	105	382
Sign Control	Stop	Free			Free	
Grade	0%	0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	98	123	305	91	114	415
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None			None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked	948	305		396		
vC, conflicting volume						
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	948	305		396		
tC, single (s)	6.4	6.2		4.1		
tC, 2 stage (s)						
tF (s)	3.5	3.3		2.2		
p0 queue free %	62	83		90		
cM capacity (veh/h)	261	735		1163		
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	98	123	305	91	114	415
Volume Left	98	0	0	0	114	0
Volume Right	0	123	0	91	0	0
cSH	261	735	1700	1700	1163	1700
Volume to Capacity	0.38	0.17	0.18	0.05	0.10	0.24
Queue Length 95th (m)	12.7	4.5	0.0	0.0	2.5	0.0
Control Delay (s)	26.8	10.9	0.0	0.0	8.4	0.0
Lane LOS	D	B			A	
Approach Delay (s)	18.0		0.0		1.8	
Approach LOS	C					
Intersection Summary						
Average Delay			4.3			
Intersection Capacity Utilization		35.6%		ICU Level of Service		
Analysis Period (min)		15				

# AFT

Timings  
1: Chinguacousy Road & Mayfield Road

FUT 2031 PM (No GTA W) Alt B

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑↑	↑↑	↑	↑↑	↑	↑↑
Traffic Volume (vph)	12	917	399	1273	115	309	11	130
Future Volume (vph)	12	917	399	1273	115	309	11	130
Lane Group Flow (vph)	13	1020	416	1364	120	646	11	144
Turn Type	Perm	NA	Prot	NA	pm+pt	NA	Perm	NA
Protected Phases	2	1	6	3	8	4	4	
Permitted Phases	2	2	1	6	3	8	4	4
Detector Phase								
Switch Phase								
Minimum Initial (s)	12.0	12.0	12.0	12.0	5.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	23.6	23.6	9.5	23.6	23.6	23.6
Total Split (s)	33.6	33.6	23.0	56.6	9.8	33.4	23.6	23.6
Total Split (%)	37.3%	37.3%	25.6%	62.9%	10.9%	37.1%	26.2%	26.2%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.5	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.6	6.6	6.6	6.6	4.5	6.6	6.6	
Lead/Lag	Lag	Lag	Lead	Lead	Lag	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	None	Max	Max	
v/c Ratio	0.12	0.97	0.71	0.49	0.34	0.55	0.09	0.21
Control Delay	26.3	52.1	42.0	13.1	25.2	16.0	32.2	29.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	26.3	52.1	42.0	13.1	25.2	16.0	32.2	29.9
Queue Length 50th (m)	1.6	89.9	34.7	49.0	14.8	25.7	1.6	10.5
Queue Length 95th (m)	6.4	#133.6	49.5	59.9	28.0	42.7	6.2	18.7
Internal Link Dist (m)	324.8		438.2		224.1		938.0	
Turn Bay Length (m)	100.0		100.0		100.0			
Base Capacity (vph)	109	1056	649	2846	352	1170	127	688
Starvation Cap Reductn	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.12	0.97	0.64	0.48	0.34	0.55	0.09	0.21
<b>Intersection Summary</b>								
Cycle Length: 90								
Actuated Cycle Length: 88.5								
Natural Cycle: 85								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 1: Chinguacousy Road & Mayfield Road



HCM Signalized Intersection Capacity Analysis  
1: Chinguacousy Road & Mayfield Road

FUT 2031 PM (No GTA W) Alt B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑	↑	↑↑	↑↑	↑	↑	↑↑	↑	↑↑	↑↑	↑
Traffic Volume (vph)	12	917	62	399	1273	36	115	309	311	11	130	9
Future Volume (vph)	12	917	62	399	1273	36	115	309	311	11	130	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	4.5	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.95	0.97	0.91	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95
Fr <sub>t</sub>	1.00	0.99	1.00	1.00	1.00	0.92	1.00	0.99	1.00	0.99	1.00	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	3443	3506	5027	1706	3199	1560	3552				
Flt Permitted	0.19	1.00	0.95	1.00	0.52	1.00	0.41	1.00				
Satd. Flow (perm)	360	3443	3506	5027	938	3199	667	3552				
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	12	955	65	416	1326	38	120	322	324	11	135	9
RTOR Reduction (vph)	0	6	0	0	3	0	0	201	0	0	6	0
Lane Group Flow (vph)	13	1014	0	416	1361	0	120	445	0	11	138	0
Heavy Vehicles (%)	0%	5%	5%	1%	4%	0%	7%	4%	7%	17%	1%	14%
Turn Type	Perm	NA	Prot	NA	pm+pt	NA	Perm	NA				
Protected Phases	2	1	6		3	8						
Permitted Phases												
Actuated Green, G (s)	27.0	27.0		14.8	48.4		26.8	26.8		17.0	17.0	
Effective Green, g (s)	27.0	27.0		14.8	48.4		26.8	26.8		17.0	17.0	
Actuated g/C Ratio	0.31	0.31		0.17	0.55		0.30	0.30		0.19	0.19	
Clearance Time (s)	6.6	6.6		6.6	6.6		4.5	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	109	1051		586	2752		330	969		128	683	
v/s Ratio Prot	c0.29		c0.12	0.27			0.02	c0.14		0.04		
v/s Ratio Perm	0.04						0.09			0.02		
v/c Ratio	0.12	0.97		0.71	0.49		0.36	0.46		0.09	0.20	
Uniform Delay, d <sub>1</sub>	22.1	30.2		34.8	12.4		23.2	24.9		29.3	30.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d <sub>2</sub>	0.5	19.7		3.9	0.1		0.7	1.6		1.3	0.7	
Delay (s)	22.6	49.9		38.7	12.6		23.9	26.5		30.6	30.7	
Level of Service	C	D		B	B		C	C		C	C	
Approach Delay (s)	49.6			18.7			26.1			30.7		
Approach LOS	D			B			C			C		
<b>Intersection Summary</b>												
HCM 2000 Control Delay	29.2											C
HCM 2000 Volume to Capacity ratio	0.76											
Actuated Cycle Length (s)	88.4											24.3
Intersection Capacity Utilization	89.2%											E
Analysis Period (min)	15											
c Critical Lane Group												

Timings  
2: Chinguacousy Road & Old School Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑	←	↑	→	↑	↓
Traffic Volume (vph)	15	218	77	601	17	271	4	90
Future Volume (vph)	15	218	77	601	17	271	4	90
Lane Group Flow (vph)	16	247	84	687	18	374	4	102
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		2	
Permitted Phases	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	34.0	34.0	34.0	34.0	26.0	26.0	26.0	26.0
Total Split (%)	56.7%	56.7%	56.7%	56.7%	43.3%	43.3%	43.3%	43.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.11	0.30	0.20	0.83	0.03	0.50	0.01	0.14
Control Delay	10.7	10.3	10.2	23.0	12.7	15.9	12.5	12.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.7	10.3	10.2	23.0	12.7	15.9	12.5	12.8
Queue Length 50th (m)	0.9	14.3	4.7	55.2	1.1	26.8	0.3	6.4
Queue Length 95th (m)	3.8	26.0	11.5	91.9	4.7	52.2	1.9	15.8
Internal Link Dist (m)	414.1		424.5		2089.6		405.3	
Turn Bay Length (m)	100.0		100.0		100.0		100.0	
Base Capacity (vph)	174	1041	527	1031	526	741	332	705
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.24	0.16	0.67	0.03	0.50	0.01	0.14
<b>Intersection Summary</b>								
Cycle Length: 60								
Actuated Cycle Length: 54.8								
Natural Cycle: 60								
Control Type: Semi Act-Uncoord								
Splits and Phases: 2: Chinguacousy Road & Old School Road								

HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑	←	↑	→	↑	↓				
Traffic Volume (vph)	15	218	9	77	601	31	17	271	73	4	90	4
Future Volume (vph)	15	218	9	77	601	31	17	271	73	4	90	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99			1.00	0.99	1.00	0.97	1.00	0.99		
Flt Protected	0.95	1.00			0.95	1.00	0.95	1.00	0.95	1.00		
Satd. Flow (prot)	1825	1909			1547	1889	1825	1831	1825	1773		
Flt Permitted	0.17	1.00			0.60	1.00	0.69	1.00	0.44	1.00		
Satd. Flow (perm)	320	1909			970	1889	1328	1831	838	1773		
Peak-hour factor, PHF	0.92	0.92			0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	237	10	84	653	34	18	295	79	4	98	4
RTOR Reduction (vph)	0	3	0	0	3	0	0	15	0	0	2	0
Lane Group Flow (vph)	16	244	0	84	684	0	18	359	0	4	100	0
Heavy Vehicles (%)	0%	0%	0%	0%	18%	1%	0%	0%	2%	0%	0%	8%
Turn Type	Perm	NA			Perm	NA		Perm	NA		Perm	NA
Protected Phases	4				8			2			6	
Permitted Phases												
Actuated Green, G (s)	24.0	24.0			24.0	24.0		21.7	21.7		21.7	
Effective Green, g (s)	24.0	24.0			24.0	24.0		21.7	21.7		21.7	
Actuated g/C Ratio	0.44	0.44			0.44	0.44		0.40	0.40		0.40	
Clearance Time (s)	4.5	4.5			4.5	4.5		4.5	4.5		4.5	
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0	3.0		3.0	
Lane Grp Cap (vph)	140	837			425	828		526	726		332	703
v/s Ratio Prot	0.13				c0.36			c0.20			0.06	
v/s Ratio Perm	0.05				0.09			0.01			0.00	
v/c Ratio	0.11	0.29			0.20	0.83		0.03	0.49		0.01	0.14
Uniform Delay, d1	9.1	9.9			9.4	13.5		10.1	12.4		10.0	10.5
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	0.4	0.2			0.2	6.7		0.1	2.4		0.1	0.4
Delay (s)	9.4	10.1			9.7	20.3		10.2	14.8		10.1	11.0
Level of Service	A	B			C			B	B		B	
Approach Delay (s)	10.0				19.1			14.6			10.9	
Approach LOS	B				B			B			B	
<b>Intersection Summary</b>												
HCM 2000 Control Delay	15.8				HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio	0.67											
Actuated Cycle Length (s)	54.7				Sum of lost time (s)			9.0				
Intersection Capacity Utilization	67.6%				ICU Level of Service			C				
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

FUT 2031 PM (No GTA W) Improved

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	38	193	372	152	108	311
Traffic Volume (veh/h)	38	193	372	152	108	311
Future Volume (Veh/h)						
Sign Control	Stop	Free	Free			
Grade	0%	0%	0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	41	210	404	165	117	338
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None	None				
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	976	404	569			
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCu, unblocked vol	976	404	569			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tf (s)	3.5	3.3	2.2			
p0 queue free %	83	68	88			
cm capacity (veh/h)	246	647	1003			
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	41	210	404	165	117	338
Volume Left	41	0	0	0	117	0
Volume Right	0	210	0	165	0	0
CSH	246	647	1700	1700	1003	1700
Volume to Capacity	0.17	0.32	0.24	0.10	0.12	0.20
Queue Length 95th (m)	4.5	10.7	0.0	0.0	3.0	0.0
Control Delay (s)	22.5	13.2	0.0	0.0	9.1	0.0
Lane LOS	C	B	A			
Approach Delay (s)	14.7	0.0	2.3			
Approach LOS	B					
Intersection Summary						
Average Delay		3.7				
Intersection Capacity Utilization	38.9%		ICU Level of Service		A	
Analysis Period (min)	15					

## Timings

FUT 2041 AM (GTA W) AltB

1: Chinguacousy Road &amp; Mayfield Road

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑
Traffic Volume (vph)	9	1277	138	329	1025	156	376	474	58	887	52
Future Volume (vph)	9	1277	138	329	1025	156	376	474	58	887	52
Lane Group Flow (vph)	10	1451	157	374	1175	177	427	539	66	1008	59
Turn Type	Perm	NA	Perm	Prot	NA	pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases	2			1	6	3	8	8	4	4	
Permitted Phases	2	2	2	1	6	3	8	8	4	4	4
Detector Phase											
Switch Phase											
Minimum Initial (s)	12.0	12.0	12.0	5.0	12.0	5.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	23.6	9.5	23.6	9.5	23.6	23.6	23.6	23.6	23.6
Total Split (s)	39.8	39.8	39.8	18.0	57.8	14.2	52.2	52.2	38.0	38.0	38.0
Total Split (%)	36.2%	36.2%	36.2%	16.4%	52.5%	12.9%	47.5%	47.5%	34.5%	34.5%	34.5%
Yellow Time (s)	4.6	4.6	4.6	3.5	4.6	3.5	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max
v/c Ratio	0.09	0.96	0.27	0.95	0.53	0.98	0.20	0.64	0.35	1.01	0.15
Control Delay	30.3	54.1	5.9	82.3	21.9	90.4	20.9	13.7	37.8	69.8	0.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.3	54.1	5.9	82.3	21.9	90.4	20.9	13.7	37.8	69.8	0.8
Queue Length 50th (m)	1.5	112.0	0.0	41.6	63.5	25.3	21.0	35.5	11.3	-115.1	0.0
Queue Length 95th (m)	5.8	#137.4	13.5	#67.2	74.2	#66.3	27.6	67.2	23.6	#152.9	0.0
Internal Link Dist (m)	324.8			438.2		224.1					938.0
Turn Bay Length (m)	100.0		100.0		100.0		100.0	100.0			100.0
Base Capacity (vph)	110	1507	574	395	2235	180	2110	848	188	1001	400
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.96	0.27	0.95	0.53	0.98	0.20	0.64	0.35	1.01	0.15

## Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Natural Cycle: 110

Control Type: Semi Act-Uncoord

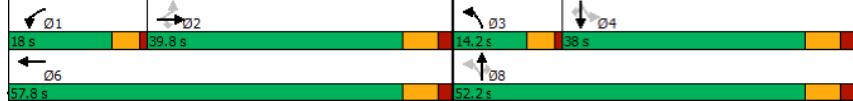
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Chinguacousy Road &amp; Mayfield Road

051561\_Chinguacousy EA\_2041 GTAW\_AltB.syn  
R.J. Burnside & Associates LimitedSynchro 11 Report  
03/21/2022 - Page 1

## HCM Signalized Intersection Capacity Analysis

1: Chinguacousy Road &amp; Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑	↑	↑↑↑	↑	↑↑↑	↑	↑
Traffic Volume (vph)	9	1277	138	329	1025	156	376	474	58	887	52	
Future Volume (vph)	9	1277	138	329	1025	156	376	474	58	887	52	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	0.91	1.00	1.00	0.95	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1521	4995	1541	3219	4799	1404	5092	1601	1267	3510	1089	
Flt Permitted	0.23	1.00	1.00	0.95	1.00	0.11	1.00	1.00	0.49	1.00	1.00	1.00
Satd. Flow (perm)	366	4995	1541	3219	4799	165	5092	1601	659	3510	1089	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	10	1451	157	374	1165	10	177	427	539	66	1008	59
RTOR Reduction (vph)	0	0	110	0	1	0	0	0	0	0	0	42
Lane Group Flow (vph)	10	1451	47	374	1174	0	177	427	354	66	1008	17
Heavy Vehicles (%)	20%	5%	6%	10%	9%	25%	30%	3%	2%	44%	4%	50%
Turn Type	Perm	NA	Perm	Prot	NA	pm+pt	NA	Perm	Perm	NA	Perm	
Protected Phases	2		1	6		3	8		8	4	4	
Permitted Phases							8					
Actuated Green, G (s)	33.2	33.2	33.2	13.5	51.2		45.6	45.6	45.6	31.4	31.4	
Effective Green, g (s)	33.2	33.2	33.2	13.5	51.2		45.6	45.6	45.6	31.4	31.4	
Actuated g/C Ratio	0.30	0.30	0.30	0.12	0.47		0.41	0.41	0.41	0.29	0.29	
Clearance Time (s)	6.6	6.6	6.6	4.5	6.6		4.5	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	110	1507	465	395	2233		177	2110	663	188	1001	310
v/s Ratio Prot	c0.29		c0.12	0.24			c0.09	0.08		0.29		
v/s Ratio Perm	0.03		0.03				c0.33			0.22	0.10	0.02
v/c Ratio	0.09	0.96	0.10	0.95	0.53		1.00	0.20	0.53	0.35	1.01	0.05
Uniform Delay, d1	27.6	37.8	27.7	47.9	20.8		28.3	20.6	24.2	31.2	39.3	28.5
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	15.2	0.1	31.6	0.2		67.6	0.2	3.1	5.1	30.2	0.3
Delay (s)	27.9	53.0	27.8	79.5	21.0		96.0	20.8	27.3	36.3	69.5	28.9
Level of Service	C	D	C	E	C		F	C	C	D	E	C
Approach Delay (s)	50.4				35.2					35.5		65.4
Approach LOS		D			D			D		E		

## Intersection Summary

HCM 2000 Control Delay 46.0 HCM 2000 Level of Service D

HCM 2000 Volume to Capacity ratio 1.01

Actuated Cycle Length (s) 110.0 Sum of lost time (s) 22.2

Intersection Capacity Utilization 85.7% ICU Level of Service E

Analysis Period (min) 15

c Critical Lane Group

051561\_Chinguacousy EA\_2041 GTAW\_AltB.syn  
R.J. Burnside & Associates LimitedSynchro 11 Report  
03/21/2022 - Page 2

Timings  
2: Chinguacousy Road & Old School Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓
Traffic Volume (vph)	20	505	78	223	36	288	36	804
Future Volume (vph)	20	505	78	223	36	288	36	804
Lane Group Flow (vph)	22	600	85	250	39	421	39	879
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6	
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.05	0.85	0.49	0.36	0.41	0.30	0.10	0.60
Control Delay	8.8	26.9	21.7	11.2	27.9	7.3	9.3	12.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.8	26.9	21.7	11.2	27.9	7.3	9.3	12.4
Queue Length 50th (m)	1.0	38.6	4.7	12.7	2.1	8.1	1.8	27.1
Queue Length 95th (m)	3.9	#86.1	#18.5	25.2	#12.3	15.1	6.0	41.3
Internal Link Dist (m)	414.1	424.5		2089.6		405.3		
Turn Bay Length (m)	100.0	100.0		100.0		100.0		
Base Capacity (vph)	478	760	190	740	96	1420	400	1474
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.79	0.45	0.34	0.41	0.30	0.10	0.60
Intersection Summary								
Cycle Length: 45								
Actuated Cycle Length: 43.8								
Natural Cycle: 45								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 2: Chinguacousy Road & Old School Road



HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBL	SBR
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓	↑	↓	↑	↓
Traffic Volume (vph)	20	505	47	78	223	7	36	288	99	36	804	5
Future Volume (vph)	20	505	47	78	223	7	36	288	99	36	804	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00
Frt	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1829	1825	1791	913	3290	1825	3576				
Flt Permitted	0.60	1.00	0.24	1.00	0.24	1.00	0.51	1.00				
Satd. Flow (perm)	1160	1829	460	1791	235	3290	972	3576				
Peak-hour factor, PHF	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)	22	549	51	85	242	8	39	313	108	39	874	5
RTOR Reduction (vph)	0	7	0	0	2	0	0	64	0	0	1	0
Lane Group Flow (vph)	22	593	0	85	248	0	39	357	0	39	878	0
Heavy Vehicles (%)	0%	1%	33%	0%	7%	0%	100%	9%	0%	0%	2%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	16.7	16.7	16.7	16.7	16.7	16.7	18.0	18.0	18.0	18.0	18.0	18.0
Effective Green, g (s)	16.7	16.7	16.7	16.7	16.7	16.7	18.0	18.0	18.0	18.0	18.0	18.0
Actuated g/C Ratio	0.38	0.38	0.38	0.38	0.38	0.38	0.41	0.41	0.41	0.41	0.41	0.41
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	443	698	175	684	96	1355	400	1472				
v/s Ratio Prot	c0.32		0.14		0.11		c0.25					
v/s Ratio Perm	0.02		0.18		0.17		0.04					
v/c Ratio	0.05	0.85	0.49	0.36	0.41	0.26	0.10	0.60				
Uniform Delay, d1	8.5	12.3	10.2	9.7	9.1	8.5	7.9	10.0				
Progression 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
Incremental Delay, d2	0.0	9.5	2.1	0.3	12.3	0.5	0.5	1.8				
Delay (s)	8.5	21.8	12.4	10.0	21.3	9.0	8.4	11.8				
Level of Service	A	C	B	B	C	A	A	B				
Approach Delay (s)	21.3		10.6		10.0		11.7					
Approach LOS	C		B		B		B					
Intersection Summary												
HCM 2000 Control Delay	13.8											
HCM 2000 Volume to Capacity ratio	0.72											
Actuated Cycle Length (s)	43.7											
Intersection Capacity Utilization	74.9%											
Analysis Period (min)	15											
c Critical Lane Group												

Timings  
3: Chinguacousy Road & Spine Road

FUT 2041 AM (GTA W)) Improved

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	110	138	528	102	128	967
Future Volume (vph)	110	138	528	102	128	967
Lane Group Flow (vph)	120	150	574	111	139	1051
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
v/c Ratio	0.32	0.33	0.26	0.11	0.27	0.48
Control Delay	13.7	4.9	5.1	1.8	7.4	6.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.7	4.9	5.1	1.8	7.4	6.4
Queue Length 50th (m)	5.7	0.0	8.0	0.0	3.7	17.5
Queue Length 95th (m)	13.6	7.7	16.4	4.2	12.6	33.8
Internal Link Dist (m)	108.0		938.0		2089.6	
Turn Bay Length (m)			100.0	100.0		
Base Capacity (vph)	883	866	2211	1031	507	2211
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.17	0.26	0.11	0.27	0.48
Intersection Summary						
Cycle Length: 45						
Actuated Cycle Length: 36.5						
Natural Cycle: 45						
Control Type: Semi Act-Uncoord						
Splits and Phases: 3: Chinguacousy Road & Spine Road						

HCM Signalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

FUT 2041 AM (GTA W)) Improved

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	110	138	528	102	128	967
Future Volume (vph)	110	138	528	102	128	967
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Fr1	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	3579	1601	1789	3579
Flt Permitted	0.95	1.00	1.00	1.00	0.44	1.00
Satd. Flow (perm)	1789	1601	3579	1601	821	3579
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	120	150	574	111	139	1051
RTOR Reduction (vph)	0	123	0	47	0	0
Lane Group Flow (vph)	120	27	574	64	139	1051
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Actuated Green, G (s)	6.7	6.7	21.7	21.7	21.7	21.7
Effective Green, g (s)	6.7	6.7	21.7	21.7	21.7	21.7
Actuated g/C Ratio	0.18	0.18	0.58	0.58	0.58	0.58
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	320	286	2076	928	476	2076
v/s Ratio Prot	c0.07		0.16		c0.29	
v/s Ratio Perm		0.02		0.04	0.17	
v/c Ratio	0.38	0.09	0.28	0.07	0.29	0.51
Uniform Delay, d1	13.5	12.8	3.9	3.4	4.0	4.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	0.1	0.3	0.1	1.6	0.9
Delay (s)	14.2	13.0	4.3	3.6	5.5	5.6
Level of Service	B	B	A	A	A	A
Approach Delay (s)	13.5		4.1		5.5	
Approach LOS	B		A		A	
Intersection Summary						
HCM 2000 Control Delay		6.1				
HCM 2000 Volume to Capacity ratio		0.48				
Actuated Cycle Length (s)		37.4				
Intersection Capacity Utilization		40.3%				
Analysis Period (min)		15				
c Critical Lane Group						

## Timings

## 1: Chinguacousy Road &amp; Mayfield Road

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑
Traffic Volume (vph)	13	1087	73	390	1244	282	757	762	26	319	22
Future Volume (vph)	13	1087	73	390	1244	282	757	762	26	319	22
Lane Group Flow (vph)	14	1132	76	406	1332	294	789	794	27	332	23
Turn Type	Perm	NA	NA	Prot	NA	pm+pt	NA	Perm	Perm	NA	NA
Protected Phases	2			1	6	3	8	8	4	4	
Permitted Phases	2	2		1	6	3	8	8	4	4	
Detector Phase											
Switch Phase											
Minimum Initial (s)	12.0	12.0		5.0	12.0	5.0	12.0	12.0	12.0	12.0	
Minimum Split (s)	23.6	23.6		9.5	23.6	9.5	23.6	23.6	23.6	23.6	
Total Split (s)	27.0	27.0		15.0	42.0	14.2	38.0	38.0	23.8	23.8	
Total Split (%)	33.8%	33.8%		18.8%	52.5%	17.8%	47.5%	47.5%	29.8%	29.8%	
Yellow Time (s)	4.6	4.6		3.5	4.6	3.5	4.6	4.6	4.6	4.6	
All-Red Time (s)	2.0	2.0		1.0	2.0	1.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.6	6.6		4.5	6.6	4.5	6.6	6.6	6.6	6.6	
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lag			
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes			
Recall Mode	None	None		None	None	None	Max	Max	Max	Max	
v/c Ratio	0.15	0.89	0.29	0.88	0.60	0.67	0.40	0.96	0.23	0.43	0.09
Control Delay	27.6	39.0	2.8	56.8	18.2	25.5	18.3	38.4	31.5	29.2	0.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.6	39.0	2.8	56.8	18.2	25.5	18.3	38.4	31.5	29.2	0.7
Queue Length 50th (m)	1.7	60.6	0.0	31.7	53.9	30.4	30.8	69.4	3.4	23.0	0.0
Queue Length 95th (m)	6.5	#84.2	0.0	#55.4	67.3	50.0	40.5	#150.3	10.5	34.9	0.0
Internal Link Dist (m)	324.8			438.2		224.1				938.0	
Turn Bay Length (m)	100.0		100.0		100.0		100.0	100.0		100.0	
Base Capacity (vph)	96	1273	262	460	2228	438	1979	824	120	777	262
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.89	0.29	0.88	0.60	0.67	0.40	0.96	0.23	0.43	0.09

## Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

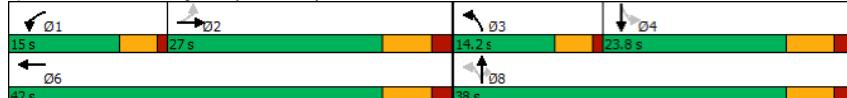
Natural Cycle: 75

Control Type: Semi Act-Uncoord

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Chinguacousy Road &amp; Mayfield Road



## HCM Signalized Intersection Capacity Analysis

## 1: Chinguacousy Road &amp; Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑	↑
Traffic Volume (vph)	13	1087	73	390	1244	282	757	762	26	319	22	
Future Volume (vph)	13	1087	73	390	1244	282	757	762	26	319	22	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	4.0	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6	4.0
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	0.91	1.00	1.00	0.95	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1825	4995	1555	3506	5028	1706	5043	1526	1560	3614	1432	
Flt Permitted	0.20	1.00	1.00	0.95	1.00	0.43	1.00	1.00	0.34	1.00	1.00	1.00
Satd. Flow (perm)	377	4995	1555	3506	5028	778	5043	1526	1560	3614	1432	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	14	1132	76	406	1296	36	294	789	794	27	332	23
RTOR Reduction (vph)	0	0	76	0	3	0	0	0	0	0	0	23
Lane Group Flow (vph)	14	1132	0	406	1329	0	294	789	568	27	332	0
Heavy Vehicles (%)	0%	5%	5%	1%	4%	0%	7%	4%	7%	17%	1%	14%
Turn Type	Perm	NA	NA	Prot	NA	pm+pt	NA	Perm	Perm	NA	NA	
Protected Phases	2			1	6		3	8	8	4		
Permitted Phases		2					8					
Actuated Green, G (s)	20.4	20.4	0.0	10.5	35.4		31.4	31.4	31.4	17.2	17.2	0.0
Effective Green, g (s)	20.4	20.4	0.0	10.5	35.4		31.4	31.4	31.4	17.2	17.2	0.0
Actuated g/C Ratio	0.25	0.25	0.00	0.13	0.44		0.39	0.39	0.39	0.21	0.21	0.00
Clearance Time (s)	6.6	6.6		4.5	6.6		4.5	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	96	1273	0	460	2224		417	1979	598	120	777	0
v/s Ratio Prot	0.04	c0.23		c0.12	0.26		0.09	0.16		c0.37	0.05	
v/s Ratio Perm	0.04						0.19					
v/c Ratio	0.15	0.89	0.00	0.88	0.60		0.71	0.40	0.95	0.23	0.43	0.00
Uniform Delay, d1	23.1	28.7	40.0	34.1	16.9		18.2	17.5	23.5	25.9	27.1	40.0
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	7.9	0.0	17.8	0.4		5.4	0.6	26.3	4.3	1.7	0.0
Delay (s)	23.8	36.6	40.0	51.9	17.3		23.6	18.1	49.9	30.2	28.9	40.0
Level of Service	C	D	D	D	B		C	B	D	C	C	D
Approach Delay (s)	36.7				25.4				32.4		29.6	
Approach LOS		D			C			C		C		

## Intersection Summary

HCM 2000 Control Delay 30.9 HCM 2000 Level of Service C

HCM 2000 Volume to Capacity ratio 0.99

Actuated Cycle Length (s) 80.0 Sum of lost time (s) 22.2

Intersection Capacity Utilization 94.7% ICU Level of Service F

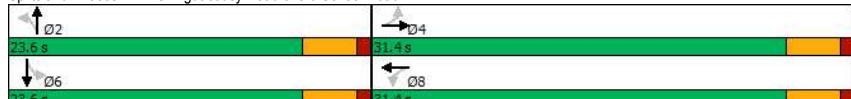
Analysis Period (min) 15

c Critical Lane Group

Timings  
2: Chinguacousy Road & Old School Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓
Traffic Volume (vph)	17	241	85	664	42	663	11	219
Future Volume (vph)	17	241	85	664	42	663	11	219
Lane Group Flow (vph)	18	273	92	759	46	913	12	250
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6	
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	31.4	31.4	31.4	31.4	23.6	23.6	23.6	23.6
Total Split (%)	57.1%	57.1%	57.1%	57.1%	42.9%	42.9%	42.9%	42.9%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.12	0.31	0.21	0.87	0.11	0.69	0.08	0.20
Control Delay	10.2	9.6	9.6	25.8	13.1	16.9	14.0	12.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	9.6	9.6	25.8	13.1	16.9	14.0	12.3
Queue Length 50th (m)	0.9	14.5	4.8	58.5	3.0	37.5	0.8	8.5
Queue Length 95th (m)	4.0	26.7	11.7	#118.6	8.6	55.6	3.8	15.3
Internal Link Dist (m)	414.1		424.5		2089.6		405.3	
Turn Bay Length (m)	100.0		100.0		100.0		100.0	
Base Capacity (vph)	165	991	487	982	422	1322	146	1245
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.28	0.19	0.77	0.11	0.69	0.08	0.20
Intersection Summary								
Cycle Length: 55								
Actuated Cycle Length: 52.2								
Natural Cycle: 55								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 2: Chinguacousy Road & Old School Road

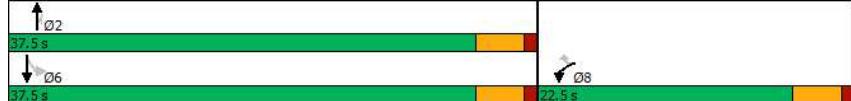


HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓	↑	↓	↑	↓
Traffic Volume (vph)	17	241	10	85	664	34	42	663	177	11	219	11
Future Volume (vph)	17	241	10	85	664	34	42	663	177	11	219	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00
Frt	1.00	0.99	1.00	0.99	1.00	0.97	1.00	0.97	1.00	0.99	1.00	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1910	1547	1889	1825	3480	1825	3480	1825	3367		
Flt Permitted	0.17	1.00	0.58	1.00	0.60	1.00	0.21	1.00				
Satd. Flow (perm)	320	1910	941	1889	1147	3480	400	3480	400	3367		
Peak-hour factor, PHF	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)	18	262	11	92	722	37	46	721	192	12	238	12
RTOR Reduction (vph)	0	3	0	0	4	0	0	42	0	0	6	0
Lane Group Flow (vph)	18	270	0	92	755	0	46	871	0	12	244	0
Heavy Vehicles (%)	0%	0%	0%	18%	1%	0%	0%	2%	0%	0%	8%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	24.0	24.0	24.0	24.0	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
Effective Green, g (s)	24.0	24.0	24.0	24.0	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
Actuated g/C Ratio	0.46	0.46	0.46	0.46	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	147	878	432	868	421	1280	147	1238				
v/s Ratio Prot	0.14		c0.40		c0.25		0.07					
v/s Ratio Perm	0.06		0.10		0.04		0.03					
v/c Ratio	0.12	0.31	0.21	0.87	0.11	0.68	0.08	0.20				
Uniform Delay, d1	8.1	8.9	8.4	12.7	10.9	13.9	10.8	11.2				
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Incremental Delay, d2	0.4	0.2	0.2	9.5	0.5	2.9	1.1	0.4				
Delay (s)	8.4	9.1	8.7	22.2	11.4	16.8	11.8	11.6				
Level of Service	A	A	A	C	B	B	B	B				
Approach Delay (s)	9.0		20.7		16.6		11.6					
Approach LOS	A		C		B		B	B				
Intersection Summary												
HCM 2000 Control Delay	16.6											
HCM 2000 Volume to Capacity ratio	0.79											
Actuated Cycle Length (s)	52.2											
Intersection Capacity Utilization	84.3%											
Analysis Period (min)	15											
c Critical Lane Group												

Timings  
3: Chinguacousy Road & Spine Road

FUT 2041 PM (GTA W) Improved

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	46	235	823	185	132	564
Future Volume (vph)	46	235	823	185	132	564
Lane Group Flow (vph)	50	255	895	201	143	613
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	37.5	37.5	37.5	37.5
Total Split (%)	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
v/c Ratio	0.15	0.64	0.39	0.18	0.39	0.26
Control Delay	17.8	17.4	5.8	1.5	10.1	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.8	17.4	5.8	1.5	10.1	5.1
Queue Length 50th (m)	3.9	10.6	16.8	0.0	5.2	10.4
Queue Length 95th (m)	10.4	27.5	36.3	6.5	20.9	23.4
Internal Link Dist (m)	108.0		938.0		2089.6	
Turn Bay Length (m)			100.0	100.0		
Base Capacity (vph)	588	612	2324	1110	364	2324
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.42	0.39	0.18	0.39	0.26
Intersection Summary						
Cycle Length: 60						
Actuated Cycle Length: 55						
Natural Cycle: 60						
Control Type: Semi Act-Uncoord						
Splits and Phases: 3: Chinguacousy Road & Spine Road						
						

HCM Signalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

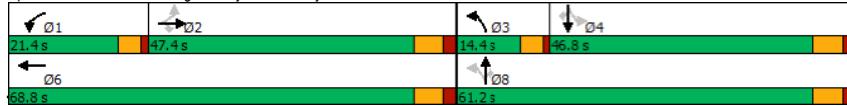
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	46	235	823	185	132	564
Future Volume (vph)	46	235	823	185	132	564
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
FrI	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	3579	1601	1789	3579
Flt Permitted	0.95	1.00	1.00	1.00	0.30	1.00
Satd. Flow (perm)	1789	1601	3579	1601	560	3579
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	50	255	895	201	143	613
RTOR Reduction (vph)	0	103	0	70	0	0
Lane Group Flow (vph)	50	152	895	131	143	613
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Actuated Green, G (s)	10.2	10.2	35.7	35.7	35.7	35.7
Effective Green, g (s)	10.2	10.2	35.7	35.7	35.7	35.7
Actuated g/C Ratio	0.19	0.19	0.65	0.65	0.65	0.65
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	332	297	2327	1041	364	2327
v/s Ratio Prot	0.03		0.25		0.17	
v/s Ratio Perm	c0.09		0.08	c0.26		
v/c Ratio	0.15	0.51	0.38	0.13	0.39	0.26
Uniform Delay, d1	18.7	20.1	4.5	3.7	4.5	4.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	1.5	0.5	0.2	3.2	0.3
Delay (s)	18.9	21.6	5.0	3.9	7.7	4.3
Level of Service	B	C	A	A	A	A
Approach Delay (s)	21.2		4.8		5.0	
Approach LOS	C		A		A	
Intersection Summary						
HCM 2000 Control Delay			7.2		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.42			
Actuated Cycle Length (s)			54.9		Sum of lost time (s)	9.0
Intersection Capacity Utilization			45.5%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

## Timings

### 1: Chinguacousy Road & Mayfield Road

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑	↑	↑↑	↑↑	↑	↑↑	↑	↑↑	↑↑	↑
Traffic Volume (vph)	9	1342	145	346	1077	164	395	498	61	932	55
Future Volume (vph)	9	1342	145	346	1077	164	395	498	61	932	55
Lane Group Flow (vph)	10	1525	165	393	1234	186	449	566	69	1059	63
Turn Type	Perm	NA	Perm	Prot	NA	pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases	2			1	6	3	8	8	4	4	
Permitted Phases	2	2	2	1	6	3	8	8	4	4	4
Detector Phase											
Switch Phase											
Minimum Initial (s)	12.0	12.0	12.0	5.0	12.0	5.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	23.6	9.5	23.6	9.5	23.6	23.6	23.6	23.6	23.6
Total Split (s)	47.4	47.4	47.4	21.4	68.8	14.4	61.2	61.2	46.8	46.8	46.8
Total Split (%)	36.5%	36.5%	36.5%	16.5%	52.9%	11.1%	47.1%	47.1%	36.0%	36.0%	36.0%
Yellow Time (s)	4.6	4.6	4.6	3.5	4.6	3.5	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead		Lag	Lag	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	
v/c Ratio	0.09	0.97	0.28	0.94	0.54	1.21	0.21	0.66	0.35	0.98	0.15
Control Delay	34.6	61.3	5.9	87.3	24.9	168.5	24.3	16.4	40.9	66.6	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.6	61.3	5.9	87.3	24.9	168.5	24.3	16.4	40.9	66.6	1.9
Queue Length 50th (m)	1.8	141.3	0.0	52.2	79.3	-45.1	26.4	49.6	13.7	141.1	0.0
Queue Length 95th (m)	6.4	#166.7	14.4	#78.9	89.9	#89.5	33.5	84.3	27.2	#178.5	1.8
Internal Link Dist (m)		324.8			438.2		224.1			938.0	
Turn Bay Length (m)	100.0		100.0		100.0		100.0		100.0		
Base Capacity (vph)	107	1567	596	418	2297	154	2138	858	199	1085	409
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.97	0.28	0.94	0.54	1.21	0.21	0.66	0.35	0.98	0.15
<b>Intersection Summary</b>											
Cycle Length: 130											
Actuated Cycle Length: 130											
Natural Cycle: 110											
Control Type: Semi Act-Uncoord											
~ Volume exceeds capacity, queue is theoretically infinite.											
Queue shown is maximum after two cycles.											
# 95th percentile volume exceeds capacity, queue may be longer.											
Queue shown is maximum after two cycles.											

Splits and Phases: 1: Chinguacousy Road & Mayfield Road



051561\_Chinguacousy EA\_2051 GTAW\_AltB.syn  
R.J. Burnside & Associates Limited

## FUT 2051 AM (GTA W) AltB

### HCM Signalized Intersection Capacity Analysis

#### 1: Chinguacousy Road & Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑	↑	↑↑	↑↑	↑	↑	↑↑	↑	↑↑	↑↑	↑
Traffic Volume (vph)	9	1342	145	346	1077	164	395	498	61	932	55	
Future Volume (vph)	9	1342	145	346	1077	164	395	498	61	932	55	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	0.91	1.00	1.00	0.95	1.00	
FrT	1.00	1.00	0.85	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1521	4995	1541	3219	4800	1404	5092	1601	1267	3510	1089	
Flt Permitted	0.21	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	344	4995	1541	3219	4800	132	5092	1601	645	3510	1089	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	10	1525	165	393	1224	10	186	449	566	69	1059	62
RTOR Reduction (vph)	0	0	113	0	1	0	0	0	186	0	0	44
Lane Group Flow (vph)	10	1525	52	393	1233	0	186	449	380	69	1059	19
Heavy Vehicles (%)	20%	5%	6%	10%	9%	25%	30%	3%	24%	4%	50%	
Turn Type	Perm	NA	Perm	Prot	NA	pm+pt	NA	Perm	Perm	NA	Perm	
Protected Phases	2		1	6		3	8		8	4		4
Permitted Phases							8					
Actuated Green, G (s)	40.8	40.8	40.8	16.9	62.2		54.6	54.6	54.6	40.2	40.2	
Effective Green, g (s)	40.8	40.8	40.8	16.9	62.2		54.6	54.6	54.6	40.2	40.2	
Actuated g/C Ratio	0.31	0.31	0.31	0.13	0.48		0.42	0.42	0.42	0.31	0.31	
Clearance Time (s)	6.6	6.6	6.6	4.5	6.6		4.5	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	107	1567	483	418	2296		152	2138	672	199	1085	336
v/s Ratio Prot	c0.31		c0.12	0.26			c0.09	0.09		0.30		
v/s Ratio Perm	0.03		0.03				0.42			0.24	0.11	0.02
v/c Ratio	0.09	0.97	0.11	0.94	0.54		1.22	0.21	0.57	0.35	0.98	0.06
Uniform Delay, d1	31.5	44.1	31.7	56.0	23.8		35.0	24.0	28.7	34.7	44.4	31.6
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	16.7	0.1	29.3	0.2		145.5	0.2	3.4	4.7	22.1	0.3
Delay (s)	31.9	60.7	31.8	85.3	24.0		180.5	24.2	32.1	39.5	66.6	31.9
Level of Service	C	E	C	F	C		F	C	C	D	E	C
Approach Delay (s)		57.7			38.8				52.1		63.2	
Approach LOS		E		D				D		E		

051561\_Chinguacousy EA\_2051 GTAW\_AltB.syn  
R.J. Burnside & Associates Limited

Synchro 11 Report  
03/21/2022 - Page 2

Synchro 11 Report  
03/21/2022 - Page 1

Timings  
2: Chinguacousy Road & Old School Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓
Traffic Volume (vph)	22	558	86	246	38	303	38	845
Future Volume (vph)	22	558	86	246	38	303	38	845
Lane Group Flow (vph)	24	664	93	276	41	442	41	923
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6	
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.06	0.91	0.54	0.39	0.48	0.32	0.11	0.64
Control Delay	8.8	34.1	26.1	11.5	35.7	7.5	9.4	13.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.8	34.1	26.1	11.5	35.7	7.5	9.4	13.3
Queue Length 50th (m)	1.1	45.2	5.2	14.2	2.3	8.5	1.9	28.9
Queue Length 95th (m)	4.1	#99.7	#21.5	27.8	#13.8	15.8	6.2	44.0
Internal Link Dist (m)	414.1	424.5		2089.6		405.3		
Turn Bay Length (m)	100.0	100.0		100.0		100.0		
Base Capacity (vph)	448	747	178	726	86	1398	385	1446
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.89	0.52	0.38	0.48	0.32	0.11	0.64
Intersection Summary								
Cycle Length: 45								
Actuated Cycle Length: 44.5								
Natural Cycle: 45								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 2: Chinguacousy Road & Old School Road



HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

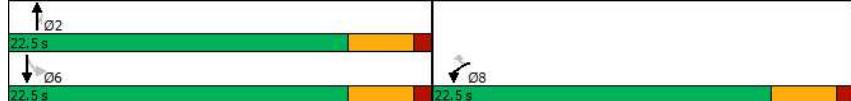
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓	↑	↓	↑	↓
Traffic Volume (vph)	22	558	52	86	246	8	38	303	104	38	845	5
Future Volume (vph)	22	558	52	86	246	8	38	303	104	38	845	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00
Frt	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1828	1825	1790	913	3290	1825	3576				
Flt Permitted	0.58	1.00	0.23	1.00	0.22	1.00	0.50	1.00	0.29	1.00	0.29	1.00
Satd. Flow (perm)	1108	1828	439	1790	213	3290	952	3576				
Peak-hour factor, PHF	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)	24	607	57	93	267	9	41	329	113	41	918	5
RTOR Reduction (vph)	0	8	0	0	2	0	0	67	0	0	1	0
Lane Group Flow (vph)	24	656	0	93	274	0	41	375	0	41	922	0
Heavy Vehicles (%)	0%	1%	33%	0%	7%	0%	100%	9%	0%	0%	2%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	17.5	17.5	17.5	17.5	17.5	17.5	18.0	18.0	18.0	18.0	18.0	18.0
Effective Green, g (s)	17.5	17.5	17.5	17.5	17.5	17.5	18.0	18.0	18.0	18.0	18.0	18.0
Actuated g/C Ratio	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.40	0.40	0.40	0.40	0.40
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	435	718	172	703	86	1330	385	1446				
v/s Ratio Prot	c0.36		0.15		0.11		c0.26					
v/s Ratio Perm	0.02		0.21		0.19		0.04					
v/c Ratio	0.06	0.91	0.54	0.39	0.48	0.28	0.11	0.64				
Uniform Delay, d1	8.4	12.8	10.4	9.7	9.8	8.9	8.2	10.6				
Progression 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
Incremental Delay, d2	0.1	16.1	3.4	0.4	17.7	0.5	0.6	2.2				
Delay (s)	8.4	28.9	13.8	10.0	27.5	9.4	8.8	12.8				
Level of Service	A	C	B	B	C	A	A	B				
Approach Delay (s)	28.2		11.0		11.0		11.0		12.6			
Approach LOS	C		B		B		B		B			
Intersection Summary												
HCM 2000 Control Delay	16.3											
HCM 2000 Volume to Capacity ratio	0.77											
Actuated Cycle Length (s)	44.5											
Intersection Capacity Utilization	80.0%											
Analysis Period (min)	15											
c Critical Lane Group												

Timings  
3: Chinguacousy Road & Spine Road

FUT 2051 AM (GTA W))

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	134	168	525	124	156	994
Future Volume (vph)	134	168	525	124	156	994
Lane Group Flow (vph)	146	183	571	135	170	1080
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
v/c Ratio	0.36	0.37	0.26	0.13	0.34	0.50
Control Delay	13.9	5.5	5.4	1.9	8.6	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.9	5.5	5.4	1.9	8.6	6.9
Queue Length 50th (m)	7.0	0.7	8.4	0.0	5.1	19.1
Queue Length 95th (m)	16.1	9.5	17.4	4.9	16.8	37.2
Internal Link Dist (m)	108.0		938.0		2089.6	
Turn Bay Length (m)				100.0	100.0	
Base Capacity (vph)	890	880	2159	1019	496	2159
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.21	0.26	0.13	0.34	0.50
Intersection Summary						
Cycle Length: 45						
Actuated Cycle Length: 36.2						
Natural Cycle: 45						
Control Type: Semi Act-Uncoord						

Splits and Phases: 3: Chinguacousy Road & Spine Road



HCM Signalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

FUT 2051 AM (GTA W))

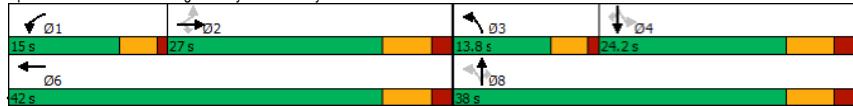
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	134	168	525	124	156	994
Future Volume (vph)	134	168	525	124	156	994
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
FrI	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	3579	1601	1789	3579
Flt Permitted	0.95	1.00	1.00	1.00	0.44	1.00
Satd. Flow (perm)	1789	1601	3579	1601	824	3579
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	146	183	571	135	170	1080
RTOR Reduction (vph)	0	135	0	59	0	0
Lane Group Flow (vph)	146	48	571	76	170	1080
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Actuated Green, G (s)	7.1	7.1	21.0	21.0	21.0	21.0
Effective Green, g (s)	7.1	7.1	21.0	21.0	21.0	21.0
Actuated g/C Ratio	0.19	0.19	0.57	0.57	0.57	0.57
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	342	306	2025	906	466	2025
v/s Ratio Prot	c0.08		0.16		c0.30	
v/s Ratio Perm		0.03		0.05	0.21	
v/c Ratio	0.43	0.16	0.28	0.08	0.36	0.53
Uniform Delay, d1	13.2	12.5	4.2	3.7	4.4	5.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.2	0.3	0.2	2.2	1.0
Delay (s)	14.1	12.7	4.5	3.9	6.6	6.0
Level of Service	B	B	A	A	A	A
Approach Delay (s)	13.3		4.4		6.1	
Approach LOS	B		A		A	
Intersection Summary						
HCM 2000 Control Delay			6.6		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.51			
Actuated Cycle Length (s)			37.1		Sum of lost time (s)	9.0
Intersection Capacity Utilization			42.4%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

## Timings

### 1: Chinguacousy Road & Mayfield Road

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑
Traffic Volume (vph)	14	1143	77	410	1308	296	796	801	27	335	23
Future Volume (vph)	14	1143	77	410	1308	296	796	801	27	335	23
Lane Group Flow (vph)	15	1191	80	427	1402	308	829	834	28	349	24
Turn Type	Perm	NA	Perm	Prot	NA	pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases	2			1	6	3	8	8	4	4	
Permitted Phases	2	2	2	1	6	3	8	8	4	4	4
Detector Phase											
Switch Phase											
Minimum Initial (s)	12.0	12.0	12.0	5.0	12.0	5.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	23.6	9.5	23.6	9.5	23.6	23.6	23.6	23.6	23.6
Total Split (s)	27.0	27.0	27.0	15.0	42.0	13.8	38.0	38.0	24.2	24.2	24.2
Total Split (%)	33.8%	33.8%	33.8%	18.8%	52.5%	17.3%	47.5%	47.5%	30.3%	30.3%	30.3%
Yellow Time (s)	4.6	4.6	4.6	3.5	4.6	3.5	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	4.5	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes							
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max
v/c Ratio	0.16	0.94	0.15	0.93	0.63	0.72	0.42	1.01	0.24	0.44	0.05
Control Delay	28.0	44.1	0.6	63.8	18.7	28.7	18.5	50.3	31.8	29.0	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.0	44.1	0.6	63.8	18.7	28.7	18.5	50.3	31.8	29.0	0.2
Queue Length 50th (m)	1.8	64.8	0.0	33.6	57.7	32.2	32.6	-84.8	3.5	24.2	0.0
Queue Length 95th (m)	6.8	#91.5	0.0	#59.5	71.8	#57.8	42.8	#164.5	10.7	36.3	0.0
Internal Link Dist (m)	324.8			438.2		224.1		938.0			
Turn Bay Length (m)	100.0		100.0		100.0		100.0		100.0		
Base Capacity (vph)	96	1273	524	460	2228	426	1979	824	118	795	449
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.94	0.15	0.93	0.63	0.72	0.42	1.01	0.24	0.44	0.05
<b>Intersection Summary</b>											
Cycle Length:	80										
Actuated Cycle Length: 80											
Natural Cycle: 80											
Control Type: Semi Act-Uncoord											
~ Volume exceeds capacity, queue is theoretically infinite.											
Queue shown is maximum after two cycles.											
# 95th percentile volume exceeds capacity, queue may be longer.											
Queue shown is maximum after two cycles.											

Splits and Phases: 1: Chinguacousy Road & Mayfield Road



051561\_Chinguacousy EA\_2051 GTAW\_AltB.syn  
R.J. Burnside & Associates Limited

## FUT 2051 PM (GTA W) AltB

## HCM Signalized Intersection Capacity Analysis

### 1: Chinguacousy Road & Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑	↑↑↑
Traffic Volume (vph)	14	1143	77	410	1308	296	796	801	27	335	23	
Future Volume (vph)	14	1143	77	410	1308	296	796	801	27	335	23	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	0.91	1.00	1.00	0.95	1.00	
FrT	1.00	1.00	0.85	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1825	4995	1555	3506	5027	1706	5043	1526	1560	3614	1432	
Flt Permitted	0.20	1.00	1.00	0.95	1.00	0.42	1.00	1.00	0.33	1.00	1.00	1.00
Satd. Flow (perm)	377	4995	1555	3506	5027	754	5043	1526	1538	3614	1432	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	15	1191	80	427	1362	39	308	829	834	28	349	24
RTOR Reduction (vph)	0	0	60	0	4	0	0	0	0	0	0	19
Lane Group Flow (vph)	15	1191	20	427	1398	0	308	829	608	28	349	5
Heavy Vehicles (%)	0%	5%	5%	1%	4%	0%	7%	4%	7%	17%	1%	14%
Turn Type	Perm	NA	Perm	Prot	NA	pm+pt	NA	Perm	Perm	NA	Perm	
Protected Phases	2		1	6		3	8		8	4		4
Permitted Phases				2			8					
Actuated Green, G (s)	20.4	20.4	20.4	10.5	35.4		31.4	31.4	31.4	17.6	17.6	17.6
Effective Green, g (s)	20.4	20.4	20.4	10.5	35.4		31.4	31.4	31.4	17.6	17.6	17.6
Actuated g/C Ratio	0.25	0.25	0.25	0.13	0.44		0.39	0.39	0.39	0.22	0.22	0.22
Clearance Time (s)	6.6	6.6	6.6	4.5	6.6		4.5	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	96	1273	396	460	2224		406	1979	598	118	795	315
v/s Ratio Prot	c0.24		c0.12	0.28			0.09	0.16		0.10		
v/s Ratio Perm	0.04		0.01				0.21			c0.40	0.05	0.00
v/c Ratio	0.16	0.94	0.05	0.93	0.63		0.76	0.42	1.02	0.24	0.44	0.02
Uniform Delay, d1	23.1	29.2	22.5	34.4	17.2		18.9	17.7	24.3	25.7	26.9	24.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	12.7	0.1	24.9	0.6		7.9	0.7	41.1	4.7	1.8	0.1
Delay (s)	23.9	41.8	22.6	59.3	17.8		26.8	18.3	65.4	30.4	28.7	24.5
Level of Service	C	D	C	E	B		C	B	E	C	C	C
Approach Delay (s)	40.4				27.5				39.6		28.6	
Approach LOS		D		C			D		C		C	

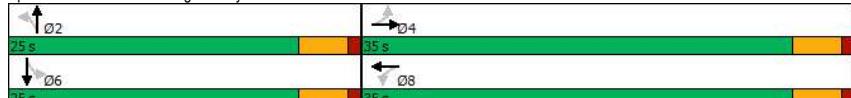
051561\_Chinguacousy EA\_2051 GTAW\_AltB.syn  
R.J. Burnside & Associates Limited

Synchro 11 Report  
03/21/2022 - Page 1

Timings  
2: Chinguacousy Road & Old School Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓
Traffic Volume (vph)	19	266	94	733	44	697	12	230
Future Volume (vph)	19	266	94	733	44	697	12	230
Lane Group Flow (vph)	21	301	102	838	48	960	13	263
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6	
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	35.0	35.0	35.0	35.0	25.0	25.0	25.0	25.0
Total Split (%)	58.3%	58.3%	58.3%	58.3%	41.7%	41.7%	41.7%	41.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.16	0.32	0.23	0.90	0.12	0.76	0.10	0.22
Control Delay	11.6	9.8	10.0	28.8	14.6	20.8	15.9	13.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.6	9.8	10.0	28.8	14.6	20.8	15.9	13.9
Queue Length 50th (m)	1.1	17.4	5.7	74.0	3.6	45.6	1.0	10.2
Queue Length 95th (m)	4.8	30.6	13.5	#143.6	9.7	65.8	4.4	17.5
Internal Link Dist (m)	414.1		424.5		2089.6		405.3	
Turn Bay Length (m)	100.0		100.0		100.0		100.0	
Base Capacity (vph)	141	1009	469	999	400	1271	132	1199
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.30	0.22	0.84	0.12	0.76	0.10	0.22
Intersection Summary								
Cycle Length: 60								
Actuated Cycle Length: 58.1								
Natural Cycle: 60								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 2: Chinguacousy Road & Old School Road



HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

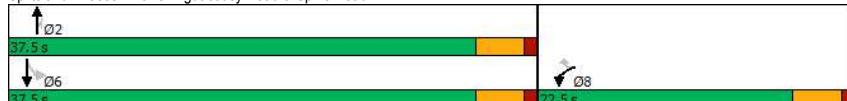
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑	↓	↑	↓	↑	↓	↑	↓	↑	↓
Traffic Volume (vph)	19	266	11	94	733	38	44	697	186	12	230	12
Future Volume (vph)	19	266	11	94	733	38	44	697	186	12	230	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95
Frt	1.00	0.99	1.00	0.99	1.00	0.97	1.00	0.99	1.00	0.99	1.00	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1910	1547	1889	1825	3480	1825	3367	1825	3480	1825	3367
Flt Permitted	0.14	1.00	0.55	1.00	0.59	1.00	0.19	1.00	0.20	1.00	0.19	1.00
Satd. Flow (perm)	270	1910	891	1889	1132	3480	373	3367	373	3480	373	3367
Peak-hour factor, PHF	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)	21	289	12	102	797	41	48	758	202	13	250	13
RTOR Reduction (vph)	0	3	0	0	3	0	0	39	0	0	6	0
Lane Group Flow (vph)	21	298	0	102	835	0	48	921	0	13	257	0
Heavy Vehicles (%)	0%	0%	0%	18%	1%	0%	0%	2%	0%	0%	8%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	28.5	28.5	28.5	28.5	28.5	28.5	20.6	20.6	20.6	20.6	20.6	20.6
Effective Green, g (s)	28.5	28.5	28.5	28.5	28.5	28.5	20.6	20.6	20.6	20.6	20.6	20.6
Actuated g/C Ratio	0.49	0.49	0.49	0.49	0.49	0.49	0.35	0.35	0.35	0.35	0.35	0.35
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	132	936	437	926	401	1233	132	1193				
v/s Ratio Prot	0.16		c0.44		c0.26		0.08					
v/s Ratio Perm	0.08		0.11		0.04		0.12					
v/c Ratio	0.16	0.32	0.23	0.90	0.12	0.75	0.10	0.22				
Uniform Delay, d1	8.2	8.9	8.5	13.5	12.6	16.5	12.5	13.1				
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Incremental Delay, d2	0.6	0.2	0.3	11.8	0.6	4.2	1.5	0.4				
Delay (s)	8.7	9.1	8.8	25.3	13.2	20.6	14.0	13.5				
Level of Service	A	A	A	C	B	C	B	B				
Approach Delay (s)	9.1		23.5		20.3		13.5					
Approach LOS	A		C		C		B					
Intersection Summary												
HCM 2000 Control Delay	19.3											
HCM 2000 Volume to Capacity ratio	0.84											
Actuated Cycle Length (s)	58.1											
Intersection Capacity Utilization	89.4%											
Analysis Period (min)	15											
c Critical Lane Group												

## Timings

### 3: Chinguacousy Road & Spine Road

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	56	286	824	226	161	572
Future Volume (vph)	56	286	824	226	161	572
Lane Group Flow (vph)	61	311	896	246	175	622
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	37.5	37.5	37.5	37.5
Total Split (%)	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
v/c Ratio	0.16	0.71	0.40	0.23	0.51	0.28
Control Delay	17.3	20.3	6.7	1.6	14.6	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.3	20.3	6.7	1.6	14.6	5.9
Queue Length 50th (m)	4.8	15.8	19.6	0.0	8.0	12.4
Queue Length 95th (m)	12.0	36.3	39.5	7.6	#33.8	25.8
Internal Link Dist (m)	108.0		938.0		2089.6	
Turn Bay Length (m)			100.0	100.0		
Base Capacity (vph)	585	609	2231	1091	341	2231
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.51	0.40	0.23	0.51	0.28
Intersection Summary						
Cycle Length: 60						
Actuated Cycle Length: 55.2						
Natural Cycle: 60						
Control Type: Semi Act-Uncoord						
# 95th percentile volume exceeds capacity, queue may be longer.						
Queue shown is maximum after two cycles.						

Splits and Phases: 3: Chinguacousy Road & Spine Road



## HCM Signalized Intersection Capacity Analysis

### 3: Chinguacousy Road & Spine Road

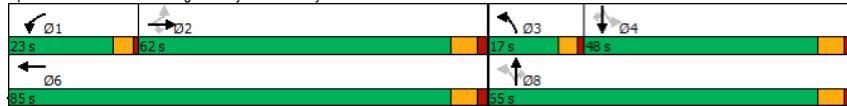
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	56	286	824	226	161	572
Future Volume (vph)	56	286	824	226	161	572
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	3579	1601	1789	3579
Flt Permitted	0.95	1.00	1.00	1.00	0.29	1.00
Satd. Flow (perm)	1789	1601	3579	1601	548	3579
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	311	896	246	175	622
RTOR Reduction (vph)	0	100	0	93	0	0
Lane Group Flow (vph)	61	211	896	153	175	622
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Actuated Green, G (s)	11.8	11.8	34.4	34.4	34.4	34.4
Effective Green, g (s)	11.8	11.8	34.4	34.4	34.4	34.4
Actuated g/C Ratio	0.21	0.21	0.62	0.62	0.62	0.62
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	382	342	2230	997	341	2230
v/s Ratio Prot	0.03		0.25		0.17	
v/s Ratio Perm	c0.13		0.10		c0.32	
v/c Ratio	0.16	0.62	0.40	0.15	0.51	0.28
Uniform Delay, d1	17.7	19.7	5.2	4.3	5.8	4.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	3.3	0.5	0.3	5.4	0.3
Delay (s)	17.9	23.0	5.8	4.7	11.2	5.1
Level of Service	B	C	A	A	B	A
Approach Delay (s)	22.1		5.5		6.4	
Approach LOS	C		A		A	
Intersection Summary						
HCM 2000 Control Delay		8.5				
HCM 2000 Volume to Capacity ratio		0.54				
Actuated Cycle Length (s)		55.2				
Intersection Capacity Utilization		48.0%				
Analysis Period (min)		15				
c Critical Lane Group						

## Timings

### 1: Chinguacousy Road & Mayfield Road

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑	↑	↑↑	↑↑	↑	↑↑	↑	↑↑	↑↑	↑
Traffic Volume (vph)	12	1594	173	372	1159	152	365	459	54	859	50
Future Volume (vph)	12	1594	173	372	1159	152	365	459	54	859	50
Lane Group Flow (vph)	14	1811	197	423	1328	173	415	522	61	976	57
Turn Type	Perm	NA	Perm	Prot	NA	pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases	2			1	6	3	8	8	4	4	
Permitted Phases	2	2	2	1	6	3	8	8	4	4	4
Detector Phase											
Switch Phase											
Minimum Initial (s)	12.0	12.0	12.0	5.0	12.0	5.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	23.6	9.5	23.6	9.5	23.6	23.6	23.6	23.6	23.6
Total Split (s)	62.0	62.0	62.0	23.0	85.0	17.0	65.0	65.0	48.0	48.0	48.0
Total Split (%)	41.3%	41.3%	41.3%	15.3%	56.7%	11.3%	43.3%	43.3%	32.0%	32.0%	32.0%
Yellow Time (s)	4.6	4.6	4.6	3.5	4.6	3.5	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	4.5	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max
v/c Ratio	0.12	0.98	0.29	1.07	0.53	1.09	0.21	0.66	0.33	1.01	0.16
Control Delay	34.9	63.7	8.8	124.2	24.6	135.7	30.8	21.4	49.5	84.3	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.9	63.7	8.8	124.2	24.6	135.7	30.8	21.4	49.5	84.3	2.6
Queue Length 50th (m)	2.8	194.7	7.1	-71.3	93.0	-44.9	29.9	61.4	14.6	-155.8	0.0
Queue Length 95th (m)	8.3	#219.9	23.2	#101.5	102.9	#90.6	37.4	96.9	28.2	#193.6	2.6
Internal Link Dist (m)	324.8		438.2		224.1			938.0			
Turn Bay Length (m)	100.0		100.0		100.0		100.0	100.0		100.0	
Base Capacity (vph)	115	1844	670	397	2509	158	1982	790	184	968	367
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.98	0.29	1.07	0.53	1.09	0.21	0.66	0.33	1.01	0.16
<b>Intersection Summary</b>											
Cycle Length: 150											
Actuated Cycle Length: 150											
Natural Cycle: 110											
Control Type: Semi Act-Uncoord											
~ Volume exceeds capacity, queue is theoretically infinite.											
Queue shown is maximum after two cycles.											
# 95th percentile volume exceeds capacity, queue may be longer.											
Queue shown is maximum after two cycles.											

Splits and Phases: 1: Chinguacousy Road & Mayfield Road



051561\_Chinguacousy EA\_2041 No GTAW\_AltB.syn  
R.J. Burnside & Associates Limited

Synchro 11 Report  
03/21/2022 - Page 1

## HCM Signalized Intersection Capacity Analysis

### 1: Chinguacousy Road & Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑	↑	↑↑	↑↑	↑	↑	↑↑	↑	↑↑	↑↑	↑
Traffic Volume (vph)	12	1594	173	372	1159	10	152	365	459	54	859	50
Future Volume (vph)	12	1594	173	372	1159	10	152	365	459	54	859	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	0.91	1.00	1.00	0.95	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95
Satd. Flow (prot)	1521	4995	1541	3219	4800	1404	5092	1601	1267	3510	1089	
Flt Permitted	0.19	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.50	1.00	1.00	1.00
Satd. Flow (perm)	311	4995	1541	3219	4800	129	5092	1601	667	3510	1089	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	14	1811	197	423	1317	11	173	415	522	61	976	57
RTOR Reduction (vph)	0	0	101	0	0	0	0	0	0	0	0	41
Lane Group Flow (vph)	14	1811	96	423	1328	0	173	415	355	61	976	16
Heavy Vehicles (%)	20%	5%	6%	10%	9%	25%	30%	3%	24%	4%	50%	
Turn Type	Perm	NA	Perm	Prot	NA	pm+pt	NA	Perm	Perm	NA	Perm	
Protected Phases	2		1	6		3	8	4	4	4	4	
Permitted Phases	2		2			8		8	4	4	4	
Actuated Green, G (s)	55.4	55.4	55.4	18.5	78.4		58.4	58.4	58.4	41.4	41.4	
Effective Green, g (s)	55.4	55.4	55.4	18.5	78.4		58.4	58.4	58.4	41.4	41.4	
Actuated g/C Ratio	0.37	0.37	0.37	0.12	0.52		0.39	0.39	0.28	0.28	0.28	
Clearance Time (s)	6.6	6.6	6.6	4.5	6.6		4.5	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	114	1844	569	397	2508		156	1982	623	184	968	300
v/s Ratio Prot	c0.36		c0.13	0.28		c0.09	0.08		c0.28			
v/s Ratio Perm	0.04		0.06			c0.34		0.22	0.09		0.01	
v/c Ratio	0.12	0.98	0.17	1.07	0.53		1.11	0.21	0.57	0.33	1.01	0.05
Uniform Delay, d1	31.2	46.8	31.8	65.8	23.6		43.4	30.5	35.9	43.3	54.3	39.9
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	16.8	0.1	63.6	0.2		104.3	0.2	3.7	4.8	31.0	0.3
Delay (s)	31.7	63.6	32.0	129.4	23.8		147.7	30.7	39.7	48.0	85.3	40.2
Level of Service	C	E	C	F	C		F	C	D	D	F	D
Approach Delay (s)	60.3				49.3			53.2		80.8		
Approach LOS	E		D				D		D	F		
<b>Intersection Summary</b>												
HCM 2000 Control Delay	59.5											
HCM 2000 Volume to Capacity ratio	1.07											
Actuated Cycle Length (s)	150.0											
Sum of lost time (s)	22.2											
Intersection Capacity Utilization	92.1%											
Analysis Period (min)	15											
c Critical Lane Group												

051561\_Chinguacousy EA\_2041 No GTAW\_AltB.syn  
R.J. Burnside & Associates Limited

Synchro 11 Report  
03/21/2022 - Page 2

Timings  
2: Chinguacousy Road & Old School Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑	←	↑	→	↑	↓
Traffic Volume (vph)	20	505	78	223	36	277	36	777
Future Volume (vph)	20	505	78	223	36	277	36	777
Lane Group Flow (vph)	22	600	85	250	39	406	39	850
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		2	
Permitted Phases	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.05	0.85	0.49	0.36	0.38	0.29	0.10	0.58
Control Delay	8.8	26.9	21.7	11.2	24.8	7.2	9.3	12.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.8	26.9	21.7	11.2	24.8	7.2	9.3	12.2
Queue Length 50th (m)	1.0	38.6	4.7	12.7	2.1	7.7	1.8	26.0
Queue Length 95th (m)	3.9	#86.1	#18.5	25.2	#11.8	14.6	6.0	39.5
Internal Link Dist (m)	414.1	424.5		2089.6		405.3		
Turn Bay Length (m)	100.0	100.0		100.0		100.0		
Base Capacity (vph)	478	760	190	740	102	1417	406	1475
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.79	0.45	0.34	0.38	0.29	0.10	0.58
Intersection Summary								
Cycle Length: 45								
Actuated Cycle Length: 43.8								
Natural Cycle: 45								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

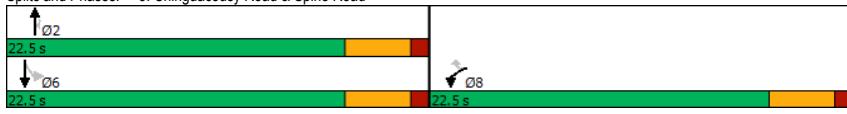
Splits and Phases: 2: Chinguacousy Road & Old School Road



HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑	←	↑	→	↑	→	↑	↑	→	↑
Traffic Volume (vph)	20	505	47	78	223	7	36	277	36	777	36	5
Future Volume (vph)	20	505	47	78	223	7	36	277	36	777	36	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
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	0.95
Frt	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1829	1825	1791	913	3289	1825	3576				
Flt Permitted	0.60	1.00	0.24	1.00	0.26	1.00	0.51	1.00	0.26	1.00	0.51	1.00
Satd. Flow (perm)	1160	1829	460	1791	248	3289	986	3576				
Peak-hour factor, PHF	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)	22	549	51	85	242	8	39	301	105	39	845	5
RTOR Reduction (vph)	0	7	0	0	2	0	0	62	0	0	1	0
Lane Group Flow (vph)	22	593	0	85	248	0	39	344	0	39	849	0
Heavy Vehicles (%)	0%	1%	33%	0%	7%	0%	100%	9%	0%	0%	2%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	16.7	16.7	16.7	16.7	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
Effective Green, g (s)	16.7	16.7	16.7	16.7	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
Actuated g/C Ratio	0.38	0.38	0.38	0.38	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	443	698	175	684	102	1354	406	1472				
v/s Ratio Prot	c0.32		0.14		0.10		c0.24					
v/s Ratio Perm	0.02		0.18		0.16		0.04					
v/c Ratio	0.05	0.85	0.49	0.36	0.38	0.25	0.10	0.58				
Uniform Delay, d1	8.5	12.3	10.2	9.7	9.0	8.4	7.9	9.9				
Progression 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
Incremental Delay, d2	0.0	9.5	2.1	0.3	10.5	0.5	0.5	1.7				
Delay (s)	8.5	21.8	12.4	10.0	19.5	8.9	8.3	11.6				
Level of Service	A	C	B	B	B	A	A	B				
Approach Delay (s)	21.3		10.6		9.8		11.4					
Approach LOS	C		B		A		B					
Intersection Summary												
HCM 2000 Control Delay	13.7											
HCM 2000 Volume to Capacity ratio	0.71											
Actuated Cycle Length (s)	43.7											
Intersection Capacity Utilization	74.6%											
Analysis Period (min)	15											
c Critical Lane Group												

Timings  
3: Chinguacousy Road & Spine Road

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	110	138	521	102	128	933
Future Volume (vph)	110	138	521	102	128	933
Lane Group Flow (vph)	120	150	566	111	139	1014
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
v/c Ratio	0.32	0.33	0.26	0.11	0.27	0.46
Control Delay	13.7	4.9	5.1	1.8	7.3	6.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.7	4.9	5.1	1.8	7.3	6.3
Queue Length 50th (m)	5.7	0.0	7.9	0.0	3.7	16.7
Queue Length 95th (m)	13.6	7.7	16.2	4.2	12.6	32.2
Internal Link Dist (m)	108.0		938.0		2089.6	
Turn Bay Length (m)				100.0	100.0	
Base Capacity (vph)	883	866	2211	1031	511	2211
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.17	0.26	0.11	0.27	0.46
Intersection Summary						
Cycle Length: 45						
Actuated Cycle Length: 36.5						
Natural Cycle: 45						
Control Type: Semi Act-Uncoord						
Splits and Phases: 3: Chinguacousy Road & Spine Road						
						

HCM Signalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	110	138	521	102	128	933
Future Volume (vph)	110	138	521	102	128	933
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	3579	1601	1789	3579
Flt Permitted	0.95	1.00	1.00	1.00	0.44	1.00
Satd. Flow (perm)	1789	1601	3579	1601	828	3579
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	120	150	566	111	139	1014
RTOR Reduction (vph)	0	123	0	47	0	0
Lane Group Flow (vph)	120	27	566	64	139	1014
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Actuated Green, G (s)	6.7	6.7	21.7	21.7	21.7	21.7
Effective Green, g (s)	6.7	6.7	21.7	21.7	21.7	21.7
Actuated g/C Ratio	0.18	0.18	0.58	0.58	0.58	0.58
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	320	286	2076	928	480	2076
v/s Ratio Prot	c0.07		0.16		c0.28	
v/s Ratio Perm		0.02		0.04	0.17	
v/c Ratio	0.38	0.09	0.27	0.07	0.29	0.49
Uniform Delay, d1	13.5	12.8	3.9	3.4	4.0	4.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	0.1	0.3	0.1	1.5	0.8
Delay (s)	14.2	13.0	4.2	3.6	5.5	5.4
Level of Service	B	B	A	A	A	A
Approach Delay (s)	13.5		4.1		5.4	
Approach LOS	B		A		A	
Intersection Summary						
HCM 2000 Control Delay		6.1				
HCM 2000 Volume to Capacity ratio		0.46				
Actuated Cycle Length (s)		37.4				
Intersection Capacity Utilization		39.4%				
Analysis Period (min)		15				
c Critical Lane Group						

Timings  
1: Chinguacousy Road & Mayfield Road

FUT 2041 PM (No GTA W) AltB

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑	↑	↑↑	↑↑	↑	↑↑	↑	↑↑	↑↑	↑
Traffic Volume (vph)	18	1357	92	441	1406	272	732	736	26	308	21
Future Volume (vph)	18	1357	92	441	1406	272	732	736	26	308	21
Lane Group Flow (vph)	19	1414	96	459	1507	283	763	767	27	321	22
Turn Type	Perm	NA	Perm	Prot	NA	pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases	2		1	6	3	8	8	4	4	4	
Permitted Phases	2	2	2	1	6	3	8	8	4	4	4
Detector Phase											
Switch Phase											
Minimum Initial (s)	12.0	12.0	12.0	5.0	12.0	5.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	23.6	9.5	23.6	9.5	23.6	23.6	23.6	23.6	23.6
Total Split (s)	33.3	33.3	33.3	17.3	50.6	14.8	39.4	39.4	24.6	24.6	24.6
Total Split (%)	37.0%	37.0%	37.0%	19.2%	56.2%	16.4%	43.8%	43.8%	27.3%	27.3%	27.3%
Yellow Time (s)	4.6	4.6	4.6	3.5	4.6	3.5	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max
v/c Ratio	0.21	0.95	0.17	0.92	0.61	0.70	0.42	0.98	0.23	0.44	0.05
Control Delay	30.7	46.8	1.7	64.4	18.0	31.7	22.3	45.2	36.3	33.9	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.7	46.8	1.7	64.4	18.0	31.7	22.3	45.2	36.3	33.9	0.2
Queue Length 50th (m)	2.4	87.3	0.0	40.9	66.3	35.2	35.5	80.9	4.0	25.8	0.0
Queue Length 95th (m)	8.6	#117.6	3.1	#68.2	80.5	#58.2	46.0	#161.9	11.6	38.2	0.0
Internal Link Dist (m)	324.8			438.2		224.1		938.0			
Turn Bay Length (m)	100.0		100.0		100.0		100.0		100.0		
Base Capacity (vph)	91	1481	568	498	2461	403	1837	781	115	722	408
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.95	0.17	0.92	0.61	0.70	0.42	0.98	0.23	0.44	0.05

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Natural Cycle: 90

Control Type: Semi Act-Uncoord

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Chinguacousy Road & Mayfield Road



HCM Signalized Intersection Capacity Analysis  
1: Chinguacousy Road & Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑	↑	↑↑	↑↑	↑	↑	↑↑	↑	↑↑	↑	↑
Traffic Volume (vph)	18	1357	92	441	1406	40	272	732	26	308	21	
Future Volume (vph)	18	1357	92	441	1406	40	272	732	26	308	21	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	0.91	1.00	1.00	0.95	1.00	
FrT	1.00	1.00	0.85	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1825	4995	1555	3506	5027	1706	5043	1526	3614	1432		
Flt Permitted	0.16	1.00	1.00	0.95	1.00	0.42	1.00	1.00	0.35	1.00	1.00	1.00
Satd. Flow (perm)	309	4995	1555	3506	5027	762	5043	1526	3614	1432		
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	19	1414	96	459	1465	42	283	762	767	27	321	22
RTOR Reduction (vph)	0	0	68	0	3	0	0	0	0	0	0	18
Lane Group Flow (vph)	19	1414	28	459	1504	0	283	763	542	27	321	4
Heavy Vehicles (%)	0%	5%	5%	1%	4%	0%	7%	4%	7%	17%	1%	14%
Turn Type	Perm	NA	Perm	Prot	NA	pm+pt	NA	Perm	Perm	NA	Perm	
Protected Phases	2		1	6		3	8	4	4	4	4	
Permitted Phases							8		8	4	4	
Actuated Green, G (s)	26.7	26.7	26.7	12.8	44.0		32.8	32.8	32.8	18.0	18.0	18.0
Effective Green, g (s)	26.7	26.7	26.7	12.8	44.0		32.8	32.8	32.8	18.0	18.0	18.0
Actuated g/C Ratio	0.30	0.30	0.30	0.14	0.49		0.36	0.36	0.36	0.20	0.20	0.20
Clearance Time (s)	6.6	6.6	6.6	4.5	6.6		4.5	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	91	1481	461	498	2457		385	1837	556	115	722	286
v/s Ratio Prot	c0.28		c0.13	0.30			0.08	0.15		0.09		
v/s Ratio Perm	0.06		0.02				0.18			c0.36	0.05	0.00
v/c Ratio	0.21	0.95	0.06	0.92	0.61		0.74	0.42	0.97	0.23	0.44	0.02
Uniform Delay, d1	23.7	31.1	22.7	38.1	16.8		22.5	21.4	28.2	30.2	31.6	28.9
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1	14.0	0.1	22.6	0.5		7.1	0.7	32.4	4.7	2.0	0.1
Delay (s)	24.9	45.0	22.7	60.7	17.2		29.6	22.1	60.6	35.0	33.6	29.0
Level of Service	C	D	C	E	B		C	C	E	C	C	C
Approach Delay (s)	43.4						27.4			39.6		33.4
Approach LOS	D		C				D			C		

Intersection Summary

HCM 2000 Control Delay 36.0 HCM 2000 Level of Service D

HCM 2000 Volume to Capacity ratio 1.02

Actuated Cycle Length (s) 90.0 Sum of lost time (s) 22.2

Intersection Capacity Utilization 98.3% ICU Level of Service F

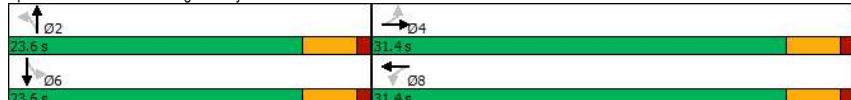
Analysis Period (min) 15

c Critical Lane Group

Timings  
2: Chinguacousy Road & Old School Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑	←	↑	→	↑	↓
Traffic Volume (vph)	17	241	85	664	40	642	9	213
Future Volume (vph)	17	241	85	664	40	642	9	213
Lane Group Flow (vph)	18	273	92	759	43	886	10	242
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6	
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	31.4	31.4	31.4	31.4	23.6	23.6	23.6	23.6
Total Split (%)	57.1%	57.1%	57.1%	57.1%	42.9%	42.9%	42.9%	42.9%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.12	0.31	0.21	0.87	0.10	0.67	0.07	0.19
Control Delay	10.2	9.6	9.6	25.8	13.0	16.5	13.7	12.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	9.6	9.6	25.8	13.0	16.5	13.7	12.2
Queue Length 50th (m)	0.9	14.5	4.8	58.5	2.8	35.9	0.7	8.3
Queue Length 95th (m)	4.0	26.7	11.7	#118.6	8.2	53.3	3.4	14.8
Internal Link Dist (m)	414.1		424.5		2089.6		405.3	
Turn Bay Length (m)	100.0		100.0		100.0		100.0	
Base Capacity (vph)	165	991	487	982	425	1322	146	1245
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.28	0.19	0.77	0.10	0.67	0.07	0.19
Intersection Summary								
Cycle Length: 55								
Actuated Cycle Length: 52.2								
Natural Cycle: 55								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 2: Chinguacousy Road & Old School Road



HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑	←	↑	→	↑	↓	↑	→	↑	↓
Traffic Volume (vph)	17	241	10	85	664	34	40	642	9	213	9	213
Future Volume (vph)	17	241	10	85	664	34	40	642	9	213	9	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00
Frt	1.00	0.99	1.00	0.99	1.00	0.97	1.00	0.99	1.00	0.99	1.00	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1910	1547	1889	1825	1889	1825	1889	1825	1889	1825	1889
Flt Permitted	0.17	1.00	0.58	1.00	0.60	1.00	0.21	1.00	0.21	1.00	0.21	1.00
Satd. Flow (perm)	320	1910	941	1889	1155	1889	400	1889	400	1889	400	1889
Peak-hour factor, PHF	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)	18	262	11	92	722	37	43	698	188	10	232	10
RTOR Reduction (vph)	0	3	0	0	4	0	0	43	0	0	6	0
Lane Group Flow (vph)	18	270	0	92	755	0	43	843	0	10	236	0
Heavy Vehicles (%)	0%	0%	0%	18%	1%	0%	0%	2%	0%	0%	8%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	24.0	24.0	24.0	24.0	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
Effective Green, g (s)	24.0	24.0	24.0	24.0	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
Actuated g/C Ratio	0.46	0.46	0.46	0.46	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	147	878	432	868	424	1279	147	1239				
v/s Ratio Prot	0.14		c0.40		c0.24		0.07					
v/s Ratio Perm	0.06		0.10		0.04		0.02					
v/c Ratio	0.12	0.31	0.21	0.87	0.10	0.66	0.07	0.19				
Uniform Delay, d1	8.1	8.9	8.4	12.7	10.8	13.8	10.7	11.2				
Progression 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
Incremental Delay, d2	0.4	0.2	0.2	9.5	0.5	2.7	0.9	0.3				
Delay (s)	8.4	9.1	8.7	22.2	11.3	16.4	11.6	11.6				
Level of Service	A	A	A	C	B	B	B	B				
Approach Delay (s)	9.0		20.7		16.2		11.6					
Approach LOS	A		C		B		B					
Intersection Summary												
HCM 2000 Control Delay	16.5											
HCM 2000 Volume to Capacity ratio	0.78											
Actuated Cycle Length (s)	52.2											
Intersection Capacity Utilization	83.6%											
Analysis Period (min)	15											
c Critical Lane Group												

Timings  
3: Chinguacousy Road & Spine Road

FUT 2041 PM (No GTA W) Improved

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	46	235	808	185	132	552
Future Volume (vph)	46	235	808	185	132	552
Lane Group Flow (vph)	50	255	878	201	143	600
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
v/c Ratio	0.11	0.55	0.42	0.20	0.44	0.29
Control Delay	10.2	13.6	7.5	2.2	16.5	6.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	13.6	7.5	2.2	16.5	6.7
Queue Length 50th (m)	2.3	10.0	16.6	0.0	5.2	10.2
Queue Length 95th (m)	6.9	23.0	36.2	7.5	#27.9	23.4
Internal Link Dist (m)	108.0		938.0		2089.6	
Turn Bay Length (m)			100.0	100.0		
Base Capacity (vph)	844	786	2079	1014	326	2079
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.32	0.42	0.20	0.44	0.29

Intersection Summary

Cycle Length: 45

Actuated Cycle Length: 38.2

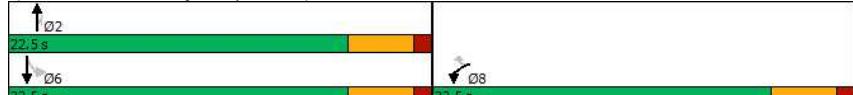
Natural Cycle: 55

Control Type: Semi Act-Uncoord

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Chinguacousy Road & Spine Road



HCM Signalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

FUT 2041 PM (No GTA W) Improved

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	46	235	808	185	132	552
Future Volume (vph)	46	235	808	185	132	552
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
FrI	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	3579	1601	1789	3579
Flt Permitted	0.95	1.00	1.00	1.00	0.30	1.00
Satd. Flow (perm)	1789	1601	3579	1601	562	3579
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	50	255	878	201	143	600
RTOR Reduction (vph)	0	45	0	92	0	0
Lane Group Flow (vph)	50	210	878	109	143	600
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Actuated Green, G (s)	8.8	8.8	21.3	21.3	21.3	21.3
Effective Green, g (s)	8.8	8.8	21.3	21.3	21.3	21.3
Actuated g/C Ratio	0.23	0.23	0.54	0.54	0.54	0.54
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	402	360	1949	872	306	1949
v/s Ratio Prot	0.03		0.25		0.17	
v/s Ratio Perm	c0.13		0.07	c0.25		
v/c Ratio	0.12	0.58	0.45	0.13	0.47	0.31
Uniform Delay, d1	12.1	13.5	5.4	4.3	5.4	4.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	2.4	0.8	0.3	5.1	0.4
Delay (s)	12.2	15.9	6.1	4.6	10.5	5.3
Level of Service	B	B	A	A	B	A
Approach Delay (s)	15.3		5.8		6.3	
Approach LOS	B		A		A	

Intersection Summary

HCM 2000 Control Delay	7.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	39.1	Sum of lost time (s)	9.0
Intersection Capacity Utilization	45.1%	ICU Level of Service	A
Analysis Period (min)	15		

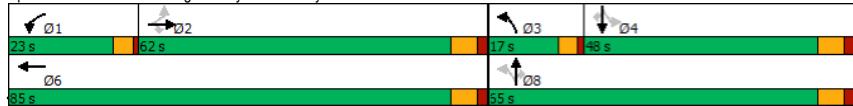
c Critical Lane Group

Timings  
1: Chinguacousy Road & Mayfield Road

FUT 2051 AM (No GTA W) AltB

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑
Traffic Volume (vph)	13	1675	182	391	1218	168	403	507	60	949	55
Future Volume (vph)	13	1675	182	391	1218	168	403	507	60	949	55
Lane Group Flow (vph)	15	1903	207	444	1397	191	458	576	68	1078	63
Turn Type	Perm	NA	Perm	Prot	NA	pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases	2			1	6	3	8	8	4	4	
Permitted Phases	2	2	2	1	6	3	8	8	4	4	4
Detector Phase											
Switch Phase											
Minimum Initial (s)	12.0	12.0	12.0	5.0	12.0	5.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	23.6	9.5	23.6	9.5	23.6	23.6	23.6	23.6	23.6
Total Split (s)	62.0	62.0	62.0	23.0	85.0	17.0	65.0	65.0	48.0	48.0	48.0
Total Split (%)	41.3%	41.3%	41.3%	15.3%	56.7%	11.3%	43.3%	43.3%	32.0%	32.0%	32.0%
Yellow Time (s)	4.6	4.6	4.6	3.5	4.6	3.5	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max
v/c Ratio	0.14	1.03	0.31	1.12	0.56	1.21	0.23	0.73	0.39	1.11	0.17
Control Delay	35.8	75.6	9.8	139.1	25.2	173.1	31.1	25.7	51.9	114.4	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.8	75.6	9.8	139.1	25.2	173.1	31.1	25.7	51.9	114.4	3.7
Queue Length 50th (m)	3.0	-221.5	9.1	-78.0	99.8	-56.2	33.3	79.9	16.5	-192.6	0.0
Queue Length 95th (m)	8.7	#239.7	26.0	#108.5	110.0	#103.1	41.1	120.2	31.4	#226.4	4.4
Internal Link Dist (m)	324.8		438.2		224.1			938.0			
Turn Bay Length (m)	100.0		100.0		100.0		100.0	100.0		100.0	
Base Capacity (vph)	107	1844	670	397	2509	158	1982	790	176	968	367
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	1.03	0.31	1.12	0.56	1.21	0.23	0.73	0.39	1.11	0.17
<b>Intersection Summary</b>											
Cycle Length: 150											
Actuated Cycle Length: 150											
Natural Cycle: 150											
Control Type: Semi Act-Uncoord											
~ Volume exceeds capacity, queue is theoretically infinite.											
Queue shown is maximum after two cycles.											
# 95th percentile volume exceeds capacity, queue may be longer.											
Queue shown is maximum after two cycles.											

Splits and Phases: 1: Chinguacousy Road & Mayfield Road



051561\_Chinguacousy EA\_2051 No GTAW\_AltB.syn  
R.J. Burnside & Associates Limited

Synchro 11 Report  
03/21/2022 - Page 1

HCM Signalized Intersection Capacity Analysis  
1: Chinguacousy Road & Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑↑	↑	↑↑↑	↑↑↑	↑	↑	↑↑↑	↑	↑↑↑	↑	↑
Traffic Volume (vph)	13	1675	182	391	1218	168	403	507	60	949	55	
Future Volume (vph)	13	1675	182	391	1218	168	403	507	60	949	55	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	0.91	1.00	1.00	0.95	1.00	
FrT	1.00	1.00	0.85	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1521	4995	1541	3219	4798		1404	5092	1601	1267	3510	1089
Flt Permitted	0.18	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	290	4995	1541	3219	4798		129	5092	1601	639	3510	1089
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	15	1903	207	444	1384	12	191	458	576	68	1078	62
RTOR Reduction (vph)	0	0	101	0	0	0	0	0	0	0	0	46
Lane Group Flow (vph)	15	1903	106	444	1397	0	191	458	409	68	1078	17
Heavy Vehicles (%)	20%	5%	6%	10%	9%	25%	30%	3%	2%	44%	4%	50%
Turn Type	Perm	NA	Perm	Prot	NA	pm+pt	NA	Perm	Perm	NA	Perm	
Protected Phases	2		1	6		8		8	4		4	
Permitted Phases	2		2									
Actuated Green, G (s)	55.4	55.4	55.4	18.5	78.4		58.4	58.4	58.4	41.4	41.4	
Effective Green, g (s)	55.4	55.4	55.4	18.5	78.4		58.4	58.4	58.4	41.4	41.4	
Actuated g/C Ratio	0.37	0.37	0.37	0.12	0.52		0.39	0.39	0.28	0.28	0.28	
Clearance Time (s)	6.6	6.6	6.6	4.5	6.6		4.5	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	107	1844	569	397	2507		156	1982	623	176	968	300
v/s Ratio Prot	c0.38		c0.14	0.29		c0.10	0.09		c0.31			
v/s Ratio Perm	0.05		0.07			c0.37			0.26	0.11		0.02
v/c Ratio	0.14	1.03	0.19	1.12	0.56		1.22	0.23	0.66	0.39	1.11	0.06
Uniform Delay, d1	31.5	47.3	32.0	65.8	24.1		43.5	30.7	37.6	44.0	54.3	40.0
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.6	29.7	0.2	81.3	0.3		144.9	0.3	5.3	6.3	65.4	0.4
Delay (s)	32.1	77.0	32.2	147.1	24.4		188.4	31.0	42.9	50.3	119.7	40.3
Level of Service	C	E	C	F	C		F	C	D	D	F	D
Approach Delay (s)	72.3				54.0			61.1			111.6	
Approach LOS	E		D				E			F		

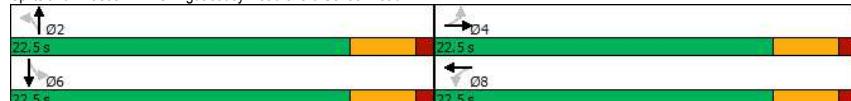
051561\_Chinguacousy EA\_2051 No GTAW\_AltB.syn  
R.J. Burnside & Associates Limited

Synchro 11 Report  
03/21/2022 - Page 2

Timings  
2: Chinguacousy Road & Old School Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓
Traffic Volume (vph)	22	558	86	246	40	306	40	858
Future Volume (vph)	22	558	86	246	40	306	40	858
Lane Group Flow (vph)	24	664	93	276	43	449	43	940
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6	
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.06	0.91	0.54	0.39	0.50	0.32	0.11	0.65
Control Delay	8.8	34.1	26.1	11.5	37.8	7.5	9.5	13.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.8	34.1	26.1	11.5	37.8	7.5	9.5	13.4
Queue Length 50th (m)	1.1	45.2	5.2	14.2	2.4	8.6	2.0	29.7
Queue Length 95th (m)	4.1	#99.7	#21.5	27.8	#14.3	16.1	6.4	44.9
Internal Link Dist (m)	414.1	424.5		2089.6		405.3		
Turn Bay Length (m)	100.0	100.0		100.0		100.0		
Base Capacity (vph)	448	747	178	726	86	1398	382	1447
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.89	0.52	0.38	0.50	0.32	0.11	0.65
Intersection Summary								
Cycle Length: 45								
Actuated Cycle Length: 44.5								
Natural Cycle: 45								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 2: Chinguacousy Road & Old School Road

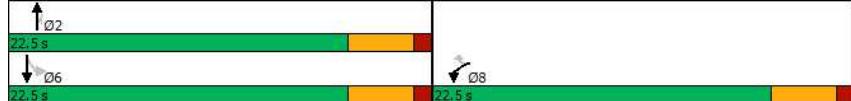


HCM Signalized Intersection Capacity Analysis  
2: Chinguacousy Road & Old School Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓	↑	↓	↑	↓
Traffic Volume (vph)	22	558	52	86	246	8	40	306	107	40	858	6
Future Volume (vph)	22	558	52	86	246	8	40	306	107	40	858	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
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	0.95
Frt	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1828	1825	1790	913	3289	1825	3575				
Flt Permitted	0.58	1.00	0.23	1.00	0.22	1.00	0.49	1.00	0.29	1.00	0.49	1.00
Satd. Flow (perm)	1108	1828	439	1790	213	3289	946	3575				
Peak-hour factor, PHF	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)	24	607	57	93	267	9	43	333	116	43	933	7
RTOR Reduction (vph)	0	8	0	0	2	0	0	69	0	0	1	0
Lane Group Flow (vph)	24	656	0	93	274	0	43	380	0	43	939	0
Heavy Vehicles (%)	0%	1%	33%	0%	7%	0%	100%	9%	0%	0%	2%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	17.5	17.5	17.5	17.5	17.5	17.5	18.0	18.0	18.0	18.0	18.0	18.0
Effective Green, g (s)	17.5	17.5	17.5	17.5	17.5	17.5	18.0	18.0	18.0	18.0	18.0	18.0
Actuated g/C Ratio	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.40	0.40	0.40	0.40	0.40
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	435	718	172	703	86	1330	382	1446				
v/s Ratio Prot	c0.36		0.15		0.12		c0.26					
v/s Ratio Perm	0.02		0.21		0.20		0.05					
v/c Ratio	0.06	0.91	0.54	0.39	0.50	0.29	0.11	0.65				
Uniform Delay, d1	8.4	12.8	10.4	9.7	9.9	8.9	8.3	10.7				
Progression 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
Incremental Delay, d2	0.1	16.1	3.4	0.4	19.3	0.5	0.6	2.3				
Delay (s)	8.4	28.9	13.8	10.0	29.2	9.5	8.9	13.0				
Level of Service	A	C	B	B	C	A	A	B				
Approach Delay (s)	28.2		11.0		11.2		12.8					
Approach LOS	C		B		B		B					
Intersection Summary												
HCM 2000 Control Delay	16.4											
HCM 2000 Volume to Capacity ratio	0.78											
Actuated Cycle Length (s)	44.5											
Intersection Capacity Utilization	80.4%											
Analysis Period (min)	15											
c Critical Lane Group												

Timings  
3: Chinguacousy Road & Spine Road

FUT 2051 AM (No GTA W))

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	134	168	539	124	156	1010
Future Volume (vph)	134	168	539	124	156	1010
Lane Group Flow (vph)	146	183	586	135	170	1098
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
v/c Ratio	0.36	0.38	0.27	0.13	0.35	0.51
Control Delay	13.9	5.9	5.4	1.9	8.7	7.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.9	5.9	5.4	1.9	8.7	7.0
Queue Length 50th (m)	7.0	1.1	8.6	0.0	5.0	19.5
Queue Length 95th (m)	16.1	9.9	17.8	4.9	17.0	38.0
Internal Link Dist (m)	108.0		938.0		2089.6	
Turn Bay Length (m)			100.0	100.0		
Base Capacity (vph)	890	876	2159	1019	490	2159
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.21	0.27	0.13	0.35	0.51
<b>Intersection Summary</b>						
Cycle Length: 45						
Actuated Cycle Length: 36.2						
Natural Cycle: 45						
Control Type: Semi Act-Uncoord						
Splits and Phases: 3: Chinguacousy Road & Spine Road						
						

HCM Signalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

FUT 2051 AM (No GTA W))

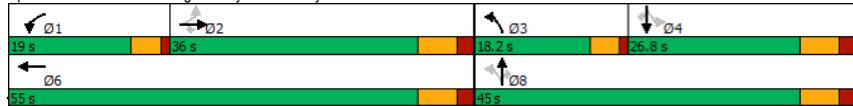
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	134	168	539	124	156	1010
Future Volume (vph)	134	168	539	124	156	1010
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
FrI	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	3579	1601	1789	3579
Flt Permitted	0.95	1.00	1.00	1.00	0.43	1.00
Satd. Flow (perm)	1789	1601	3579	1601	812	3579
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	146	183	586	135	170	1098
RTOR Reduction (vph)	0	129	0	59	0	0
Lane Group Flow (vph)	146	54	586	76	170	1098
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Actuated Green, G (s)	7.1	7.1	21.0	21.0	21.0	21.0
Effective Green, g (s)	7.1	7.1	21.0	21.0	21.0	21.0
Actuated g/C Ratio	0.19	0.19	0.57	0.57	0.57	0.57
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	342	306	2025	906	459	2025
v/s Ratio Prot	c0.08		0.16		c0.31	
v/s Ratio Perm		0.03		0.05	0.21	
v/c Ratio	0.43	0.18	0.29	0.08	0.37	0.54
Uniform Delay, d1	13.2	12.6	4.2	3.7	4.4	5.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.3	0.4	0.2	2.3	1.0
Delay (s)	14.1	12.8	4.5	3.9	6.7	6.1
Level of Service	B	B	A	A	A	A
Approach Delay (s)	13.4		4.4		6.2	
Approach LOS	B		A		A	
<b>Intersection Summary</b>						
HCM 2000 Control Delay		6.6				
HCM 2000 Volume to Capacity ratio		0.51				
Actuated Cycle Length (s)		37.1				
Intersection Capacity Utilization		42.8%				
Analysis Period (min)		15				
c Critical Lane Group						

Timings  
1: Chinguacousy Road & Mayfield Road

FUT 2051 PM (No GTA W) AltB

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑	↑	↑↑	↑↑	↑	↑↑	↑	↑↑	↑↑	↑
Traffic Volume (vph)	19	1426	97	464	1478	300	809	813	29	340	23
Future Volume (vph)	19	1426	97	464	1478	300	809	813	29	340	23
Lane Group Flow (vph)	20	1485	101	483	1584	313	843	847	30	354	24
Turn Type	Perm	NA	Perm	Prot	NA	pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases	2			1	6	3	8	8	4	4	
Permitted Phases	2	2	2	1	6	3	8	8	4	4	4
Detector Phase											
Switch Phase											
Minimum Initial (s)	12.0	12.0	12.0	5.0	12.0	5.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	23.6	23.6	23.6	9.5	23.6	9.5	23.6	23.6	23.6	23.6	23.6
Total Split (s)	36.0	36.0	36.0	19.0	55.0	18.2	45.0	45.0	26.8	26.8	26.8
Total Split (%)	36.0%	36.0%	36.0%	19.0%	55.0%	18.2%	45.0%	45.0%	26.8%	26.8%	26.8%
Yellow Time (s)	4.6	4.6	4.6	3.5	4.6	3.5	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.0	2.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	4.5	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max
v/c Ratio	0.24	1.01	0.18	0.95	0.65	0.75	0.44	1.05	0.28	0.48	0.06
Control Delay	35.8	62.2	2.8	72.8	20.9	35.1	23.7	64.2	41.7	37.8	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.8	62.2	2.8	72.8	20.9	35.1	23.7	64.2	41.7	37.8	0.3
Queue Length 50th (m)	3.0	-107.3	0.0	48.4	81.2	43.3	43.5	-133.0	5.0	32.2	0.0
Queue Length 95th (m)	9.9	#140.3	6.0	#78.5	96.6	#71.8	54.7	#205.0	13.8	46.0	0.0
Internal Link Dist (m)	324.8			438.2		224.1			938.0		
Turn Bay Length (m)	100.0		100.0		100.0		100.0		100.0		
Base Capacity (vph)	83	1468	553	508	2436	419	1936	808	108	736	400
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	1.01	0.18	0.95	0.65	0.75	0.44	1.05	0.28	0.48	0.06
<b>Intersection Summary</b>											
Cycle Length: 100											
Actuated Cycle Length: 100											
Natural Cycle: 100											
Control Type: Semi Act-Uncoord											
~ Volume exceeds capacity, queue is theoretically infinite.											
Queue shown is maximum after two cycles.											
# 95th percentile volume exceeds capacity, queue may be longer.											
Queue shown is maximum after two cycles.											

Splits and Phases: 1: Chinguacousy Road & Mayfield Road



051561\_Chinguacousy EA\_2051 No GTAW\_AltB.syn  
R.J. Burnside & Associates Limited

Synchro 11 Report  
03/21/2022 - Page 1

HCM Signalized Intersection Capacity Analysis  
1: Chinguacousy Road & Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑	↑	↑↑	↑↑	↑	↑	↑↑	↑	↑↑	↑	↑
Traffic Volume (vph)	19	1426	97	464	1478	300	809	813	29	340	23	
Future Volume (vph)	19	1426	97	464	1478	300	809	813	29	340	23	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	4.5	6.6	4.5	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	0.91	1.00	1.00	0.95	1.00	
FrT	1.00	1.00	0.85	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1825	4995	1555	3506	5027	1706	5043	1526	1560	3614	1432	
Flt Permitted	0.15	1.00	1.00	0.95	1.00	0.39	1.00	1.00	0.32	1.00	1.00	1.00
Satd. Flow (perm)	285	4995	1555	3506	5027	693	5043	1526	1530	3614	1432	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	20	1485	101	483	1540	44	312	843	847	30	354	24
RTOR Reduction (vph)	0	0	71	0	3	0	0	0	0	0	0	19
Lane Group Flow (vph)	20	1485	30	483	1581	0	313	843	625	30	354	5
Heavy Vehicles (%)	0%	5%	5%	1%	4%	0%	7%	4%	7%	17%	1%	14%
Turn Type	Perm	NA	Perm	Prot	NA	pm+pt	NA	Perm	Perm	NA	Perm	
Protected Phases	2		1	6		3	8		8	4		4
Permitted Phases												
Actuated Green, G (s)	29.4	29.4	29.4	14.5	48.4		38.4	38.4	38.4	20.4	20.4	20.4
Effective Green, g (s)	29.4	29.4	29.4	14.5	48.4		38.4	38.4	38.4	20.4	20.4	20.4
Actuated g/C Ratio	0.29	0.29	0.29	0.14	0.48		0.38	0.38	0.38	0.20	0.20	0.20
Clearance Time (s)	6.6	6.6	6.6	4.5	6.6		4.5	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	83	1468	457	508	2433		402	1936	585	108	737	292
v/s Ratio Prot	c0.30		c0.14	0.31			0.10	0.17		0.10		
v/s Ratio Perm	0.07		0.02				0.19			c0.41	0.06	0.00
v/c Ratio	0.24	1.01	0.06	0.95	0.65		0.78	0.44	1.07	0.28	0.48	0.02
Uniform Delay, d1	26.8	35.3	25.4	42.4	19.4		23.8	22.8	30.8	33.6	35.1	31.8
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5	26.4	0.1	27.9	0.6		9.2	0.7	56.6	6.3	2.2	0.1
Delay (s)	28.3	61.7	25.5	70.3	20.0		33.0	23.5	87.4	39.9	37.4	31.9
Level of Service	C	E	C	E	C		C	C	F	D	D	C
Approach Delay (s)	59.0						31.8		52.0		37.2	
Approach LOS	E						C		D		D	
<b>Intersection Summary</b>												
HCM 2000 Control Delay	46.0											D
HCM 2000 Volume to Capacity ratio	1.09											
Actuated Cycle Length (s)	100.0											22.2
Intersection Capacity Utilization	104.4%											G
Analysis Period (min)	15											
c Critical Lane Group												

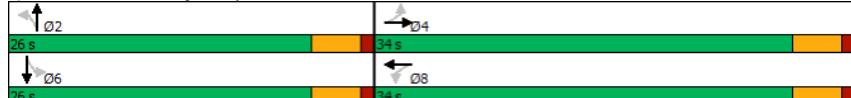
051561\_Chinguacousy EA\_2051 No GTAW\_AltB.syn  
R.J. Burnside & Associates Limited

Synchro 11 Report  
03/21/2022 - Page 2

Timings  
2: Chinguacousy Road & Old School Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↑	→	↑	←	↑	↓	↑	↓
Traffic Volume (vph)	19	266	94	733	44	709	10	235
Future Volume (vph)	19	266	94	733	44	709	10	235
Lane Group Flow (vph)	21	301	102	838	48	979	11	266
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6	
Permitted Phases	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	34.0	34.0	34.0	34.0	26.0	26.0	26.0	26.0
Total Split (%)	56.7%	56.7%	56.7%	56.7%	43.3%	43.3%	43.3%	43.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.16	0.33	0.24	0.92	0.12	0.74	0.08	0.21
Control Delay	12.2	10.4	10.7	32.3	13.9	19.7	14.9	13.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.2	10.4	10.7	32.3	13.9	19.7	14.9	13.4
Queue Length 50th (m)	1.2	18.2	6.0	77.2	3.5	45.5	0.8	10.1
Queue Length 95th (m)	5.0	31.9	14.1	#147.6	9.4	65.4	3.8	17.3
Internal Link Dist (m)	414.1		424.5		2089.6		405.3	
Turn Bay Length (m)	100.0		100.0		100.0		100.0	
Base Capacity (vph)	137	963	444	954	414	1316	130	1241
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.31	0.23	0.88	0.12	0.74	0.08	0.21
Intersection Summary								
Cycle Length: 60								
Actuated Cycle Length: 58.7								
Natural Cycle: 60								
Control Type: Semi Act-Uncoord								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

Splits and Phases: 2: Chinguacousy Road & Old School Road



FUT 2051 PM (No GTA W)

HCM Signalized Intersection Capacity Analysis

2: Chinguacousy Road & Old School Road

FUT 2051 PM (No GTA W)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	→	↑	↓	↑	↓	↑	↓	↑	↓	↑	↓
Traffic Volume (vph)	19	266	11	94	733	38	44	709	191	10	235	10
Future Volume (vph)	19	266	11	94	733	38	44	709	191	10	235	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00
Fr <sub>t</sub>	1.00	0.99	1.00	0.99	1.00	0.97	1.00	0.99	1.00	0.99	1.00	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1910	1547	1889	1825	3479	1825	3479	1825	3479	1825	3369
Flt Permitted	0.14	1.00	0.54	1.00	0.59	1.00	0.19	1.00	0.19	1.00	0.19	1.00
Satd. Flow (perm)	272	1910	885	1889	1129	3479	357	3479	357	3479	357	3369
Peak-hour factor, PHF	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)	21	289	12	102	797	41	48	771	208	11	255	11
RTOR Reduction (vph)	0	3	0	0	3	0	0	40	0	0	5	0
Lane Group Flow (vph)	21	298	0	102	835	0	48	939	0	11	261	0
Heavy Vehicles (%)	0%	0%	0%	18%	1%	0%	0%	2%	0%	0%	8%	0%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		8		2		6					
Permitted Phases												
Actuated Green, G (s)	28.2	28.2	28.2	28.2	28.2	28.2	21.5	21.5	21.5	21.5	21.5	21.5
Effective Green, g (s)	28.2	28.2	28.2	28.2	28.2	28.2	21.5	21.5	21.5	21.5	21.5	21.5
Actuated g/C Ratio	0.48	0.48	0.48	0.48	0.48	0.48	0.37	0.37	0.37	0.37	0.37	0.37
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	130	917	425	907	413	1274	130	1233				
v/s Ratio Prot	0.16		c0.44		c0.27		0.08					
v/s Ratio Perm	0.08		0.12		0.04		0.12					
v/c Ratio	0.16	0.33	0.24	0.92	0.12	0.74	0.08	0.21				
Uniform Delay, d <sub>1</sub>	8.6	9.4	9.0	14.2	12.3	16.1	12.2	12.8				
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Incremental Delay, d <sub>2</sub>	0.6	0.2	0.3	14.3	0.6	3.8	1.3	0.4				
Delay (s)	9.2	9.6	9.3	28.5	12.9	20.0	13.4	13.2				
Level of Service	A	A	A	C	B	B	B	B				
Approach Delay (s)	9.6		26.4		19.7		13.2					
Approach LOS	A		C		B		B					
Intersection Summary												
HCM 2000 Control Delay	20.2		HCM 2000 Level of Service		C							
HCM 2000 Volume to Capacity ratio	0.84											
Actuated Cycle Length (s)	58.7		Sum of lost time (s)		9.0							
Intersection Capacity Utilization	89.9%		ICU Level of Service		E							
Analysis Period (min)	15											
c Critical Lane Group												

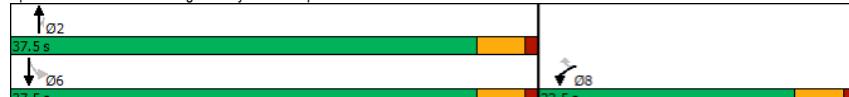
Timings  
3: Chinguacousy Road & Spine Road

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	56	286	847	226	161	579
Future Volume (vph)	56	286	847	226	161	579
Lane Group Flow (vph)	61	311	921	246	175	629
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	37.5	37.5	37.5	37.5
Total Split (%)	37.5%	37.5%	62.5%	62.5%	62.5%	62.5%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
v/c Ratio	0.16	0.71	0.41	0.23	0.53	0.28
Control Delay	17.2	21.0	6.8	1.6	16.0	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.2	21.0	6.8	1.6	16.0	6.0
Queue Length 50th (m)	4.8	16.6	20.8	0.0	8.4	12.8
Queue Length 95th (m)	12.0	37.3	41.0	7.6	#39.0	26.2
Internal Link Dist (m)	108.0		938.0		2089.6	
Turn Bay Length (m)			100.0	100.0		
Base Capacity (vph)	582	601	2222	1087	328	2222
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.52	0.41	0.23	0.53	0.28

Intersection Summary

Cycle Length: 60  
Actuated Cycle Length: 55.4  
Natural Cycle: 60  
Control Type: Semi Act-Uncoord  
# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

Splits and Phases: 3: Chinguacousy Road & Spine Road



HCM Signalized Intersection Capacity Analysis  
3: Chinguacousy Road & Spine Road

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	56	286	847	226	161	579
Future Volume (vph)	56	286	847	226	161	579
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1601	3579	1601	1789	3579
Flt Permitted	0.95	1.00	1.00	1.00	0.28	1.00
Satd. Flow (perm)	1789	1601	3579	1601	529	3579
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	311	921	246	175	629
RTOR Reduction (vph)	0	93	0	93	0	0
Lane Group Flow (vph)	61	218	921	153	175	629
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2		6	
Permitted Phases		8		2	6	
Actuated Green, G (s)	12.0	12.0	34.4	34.4	34.4	34.4
Effective Green, g (s)	12.0	12.0	34.4	34.4	34.4	34.4
Actuated g/C Ratio	0.22	0.22	0.62	0.62	0.62	0.62
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	387	346	2222	994	328	2222
v/s Ratio Prot	0.03		0.26		0.18	
v/s Ratio Perm	c0.14		0.10		c0.33	
v/c Ratio	0.16	0.63	0.41	0.15	0.53	0.28
Uniform Delay, d1	17.6	19.7	5.4	4.4	6.0	4.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	3.6	0.6	0.3	6.1	0.3
Delay (s)	17.8	23.2	5.9	4.7	12.1	5.1
Level of Service	B	C	A	A	B	A
Approach Delay (s)	22.4		5.7		6.7	
Approach LOS	C		A		A	

Intersection Summary

HCM 2000 Control Delay 8.7 HCM 2000 Level of Service A  
HCM 2000 Volume to Capacity ratio 0.56  
Actuated Cycle Length (s) 55.4 Sum of lost time (s) 9.0  
Intersection Capacity Utilization 48.6% ICU Level of Service A  
Analysis Period (min) 15

c Critical Lane Group



[THE DIFFERENCE IS OUR PEOPLE]

---

## Appendix J

### Signal Warrants

# DRAFT

## Input Sheet

Main Road Chinguacousy Road  
Minor Road Old School Road

Direction of Main Road North / South

Date: 22-Dec-21

No. of Lanes on Main 1

T-Intersection No

Operating Environment Rural

Scenario  
Forecasted Traffic Volumes (Existing Intersection)  
2031 Conditions  
No GTA West

## Analysis Sheet

### Justification 1: Minimum Vehicle Volumes

Justification	Guidance Approach Lanes				Total	Section Percent
	1 Lanes		2 or More Lanes			
Flow Condition	FREE FLOW	RESTR. FLOW	FREE FLOW	RESTR. FLOW		
1A (All Approach Lanes)	480	720	600	900		
	X				681	142%
1B (Minor Street Both Approaches)	120	170	120	170		
	X				437	364%
COMPLIANCE %						
Signal Justification 1:						

### Justification 2: Delay to Cross Traffic

Justification	Guidance Approach Lanes				Total	Section Percent
	1 lanes		2 or More lanes			
Flow Condition	FREE FLOW	RESTR. FLOW	FREE FLOW	RESTR. FLOW		
2A (Major Street Both Approaches)	480	720	600	900		
	X				244	51%
2B (Traffic Crossing Major Street)	50	75	50	75		
	X				310	620%
COMPLIANCE %						
Signal Justification 2:						

### Justification 3: Combination (Justification 1 and 2)

Justification Satisfied 80% or More	
Justification 1	Minimun Vehicular Volume
Justification 2	Delay Cross Traffic

## Results Sheet

Justification	Compliance	Minimum Target	Signal Justified?	
			YES	NO
1. Minimum Vehicular Volume	A. Total Volume	142%	120%	YES
	B. Crossing Volume	364%		
2. Delay to Cross Traffic	A. Main Road	51%	120%	NO
	B. Crossing Road	620%		
3. Combination	A. Justificaton 1	142%	120%	NO
	B. Justification 2	51%		

## Input Sheet

Main Road Chinguacousy Road  
Minor Road Old School Road

Direction of Main Road North / South

Date: 22-Dec-21

No. of Lanes on Main 2 or more

T-Intersection No

Operating Environment Urban

Scenario Forecasted Traffic Volumes (Existing Intersection)  
2041 Conditions  
GTA West

## Analysis Sheet

### Justification 1: Minimum Vehicle Volumes

Justification	Guidance Approach Lanes				Total	Section Percent
	1 Lanes		2 or More Lanes			
Flow Condition	FREE FLOW	RESTR. FLOW	FREE FLOW	RESTR. FLOW		
1A (All Approach Lanes)	480	720	600	900		
				x		
COMPLIANCE %					1,081	120%
1B (Minor Street Both Approaches)	120	170	120	170		
				x		
COMPLIANCE %					483	284%
Signal Justification 1:						

### Justification 2: Delay to Cross Traffic

Justification	Guidance Approach Lanes				Total	Section Percent
	1 lanes		2 or More lanes			
Flow Condition	FREE FLOW	RESTR. FLOW	FREE FLOW	RESTR. FLOW		
2A (Major Street Both Approaches)	480	720	600	900		
				x		
COMPLIANCE %					598	66%
2B (Traffic Crossing Major Street)	50	75	50	75		
				x		
COMPLIANCE %					342	456%
Signal Justification 2:						

### Justification 3: Combination (Justification 1 and 2)

Justification Satisfied 80% or More	
Justification 1	Minimun Vehicular Volume
Justification 2	Delay Cross Traffic

## Results Sheet

Justification	Compliance	Minimum Target	Signal Justified?	
			YES	NO
1. Minimum Vehicular Volume	A. Total Volume	120%	120%	YES
	B. Crossing Volume	284%		
2. Delay to Cross Traffic	A. Main Road	66%	120%	NO
	B. Crossing Road	456%		
3. Combination	A. Justificaton 1	120%	120%	NO
	B. Justification 2	66%		

## Input Sheet

Main Road Chinguacousy Road  
Minor Road Old School Road

Direction of Main Road North / South

Date: 22-Dec-21

No. of Lanes on Main 2 or more

T-Intersection No

Operating Environment Urban

Scenario  
Forecasted Traffic Volumes (Existing Intersection)  
2041 Conditions  
No GTA West

## Analysis Sheet

### Justification 1: Minimum Vehicle Volumes

Justification	Guidance Approach Lanes				Total	Section Percent
	1 Lanes		2 or More Lanes			
Flow Condition	FREE FLOW	RESTR. FLOW	FREE FLOW	RESTR. FLOW		
1A (All Approach Lanes)	480	720	600	900		
				x		
COMPLIANCE %					1,061	118%
1B (Minor Street Both Approaches)	120	170	120	170		
				x		
COMPLIANCE %					483	284%
Signal Justification 1:						

### Justification 2: Delay to Cross Traffic

Justification	Guidance Approach Lanes				Total	Section Percent
	1 lanes		2 or More lanes			
Flow Condition	FREE FLOW	RESTR. FLOW	FREE FLOW	RESTR. FLOW		
2A (Major Street Both Approaches)	480	720	600	900		
				x		
COMPLIANCE %					579	64%
2B (Traffic Crossing Major Street)	50	75	50	75		
				x		
COMPLIANCE %					342	456%
Signal Justification 2:						

### Justification 3: Combination (Justification 1 and 2)

Justification Satisfied 80% or More	
Justification 1	Minimun Vehicular Volume
Justification 2	Delay Cross Traffic

## Results Sheet

	Justification	Compliance	Minimum Target	Signal Justified?	
				YES	NO
1. Minimum Vehicular Volume	A. Total Volume	118%	120%		NO
	B. Crossing Volume	284%			NO
2. Delay to Cross Traffic	A. Main Road	64%	120%		NO
	B. Crossing Road	456%			NO
3. Combination	A. Justificaton 1	118%	120%		NO
	B. Justification 2	64%			NO

## Input Sheet

Main Road Chinguacousy Road  
Minor Road Old School Road

Direction of Main Road North / South

Date: 22-Dec-21

No. of Lanes on Main 2 or more

T-Intersection No

Operating Environment Urban

Scenario Forecasted Traffic Volumes (Existing Intersection)  
2051 Conditions  
GTA West

## Analysis Sheet

### Justification 1: Minimum Vehicle Volumes

Justification	Guidance Approach Lanes				Total	Section Percent
	1 Lanes		2 or More Lanes			
Flow Condition	FREE FLOW	RESTR. FLOW	FREE FLOW	RESTR. FLOW		
1A (All Approach Lanes)	480	720	600	900		
				x		
COMPLIANCE %					1,162	129%
1B (Minor Street Both Approaches)	120	170	120	170		
				x		
COMPLIANCE %					533	314%
Signal Justification 1:						

### Justification 2: Delay to Cross Traffic

Justification	Guidance Approach Lanes				Total	Section Percent
	1 lanes		2 or More lanes			
Flow Condition	FREE FLOW	RESTR. FLOW	FREE FLOW	RESTR. FLOW		
2A (Major Street Both Approaches)	480	720	600	900		
				x		
COMPLIANCE %					629	70%
2B (Traffic Crossing Major Street)	50	75	50	75		
				x		
COMPLIANCE %					378	504%
Signal Justification 2:						

### Justification 3: Combination (Justification 1 and 2)

Justification Satisfied 80% or More	
Justification 1	Minimun Vehicular Volume
Justification 2	Delay Cross Traffic

## Results Sheet

Justification	Compliance	Minimum Target	Signal Justified?	
			YES	NO
1. Minimum Vehicular Volume	A. Total Volume	129%	120%	YES
	B. Crossing Volume	314%		
2. Delay to Cross Traffic	A. Main Road	70%	120%	NO
	B. Crossing Road	504%		
3. Combination	A. Justificaton 1	129%	120%	NO
	B. Justification 2	70%		

## Input Sheet

Main Road Chinguacousy Road  
Minor Road Old School Road

Direction of Main Road North / South

Date: 22-Dec-21

No. of Lanes on Main 2 or more

T-Intersection No

Operating Environment Urban

Scenario Forecasted Traffic Volumes (Existing Intersection)

2051 Conditions

No GTA West

## Analysis Sheet

### Justification 1: Minimum Vehicle Volumes

Justification	Guidance Approach Lanes				Total	Section Percent
	1 Lanes		2 or More Lanes			
Flow Condition	FREE FLOW	RESTR. FLOW	FREE FLOW	RESTR. FLOW		
1A (All Approach Lanes)	480	720	600	900		
				x		
COMPLIANCE %					1,172	130%
1B (Minor Street Both Approaches)	120	170	120	170		
				x		
COMPLIANCE %					533	314%
Signal Justification 1:						

### Justification 2: Delay to Cross Traffic

Justification	Guidance Approach Lanes				Total	Section Percent
	1 lanes		2 or More lanes			
Flow Condition	FREE FLOW	RESTR. FLOW	FREE FLOW	RESTR. FLOW		
2A (Major Street Both Approaches)	480	720	600	900		
				x		
COMPLIANCE %					639	71%
2B (Traffic Crossing Major Street)	50	75	50	75		
				x		
COMPLIANCE %					378	504%
Signal Justification 2:						

### Justification 3: Combination (Justification 1 and 2)

Justification Satisfied 80% or More	
Justification 1	Minimun Vehicular Volume
Justification 2	Delay Cross Traffic

## Results Sheet

	Justification	Compliance	Minimum Target	Signal Justified?	
				YES	NO
1. Minimum Vehicular Volume	A. Total Volume	130%	120%	YES	
	B. Crossing Volume	314%			
2. Delay to Cross Traffic	A. Main Road	71%	120%		NO
	B. Crossing Road	504%			
3. Combination	A. Justificaton 1	130%	120%		NO
	B. Justification 2	71%			