



# **Future Conditions Report**

Westdale Traffic Management Review  
Hamilton, Ontario  
Project # TPB186045

Prepared for:

**City of Hamilton**

330 Wentworth Street, Hamilton, ON

1/7/2018

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## Prepared for:

City of Hamilton  
330 Wentworth Street, Hamilton, ON

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**1/7/2018**

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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 Westdale neighbourhood area. The primary objective of this study was to conduct a multi-modal review of the transportation system within the Westdale 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 Westdale 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 the two scenarios.

### 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 Westdale area. This Traffic Management study uses the outputs of the macro transportation model that was developed in the *Hamilton Light Rail Transit Environmental Project Report (Hamilton LRT EPR) Addendum*<sup>1</sup> 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 Westdale 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. The extent of the traffic model within the study area is shown in **Figure 1**.

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<sup>1</sup> Hamilton Light Rail Transit (LRT) Environmental Project Report (EPR) Addendum, Steer Davies Gleave (February 2017)

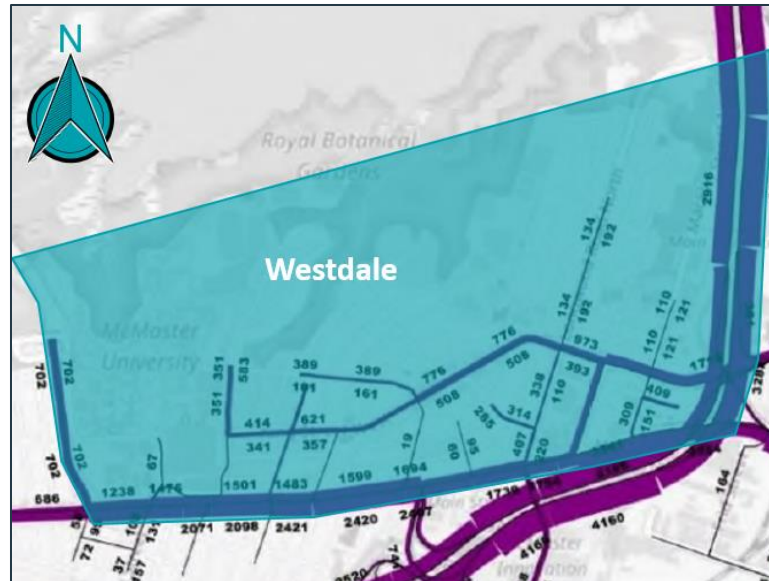


Figure 1: Extent of EMME Model with Forecasted Link Volumes for AM 2031 Business as Usual Scenario  
(Source: City of Hamilton Append E2 - Ridership Modelling and Traffic Report, 2017)

## 2.3 Growth Rate Calculations

### 2.3.1 Do Nothing Scenario - 2031

In the Do-Nothing scenario, volumes from the 2031 Business-As-Usual (BAU) EMME plots were compared to 2018 turning movement counts (as noted in the Existing Conditions Report) to estimate a growth rate. Future traffic volumes from the EMME plots were available for points along Main Street West and King Street West within the study area. The traffic projections were reviewed by corridor and by direction to develop growth rates within the study. 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
<b>Main Street West</b>						
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	-	-
<b>Average</b>			<b>0.56%</b>			<b>-1.94%</b>
<b>King Street West</b>						
Forsyth Ave	23	-	-	242	414	4.22%
Dalewood Ave	130	341	7.70%	411	621	3.23%
Haddon Ave	85	357	11.67%	356	-	-
Sterling St	208	-	-	635	776	1.55%
Marion Ave	307	508	3.95%	658	776	1.28%
Longwood Rd	314	508	3.77%	426	973	6.56%
Paradise Rd	328	393	1.40%	699	-	-
<b>Average</b>			<b>5.70%</b>			<b>3.37%</b>

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. King Street West is expected to grow by an average of 5.70% per annum in the eastbound direction and 3.37% 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
<b>Main Street West</b>						
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	-	-
<b>Average</b>			<b>-0.06%</b>			<b>0.60%</b>
<b>King Street West</b>						
Forsyth Ave	152	-	-	195	401	5.70%
Dalewood Ave	363	225	-3.61%	409	570	2.59%
Haddon Ave	136	61	-5.98%	368	-	-
Sterling St	246	61	-10.17%	523	570	0.66%
Marion Ave	462	175	-7.20%	546	570	0.33%
Longwood Rd	445	175	-6.93%	538	709	2.15%
Paradise Rd	279	207	-2.27%	1161	-	-
<b>Average</b>			<b>-6.03%</b>			<b>2.29%</b>

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. King Street West is expected to decrease by an average of 6.12% per annum in the eastbound direction and grow by an average of 2.29% per annum in the westbound direction.

**Figure 2** illustrates the growth rates for the study area.



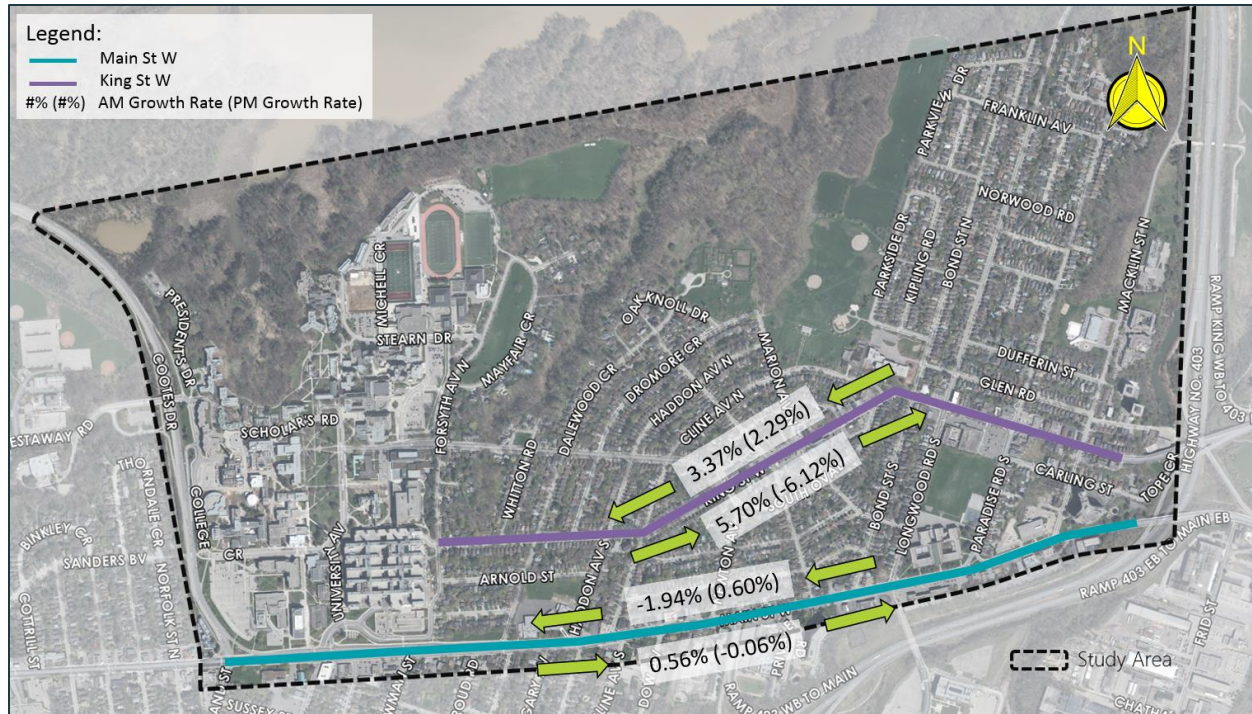


Figure 2: 2031 Do-Nothing Scenario - Growth Rates

### 2.3.2 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 again compared to 2018 traffic volumes to estimate a growth rates. The traffic volume 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
<b>Main Street West</b>						
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	-	-
<b>Average</b>			<b>-0.21%</b>			<b>-2.49%</b>
<b>King Street West</b>						
Forsyth Ave	23	-	-	242	405	4.04%
Dalewood Ave	130	406	9.16%	411	581	2.70%
Haddon Ave	85	-	-	356	368	0.26%
Sterling St	208	427	5.69%	635	572	-0.80%
Marion Ave	307	625	5.62%	658	572	-1.07%
Longwood Rd	314	-	-	426	-	-
Paradise Rd	328	-	-	699	-	-
<b>Average</b>			<b>6.82%</b>			<b>1.03%</b>

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 while traffic along King Street West is expected to increase by 6.82% per annum in the eastbound direction and 1.03% per annum 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
<b>Main Street West</b>						
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	-	-
<b>Average</b>			<b>-0.78%</b>			<b>-1.14%</b>
<b>King Street West</b>						
Forsyth Ave	152	-	-	195	454	6.72%
Dalewood Ave	363	181	-5.21%	409	605	3.06%
Haddon Ave	136	122	-0.83%	368	486	2.16%
Sterling St	246	122	-5.25%	523	552	0.42%
Marion Ave	462	272	-3.99%	546	552	0.08%
Longwood Rd	445	272	-3.72%	538	565	0.38%
Paradise Rd	279	375	2.30%	1161	-	-
<b>Average</b>			<b>-2.78%</b>			<b>2.14%</b>

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. King Street West traffic is forecast to decrease by 2.78% in the eastbound direction in the afternoon peak period but increase in westbound direction by 2.14% per annum.

**Figure 3** illustrates the growth rates within the study area for the scenario with the LRT.

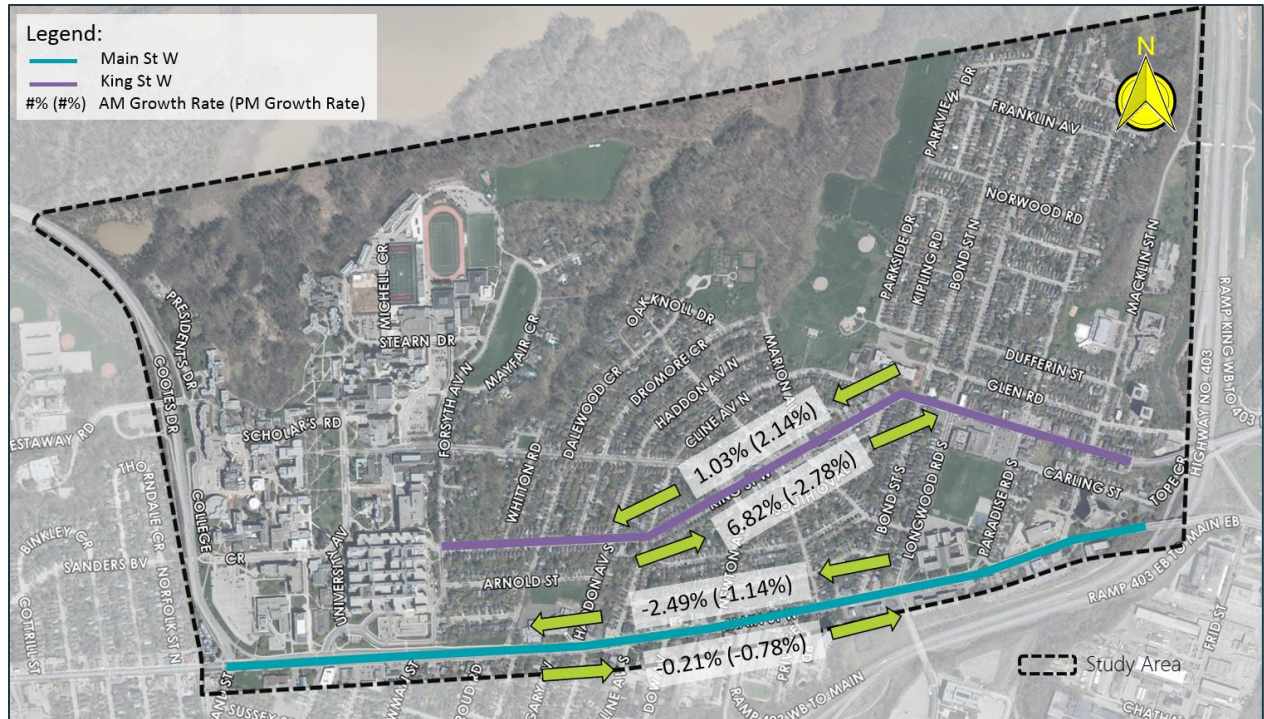


Figure 3: 2031 LRT Scenario - Growth Rates

## 2.4 Growth Rate Summary

Based on the review of existing traffic volumes and those forecasted in the *Hamilton LRT EPR*, 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	Without LRT				With LRT			
	AM Peak		PM Peak		AM Peak		PM Peak	
	EB	WB	EB	WB	EB	WB	EB	WB
Main Street West	0.56%	-1.94%	-0.06%	0.60%	-0.21%	-2.49%	-0.78%	-1.14%
King Street West	5.70%	3.37%	-6.03%	2.29%	6.82%	1.03%	-2.78%	2.14%
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 and King Street West as well as at individual intersections that had been previously identified as locations in need of improvement 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 conflicting 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.

### 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 **Figure 4**.

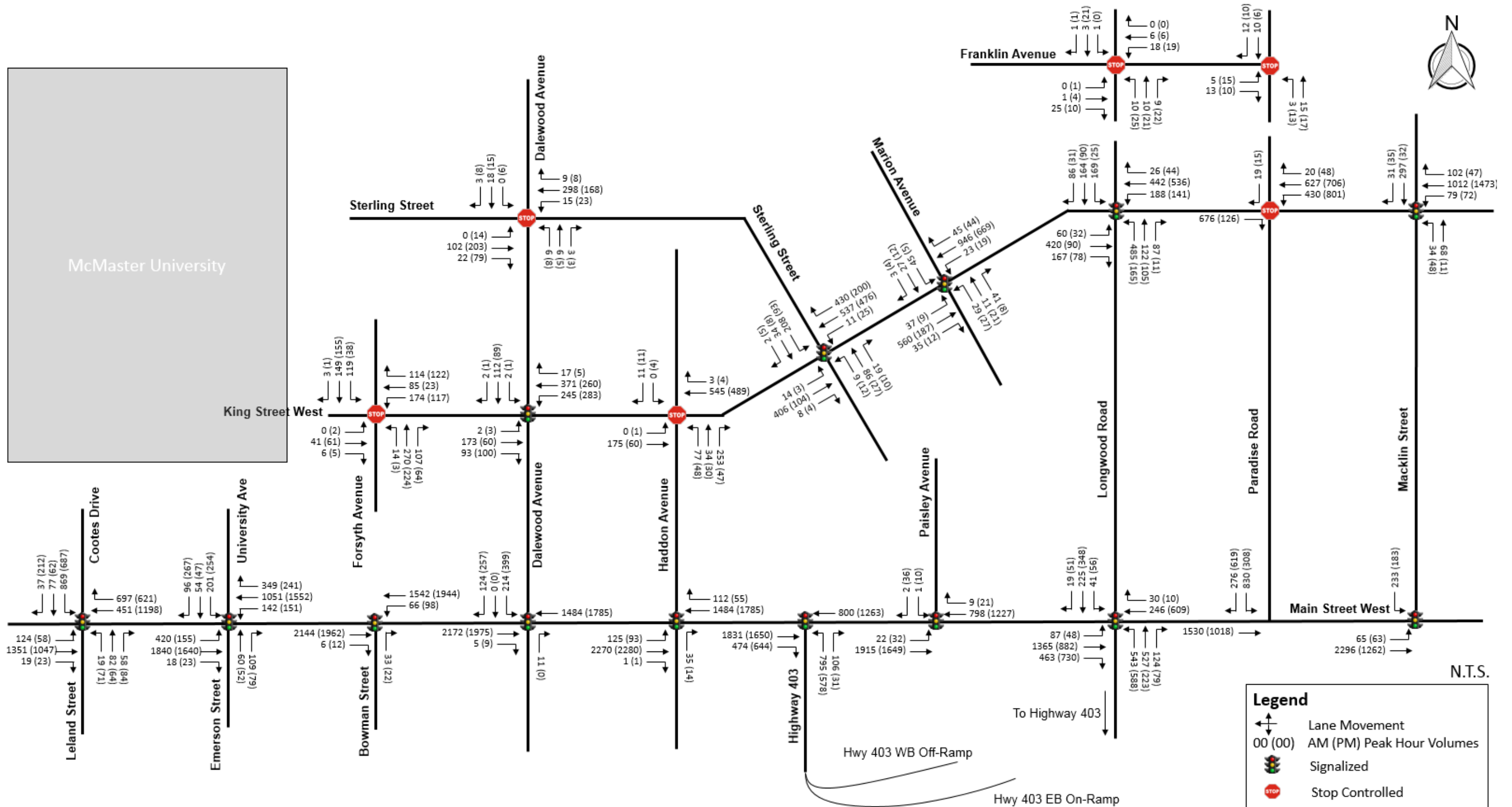


Figure 4: 2031 Future Traffic Volumes (Do Nothing)

Table 6: Future Intersection Operations (Do Nothing)

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	v/c	LOS	v/c
Main St W / Cootes Dr	D	<b>0.96</b>	C	0.87
Main St W / Emerson St	D	<b>0.93</b>	C	<b>0.92</b>
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
Main St W / Paisley Ave	A	0.49	A	0.47
Main St W / Longwood Rd	D	<b>0.99</b>	D	<b>0.88</b>
Main St W / Macklin St	C	0.72	B	0.43
King St W / Forsyth Ave	C	0.82	B	0.50
King St W / Dalewood Ave	C	0.52	B	0.43
King St W / Haddon Ave	A	0.54	A	0.21
King St W / Sterling St	C	<b>0.86</b>	B	0.58
King St W / Marion Ave	D	<b>0.99</b>	C	0.67
King St W / Longwood Rd	B	0.69	A	0.46
King St W / Macklin St	B	0.69	A	0.46
Longwood Rd N / Franklin Ave	A	0.03	A	0.04
Paradise Rd N / Franklin Ave	A	0.03	A	0.04
Sterling St / Dalewood Crt	A	0.43	A	0.39

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 further illustrated in **Figure 5**. Opportunities to improve capacity will be assessed in the Westdale Neighbourhood Traffic Management Review – Identification of Alternatives Memo.

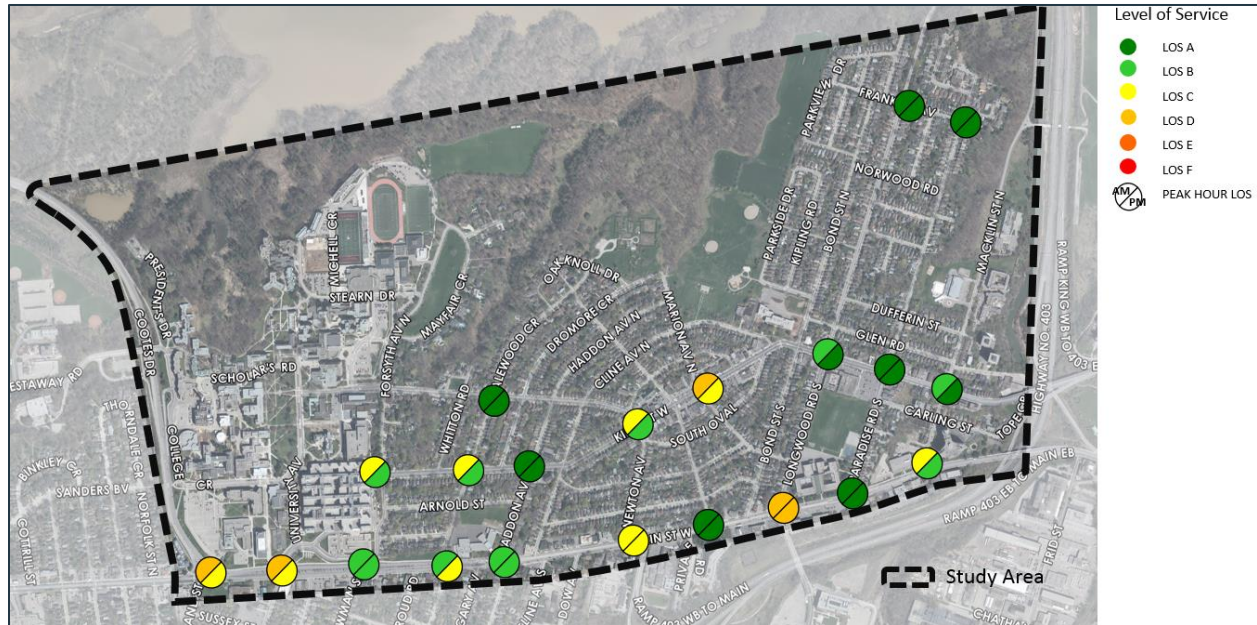


Figure 5: 2031 Level of Service (Do Nothing)

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, 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. The largest 95<sup>th</sup> 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. Queueing also occurs in both directions on a stretch of King Street West, between Sterling Street and Marion Avenue. During the AM peak hour, the eastbound direction was observed to incur 95<sup>th</sup> percentile queues of approximately 127 metres at Sterling Street and 190 metres at Marion Avenue. In the westbound direction, 95<sup>th</sup> percentile queues measured 265 metres at Marion Avenue. Other local streets are mostly used by local traffic, as such, are anticipated to provide adequate capacities and operation with acceptable LOS.

Operations along Main Street West are acceptable during both peak hours. As noted in **Figure 5**, the intersections of Main Street with Cootes Drive and with Emerson Street / University Avenue are two popular routes to access McMaster University which contributed to the high traffic volumes during peak hours. Delays are also high at the 403 Off-Ramp and Longwood Road due to the significant amount of traffic entering and exiting Highway 403.



### 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 **Figure 6**.

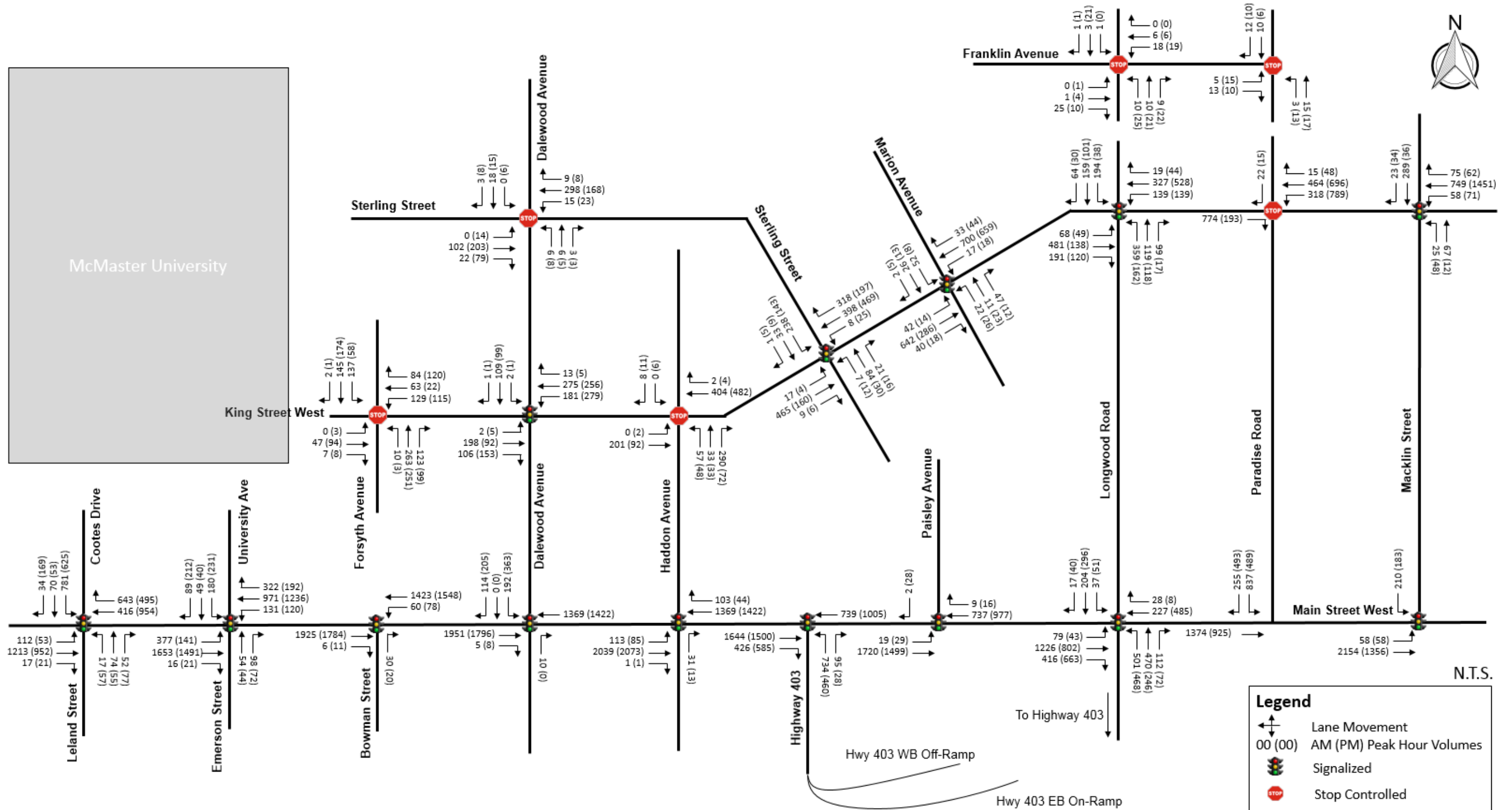


Figure 6: 2031 Future Traffic Volumes (LRT)

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 the study scope and are not included.

The overall intersection capacity analysis results for AM and PM peak hours are shown in **Table 7** 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 / Cootes Dr	C	<b>0.92</b>	C	0.78
Main St W / Emerson St	D	<b>0.99</b>	D	<b>0.95</b>
Main St W / Bowman St	B	<b>0.89</b>	B	<b>0.89</b>
Main St W / Dalewood Ave	D	<b>0.85</b>	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
Main St W / Paisley Ave	A	0.53	A	0.48
Main St W / Longwood Rd	D	<b>0.99</b>	C	0.82
Main St W / Paradise Rd	C	0.60	B	0.41
Main St W / Macklin St	C	0.82	B	0.55
King St W / Forsyth Ave	C	0.79	B	0.65
King St W / Dalewood Ave	B	0.43	B	0.48
King St W / Haddon Ave	A	0.59	A	0.21
King St W / Sterling St	D	<b>0.94</b>	C	0.67
King St W / Marion Ave	C	0.83	B	0.56
King St W / Longwood Rd	D	<b>0.95</b>	C	0.68
King St W / Macklin St	B	0.58	A	0.50
Longwood Rd N / Franklin Ave	A	0.03	A	0.04
Paradise Rd N / Franklin Ave	A	0.03	A	0.04
Sterling St / Dalewood Crt	A	0.43	A	0.39

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 7**.

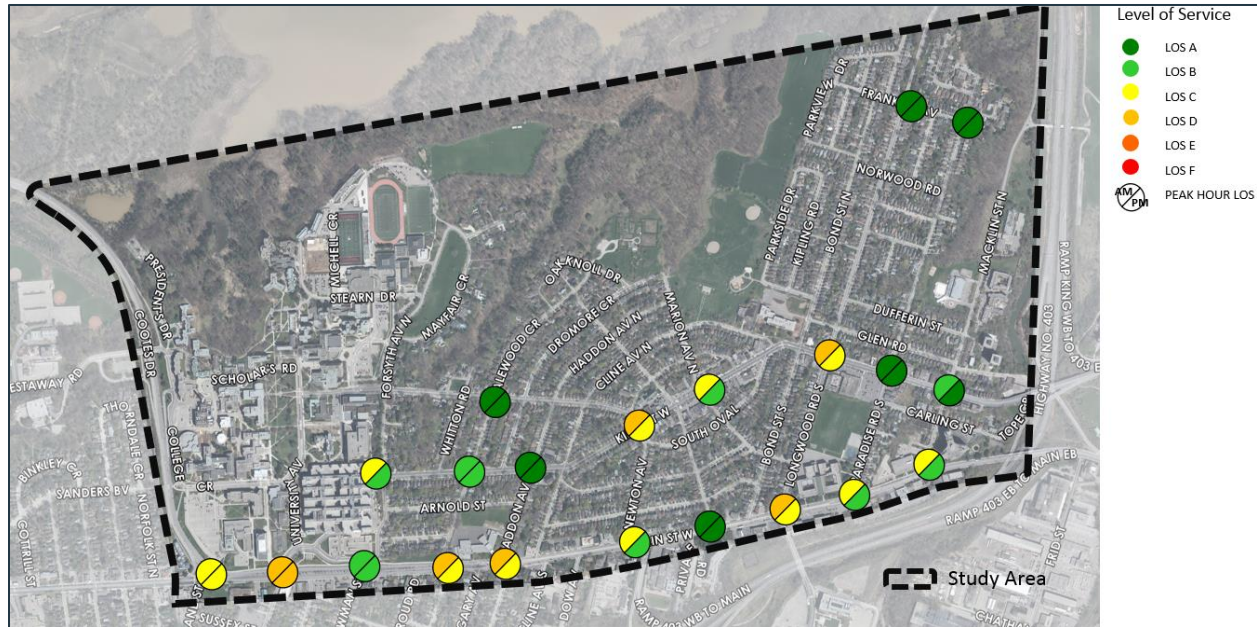


Figure 7: 2031 Level of Service (LRT)

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 95<sup>th</sup> percentile queues during the AM peak hour occur along Main Street West 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. Queueing also occurs in both directions on a stretch of King Street West, between Sterling Street and Marion Avenue. During the AM peak hour, the eastbound direction was observed to incur 95<sup>th</sup> percentile queues of approximately 163 metres at Sterling Street and 140 metres at Marion Avenue. In the westbound direction, 95<sup>th</sup> percentile queues measured 148 metres at Marion Avenue. Other local streets are mostly used by local traffic, as such, are anticipated to provide adequate capacities and operation with acceptable LOS.

Operations along Main Street West are acceptable during both peak periods for the “With LRT” option. As noted in **Figure 7**, delays are generally high along Main Street from Cootes Drive to Longwood Road. The majority of the intersections operate with a LOS of “C” or “D” during the peak hours. A contribution to this delay is the implementation of the LRT which will reduce lanes. King Street West experiences also experiences higher delay caused by traffic re-routing from Main Street to avoid the LRT and using King Street as an alternate route.

## 4.0 Conclusion

As part of the Westdale 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 *Westdale Neighbourhood Traffic Management Review – Identification of Alternatives Memo*.