Future Conditions Report

Ainslie Wood Traffic Management Review
Hamilton, Ontario
Project # TPB186044

Prepared for:

City of Hamilton
330 Wentworth Street, Hamilton, ON

1/4/2019

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Table of Contents

1.0 Introduction 1
2.0 Future Traffic Growth 1
2.1 Overview 1
2.2 Methodology 1
2.3 Figure 1: Extent of EMME Model with Forecasted Link Volumes for AM 2031 Business as Usual Scenario *(Source: City of Hamilton Append E2 - Ridership Modelling and Traffic Report, 2017)*Growth Rate Calculations 2
2.3.1 Do Nothing Scenario - 2031 2
2.3.2 Light Rail Transit Scenario – 2031 3
2.4 Growth Rate Summary 4
3.0 Analysis 4
3.1 Vehicular Level of Service 4
3.1.1 Do Nothing Scenario - 2031 5
3.1.2 Light Rail Transit Scenario - 2031 9
4.0 Conclusion 13

List of Figures

Figure 1: Extent of EMME Model 2
Figure 3: 2031 Future Traffic Volumes (Do Nothing) 6
Figure 2: 2031 Level of Service (Do Nothing) 8
Figure 5: 2031 Future Traffic Volumes (LRT) 10
Figure 4: 2031 Level of Service (LRT) 12

List of Tables

Table 1: AM Growth Rate – Do Nothing Scenario 2
Table 2: PM Growth Rate – Do Nothing Scenario 3
Table 3: AM Growth Rate – LRT Scenario 3
Table 4: PM Growth Rate – LRT Scenario 4
Table 5: Summary of Growth Rates 4
Table 6: Future Intersection Operations (Do Nothing) 7
Table 7: Future Intersection Operations (LRT) 11

List of Appendices

Appendix A: Traffic Analysis Results (Do Nothing)
Appendix B: Traffic Analysis Results (With LRT)
Appendix C: HCM Reports (Do Nothing)
Appendix D: HCM Reports (With LRT)

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1.0 Introduction

Wood Environment & Infrastructure Solutions ("Wood") was retained by the City of Hamilton (referred to as "City" hereinafter) to conduct a Traffic Management Study for the Ainslie Wood neighbourhood area. The primary objective of this study was to conduct a multi-modal review of the transportation system within the Ainslie Wood neighbourhood and provide recommendations on potential transportation-related improvements which will address the needs of all road-users in a safe and efficient manner.

The purpose of this report is to discuss the future transportation context for the Ainslie Wood neighbourhood. A traffic operational assessment was completed considering two scenarios for the 2031 horizon year; "Do-Nothing" and "With Light Rail Transit (LRT)". The "Do-Nothing" option will evaluate future traffic conditions assuming that the LRT is not constructed. Conversely, the "With LRT" scenario will assess future traffic operations by considering the projected impact of the LRT on the road network.

2.0 Future Traffic Growth

This section documents the method used for developing the 2031 traffic forecasts and the projected growth patterns for two scenarios; Do-Nothing vs With LRT.

2.1 Overview

Given that the Hamilton B-Line Light Rail Transit (LRT) is planned to be constructed along Main Street, the travel patterns and behaviours are expected to change in the Ainslie Wood neighbourhood area. This Traffic Management study used the macro transportation model that was developed in the *Hamilton Light Rail Transit Environmental Project Report (Hamilton LRT EPR) Addendum*[1] to assess future traffic impacts as a result of the implementation of the B-Line LRT.

The expected changes in traffic patterns as noted in the referenced EPR have been documented and will be reflected in future traffic projections. These transportation model volumes will be used to determine appropriate growth rates to forecast future traffic growth.

Although the *City of Hamilton Transportation Master Plan* (TMP), approved by City Council in August 2018, projects traffic volumes to the 2031 horizon, it does not consider the implication of other transportation / transit improvements such as the BLAST network and GO rail expansion. As such, the traffic projections documented in the TMP are not comparable to the scenarios that are being assessed for the Ainslie Wood Traffic Management study and not used directly in this report.

2.2 Methodology

The *Hamilton Light Rail Transit Environmental Project Report (Hamilton LRT EPR) Addendum* forecasts traffic volumes for the area impacted by the B-Line LRT using EMME software. The traffic model outputs were developed in 2 scenarios: a "Do Nothing" scenario which forecasted link volumes if no LRT is constructed and a "With LRT" option which forecasted link volumes capturing the impact of the LRT for the City. These link volumes will be compared to existing 2018 link volumes (obtained from received turning movement count data) and used to estimate growth rates for the 2031 horizon year. The Hamilton LRT EPR traffic model is the most up to date model that provides the scenarios which Wood is considering. It should be noted that the model does culminate just west of the intersection of Main Street West and Cootes Drive. To account for this, traffic growth patterns along Main Street outside of the

[1] Hamilton Light Rail Transit (LRT) Environmental Project Report (EPR) Addendum, Steer Davies Gleave (February 2017)

EMME model output boundaries will be assumed to be similar to those observed on Main Street within the boundaries. The extent of the traffic model within the study area is shown in **Figure 1**.

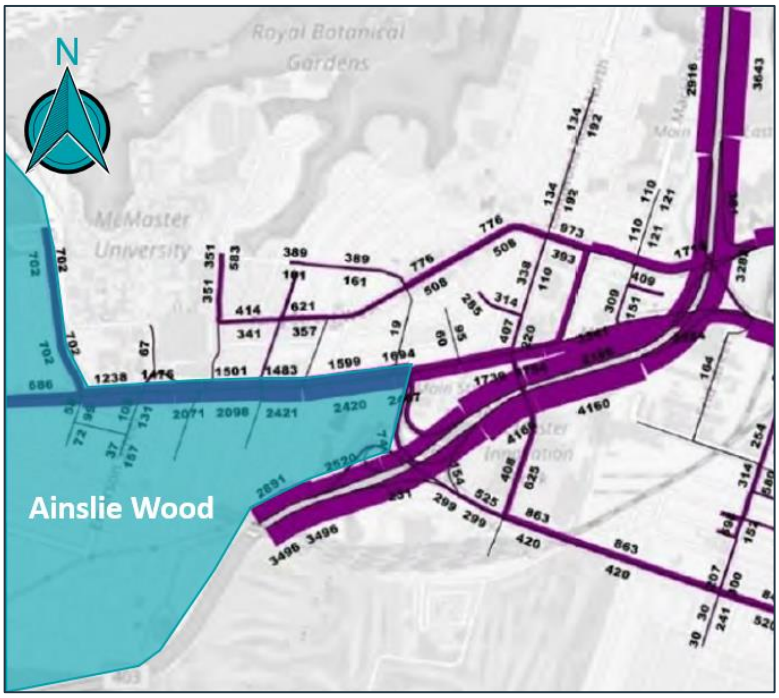

Figure 1: Extent of EMME Model with Forecasted Link Volumes for AM 2031 Business as Usual Scenario *(Source: City of Hamilton Append E2 - Ridership Modelling and Traffic Report, 2017)*Growth Rate Calculations

2.2.1 Do Nothing Scenario - 2031

In the Do-Nothing scenario, volumes from the 2031 Business-As-Usual (BAU) EMME plots were compared to the 2018 traffic volumes (as noted in the Existing Conditions Report) to estimate a growth rate. Future traffic volumes from the EMME plots was available for points along Main Street West within the study area. The traffic projections were reviewed by direction and average growth rates have been calculated for Main Street West in both directions for the AM and PM peak periods. The traffic growth projections within the study area during the AM peak hour is provided in **Table 1.**

Table 1: AM Growth Rate – Do Nothing Scenario

Intersection	Eastbound			Westbound		
	2018 Volume	2031 Volume	Growth Rate	2018 Volume	2031 Volume	Growth Rate
Main Street West						
Cootes Dr	1364	-	-	1471	1238	-1.32%
Emerson St	2110	-	-	1977	1476	-2.22%
Bowman Ave	1991	2071	0.30%	2061	1501	-2.41%
Dalewood Ave	2016	2098	0.31%	1902	1483	-1.90%
Haddon Ave	2219	2421	0.67%	2045	1599	-1.87%
Hwy 403	2134	2420	0.97%	1026	-	-
Average			**0.56%**			**-1.94%**

During the AM peak period, Main Street West is expected to grow an average of 0.56% per annum in the eastbound direction and decrease by 1.94% per annum in the westbound direction.

The traffic growth projections within the study area during the PM peak hour is provided in **Table 2**.

Table 2: PM Growth Rate – Do Nothing Scenario

Intersection	Eastbound			Westbound		
	2018 Volume	2031 Volume	Growth Rate	2018 Volume	2031 Volume	Growth Rate
Main Street West						
Cootes Dr	1140	-	-	1684	1701	0.08%
Emerson St	1837	-	-	1800	1761	-0.17%
Bowman Ave	1994	2038	0.17%	1891	1997	0.42%
Dalewood Ave	2004	2056	0.20%	1653	1969	1.35%
Haddon Ave	2398	2291	-0.35%	1704	2015	1.30%
Hwy 403	2317	2240	-0.26%	1169	-	-
Average			**-0.06%**			**0.60%**

During the PM peak period, Main Street West is expected to decrease by an average of 0.06% per annum in the eastbound direction and grow by 0.60% per annum in the westbound direction.

2.2.2 Light Rail Transit Scenario – 2031

In the LRT scenario, the model assumes that the LRT is constructed along Main Street West within the study area. Traffic projections from the 2031 LRT EMME plots were compared to 2018 traffic volumes to estimate a growth rates. The traffic volumes comparisons for the AM peak period are presented in **Table 3**.

Table 3: AM Growth Rate – LRT Scenario

Intersection	Eastbound			Westbound		
	2018 Volume	2031 Volume	Growth Rate	2018 Volume	2031 Volume	Growth Rate
Main Street West						
Cootes Dr	1384	-	-	1471	1103	-2.19%
Emerson St	2110	1937	-0.66%	1977	-	-
Bowman Ave	1991	1895	-0.38%	2061	1301	-3.48%
Dalewood Ave	2016	1895	-0.47%	1902	1299	-2.89%
Haddon Ave	2219	2240	0.07%	2045	1704	-1.39%
Hwy 403	2134	2240	0.37%	1026	-	-
Average			**-0.21%**			**-2.49%**

Based on the forecasted traffic volumes, during the morning peak period the traffic along Main Street West is expected to decrease by 0.21% per annum in the eastbound direction and 2.49% in the westbound direction.

The traffic volumes and forecasts for the PM peak hour for the study area are provided **Table 4**.

Table 4: PM Growth Rate – LRT Scenario

Intersection	Eastbound			Westbound		
	2018 Volume	2031 Volume	Growth Rate	2018 Volume	2031 Volume	Growth Rate
Main Street West						
Cootes Dr	1140	-	-	1684	1479	-0.99%
Emerson St	1837	-	-	1800	1416	-1.83%
Bowman Ave	1994	1877	-0.46%	1891	1511	-1.71%
Dalewood Ave	2004	1895	-0.43%	1653	1480	-0.85%
Haddon Ave	2398	2046	-1.21%	1704	1638	-0.30%
Hwy 403	2317	2025	-1.03%	1169	-	-
Average			**-0.78%**			**-1.14%**

During the PM peak period, the traffic along Main Street West is expected to decrease by 0.78% in the eastbound direction and 1.14% in the westbound direction.

2.3 Growth Rate Summary

Based on the review of existing traffic volumes and those forecasted in the *Hamilton Light Rail Transit Environmental Project Report (Hamilton LRT EPR) Addendum*, the growth rates for the two scenarios are provided in **Table 5**. Traffic volumes outside of Main Street West will assume a growth rate of 2% per annum.

Table 5: Summary of Growth Rates

Corridor	With LRT				Without LRT			
	AM Peak		PM Peak		AM Peak		PM Peak	
	EB	WB	EB	WB	EB	WB	EB	WB
Main Street West	-0.21%	-2.49%	-0.78%	-1.14%	0.56%	-1.94%	-0.06%	0.60%
All Other Areas	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%

3.0 Analysis

Traffic operations were assessed at intersections along Main Street West as well as at individual intersections that had been previously identified as locations in need of improvements and updates. The analysis results are documented in this section. Two performance metrics – Level of Service (LOS) and volume to capacity (v/c) – were used to make a quantitative assessment of operations.

3.1 Vehicular Level of Service

Intersection operations were assessed using Synchro software based on the Highway Capacity Manual (HCM2000) methodology published by the Transportation Research Board National Research Council. Synchro can analyze both signalized and unsignalized intersections in a road corridor or network taking into account the spacing, interaction, queues and operations between intersections.

Two separate measures of performance are considered in the signalized intersection analysis:

- volume to capacity (v/c) ratio; and

- Level of Service (LOS) for all intersection movements.

Two separate measures of performance are considered in the two-way un-signalized intersection analysis:

- Volume to capacity (v/c) ratio; and
- Level of Service (LOS) for the critical movements.

Level of service (LOS) is based on the average control delay per vehicle for a given movement. 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 volume to capacity (v/c) ratio is a measure of the degree of capacity expected at an intersection, where any value greater than 0.85 indicates a movement is significantly congested and approaching capacity.

3.1.1 Do Nothing Scenario - 2031

The "Do Nothing" scenario forecasts traffic link volumes under the assumption that no LRT is constructed. Growth rates as summarized in **Table 5** were used to project 2031 volumes. Future intersection capacity analysis for both AM and PM peak hours was performed using balanced 2031 traffic volumes and optimizing signal timings. The overall intersection capacity analysis results for AM and PM peak hours are shown in **Table 6,** where movements that are approaching capacity are bolded (v/c greater than 0.85). These critical movements should be monitored to determine whether mitigation is required at that time. Complete results, summarized by intersection and movements are shown in **Appendix A** and the traffic volumes used in the analysis (where traffic data is available) of the "Do-Nothing" scenario are illustrated in

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Light Rail Transit Scenario - 2031

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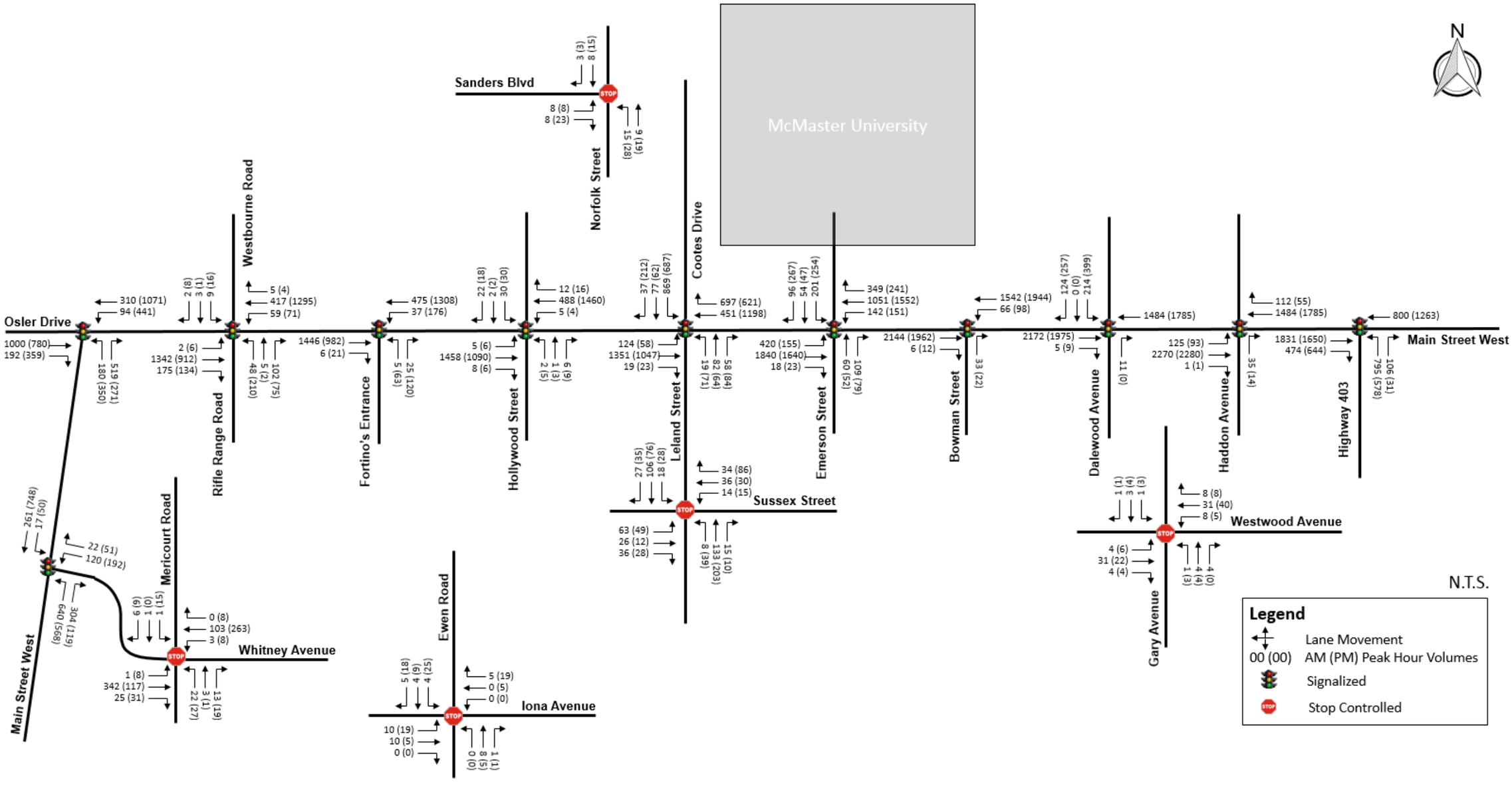

Figure 2: 2031 Future Traffic Volumes (Do Nothing)

Table 6: Future Intersection Operations (Do Nothing)

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	v/c	LOS	v/c
Main St W / Whitney Ave	A	0.58	B	0.81
Main St W / Osler Dr	C	**0.88**	D	**0.89**
Main St W / Rifle Range Rd	A	0.68	B	0.71
Main St W / Fortinos	A	0.53	A	0.61
Main St W / Hollywood St	A	0.57	A	0.60
Main St W / Cootes Dr	D	**0.96**	C	**0.87**
Main St W / Emerson St	D	**0.93**	C	**0.92**
Main St W / Bowman St	B	0.71	B	0.73
Main St W / Dalewood Ave	B	**0.87**	C	0.83
Main St W / Haddon Ave	B	0.70	B	0.61
Main St W / Hwy 403 Ramp	C	0.80	C	0.67
Westwood Ave / Gary Ave	A	0.06	A	0.07
Sussex St / Leland St	A	0.24	A	0.27
Iona Ave / Ewen Rd	A	0.02	A	0.03
Whitney Ave / Mericourt Rd	A	0.09	A	0.09
Sanders Blvd / Norfolk St	A	0.03	A	0.07

Based on the results shown in **Table 6**, the intersections are projected to operate with an overall acceptable level of service in both the AM and PM peak hours. All study intersections are operating with an overall LOS of "D" or better. These results are illustrated in **Figure 3** below. Opportunities to improve capacity will be assessed in the Ainslie Wood Neighbourhood Traffic Management Review – Identification of Alternatives Memo.

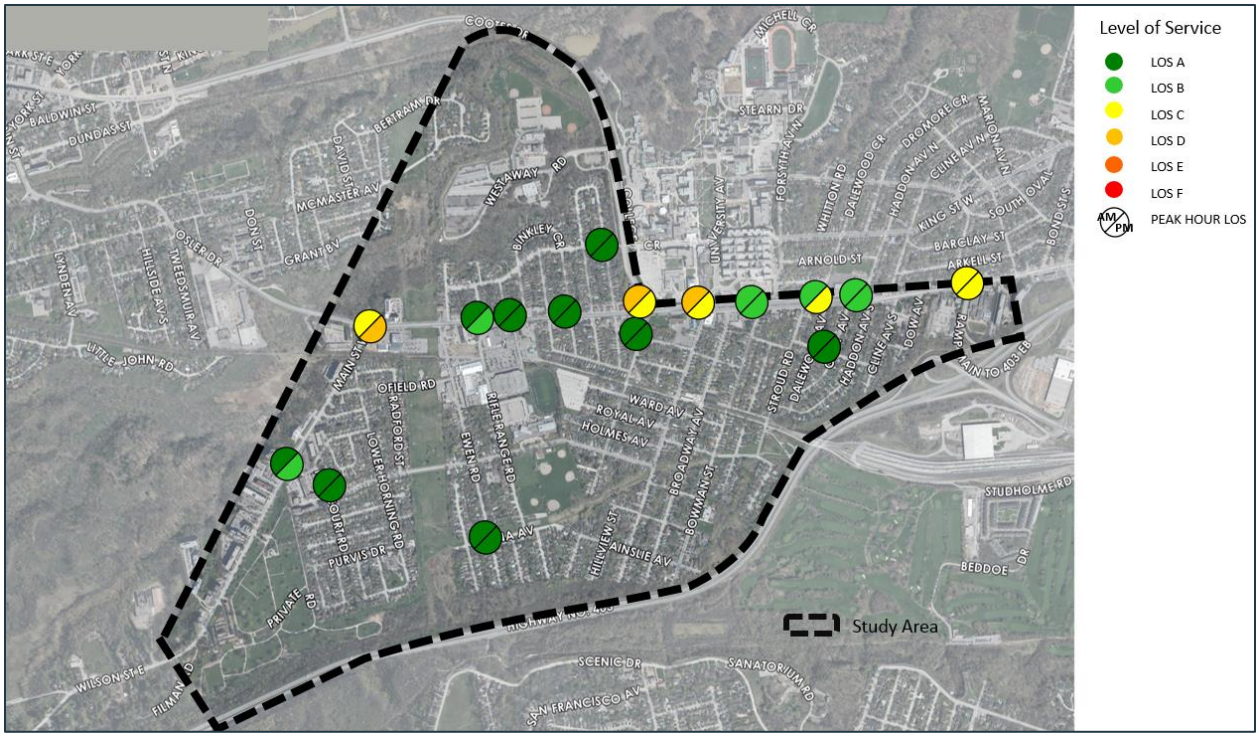

Figure 3: 2031 Level of Service (Do Nothing)

Notwithstanding the fact that the overall LOS for each intersection are deemed acceptable, several intersections are projected to operate near capacity. The critical intersections are Cootes Dr / Main St and Emerson St / Main St. Signal timings plans have been optimized at these intersections to ensure that all individual movements operate with a level of service of "E" or better. In order to improve capacity, geometric improvements may need to be considered.

In general, queueing is not an issue within the study area. The largest 95th percentile queues during the AM peak hour occur in the eastbound direction at Cootes Drive, Emerson Street, and Dalewood Avenue and measure approximately 240 metres, 198 metres, and 238 metres respectively. These queues result from the convergence of southbound traffic on Cootes Drive and eastbound traffic on Main Street West. Other local roadways are used mostly by local traffic only and so queueing is negligible in these areas. As such, these local streets are anticipated to provide adequate capacities and operate with acceptable LOS.

Operations along Main Street West are acceptable during both peak hours. As noted in **Figure 3,** the intersections of Cootes Drive and Main Street and Emerson Street / University Avenue and Main Street experience delays corresponding to a LOS "C" and/or "D". Cootes Drive and University Avenue are two popular routes to access McMaster University which contributed to the high traffic volumes during peak hours. As expected, delays are also high at the Highway 403 Off-Ramp, as a significant amount of traffic uses the ramps to travel to external municipalities. Although there is no dominant direction of travel on Main Street during the peak periods, it can be observed that Eastbound volumes are slightly higher during the AM peak hour, whereas Westbound volumes are slightly greater during the PM peak hour.

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3.1.2 Light Rail Transit Scenario - 2031

The "LRT" scenario forecasts traffic link volumes by modelling the impact of the LRT along its route for the larger City of Hamilton as a whole. Future intersection capacity analysis for both AM and PM peak hours was performed using balanced 2031 traffic volumes and optimizing signal timings. Traffic volumes used in the analysis of the "With LRT" scenario are illustrated in Error! Reference source not found..

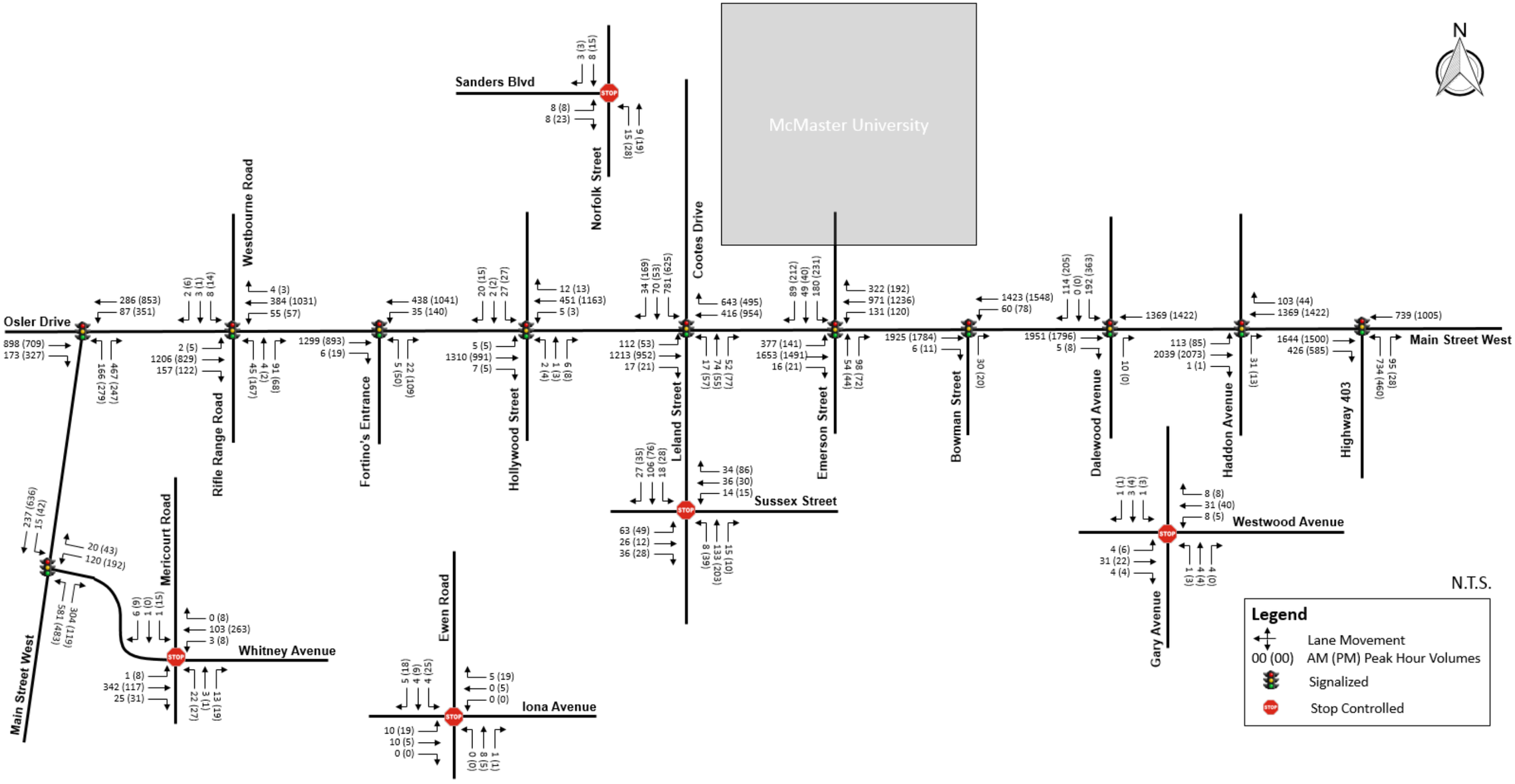

Figure 4: 2031 Future Traffic Volumes (LRT)

The overall intersection capacity analysis results for AM and PM peak hours are shown in **Table 7** where v/c ratios greater than 0.85 are bolded to present movements that are approaching capacity. These critical movements should be monitored to determine whether mitigation is required during the LRT implementation phase. Complete results, summarized by intersection and movements are show in **Appendix B**.

Table 7: Future Intersection Operations (LRT)

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	v/c	LOS	v/c
Main St W / Whitney Ave	A	0.54	B	0.73
Main St W / Osler Dr	C	0.81	C	0.75
Main St W / Rifle Range Rd	A	0.62	B	0.60
Main St W / Fortinos	A	0.51	A	0.47
Main St W / Hollywood St	A	0.53	A	0.51
Main St W / Cootes Dr	C	0.92	C	0.78
Main St W / Emerson St	D	**0.99**	D	**0.95**
Main St W / Bowman St	B	**0.89**	B	**0.89**
Main St W / Dalewood Ave	D	**0.85**	C	0.82
Main St W / Haddon Ave	D	0.66	C	0.57
Main St W / Hwy 403 Ramp	C	0.70	B	0.58
Westwood Ave / Gary Ave	A	0.06	A	0.07
Sussex St / Leland St	A	0.24	A	0.27
Iona Ave / Ewen Rd	A	0.02	A	0.03
Whitney Ave / Mericourt Rd	A	0.09	A	0.09
Sanders Blvd / Norfolk St	A	0.03	A	0.07

Based on the results shown in **Table 7**, the intersections are projected to operate with an overall acceptable level of service in both the AM and PM peak hours. All study intersections are operating with an overall LOS of "D" or better. These results are further illustrated in **Figure 5** below. Opportunities to improve capacity will be assessed in the Ainslie Wood Neighbourhood Traffic Management Review – Identification of Alternatives Memo.

Main Street West will undergo significant reconstruction and reconfiguration to accommodate the pending LRT. Thus, operations are expected to change significantly. The model used to assess operations under the LRT scenario reflects geometric changes as noted in the proposed plans. However, future signal timings and preemption are outside of this study scope and are not included.

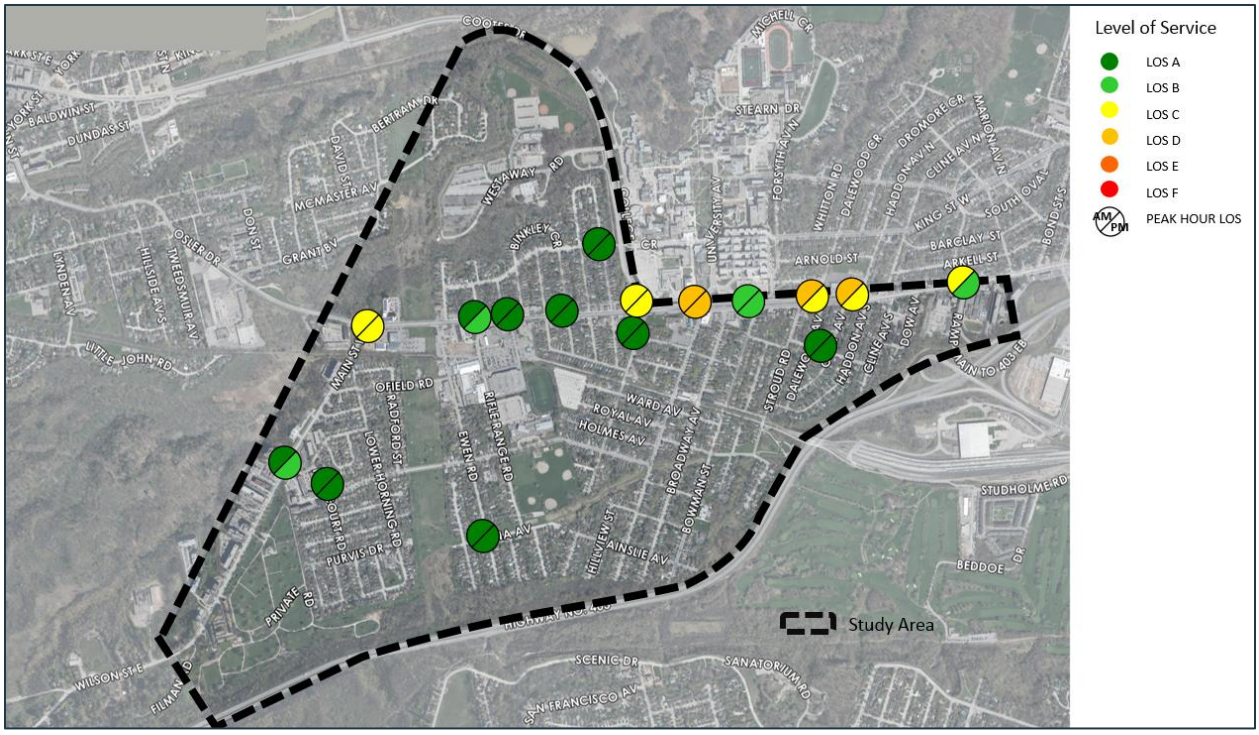

Figure 5: 2031 Level of Service (LRT)

Although the overall LOS for each intersection are deemed acceptable, several intersections are projected to operate near capacity. As with the "Do-Nothing" scenario, the critical intersections regarding capacity for the "With LRT" option are Cootes Dr / Main St, Emerson St / Main St, and Longwood Rd / Main St. Signal timings plans have been optimized at these intersections to ensure that all individual movements operate with a level of service of "E" or better. In order to improve capacity, geometric improvements may need to be considered.

In general, queueing is not an issue within the study area with LRT service. The largest 95th percentile queues during the AM peak hour occur in the eastbound direction at Cootes Drive, Emerson Street, and Dalewood Avenue and measure approximately 163 metres, 137 metres, and 167 metres respectively. These queues result from the convergence of southbound traffic on Cootes Drive and eastbound traffic on Main Street West. It should be noted that these queues are slightly smaller than those observed for the "Do Nothing" scenario. This is expected, as traffic is projected to decrease on Main Street due to the implementation of LRT. Other roadways are used mostly by local traffic only and so queueing is negligible in these areas. As such, these local streets are anticipated to provide adequate capacities and operate with acceptable LOS.

Similar to the "Do Nothing" scenario, operations along Main Street West are acceptable during both peak hours for the "With LRT" option. As noted in **Figure 5,** the intersections of Cootes Drive and Main Street and Emerson Street / University Avenue and Main Street experience the highest delays. Cootes Drive and University Avenue are the two main roadways for accessing McMaster University; thus resulted in high traffic volumes during peak hours. Delays are generally high along Main Street between Cootes Drive and the Highway 403 Off-Ramp. This is in part due to the lane reduction caused by the implementation of the LRT. The dominant direction of travel on Main Street during the AM peak hour is Eastbound. Conversely, throughout the PM peak hour, volumes are higher in the Westbound direction.

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4.0 Conclusion

As part of the Ainslie Wood Traffic Management Study, a future conditions analysis was undertaken by Wood to determine the projected operational performance of the intersections within the study area. The future conditions were modelled in Synchro for weekday AM and PM peak hours and utilized to develop performance metrics such as level-of-service, volume-to-capacity ratios, and delays. Two future scenarios were considered for the 2031 horizon year: a "Do Nothing" scenario which forecasts traffic link volumes as if no LRT is constructed and a "With LRT" option which forecasts traffic link volumes with consideration of the impact of the LRT along its route for the larger City of Hamilton as a whole.

In general, intersections are projected to operate with an overall acceptable level of service in both the AM and PM peak hours for both scenarios. Additionally, all study intersections are operating with an overall LOS of "D" or better. It should be noted that some intersections are anticipated to reach near capacity by the 2031 horizon year. Opportunities to improve capacity will be assessed and documented in the *Ainslie Wood Neighbourhood Traffic Management Review – Identification of Alternatives Memo*.