

Huntington Road Class Environmental Assessment

Nashville Road to Langstaff Road

Traffic Operational Analysis

Prepared By:

PARSONS

Prepared For:



Date: September 2015

TABLE OF CONTENTS

1.0	Introduction	4
2.0	Study Area.....	4
3.0	Study Methodology.....	6
4.0	Future Developments and Road Network	6
	4.1 Nashville Heights Community	6
	4.2 Block 59 Development	6
	4.3 Block 66 Development	6
	4.4 Future Road Network Improvements	7
	4.5 Study Horizons	7
5.0	Background Traffic Studies	10
6.0	Existing Traffic Conditions Year 2015	11
	6.1 Existing Road Network.....	11
	6.2 Traffic Volumes	14
	6.3 Signal Timing Plans (STP)	14
	6.4 Collision Data	14
	6.5 Heavy Vehicles	14
	6.6 Traffic Capacity Analysis.....	15
7.0	Future Traffic Volumes	18
	7.1 Background Traffic Volume Growth	18
	7.2 Future Development Traffic.....	18
8.0	Future Traffic Conditions Year 2021	26
	8.1 Traffic Volumes	26
	8.2 Signal Timing Plans (STP)	26
	8.3 Road Network	27
	8.4 Traffic Capacity Analysis.....	28
9.0	Future Traffic Conditions Year 2034	33
	9.1 Traffic Volumes	33
	9.2 Signal Timing Plans (STP)	33
	9.3 Road Network	34
	9.4 Traffic Capacity Analysis.....	34

10.0	Future 2034 Traffic Conditions with Link between McGillivray Rd and Major Mackenzie Dr.....	39
11.0	Conclusions and Recommendations.....	39

LIST OF FIGURES

Figure 1:	Huntington Road Study Area and Intersections	5
Figure 2:	Study Area Proposed Future Road Network.....	8
Figure 3:	Study Area Proposed Future Transit Network.....	9
Figure 4:	Study Area Future Residential/Commercial Developments	10
Figure 5:	Existing intersections Lane Configurations	13
Figure 6:	Screen Line Method to Calculate Growth Rate (Auto)	19
Figure 7:	Screen Line Method to Calculate Growth Rate (Transit)	20
Figure 8:	Proposed Signal Timing Plan for Rutherford Road and Huntington Road.....	26
Figure 9:	Proposed Signal Timing Plan for Nashville Road and Huntington Road	26
Figure 10:	Year 2021 Modified Intersections Layout.....	30
Figure 11:	Proposed Signal Timing Plan for Major Mackenzie Dr. and Future Rd/Hwy 427 NB Off-Ramp	33
Figure 12:	Proposed Signal Timing Plan for Huntington Road and Rutherford Road.....	33
Figure 13:	Proposed Signal Timing Plan for Huntington Road and Trade Valley Drive/Street A.....	34
Figure 14:	Proposed Signal Timing Plan for Huntington Road and Langstaff Road	34
Figure 15:	Year 2034 Modified Intersections Layout.....	36
Figure 16:	EA Study Road Network Improvement Recommendations.....	42

LIST OF TABLES

Table 1:	Existing 2015 Weekday AM Peak Hour Traffic Operational Performance	16
Table 2:	Existing 2015 Weekday PM Peak Hour Traffic Operational Performance	17
Table 3:	Growth Rate Calculation 2011-2031 (NB/EB)	21
Table 4:	Growth Rate Calculation 2011-2031 (SB/WB)	22
Table 5:	Intersections of Interest’s Future Traffic Volumes Calculation Methodology.....	23
Table 6:	Year 2021 Left/Right Turn Storage lane Warrant	29
Table 7:	Future 2021 Weekday AM Peak Hour Traffic Operational Performance	31
Table 8:	Future 2021 Weekday PM Peak Hour Traffic Operational Performance.....	32
Table 9:	Year 2034 Left/Right Turn Storage lane Warrant	35

Table 10: Future 2034 Weekday AM Peak Hour Traffic Operational Performance 37
Table 11: Future 2034 Weekday PM Peak Hour Traffic Operational Performance..... 38
Table 12: Summary of Traffic Analysis Findings..... 40
Table 13: Summary of recommended Improvements..... 41

1.0 INTRODUCTION

Parsons has been retained by the City of Vaughan to provide a Class Environmental Assessment (EA) for the improvements on Huntington Road from Nashville Road to Langstaff Road. The road improvements may include road widening and urbanization (e.g., adding adequate turning lanes, intersection traffic signal control, etc.). Proposed developments in the vicinity of Huntington Road dictated an extensive traffic study to investigate future road network's capacity requirements and improvements. To achieve the objectives, this traffic study undertakes the following steps:

1. Define study area
2. Review related and background studies
3. Define future proposed developments in the study area
4. Define future proposed road network in the study area
5. Define study and planning horizons
6. Assemble existing and proposed conditions' data and assure data consistency
7. Traffic modelling
8. Traffic operations and capacity analysis
9. Recommendations according to the study results

2.0 STUDY AREA

The full length of Huntington Road extends 11 kilometres from the north, at Kirby Road, to the south at Highway 7 in the City of Vaughan. The stretch of Huntington Road within the study area starts from Nashville Road in the north to Langstaff Road in the south (i.e., 6.5 kilometres), and includes seven intersections with regional/local roads. In this area, only the intersection of Huntington Road and Langstaff Road is signalized. The existing intersections of interest in the study area are as follows:

1. Huntington Road and Nashville Road
2. Huntington Road and East Corner's Drive
3. Huntington Road and Major Mackenzie Drive
4. Huntington Road and McGillivray Road
5. Huntington Road and Rutherford Road
6. Huntington Road and Trade Valley Drive
7. Huntington Road and Langstaff Road

Figure 1 shows the study area and the locations of key intersections of interests.

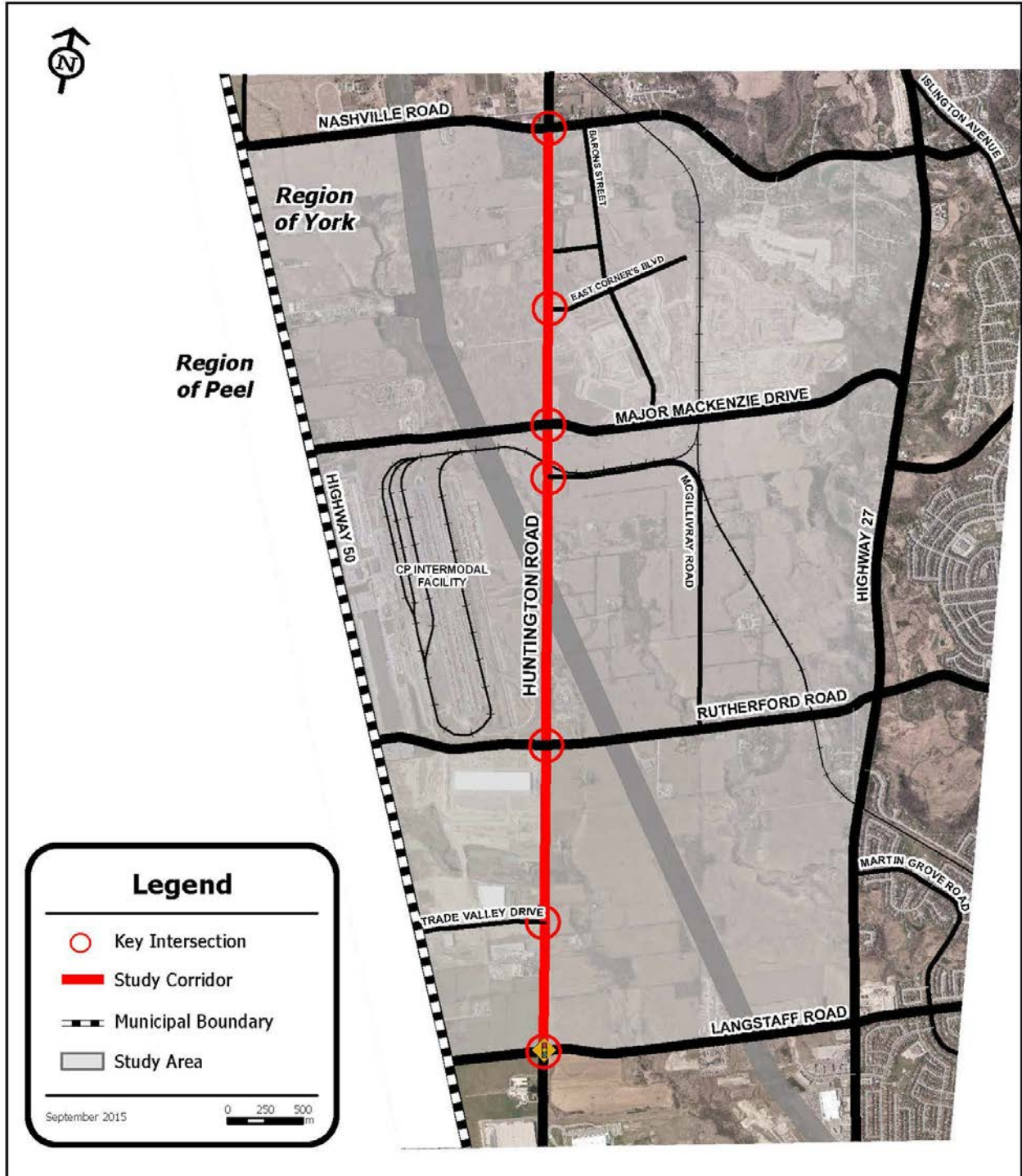


Figure 1: Huntington Road Study Area and Intersections

3.0 STUDY METHODOLOGY

The initial study task was a complete review of all the information provided by the City of Vaughan including previous traffic and development studies, future plans, and traffic and collision data. The study was followed by a review of the existing on-site conditions through site visits. Site visits included intersection geometric configurations verification, lane configurations verification and traffic signal cycle length verification. Further, the study considered intersection traffic operations and capacity analyses for both existing conditions and the study horizon years. The final section of the study provides recommendations to enhance future traffic performance of the study area based on the traffic analysis results.

4.0 FUTURE DEVELOPMENTS AND ROAD NETWORK

The aforementioned study area of the Huntington Road Class EA includes three major residential and commercial future developments as described below.

4.1 Nashville Heights Community

The Nashville Heights Community (Block 61) is bounded by Major Mackenzie Drive to the south, Nashville Road to the north, Huntington Road to the west and the CP rail line to the east. This development includes 3,000 residential units and 120 commercial units (1,000sq.ft) which generate 2,205 and 2,753 vehicle trips during weekdays AM and PM peak hours, respectively. This residential/commercial development will be completed during different phases: Phase 1, 2 and 3 by 2018 and the full site development by 2021.

4.2 Block 59 Development

Block 59, a part of the West Vaughan Employment Area, is bounded by Rutherford Road to the north, Highway 27 to the east, Langstaff Road to the south and Huntington Road to the west. Phase one of this development includes 50.1 hectares of industrial park land use and 80.65 hectares of distribution warehouse land, with total trip generation of 1,384 and 1,350 vehicles during the AM and PM peak hours, successively. Phase two includes 93.51 hectares of industrial parks with total trip generation of 1,347 during the AM peak hour and 1,016 vehicles during the PM peak hour. Phase one will be completed by 2019 and phase two by 2024.

4.3 Block 66 Development

Block 66 development is bounded by Highway 50 to the west, Major Mackenzie Drive to the south, Nashville Road to the north and Hydro Corridor to the east. This development includes commercial/retail land uses. While Huntington Road will not provide any access to the development, traffic could reach the site through Highway 50. The northern portion of Block 66 will be protected for the GTA West Transportation Corridor. This development will not affect traffic conditions on Huntington Road and is not included in the scope of this study.

4.4 Future Road Network Improvements

In accordance with previous traffic studies of the study area, a future road network map is provided by Parsons to cover the recommended, proposed and approved road improvements. **Figure 2** shows the complete road network improvements as described below. These improvements were proposed by different studies in the study area (e.g., City of Vaughan Transportation Master Plan) and were approved by the applicable agencies:

- Highway 427 extension to Major Mackenzie Drive in Phase 1 and to north of Kirby Road in Phase 2.
- Major Mackenzie Drive realignment and widening from two lanes to six lanes, including one HOV lane in each direction.
- Rutherford Road widening from four lanes to six lanes, including one HOV lane in each direction.
- Huntington Road discontinuity from McGillivray Road to Major Mackenzie Drive.
- Construction of new roads includes “Future Road”, “Street A”, “Street B”, MacTier Drive, Algoma Drive, East Corner’s Boulevard and the intersections of the new roads with Huntington Road.

Figure 3 shows the proposed transit network in the study area, which includes the following:

- Highway 427 Transitway.
- Transit priority network along Major Mackenzie Drive, Highway 27 and Rutherford Road.
- Transit routes along Huntington Road, Rutherford Road, Langstaff Road, McGillivray Road, Street A and B, and Nashville Road.

4.5 Study Horizons

To complete an extensive traffic capacity analysis of the study area, the horizon years of 2021 and 2034 were selected to coincide with the development’s full built timelines and 10 years after development completion. **Figure 4** shows the future developments of the study area evolving through the proposed study horizons.

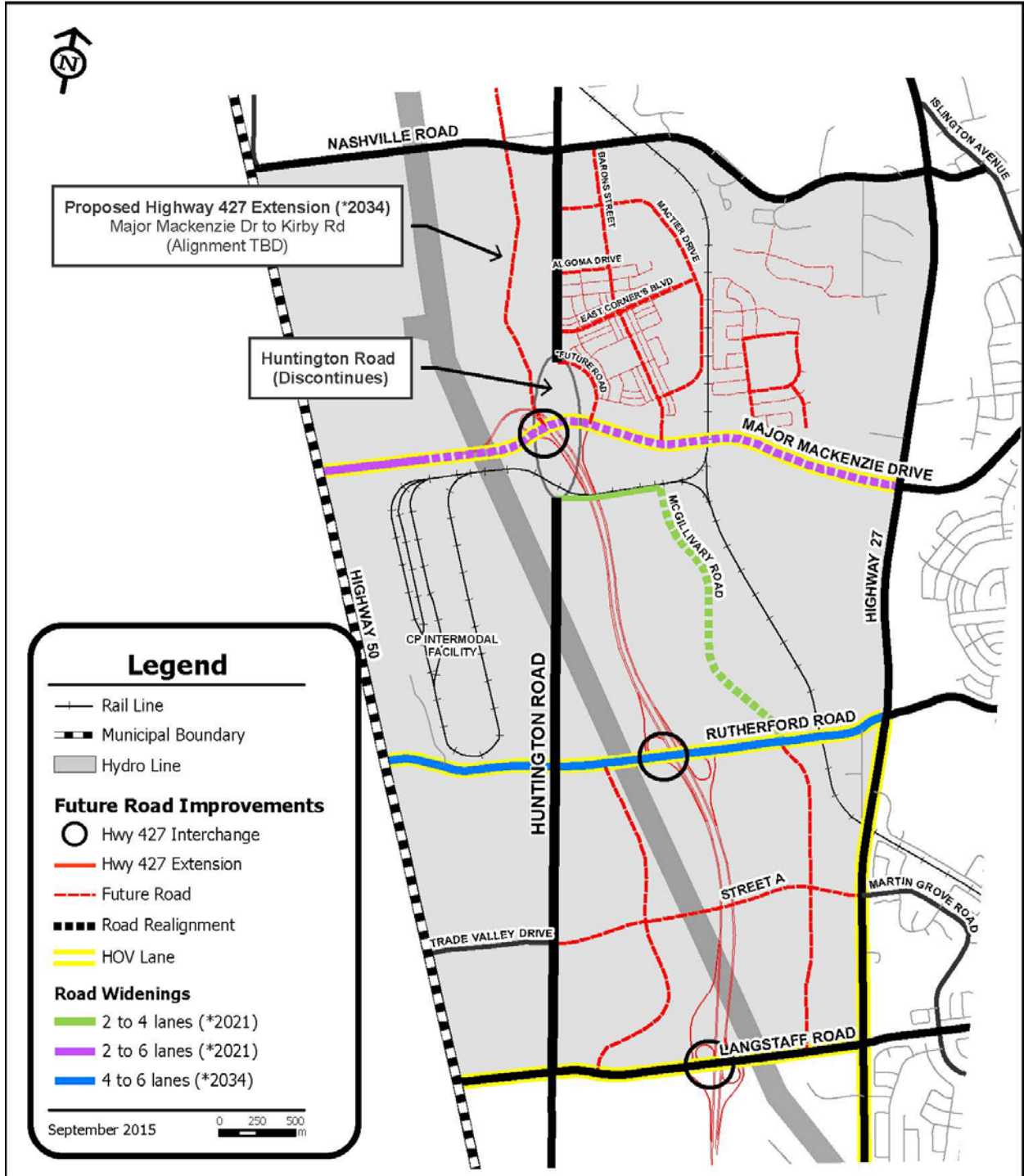


Figure 2: Study Area Proposed Future Road Network

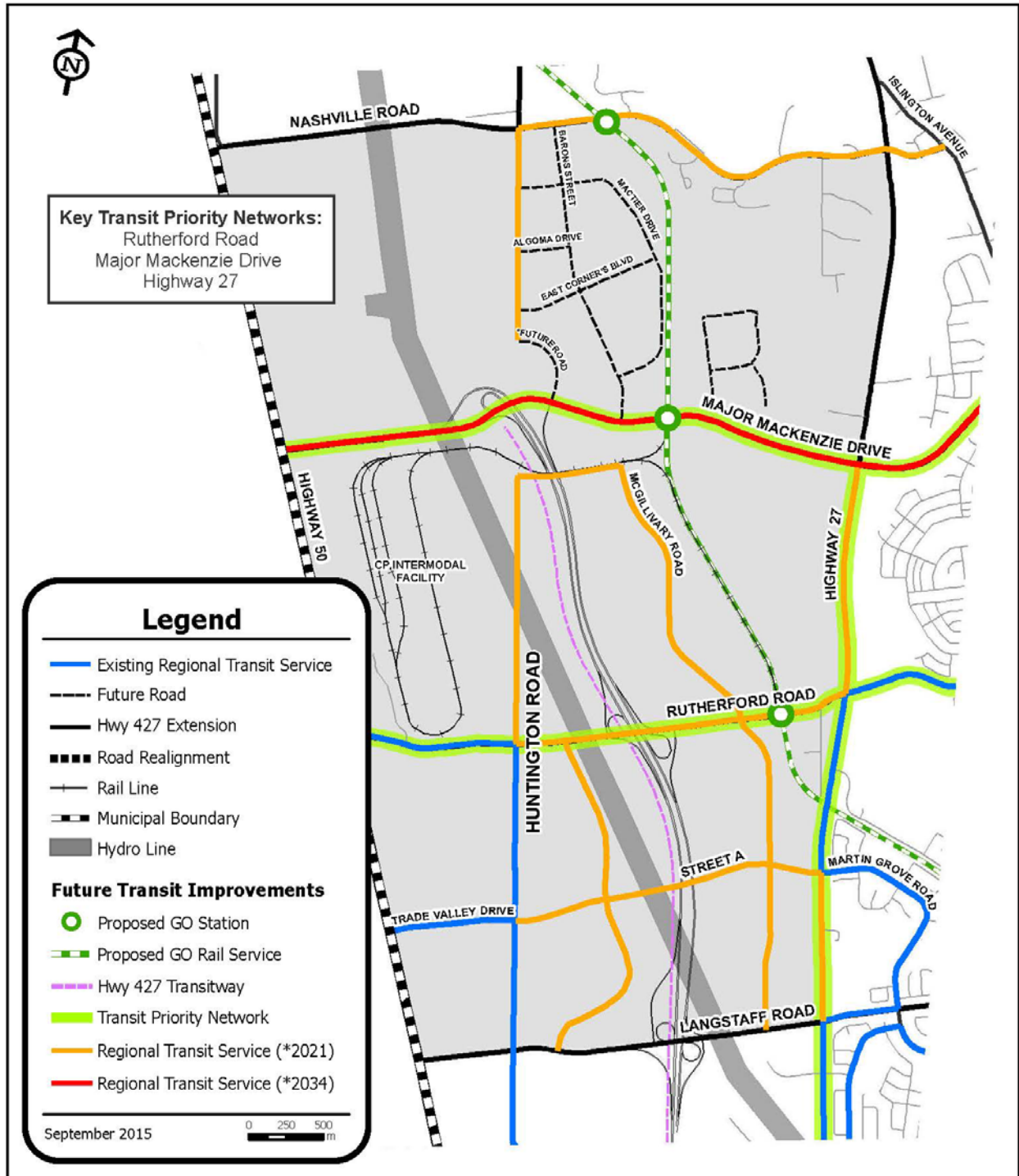


Figure 3: Study Area Proposed Future Transit Network

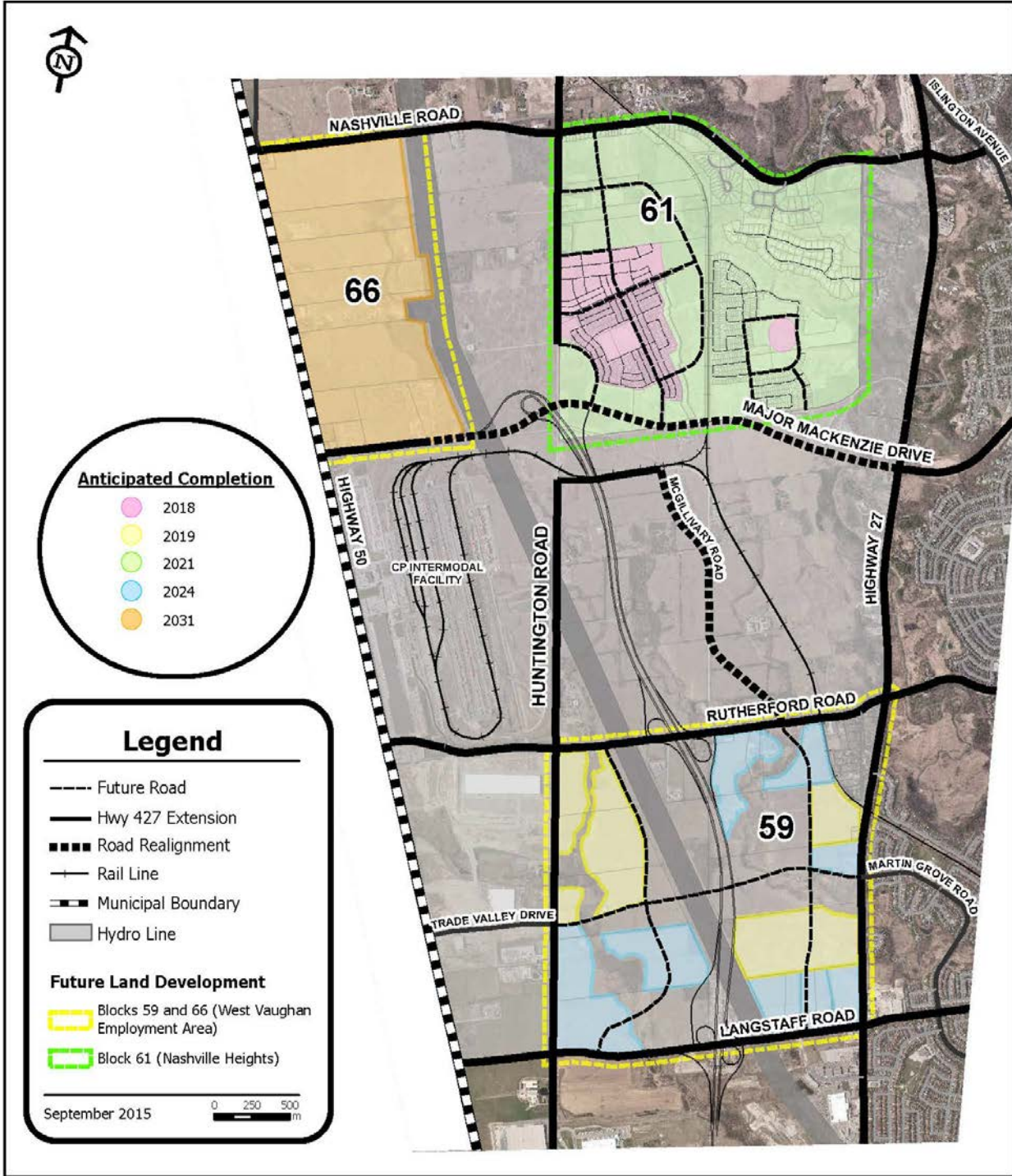


Figure 4: Study Area Future Residential/Commercial Developments

5.0 BACKGROUND TRAFFIC STUDIES

The previous traffic studies related to the study area were provided by the City or other consultants. A complete review of the studies identified below provided an enhanced vision of every approved and

proposed plan that affects Huntington Road's traffic conditions. Parsons completed its due diligence for the following:

- City of Vaughan Transportation Master Plan Study Kleinburg - Nashville Focus Area by AECOM, September 2009
- West Vaughan Employment Area Transportation Plan by AECOM, August 2010
- West Vaughan Transportation Improvements Individual Environmental Assessment by AECOM
- Phase 3 Transportation Assessment Report by Poulos & Chung, May 2014
- Nashville External TIS Final Report by Poulos & Chung, December 2009
- Future Huntington Road Alignment by Poulos & Chung, November 2012
- Huntington Road Assessment by Poulos & Chung, March 2013
- Nashville West Landowners Group MTO TIS by Poulos & Chung, September 2009
- Phase 1 Transportation Assessment Report by Poulos & Chung, August 2012
- Phase 1 Transportation Assessment Report, by Poulos & Chung, March 2011
- Huntington Traffic Monitoring Program by Poulos & Chung, April 2015
- Block 59 Development Transportation Assessment by Cole Engineering, April 2014

6.0 EXISTING TRAFFIC CONDITIONS YEAR 2015

6.1 Existing Road Network

The major roads considered in this study are described below. **Figure 5** shows the existing lane configurations of the roads in the study area. The intersection of Langstaff Road and Huntington Road is currently controlled by a traffic signal. The intersections of Huntington Road with Nashville Road, Major Mackenzie Drive, Rutherford Road and Trade Valley Drive are controlled by stop signs.

- **Huntington Road** is a north-south collector road extending from Highway 7 to the Humber River Valley (approximately 12 km) with one lane per direction and posted speed limit of 80 km/h in the study area.
- **Nashville Road (Regional Road 49)** is an east-west minor arterial extending from Highway 50 to Islington Avenue (approximately 5 km) with one lane per direction and posted speed limit of 50 km/h in the study area.
- **Major Mackenzie Drive (Regional Road 25)** is an east-west minor arterial extending from Highway 50 to York Durham line (approximately 40 km) with one lane per direction and posted speed limit of 70 km/h in the study area.
- **Rutherford Road (Regional Road 73)** is an east-west minor arterial extending from Highway 50 to Bathurst Street (approximately 18 km) with two lanes per direction and posted speed limit of 70 km/h in the study area.
- **Langstaff Road (Regional Road 72)** is an east-west minor arterial with two disconnected sections. The first section starts from Highway 50 to Vaughan Mills Road (approximately

4 km) with two lanes per direction and posted speed limit of 80 km/h. The second section begins from Islington Avenue to the CN Railway east of Jane Street (approximately 5 km) with two lanes per direction and posted speed limit of 60 km/h.

- **Trade Valley Drive** is an east-west collector road extending from Highway 50 to Huntington Road (approximately 1 km) with two lanes per direction.

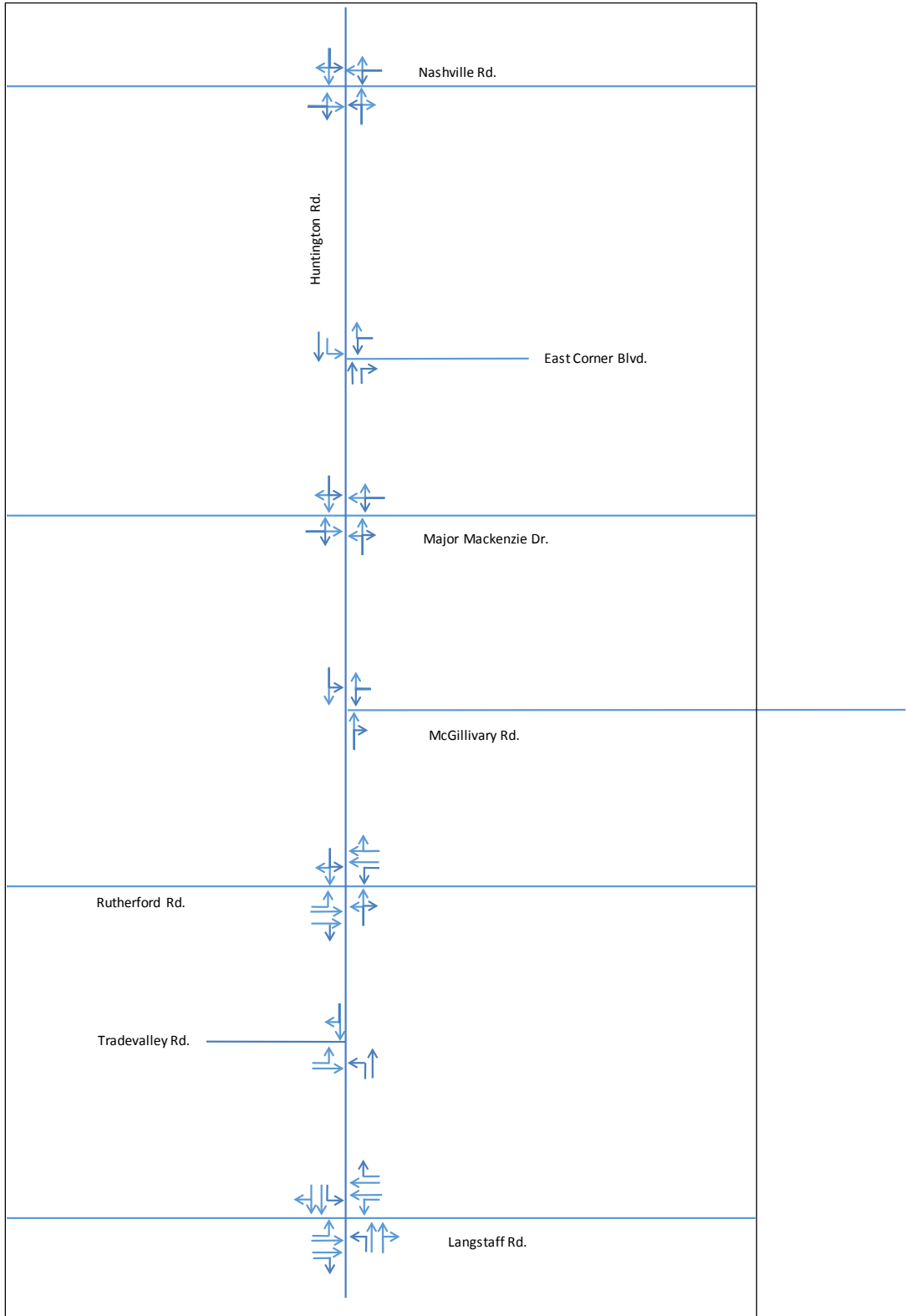


Figure 5: Existing intersections Lane Configurations

6.2 Traffic Volumes

The existing 2015 traffic volumes for both AM and PM peak were determined based on the turning movement counts data (TMCs) provided to Parsons by the City of Vaughan, Poulos and Chung Limited, and Cole Engineering for the following study area intersections:

- Huntington Road and Nashville Road
- Huntington Road and Major Mackenzie Drive
- Huntington Road and Rutherford Road
- Huntington Road and Trade Valley Drive
- Huntington Road and Langstaff Road

Details of the existing traffic volumes (TMCs) are presented in **Appendix A**. The traffic counts were collected at 2015 for all locations except for the intersection of Huntington Road and Nashville Road. The traffic volumes of this intersection were collected in 2013 and a growth rate was applied to the counts to grow them to the 2015 base year. Since TMCs were not available for the intersections of Huntington Road with McGillivray Road and East Corner's Boulevard, the volumes were balanced with the adjacent intersections. The resulting 2015 traffic volumes are shown in **Appendix B**.

6.3 Signal Timing Plans (STP)

As previously mentioned, only one intersection located in the study area is currently controlled by traffic signal, i.e., Huntington Road and Langstaff Road. The signal timing plan for this intersection was provided by the City of Vaughan and is shown in **Appendix D**.

6.4 Collision Data

Based on York Region collision reports from 2009-2013, 6 vehicle collisions in the study area were reported as follows:

- A vehicle reversed and hit the vehicle behind it on Huntington Road, south of Major Mackenzie Drive near railway (2013)
- A vehicle lost control from the east approach, and hit a vehicle at a right angle at the intersection of Huntington Road and Trade Valley Drive (2013)
- Single vehicle hit a parking car at #12311 Huntington Road (2012)
- Unknown vehicle struck telecom pole on Huntington Road near Nashville Road (2011)
- A vehicle U-turned and hit another vehicle on Huntington Road near Rutherford Road (2010)
- A vehicle was struck by a vehicle from opposite direction, and then drove into ditch on Huntington Road, 200m north of Rutherford Road (2009)

6.5 Heavy Vehicles

Understanding traffic composition is important for roadway and pavement design. In addition, a high number of heavy vehicles reduce a road's capacity. The heavy vehicle percentage is a factor that is used

in Synchro models to determine the actual capacity of a road. We extracted this factor from the provided TMCs and applied it to the Synchro model. The same heavy vehicle percentages were used for the future years' models.

6.6 Traffic Capacity Analysis

A traffic capacity analysis was performed on the study area intersections using Synchro/SimTraffic software Version 8. The analysis focused on performance measures including Level of Service (LOS), volume to capacity ratio (v/c), delay time and queue length. The measure of LOS provides insight into how well the intersection is operating and is expressed as a letter between 'A' and 'F', based on delay. The measure of v/c is the volume of vehicles divided by the roadway capacity and indicates the level of physical capacity utilized on a roadway. The results of the traffic capacity analysis completed for the weekday AM and PM peak hours under existing 2015 traffic conditions are presented in **Table 1** and **Table 2**. The tables include LOS and delay for the overall intersection and traffic volumes, LOS, v/c ratios, delay and 95th percentile queue length per movement. The critical movements are the movements with LOS 'E' or 'F' (highlighted in purple and red) and/or v/c ratios over 0.85. The Synchro reports prepared using HCM 2000 methodology are presented in **Appendix F**.

As presented in **Table 1** and **Table 2**, the Huntington Road intersections at both Nashville Road and Rutherford Road comprise movements with poor levels of service under existing 2015 traffic conditions. This is the result of vehicles on Huntington Road experiencing significant delay, due to the stop control, when trying to enter both Nashville Road and Rutherford Road which operate at free flow traffic. Except for the above mentioned movements, the study area's intersections including signalized intersection of Huntington Road and Langstaff Road operate at good traffic conditions.

A traffic signal warrant analysis was completed for the intersections of Nashville Road and Rutherford Road with Huntington Road to determine if a traffic signal was required. The results indicated that under existing conditions, both traffic signals are warranted. The signal warrant analysis is presented in **Appendix E**.

Table 1: Existing 2015 Weekday AM Peak Hour Traffic Operational Performance

Intersection	MOE	Overall	Movement											
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Nashville Rd. & Huntington Rd.	Volume		6	452	15	9	449	55	6	14	9	75	26	9
	LOS	A		A			A			C			E	
	v/c	-		0.01			0.01			0.14			0.62	
	Delay (s)	6		0.2			0.3			23.5			49.6	
	Queue 95th			0			0			4			27	
East Corner's Blvd. & Huntington Rd.	Volume					0		0		25	0	0	50	
	LOS	A								A			A	
	v/c	-								0.02			0.03	
	Delay (s)	0								0			0	
	Queue 95th									0			0	
Major Mackenzie Dr. & Huntington Rd.	Volume		6	194	3	27	126	14	1	5	1	38	24	10
	LOS	A		A			A			B			B	
	v/c	-		0			0.02			0.01			0.14	
	Delay (s)	3		0			1			12			13	
	Queue 95th			0			1			12			4	
McGillivray Rd. & Huntington Rd.	Volume					5		1		9	7	4	50	
	LOS	A				A				A			A	
	v/c	-				0.01				0.01			0	
	Delay (s)	1				9				0			1	
	Queue 95th					0				0			0	
Rutherford Rd. & Huntington Rd.	Volume		4	1062	188	130	825	5	27	7	20	4	40	10
	LOS	B		B			C	-		F			F	
	v/c	-	0.1	0.45	0.35	0.28	0.35	0.18		NA			NA	
	Delay (s)	NA	11	0	0	15	0	0		NA			NA	
	Queue 95th		0	0	0	9	0	0		NA			NA	
Trade Valley/Street A & Huntington Rd.	Volume		8		207				30	83			291	5
	LOS	A	B		B				A	A			A	
	v/c	-	0.02		0.16				0.06	0.05			0.19	
	Delay (s)	4	12		11				8	0			0	
	Queue 95th		0		4				1	0			0	
Langstaff Rd. & Huntington Rd.	Volume		38	564	259	57	242	33	57	130	16	93	385	35
	LOS	B	A	A	A	A	A	A	C	C		C	C	
	v/c	0.37	0.06	0.27	0.18	0.15	0.12	0.02	0.43	0.23		0.4	0.65	
	Delay (s)	15	6	7	7	7	6	6	29	26		28	30	
	Queue 95th		7	33	10	10	14	4	19	17		26	46	

Table 2: Existing 2015 Weekday PM Peak Hour Traffic Operational Performance

Intersection	MOE	Overall	Movement											
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Nashville Rd. & Huntington Rd.	Volume		13	492	7	6	559	56	37	47	24	42	13	9
	LOS	A		A			A			F			F	
	v/c	-		0.02			0.01			0.64			0.56	
	Delay (s)	8		0.5			0.2			54.6			66.5	
	Queue 95th			0			0			28			21	
East Corner's Blvd. & Huntington Rd.	Volume					0		0		114	0	0	26	
	LOS	A								A			A	
	v/c	-								0.07			0.02	
	Delay (s)	0								0			0	
	Queue 95th									0			0	
Major Mackenzie Dr. & Huntington Rd.	Volume		10	142	1	4	231	45	5	59	12	20	4	3
	LOS	A		A			A			B			B	
	v/c	-		0.01			0			0.16			0.06	
	Delay (s)	3		1			0			13			14	
	Queue 95th			0			0			4			2	
McGillivray Rd. & Huntington Rd.	Volume					12		8		68	5	0	9	
	LOS	A				A		A		A			A	
	v/c	-				0.02		0.02		0.05			0	
	Delay (s)	2				9		9		0			0	
	Queue 95th					0.5		0.5		0			0	
Rutherford Rd. & Huntington Rd.	Volume		9	788	44	20	1078	2	132	62	110	4	11	6
	LOS	B		B			B	-		F			F	
	v/c	-	0.02	0.34	0.2	0.03	0.46	0.23		4.74			NA	
	Delay (s)	NA	13	0	0	11	0	0		NA			NA	
	Queue 95th		0.5	0	0	0.8	0	0		NA			NA	
Trade Valley/Street A & Huntington Rd.	Volume		14		62				287	290			18	5
	LOS	A	D		A				A	A			A	
	v/c	-	0.08		0.04				0.21	0.19			0.07	
	Delay (s)	4	27		9				8	0			0	
	Queue 95th		2.1		0.9				6.1	0			0	
Langstaff Rd. & Huntington Rd.	Volume		18	412	64	21	642	81	267	512	94	31	145	17
	LOS	B	A	B	A	A	B	A	D	C		C	C	
	v/c	0.51	0.05	0.23	0.04	0.06	0.36	0.06	0.78	0.61		0.22	0.17	
	Delay (s)	20	10	11	10	10	12	10	38	27		24	22	
	Queue 95th		6	36	7	7	58	8	73	64		12	17	

7.0 FUTURE TRAFFIC VOLUMES

The study area's future traffic volumes include background traffic volumes and traffic volumes generated by the future developments (i.e., site traffic). The methodology to calculate future traffic volumes of the study area is described in **Section 7.1** and **Section 7.2**.

7.1 Background Traffic Volume Growth

Background traffic volumes consist of the existing 2015 volumes, which were grown by the proper growth rates for the horizon years of 2021 and 2034. The growth rates were calculated based on York Region's EMME model (**Appendix C**) outputs using the screen line method as shown in **Table 3** and **Table 4**. The applied traffic volumes include both auto and transit volumes as shown in **Figure 6** and **Figure 7** for the growth of Huntington Road, as an example. Background traffic volumes for horizon years were calculated using the compound growth equation and the year 2015 traffic volumes as the base year.

7.2 Future Development Traffic

The future developments in the study area were introduced in **Section 4**. The trips generated from the future developments are extracted from their respective studies and illustrated in **Appendix B**.

As shown in **Figure 4**, the first phase of Nashville Heights development will be completed by 2018. By the year 2018, the intersections of MacTier Drive and Algoma Drive with Huntington Road will be in operation. The future traffic volumes of these intersections were calculated using balancing with the adjacent intersections. Furthermore, the intersection of Major Mackenzie Drive and Future Road/Highway 427 northbound off-ramp will have a completely new layout and lane configuration. Thus, the traffic volumes were assigned to each movement based on the Nashville Heights Study's TMCs and balancing.

All the future developments are assumed to be completed by the year 2021. The method used to determine the future traffic volumes of the study area considering the background traffic volumes, site traffic volumes and growth rates for each horizon is described in **Table 5**.

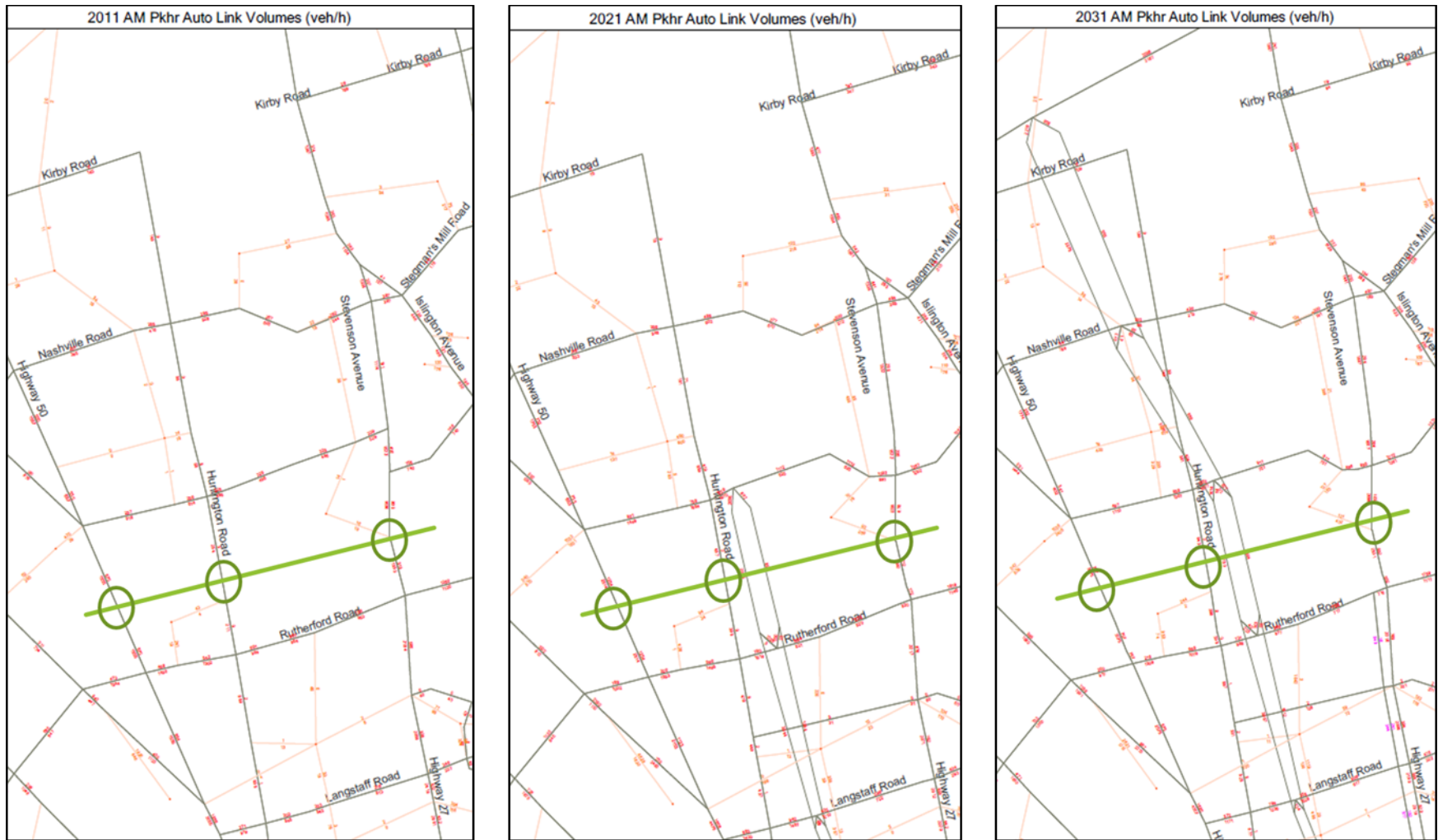


Figure 6: Screen Line Method to Calculate Growth Rate (Auto)



Figure 7: Screen Line Method to Calculate Growth Rate (Transit)

Table 3: Growth Rate Calculation 2011-2031 (NB/EB)

2011 to 2021 Growth Rate (NB/EB)																											
Huntington Road (Rutheeford Road-Street A)			Huntington Road (Street A-Langstaff Road)			Huntington Road (Nashville Rd-Major Mackenzie Drive)			Nashville Road			Major Mackenzie Drive			Rutherford Road			Trade Valley Drive			Langstaff Road						
Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %				
2011	2021		2011	2021		2011	2021		2011	2021		2011	2021		2011	2021		2011	2021		2011	2021		2011	2021	2011	2021
864	1123			1299		1908			550	732			526		600			526	600			496		625		963	776
2	6		1	1		0	96		496	625		496	625		963	888		0	128		813	722					
592	930		512	821		191	257		-	-		963	888		813	722		813	617		272	721					
Total			Total			Total			Total			Total			Total			Total			Total						
1458	2059	4%	1812	2730	4%	741	1085	4%	1022	1225	2%	1985	2113	1%	2272	2235	0%	1776	1521	-2%	2048	2331	1%				

2011 to 2031 Growth Rate (NB/EB)																											
Huntington Road (Rutheeford Road-Street A)			Huntington Road (Street A-Langstaff Road)			Huntington Road (Nashville Rd-Major Mackenzie Drive)			Nashville Road			Major Mackenzie Drive			Rutherford Road			Trade Valley Drive			Langstaff Road						
Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %				
2011	2031		2011	2031		2011	2031		2011	2031		2011	2031		2011	2031		2011	2031		2011	2031		2011	2031	2011	2031
864	875			1299		1920			550	282			526		198			526	198			496		1039		963	888
2	17		1	96		0	68		496	1039		496	1039		963	776		0	31		813	617					
592	858		512	711		191	221		-	-		963	776		813	617		813	722		272	597					
Total			Total			Total			Total			Total			Total			Total			Total						
1458	1750	1.8%	1812	2727	4.2%	741	571	-2.6%	1022	1237	1.9%	1985	2013	0.1%	2272	2432	0.7%	1776	1641	-0.8%	2048	1990	-0.3%				

Table 4: Growth Rate Calculation 2011-2031 (SB/WB)

2011 to 2021 Growth Rate (SB/WB)																										
Huntington Road (Rutheford Road-Street A)			Huntington Road (Street A-Langstaff Road)			Huntington Road (Nashville Rd-Major Mackenzie Drive)			Nashville Road			Major Mackenzie Drive			Rutherford Road			Trade Valley Drive			Langstaff Road					
Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %						
2011	2021		2011	2021		2011	2021		2011	2021		2011	2021		2011	2021		2011	2021		2011	2021	2011	2021		
1939	2163		3055	4479		1597	1763		267	428		267	428		328	1112		708	1223		708	1223	708	1223	708	1223
669	409		656	367		56	218		328	1112		328	1112		708	1295		0	2		376	596	0	2	376	596
2276	2341	2138	2258	1114	1573	-	-	708	1295	376	596	376	906	1197	515	1197	515	1197	515							
Total		Total		Total		Total		Total		Total		Total		Total		Total		Total								
4884	4913	0.1%	5849	7104	2.0%	2767	3554	2.5%	595	1540	10.0%	1303	2835	8.1%	1412	3003	7.8%	1084	2131	7%	2281	2406	0.5%			

2011 to 2031 Growth Rate (SB/WB)																										
Huntington Road (Rutheford Road-Street A)			Huntington Road (Street A-Langstaff Road)			Huntington Road (Nashville Rd-Major Mackenzie Drive)			Nashville Road			Major Mackenzie Drive			Rutherford Road			Trade Valley Drive			Langstaff Road					
Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %	Selected Point		Annual Growth Rate %						
2011	2031		2011	2031		2011	2031		2011	2031		2011	2031		2011	2031		2011	2031		2011	2031	2011	2031		
1939	2578		3055	4307		1597	1774		267	233		267	196		328	1052		708	1295		708	1295	708	1295	708	1223
669	554		656	424		56	206		328	1052		328	1052		708	1223		0	5		376	906	0	5	376	906
2276	3056	2132	2824	1114	1667	-	-	708	1223	376	906	376	596	1197	519	1197	519	1197	519							
Total		Total		Total		Total		Total		Total		Total		Total		Total		Total								
4884	6188	2.4%	5843	7555	2.6%	2767	3647	2.8%	595	1285	8.0%	1303	2471	6.6%	1412	3181	8.5%	1084	1896	5.8%	2281	2648	1.5%			

Table 5: Intersections of Interest’s Future Traffic Volumes Calculation Methodology

Year	Location	Background Traffic	Site Traffic	Total Traffic	Source
2015	Nashville Road MacTier Drive Algoma Drive East Corner Boulevard Major Mackenzie Drive	TMC 2013+ Growth - - Volume Balancing TMC 2015	-----	Background Traffic	-----
	Rutherford Road McGillivray Road Trade Valley Drive Langstaff Road	TMC 2015 Volume Balancing TMC 2015 TMC 2015	-----	Background Traffic	-----
2018	Nashville Road MacTier Drive Algoma Drive East Corner Blvd Major Mackenzie Drive	TMC 2013+ Growth Volume Balancing Volume Balancing Background 2015+Growth TMC 2015+ Growth	Nashville Heights Phases 1,2,3 Nashville Heights Phases 1,2,3	Background Traffic + Site Traffic Background Traffic + Site Traffic	Phase 3 Nashville Heights Transportation Assessment Report,2014
	Rutherford Road Trade Valley Drive Langstaff Road	TMC2015+ Growth TMC2015+ Growth TMC2015+ Growth	-----	Background Traffic	-----

Table 5: Future Traffic Volume Calculation Methodology (Cont'd)

Year	Location	Background Traffic	Site Traffic	Total Traffic	Source
2021	Nashville Road	TMC 2013+ Growth	Nashville Heights Full Site Traffic	Background Traffic + Site Traffic	Nashville Heights Transportation Assessment Report, 2009
	MacTier Drive	Background 2018+ Growth	Volume Balancing		Nashville Heights Phase 3 Transportation Assessment Report, 2014
	Algoma Drive	Background 2018+ Growth			
	East Corner's Boulevard	Background 2018+ Growth			
	Major Mackenzie Drive	TMC 2015+ Growth Volume Balancing	Nashville Heights Full Site Traffic	Nashville Heights Transportation Assessment Reports, 2009, 2014	
Rutherford Road Trade Valley Drive- Street A Langstaff Road	TMC 2015+ Growth TMC 2015+ Growth TMC 2015+ Growth	Block 59 phase 1 Site Traffic	Background Traffic + Site Traffic	Block 59 Development Transportation Assessment, 2014	

Table 5: Future Traffic Volume Calculation Methodology (Cont'd)

Year	Location	Background Traffic	Site Traffic	Total Traffic	Source
2034	Nashville Road	TMC 2013+ Growth	Nashville Heights Full Site Traffic	Background Traffic + Site Traffic	Nashville Heights Transportation Assessment Reports, 2009,2014
	MacTier Drive	Background 2018+ Growth	Balancing		
	Algoma Drive	Background 2018+ Growth	Balancing		
	East Corner's Boulevard	Background 2018 + Growth	Balancing		
	Major Mackenzie Drive	TMC 2015+ Growth	Nashville Heights full site	Background Traffic + Site Traffic	Block 59 Developments Transportation Assessment, 2014
	Rutherford Road	TMC 2015+ Growth	Block 59 phase 1,2		
Trade Valley Drive-Street A	TMC 2015+ Growth	Block 59 phase 1,2			
Langstaff Road	TMC 2015+ Growth	Block 59 phase 1,2			

8.0 FUTURE TRAFFIC CONDITIONS YEAR 2021

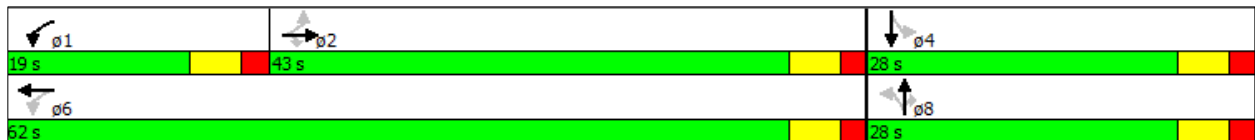
8.1 Traffic Volumes

The horizon year 2021 traffic volumes for both AM and PM peaks were calculated using the methodology described in **Section 7**. Future traffic volumes are presented in **Appendix B**. These volumes were applied to the year 2021 Synchro models.

8.2 Signal Timing Plans (STP)

As previously discussed, intersections of Huntington Road with Nashville Road and Rutherford Road are warranted to be signalized by the year 2021. **Figure 8** and **Figure 9** show the signal timing plans for the two new signalized intersections. These STPs were developed in order to minimize control delay and provide optimum traffic operations. The proposed signal timing plans were provided in accordance with the OTM Book 12 standards.

AM Peak



PM Peak

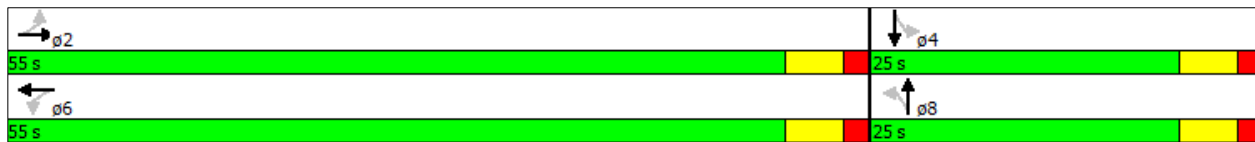
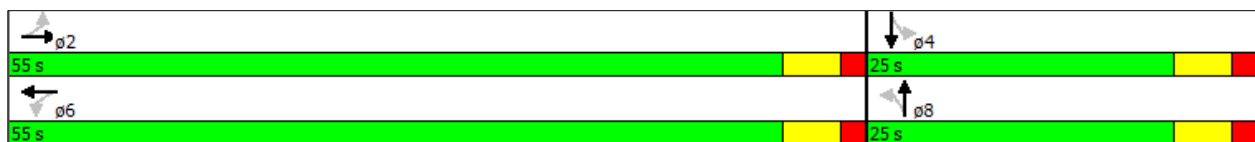


Figure 8: Proposed Signal Timing Plan for Rutherford Road and Huntington Road

AM Peak



PM Peak

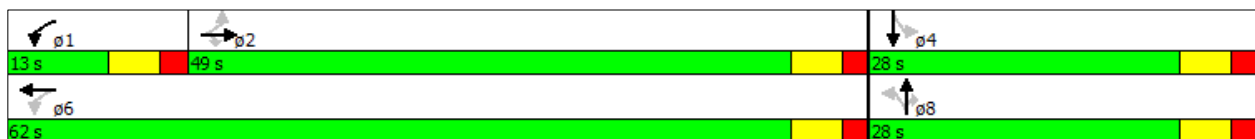


Figure 9: Proposed Signal Timing Plan for Nashville Road and Huntington Road

8.3 Road Network

The major roads of the study area are described in **Section 6.1**. The changes to the existing 2015 road network are as follows and shown in **Figure 2**.

- **Highway 427** will be extended up to Major Mackenzie Drive.
- **Major Mackenzie Drive (Regional Road 25)** will be widened to three lanes per direction including one HOV lane per direction.
- **Street A** as the fourth leg of the Huntington Road and Trade Valley drive intersection will be an east-west collector road extending from Huntington Road to Highway 27 (approximately 2 km).
- **Future Road** will be constructed as a connection between Huntington Road and Highway 427 northbound off-ramp with one lane per direction.
- **Barons Street** will be a north south local road within the Nashville Heights development extending from Nashville Road to Major Mackenzie Drive with two lanes per direction.
- **East Corner's Boulevard** will be an east-west local road within the Nashville Heights development extending from Huntington Road to MacTier Drive (approximately 0.8 km) with one lane per direction.
- **MacTier Drive** will be an east-west local road in the north and will be curved to the south down to Moody Drive within the Nashville Heights development (approximately 1.8 km) with one lane per direction.
- **Algoma Drive** will be an east-west local road within the Nashville Heights development extending from Huntington road to Barons Street (approximately 0.4 km) with one lane per direction.
- **Huntington Road** will be widened from two-lane to four-lane from Rutherford Road to Langstaff Road.

8.4 Traffic Capacity Analysis

The future year 2021 traffic operations within the study area were analyzed to determine if there are any problematic intersections or movements which may arise in the future due to traffic volume growth. To analyze the future traffic conditions of the study area's intersections, a Synchro model was developed. According to the model's results, there are several roadway improvements that needs to be implemented within the study area. These improvements include:

- Road widening
- Installing traffic signals
- Adding left/right turn storage lanes

The 2021 traffic analysis assumed traffic signals at the intersections of Huntington Road with Nashville Road and Rutherford Road as this was recommended for the 2015 existing conditions assessment. Additionally, the analysis included the discontinuation of Huntington Road as a result of the new Highway 427 off-ramp at Major Mackenzie Drive. Adding left/right turn storage lanes was also recommended to improve the road network's traffic performance. An analysis was completed to determine where the turn storage lanes are warranted based on the *TAC Geometric Design Guide* and *FHWA Signalized Intersections Informational Guide* as follows:

- Exclusive left-turn lanes are warranted if:
 - Left-turn volume > 20% of total approach volume; or
 - Left-turn volume >100 (veh/hr) in peak periods
 - The opposing traffic volume is significant
- Exclusive right-turn lanes without separate signal indication are warranted if:
 - Right-turn volume equals to 10% to 20% of total approach volume

The warrant analysis is shown in **Table 6**. The intersection's layout for the year 2021, including left/right turn storage lanes, are shown in **Figure 10**: Year 2021 Modified Intersections Layout

The results of the traffic capacity analysis completed for the weekday AM and PM peak hours under future 2021 traffic conditions are presented in **Table 7** and **Table 8**. The tables include LOS and delay for the overall intersection and traffic volumes, LOS, v/c ratios, delay and 95th percentile queue length for each movement. The critical movements are the movements with LOS 'E' or 'F' (highlighted in purple and red) and/or v/c ratios over 0.85. The Synchro reports prepared using HCM 2000 methodology are represented in **Appendix F**.

As presented in **Table 7** and **Table 8**, the unsignalized intersections of Huntington Road with Trade Valley Drive/Street A and the Future Road with Major Mackenzie Drive/Highway 427 northbound off-ramp comprise movements with poor levels of service under 2021 traffic conditions. This is a result of stop control on the side streets which impose significant delay to the turning vehicles to the main

street. Another problematic movement is the northbound left turn movement at the Langstaff Road and Huntington Road intersection during the PM peak hour due to rather high volumes.

A traffic signal warrant analysis was completed for the intersections of Huntington Road with Trade Valley Drive/Street A and the Future Road with Major Mackenzie Drive/Highway 427 northbound off-ramp to determine if a traffic signal is required. The results indicated that under 2021 traffic conditions, both traffic signals are warranted. The signal warrant analysis is presented in **Appendix E**.

Table 6: Year 2021 Left/Right Turn Storage lane Warrant

Location	Movement	2021										Exclusive Turn Lane Warranted
		Volume										
		Movement		Average	Approach		Average	Percentage	Opposing Traffic		Average	
		AM	PM		AM	PM			AM	PM		
Future Rd- Major Mackenzie Dr.	SBR	256	190	223	359	227	293	76%	-	-	-	Yes
Rutherford Rd-Huntington Rd	NBL	38	156	97	78	318	198	49%	10	3		No
	NBR	31	148	90				45%	-	-	-	Yes
Huntington Rd- Street A	NBR	103	71	87	298	628	463	19%	-	-	-	No
	NBL	37	318	178				38%	302	175	330	Yes
	SBL	13	3	8	321	208	265	3%	158	239	199	Yes

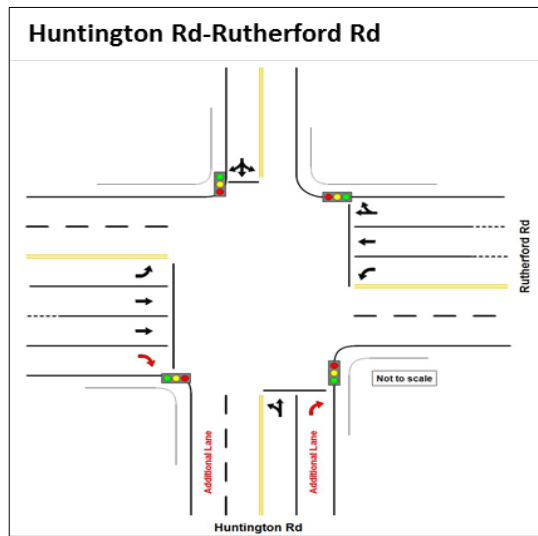
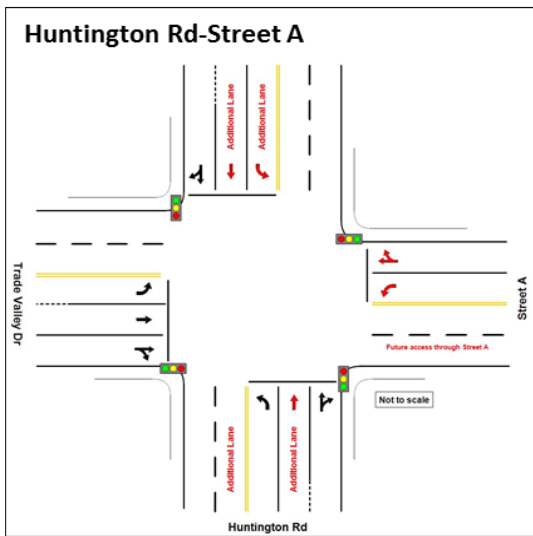
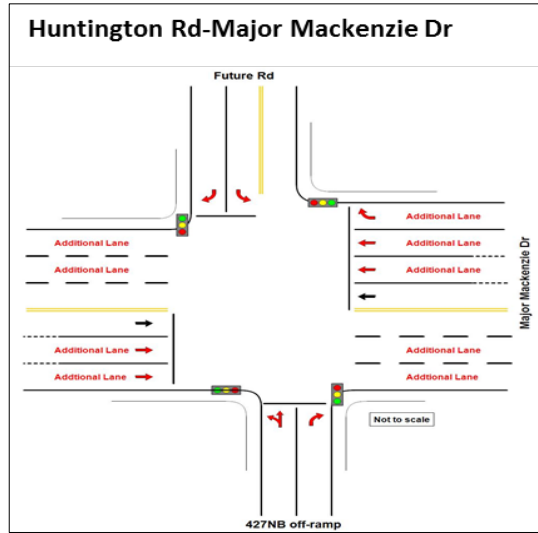
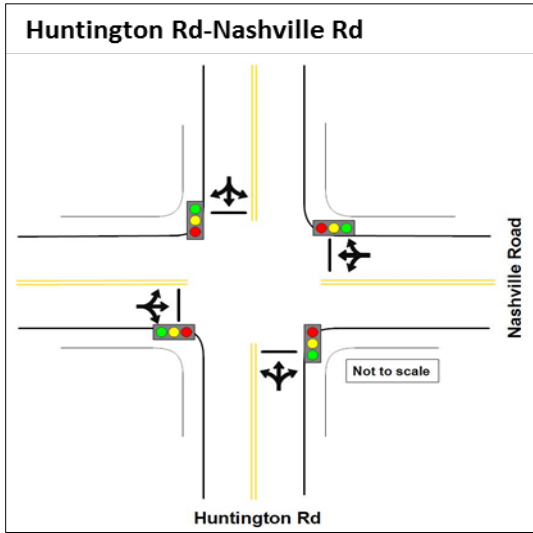


Figure 10: Year 2021 Modified Intersections Layout

Table 7: Future 2021 Weekday AM Peak Hour Traffic Operational Performance

Intersection	MOE	Overall	Movement											
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Nashville Rd. & Huntington Rd.	Volume	-	7	544	37	17	885	97	60	18	11	87	30	11
	LOS	B		A			B			C			C	
	v/c	0.81		0.52			0.89			0.36			0.52	
	Delay (s)	15		6			18			25			27	
	Queue 95th	-		72			229			24			33	
MacTier Dr. & Huntington Rd.	Volume	-				22		24		61	83	6	99	
	LOS	A				A		A		A	A	A	A	
	v/c	-				0.06		0.06		0.04	0.05	0	0.06	
	Delay (s)	2				9		9		0	0	8	0	
	Queue 95th	-				1.4		1.4		0	0	0.1	0	
Algoma Dr. & Huntington Rd.	Volume	-				76		29		114	26	11	110	
	LOS	A				B		B		A	A	A	A	
	v/c	-				0.15		0.15		0.07	0.02	0.01	0.07	
	Delay (s)	3				11		11		0	0	8	0	
	Queue 95th	-				4		4		0	0	0.2	0	
East Corner's Blvd. & Huntington Rd.	Volume	-				201		83		57	57	28	159	
	LOS	A				B		B		A	A	A	A	
	v/c	-				0.41		0.41		0.04	0.04	0.02	0.1	
	Delay (s)	-				13		13		0	0	8	0	
	Queue 95th	-				15		15		0	0	1	0	
Future Rd/Hwy 427 Off Ramp & Major Mackenzie Dr	Volume	-	0	73	0	0	816	27	0	98	204	103		256
	LOS	C		A			A	A		C	C	F		F
	v/c	-		0.02			0.17	0.02		0.44	0.44	1.04		1.04
	Delay (s)	17		0			0	0		16	16	59		59
	Queue 95th	-		0			0	0		17	17	99		99
Rutherford Rd. & Huntington Rd.	Volume	-	4	1127	213	287	1350	9	38	9	31	5	10	10
	LOS	B	B	B	B	C	A			C	C		C	
	v/c	0.7	0.03	0.76	0.15	0.75	0.59			0.26	0.02		0.07	
	Delay (s)	14	11	19	12	24	6			28	27		27	
	Queue 95th	-	2	98	10	62	56			10	-		33	
Trade Valley/Street A & Huntington Rd.	Volume	-	17	87	207	33	15	10	37	158	103	13	302	6
	LOS	A	B	C		D	B		A	A		A	A	
	v/c	-	0.05	0.36		0.22	0.06		0.03	0.1		0.01	0.13	
	Delay (s)	6	15	16		34	13		8	0		8	0	
	Queue 95th	-	1	12		6	1		0	0		0	0	
Langstaff Rd. & Huntington Rd.	Volume	-	50	641	280	66	264	54	72	294	49	109	463	50
	LOS	B	A	A	A	A	A	A	C	C		C	C	
	v/c	0.42	0.08	0.32	0.23	0.17	0.13	0.04	0.6	0.44		0.56	0.67	
	Delay (s)	17	7	8	8	8	7	6	35	27		30	30	
	Queue 95th	-	9	41	19	12	17	5	25	36		32	55	

Table 8: Future 2021 Weekday PM Peak Hour Traffic Operational Performance

Intersection	MOE	Overall	Movement											
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Nashville Rd. & Huntington Rd.	Volume	-	24	1037	67	7	744	62	78	55	28	53	16	11
	LOS	A		D			A			C			C	
	v/c	0.91		0.99			0.71			28.2			26.8	
	Delay (s)	25		35			9			32			28	
	Queue 95th	-		284			133			39			22	
MacTier Dr. & Huntington Rd.	Volume	-				115		26		141	115	31	58	
	LOS	A				B		B		A	A	A	A	
	v/c					0.21		0.21		0.09	0.07	0.03	0.04	
	Delay (s)					11		11		0	0	8	0	
	Queue 95th	-				6		6		0	0	1	0	
Algoma Dr. & Huntington Rd.	Volume	-				55		81		175	74	38	135	
	LOS	A				B		B		A	A	A	A	
	v/c	-				0.21		0.21		0.11	0.05	0.03	0.09	
	Delay (s)	3				11		11		0	0	8	0	
	Queue 95th	-				6		6		0	0	1	0	
East Corner's Blvd. & Huntington Rd.	Volume	-				139		57		191	161	103	87	
	LOS	A				C		C		A	A	A	A	
	v/c	-				0.4		0.4		0.12	0.1	0.1	0.06	
	Delay (s)	6				16		16		0	0	8	0	
	Queue 95th	-				15		15		0	0	2	0	
Future Rd/Hwy 427 Off Ramp & Major Mackenzie Dr	Volume	-		1088			494	144		209	603	37		190
	LOS	F		A			A	A		F	F	F		F
	v/c	-		0.23			0.11	0.09		4.06	4.06	NA		NA
	Delay (s)	NA		0			0	0		NA	NA	NA		NA
	Queue 95th	-		0			0	0		NA	NA	NA		NA
Rutherford Rd. & Huntington Rd.	Volume	-	14	1303	76	58	1139	3	156	14	148	6	3	7
	LOS	B	B	B	A	A	A			C	C		C	
	v/c	0.77	0.07	0.81	0.05	0.28	0.55			0.62	0.1		0.03	
	Delay (s)	15	13	18	9	10	6			28	24		23	
	Queue 95th	-	5	125	5	7	59			26	14		7	
Trade Valley/Street A & Huntington Rd.	Volume	-	22	20	93	110	85	14	318	239	71	3	175	30
	LOS	E	F	D		F	F		A	A		A	A	
	v/c	-	0.4	0.17		1.37	0.71		0.26	0.1		0	0.07	
	Delay (s)	41	101	28		309	73		9	0		0	0	
	Queue 95th	-	11	5		69	32		8	0		0	0	
Langstaff Rd. & Huntington Rd.	Volume	-	27	433	66	59	698	93	301	618	113	63	294	55
	LOS	C	B	B	B	B	B	B	E	C		C	C	
	v/c	0.64	0.1	0.27	0.05	0.15	0.43	0.06	0.93	0.6		0.42	0.28	
	Delay (s)	24	14	15	13	14	17	13	59	25		25	22	
	Queue 95th	-	8	38	7	15	64	8	110	79		23	35	

9.0 FUTURE TRAFFIC CONDITIONS YEAR 2034

9.1 Traffic Volumes

The horizon year 2034 traffic volumes for both AM and PM peaks were calculated using the methodology described in **Section 7**. Future traffic volumes are presented in **Appendix B**. These volumes were applied to the year 2034 Synchro models.

9.2 Signal Timing Plans (STP)

As previously discussed, intersections of Huntington Road at Trade Valley/ Street A and Major Mackenzie Drive at Future Road/Highway 427 northbound Off-Ramp are warranted to be signalized by the year 2034. **Figure 11, Figure 12, Figure 13** and **Figure 14** show the updated signal timing plans for the signalized intersections of the study area. Signal timing plan of Nashville Road and Huntington Road will remain unchanged from 2021. These STPs were developed/optimized in order to minimize control delay and provide optimum traffic operations. The proposed signal timing plans were provided in accordance with the OTM Book 12 standards.

AM Peak



PM Peak

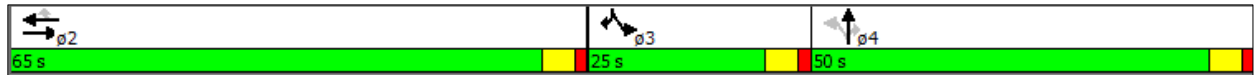
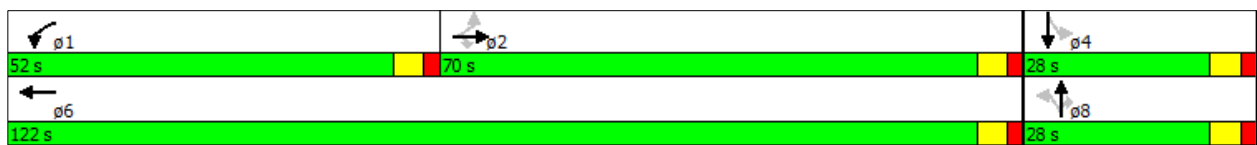


Figure 11: Proposed Signal Timing Plan for Major Mackenzie Dr. and Future Rd/Hwy 427 NB Off-Ramp

AM Peak



PM Peak

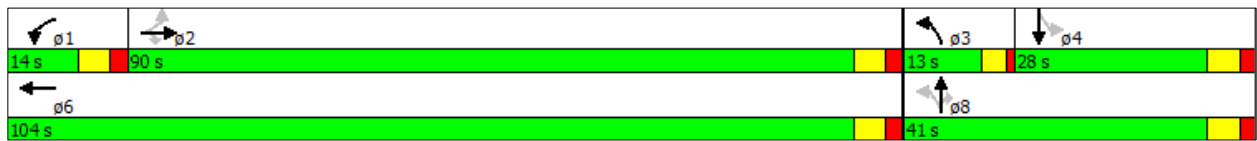
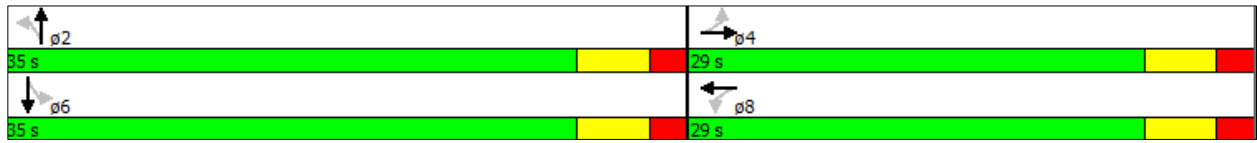


Figure 12: Proposed Signal Timing Plan for Huntington Road and Rutherford Road

AM Peak

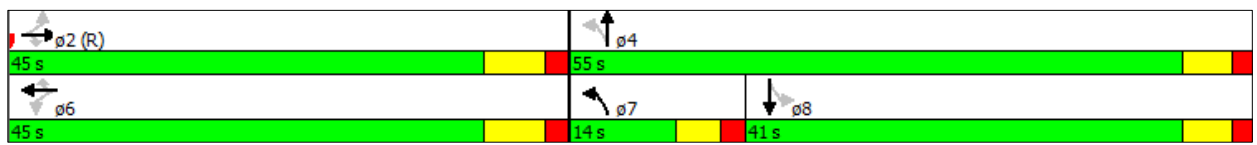


PM Peak



Figure 13: Proposed Signal Timing Plan for Huntington Road and Trade Valley Drive/Street A

AM Peak



PM Peak

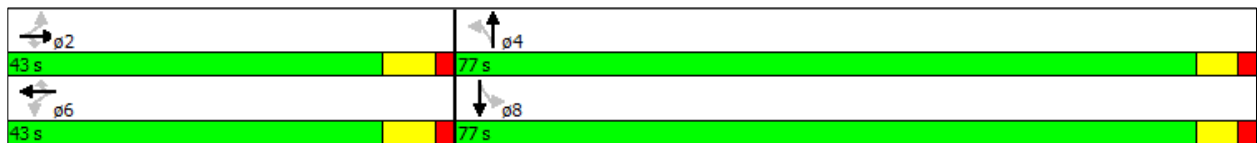


Figure 14: Proposed Signal Timing Plan for Huntington Road and Langstaff Road

9.3 Road Network

The major roads of the study area are described in **Section 6.1**. The changes to the 2021 road network are as follows and shown in **Figure 2**:

- **Highway 427** will be extended up to Kirby Road.
- **Rutherford Road (Regional Road 73)** will be widened to 3 lanes per directions including one HOV lane per direction.

9.4 Traffic Capacity Analysis

The future year 2034 traffic operations within the study area were analyzed to determine if there are any problematic intersections or movements which may arise in the future due to traffic volume growth. To analyze the future traffic conditions of the study area’s intersections, a Synchro model was developed. According to the model’s results, there are several roadway improvements that need to be implemented within the study area. These improvements include:

- Road widening
- Installing traffic signals
- Adding left/right turn storage lanes

The 2034 traffic analysis assumed traffic signals at the intersections of Huntington Road with Trade Valley Drive/Street A and Major Mackenzie Drive and Future Road/Highway 427 northbound off-ramp as this was recommended for the 2021 conditions assessment. Additionally, the analysis included the discontinuation of Huntington Road as a result of the new Highway 427 off-ramp at Major Mackenzie Drive and widening of Huntington Road from two to four lanes from Rutherford Road to Langstaff Road, as recommended for 2021 traffic conditions. Adding left/right turn storage lanes were also recommended to improve the road network’s traffic performance. An analysis was completed as discussed in **Section 8.3** to determine where the turn storage lanes are warranted. The warrant analysis is shown **Table 9**. The year 2034 intersections layout including left/right turn storage lanes are shown in **Figure 15**.

The results of the traffic capacity analysis completed for the weekday AM and PM peak hours under future 2034 traffic conditions are presented in **Table 10** and **Table 11**. The tables include LOS and delay for the overall intersection and traffic volumes, LOS, v/c ratios, delay and 95th percentile queue length per movement. The critical movements are the movements with LOS ‘E’ or ‘F’ (highlighted in purple and red) and/or v/c ratios over 0.85. The Synchro reports prepared using HCM 2000 methodology are represented in **Appendix F**.

As presented in **Table 10** and **Table 11**, the intersection of Huntington Road with Rutherford Road operates at poor traffic conditions with LOS ‘E’ during the AM peak and LOS ‘F’ during the PM peak. Huntington Road’s movements experience significant delay due to long cycle times which is necessitated by the high traffic volumes on Rutherford Road. To provide enough capacity, westbound left turn movement at Rutherford Road requires double left turn lanes with protected signal phase. This critical condition urges further considerations toward capacity improvement on Rutherford Road. During the PM peak period, the intersection of Major Mackenzie Drive with Future Road/Highway 427 northbound off-ramp operates at LOS ‘E’ and comprises two critical movements: eastbound through and northbound right turn movements, which operate at capacity. Double right turn lanes are recommended for the northbound right turn movement on Highway 427 northbound off-ramp due to high traffic volumes.

A traffic signal warrant analysis was completed for the intersections of Huntington Road with Trade Valley Drive/Street A and the Future Road with Major Mackenzie Drive/Highway 427 northbound off-Ramp to determine if a traffic signal is required. The results indicated that under 2034 traffic conditions, both traffic signals are warranted. The signal warrant analysis is presented in **Appendix E**.

Table 9: Year 2034 Left/Right Turn Storage lane Warrant

Location	Movement	2034										Exclusive Turn Lane Warranted
		Volume										
		Movement		Average	Approach		Average	Percentage	Opposing Traffic		Average	
AM	PM		AM	PM			AM	PM				
Nashville Rd- Huntington Rd	SBL	126	42	84	186	63	124.5	67%	-	-	-	Yes
Rutherford Rd-Huntington Rd	NBL	54	290	172	116	638	377	46%	16	4	10	Yes
Huntington Rd- Street A	NBR	35	106	71	320	1111	715.5	10%	-	-	-	No

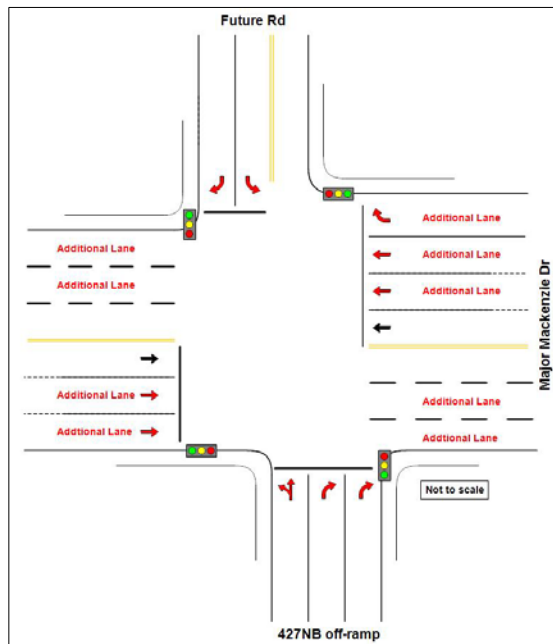
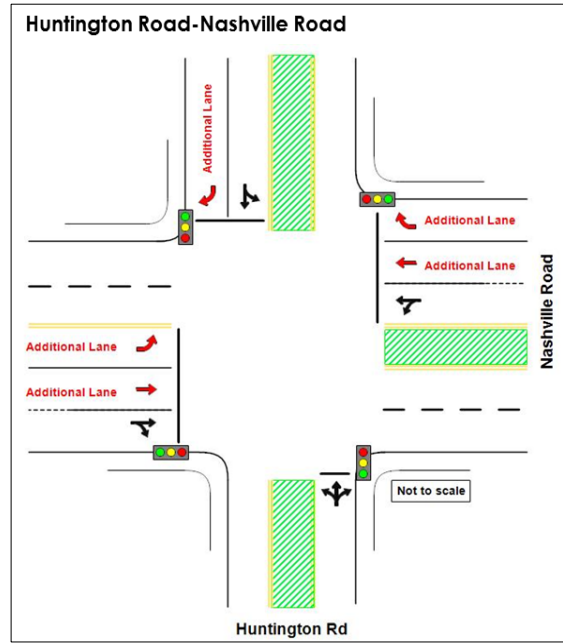
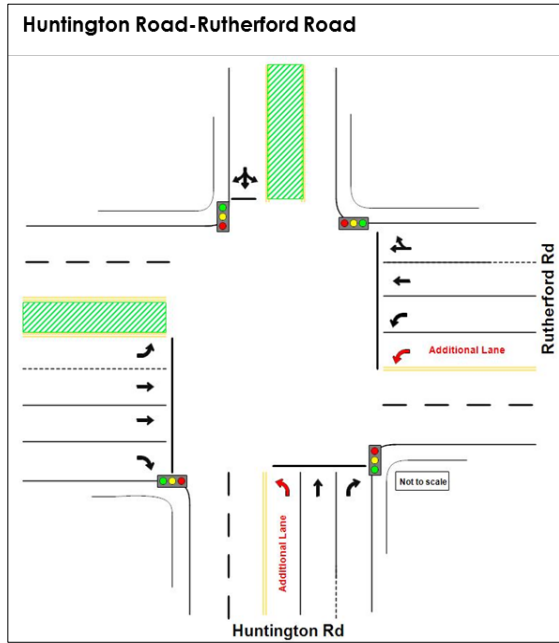


Figure 15: Year 2034 Modified Intersections Layout

Table 10: Future 2034 Weekday AM Peak Hour Traffic Operational Performance

Intersection	MOE	Overall	Movement											
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Nashville Rd. & Huntington Rd.	Volume	-	9	687	42	40	2026	236	58	14	9	126	44	16
	LOS	C	A	A			C	A		C		C	C	
	v/c	0.91	0.1	0.33			0.99	0.16		0.35		0.57	0.19	
	Delay (s)	22	4	5			28	4		28		31	27	
	Queue 95th	-	3	36			243	7		22		33	16	
MacTier Dr. & Huntington Rd.	Volume	-				22		24		58	83	6	136	
	LOS	A				A		A		A	A	A	A	
	v/c	-				0.06		0.06		0.04	0.05	0	0.09	
	Delay (s)	2				9		9		0	0	8	0	
	Queue 95th	-				1.4		1.4		0	0	0.1	0	
Algoma Dr. & Huntington Rd.	Volume	-				76		29		111	26	11	147	
	LOS	A				B		B		A	A	A	A	
	v/c	-				0.16		0.16		0.07	0.02	0.01	0.09	
	Delay (s)	3				11		11		0	0	8	0	
	Queue 95th	-				4		4		0	0	0	0	
East Corner's Blvd. & Huntington Rd.	Volume	-				201		83		54	67	28	196	
	LOS	A				B		B		A	A	A	A	
	v/c	-				0.43		0.43		0.03	0.04	0.02	0.13	
	Delay (s)	7				14		14		0	0	8	0	
	Queue 95th	-				16		16		0	0	1	0	
Future Rd/Hwy 427 Off Ramp & Major Mackenzie Dr	Volume	-		73				1478	25	95	204	130		266
	LOS	D		B				D	B		C	C	C	C
	v/c	0.55		0.05				1.01	0.02	0.22	0.08	0.32		0.16
	Delay (s)	43		19				52	19	25	23	27		25
	Queue 95th	-		7				123	0	25	9	33		17
Rutherford Rd. & Huntington Rd.	Volume	-	5	1307	302	749	3933	25	54	12	50	8	16	16
	LOS	C	B	C	B	E	C		E	E	E		E	
	v/c	1.00	0.09	0.53	0.2	0.87	1		0.45	0.08	0.03		0.3	
	Delay (s)	30	18	22	18	57	27		63	59	59		61	
	Queue 95th	-	4	126	17	128	490		30	10	11		24	
Trade Valley/Street A & Huntington Rd.	Volume	-	17	138	229	115	24	16	66	219	35	48	512	9
	LOS	B	B	B		C	V		A	A		A	A	
	v/c	0.37	0.06	0.31		0.56	0.07		0.16	0.13		0.09	0.28	
	Delay (s)	11	16	17		21	16		6	6		6	6	
	Queue 95th	-	5	16		24	8		10	12		8	27	
Langstaff Rd. & Huntington Rd.	Volume	-	51	727	259	78	357	64	120	301	51	159	640	69
	LOS	C	B	C	B	C	B	B	C	B		C	D	
	v/c	0.59	0.13	0.5	0.18	0.37	0.24	0.04	0.53	0.25		0.61	0.76	
	Delay (s)	24	17	21	17	23	18	16	23	19		35	36	
	Queue 95th	-	16	82	16	27	38	6	23	29		47	83	

Table 11: Future 2034 Weekday PM Peak Hour Traffic Operational Performance

Intersection	MOE	Overall	Movement											
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Nashville Rd. & Huntington Rd.	Volume	-	57	2289	84	9	921	80	97	80	41	42	12	9
	LOS	D	A	E		A	A			D		C	C	
	v/c	1.02	0.2	1.11		0.56	0.05			0.73		0.22	0.24	
	Delay (s)	49	6	70		8	5			39		26	26	
	Queue 95th	-	10	293		60	5			54		14	7	
MacTier Dr. & Huntington Rd.	Volume	-				115		26		199	115	31	54	
	LOS	A				B		B		A	A	A	A	
	v/c	-				0.23		0.23		0.13	0.07	0.03	0.03	
	Delay (s)	4				12		12		0	0	8	0	
	Queue 95th	-				6.8		6.8		0	0	0.6	0	
Algoma Dr. & Huntington Rd.	Volume	-				55		81		233	74	38	131	
	LOS	A				B		B		A	A	A	A	
	v/c	-				0.23		0.23		0.15	0.05	0.03	0.08	
	Delay (s)	3				12		12		0	0	8	0	
	Queue 95th	-				6.5		6.5		0	0	0.8	0	
East Corner's Blvd. & Huntington Rd.	Volume	-				139		57		249	161	103	83	
	LOS	A				C		C		A	A	A	A	
	v/c	-				0.44		0.44		0.16	0.1	0.1	0.05	
	Delay (s)	5				18		18		0	0	9	0	
	Queue 95th	-				16.5		16.5		0	0	2.5	0	
Future Rd/Hwy 427 Off Ramp & Major Mackenzie Dr	Volume	-		2292				564	198		213	988	37	187
	LOS	E		F				C	C		C	E	D	D
	v/c	0.91		1.13				0.28	0.13		0.39	0.94	0.16	0.11
	Delay (s)	78		107				26	25		39	65	54	54
	Queue 95th	-		319				49	15		74	174	21	21
Rutherford Rd. & Huntington Rd.	Volume	-	42	3775	229	53	1317	4	290	101	247	7	4	8
	LOS	F	B	F	A	E	A		F	D	D		E	
	v/c	1.23	0.22	1.25	0.19	0.36	0.38		1.12	0.31	0.63		0.1	
	Delay (s)	321	11	490	10	64	9		146	47	55		55	
	Queue 95th	-	14	554	21	15	63		143	43	74		11	
Trade Valley/Street A & Huntington Rd.	Volume	-	44	32	192	67	128	45	487	518	106	12	182	34
	LOS	B	C	C		C	C		B	A		A	A	
	v/c	0.67	0.25	0.13		0.38	0.55		0.7	0.29		0.03	0.1	
	Delay (s)	13	25	24		26	28		13	5		4	4	
	Queue 95th	-	13	10		19	36		96	27		3	9	
Langstaff Rd. & Huntington Rd.	Volume	-	33	586	85	37	767	89	435	852	158	89	331	74
	LOS	C	D	C	C	C	D	C	D	B		B	B	
	v/c	0.85	0.33	0.55	0.06	0.22	0.71	0.06	0.93	0.56		0.49	0.22	
	Delay (s)	27	36	33	26	30	37	26	46	16		17	13	
	Queue 95th	-	18	86	12	17	118	12	162	91		29	31	

10.0 FUTURE 2034 TRAFFIC CONDITIONS WITH LINK BETWEEN MCGILLIVRAY ROAD AND MAJOR MACKENZIE DRIVE

As mentioned previously, due to the construction of the Highway 427 interchange at Major Mackenzie Drive, Huntington Road will not be a continuous north-south roadway in the future. As a result, the traffic capacity and operations analysis were performed reflecting this condition with new traffic distributions on affected roads. It was assumed that just 10% of the projected volume will come from north of the Huntington Road and Rutherford Road intersection. According to a critical need for connectivity between the areas north and south of Huntington Road for emergency and accessibility purposes, a link is assumed to be provided between McGillivray Road and Major Mackenzie Drive; however, it is unlikely that vehicles travelling north will use this link since there are more convenient alternatives such as Highway 50, Highway 27 or the Highway 427 extension. Therefore, this new link will not change the traffic volumes on the study area's road network and a need for a new traffic capacity analysis is negated.

11.0 CONCLUSIONS AND RECOMMENDATIONS

The goal of this Traffic Operational Analysis was to provide an extensive traffic capacity and performance review of Huntington Road and the surrounding area road network for the horizon years of 2021 and 2034. The future traffic conditions and traffic growth is a result of broad future residential/commercial developments, road network improvements and population and employment growth of the study area. Two major developments on Block 61 and Block 59 will be fully built by 2021. Highway 427 will be extended up to Kirby Road by 2034 and Major Mackenzie Drive and Rutherford Road will be widened to six lanes, including one HOV lane per direction, by 2034. Major improvements will enhance transit network performance within the study area in the future horizons. The future traffic volumes of the study area includes projected background traffic and new developments' site traffic.

It is assumed that there will be a discontinuity on Huntington Road between McGillivray Road and Major Mackenzie Drive resulting from the Highway 427 extension, which is supposed to be replaced by a substitute link. This discontinuity will change the north-south traffic distribution on Huntington Road and other respective roads, such as Rutherford Road. **Table 12** presents a summary of the findings and outputs of this Traffic Operational Analysis study, from a capacity and traffic performance point of view.

According to the study results, several capacity and safety improvement measures are recommended as shown in **Figure 16** and **Table 13**. The recommendations include urbanization (e.g., adding left/right turn lanes and signalization) and widening. Urbanization measures could contribute to safety enhancement, as well as capacity improvement.

Table 12: Summary of Traffic Analysis Findings

Intersection	Existing 2015 Conditions	Future 2021 Traffic Conditions	Future 2034 Traffic Conditions
Huntington Road & Nashville Road	Side street movements (NBT and SBT) experience significant delay. Warranted for signalization.	Operates well under signal control.	Operates well except for EBT movement operates at LOS 'E'.
Huntington Road & MacTier Drive	Not constructed	Operates well under stop sign control.	Operates well under stop sign control.
Huntington Road & Algoma Drive	Not constructed	Operates well under stop sign control.	Operates well under stop sign control.
Huntington Road & East Corner's Drive	Not in operation	Operates well under stop sign control.	Operates well under stop sign control.
Major Mackenzie Drive & Huntington Road (Future Road/Highway 427 NB Off-Ramp)	Intersection operates well under stop sign control with no issues.	Proposed new intersection with Future road and Highway 427 NB Off-Ramp operates at LOS 'F' during PM peak hour. Warranted for signalization.	Intersection operates at LOS 'E' due to at/over capacity movements of EBT and NBR. Consideration should be given for capacity improvements on Highway 427 NB off-ramp and Major Mackenzie Drive eastbound movement.
Huntington Road & Rutherford Road	Side street movements (NBT and SBT) experience significant delay. Warranted for signalization.	Operates well under signal control.	Intersection operates at LOS 'F' during the PM peak hour due to over capacity movements of EBT and NBL. Consideration should be given for capacity improvements on Rutherford Road EBT movement and Huntington Road NBL.
Huntington Road & Trade Valley Drive/Street A	A three-leg intersection operates well under stop sign control with no issues.	A four-leg intersection with poor traffic operations on side street movements (WBT, WBL, EBL) and experience significant delay. Warranted for signalization.	Operates well under signal control.
Huntington Road & Langstaff Road	Intersection operates well with no significant issues.	Intersection operates well with no significant issues.	Intersection operates well with no significant issues.

Table 13: Summary of recommended Improvements

Category	Improvement Type	Location	Year
Urbanization	Exclusive Right Turn Lanes	Future Rd @ Major Mackenzie Drive - SB	2021
		Major Mackenzie Dr @ Future Rd/HWY 427 NB Off Ramp- WB	
		Rutherford Rd @ Huntington Rd- EB	
		Huntington Rd @ Nashville Rd- SB	2034
		Nashville Rd @ Huntington Rd- WB	
		Double right lanes on Major Mackenzie Drive @ Future Rd/HWY 427 NB Off Ramp- WB	
	Exclusive Left Turn Lanes	Rutherford @ Huntington Rd- WB	2021
		Huntington Rd@ Street A- NB	
		Huntington Rd@ Street A- SB	
		Street A @ Huntington Rd- WB	
		Nashville Rd @ Huntington Rd- EB	2034
		Double left lanes on Rutherford Rd @ Huntington Rd- WB	
		Huntington Rd @ Rutherford Rd- NB	
	Traffic Signal	Huntington Rd & Nashville Rd	2021
		Huntington Rd & Rutherford Rd	
		Huntington Rd & Major Mackenzie Dr	
Huntington Rd & Trade Valley/Street A			
Widening	Two-Lane to Four-Lane	Huntington Rd (Rutherford Rd to Langstaff Rd)	2021

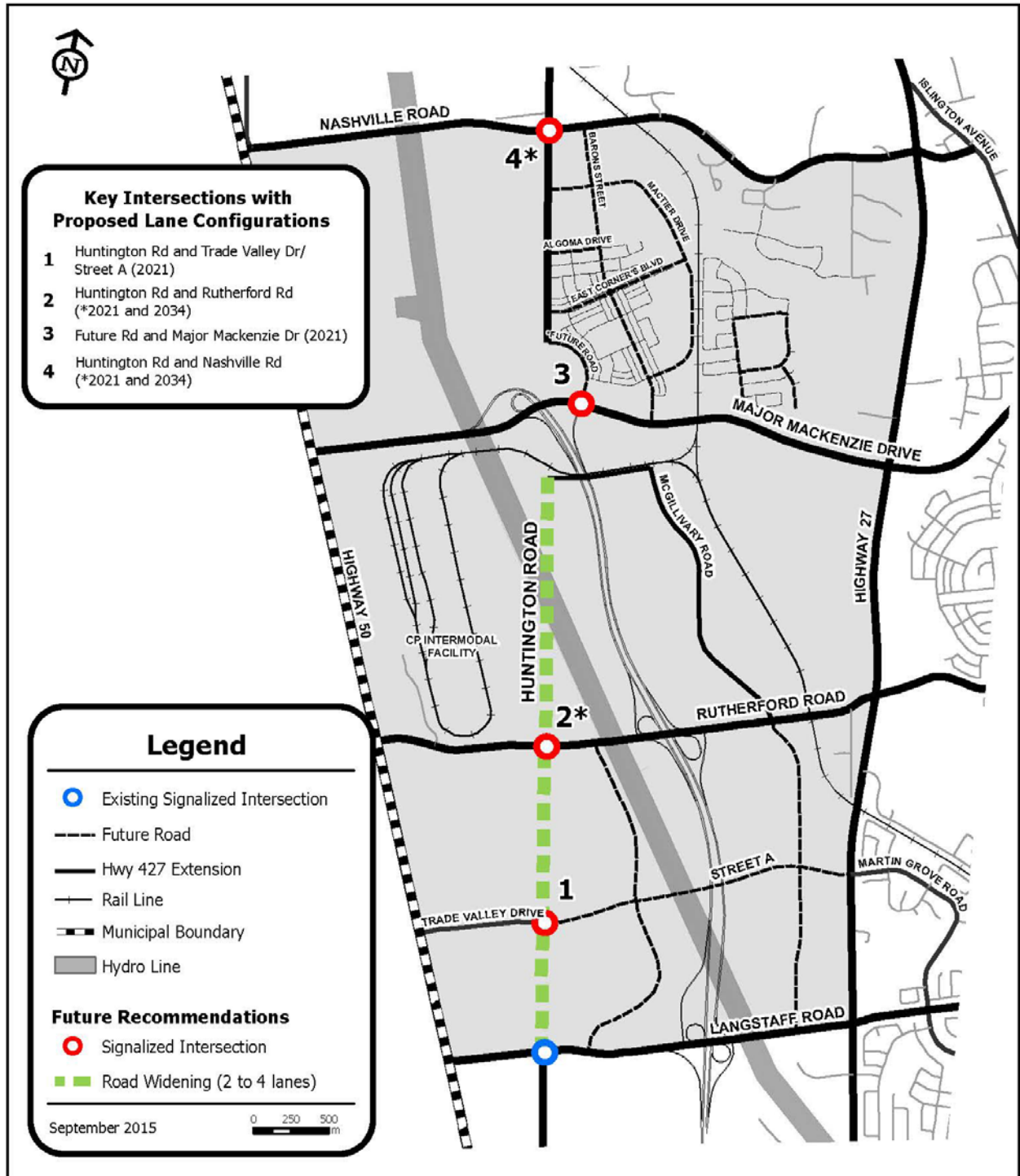


Figure 16: EA Study Road Network Improvement Recommendations

Appendix A

Turning Movement Counts (TMC)

Appendix B

Existing and Future Traffic Volumes

Appendix C

EMME Model Results

Appendix D

Signal Timing Plans

Appendix E

Traffic Signal Warrants

Appendix F

Synchro Traffic Analysis Reports