

Transportation Impact Study

PROPOSED DRAFT PLAN OF SUBDIVISION

Di Poce Subdivision
CITY OF BARRIE, ONTARIO

December 2018
Project No: NT-17-231

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NextEng Consulting Group Inc.

December 13, 2018

Attention: Oksana Vialykh

Di Poce Management Inc. c/o
Oksana Vialykh, BBA, AACI
4300 Steeles Avenue West, Unit 32
Vaughan, Ontario L4L 4C2

**Re: Transportation Impact Study
 Proposed Draft Plan of Subdivision
 Di Poce Sudvision, City of Barrie
 Our Project No. NT-17-231**

Nextrans Consulting Engineers (A Division of NextEng Consulting Group Inc.) is pleased to present the enclosed Transportation Study for the above noted site in support of the above referenced Di Poce proposed draft plan of subdivision.

The subject property is located north-east of County Road 27 and Salem Road within the Salem Secondary Plan Area, in the City of Barrie. The proposed development consists of approximately 199 townhouse residential units, up to 242 mid-rise residential units, 0.28 hectares of neighbourhood commercial and an elementary school. The proposed development will be constructed in two phases, with the townhouse units will be constructed in the first phase and the remaining land uses will be constructed in the later phase.

Two full moves accesses will be provided via County Road 27, one access will accommodate the proposed neighbourhood commercial and the second access (Mabern Street) will accommodate the residential and school components. Mabern Street will connect with the proposed Crisdawn subdivision to the east and eventually to Essa Road. It should be noted that the proposed development also protects for additional accesses onto Salem Road and to Crisdawn subdivision to the south, when these lands redeveloped in the future.

The Transportation Impact Study concludes that the development proposal can adequately be accommodated by the existing transportation network, the proposed network improvements identified and scheduled by the City of Barrie and other developments in the Salem Secondary Plan, as well as the proposed improvements recommended in this Study.

We trust the enclosed sufficiently addresses your needs. Should you have any questions, please do not hesitate to contact the undersigned.

Yours truly,

Nextrans Consulting Engineers

A Division of NextEng Consulting Group Inc.

A handwritten signature in black ink, appearing to read "R. Pernicky", is written over a light blue circular stamp that contains the text "Richard Pernicky, CET, MITE".

Richard Pernicky, CET, MITE
Principal

EXECUTIVE SUMMARY

Nextrans Consulting Engineers (A Division of NextEng Consulting Group Inc.) is pleased to present the enclosed Transportation Study for the above noted site in support of the above referenced Di Poce proposed draft plan of subdivision. The subject land is located north-east of County Road 27 and Salem Road within the Salem Secondary Plan Area, in the City of Barrie. The subject land is currently vacant.

Proposed Development

The proposed development consists of:

- 199 Townhouse residential dwelling units;
- Up to 242 Medium density residential dwelling units;
- An elementary school (2.21 ha or 237,882 ft²); and
- Neighbourhood commercial (0.28 ha or 30,139 ft²)

It is our understanding that the proposed development will be constructed in two phases, with the townhouse units will be constructed in the first phase, and the remaining land uses will be constructed in the later phase.

Proposed Development Access

Two full moves accesses will be provided via County Road 27, one access will accommodate the proposed neighbourhood commercial and the second access (Mabern Street) will accommodate the residential and school components. Mabern Street will connect with the proposed Crisdawn subdivision to the east and eventually to Essa Road. It should be noted that the proposed development also protects for additional accesses onto Salem Road and to Crisdawn subdivision to the south, when these lands redeveloped in the future.

Operational Analysis

The proposed Phase 1 development is expected to generate 103 new two-way auto trips (19 inbound and 84 outbound) during the weekday morning peak hour and 121 new two-way trips (66 inbound and 55 outbound) during the afternoon peak hour. The proposed development is also expected to generate 5 new two-way transit/active mode trips (1 inbound and 4 outbound) and 7 new two-way transit/active mode trips (4 inbound and 3 outbound) during the morning and afternoon peak hours, respectively.

The remainder phase of the proposed development is expected to generate 335 new two-way auto trips (154 inbound and 181 outbound) during the weekday morning peak hour and 245 new two-way trips (136 inbound and 109 outbound) during the afternoon peak hour. The proposed development is also expected to generate 57 new two-way transit/active mode trips (30 inbound and 27 outbound) and 21 new two-way transit/active mode trips (11 inbound and 10 outbound) during the morning and afternoon peak hours, respectively.

Auto Mode Assessment

The analysis indicates that, under the existing conditions, all of the intersections considered are currently operating at acceptable levels of service. The eastbound left turn at the Mapleview Drive W/Essa Road intersection is currently operating at a slightly higher level of service, however, an eastbound advance phase can be added to the existing signal timing plan to correct this. Nextrans will recommend some potential signal timing optimization measures under the future background and future total conditions for this intersection.

The analysis indicates that, under the 2021 and 2031 future background conditions, all of the intersections considered are expected to operate at acceptable levels of service. The delays and volume-to-capacity ratios (v/c) are expected to be higher than the existing conditions. Some of the mitigation measures include signal timing optimizations at the Mapleview

Drive/Essa Road intersection, along with the proposed improvements identified in the Salem Secondary Plan Transportation Improvements Environmental Study Report (Stantec, October 12, 2017) and by other adjacent proposed developments within the Salem Secondary Plan Area.

The analysis indicates that, under the 2021 and 2031 future total conditions, all of the intersections considered are expected to operate at acceptable levels of service. The delays and volume-to-capacity ratios (v/c) are expected to be higher than the 2021 and 2031 future background conditions, respectively. Similarly, some of the mitigation measures include signal timing optimizations at the Mapleview Drive/Essa Road intersection, along with the proposed improvements identified in the Salem Secondary Plan Transportation Improvements Environmental Study Report (Stantec, October 12, 2017) and by other adjacent proposed developments within the Salem Secondary Plan Area.

Traffic signal warrant analysis has been conducted for the Essa Road/Mabern Street intersection for both 2021 and 2031 horizon. The analysis indicates that traffic signals are not numerically warranted based combined traffic volumes, but warranted based on traffic crossing major street under both horizons. Although traffic signals are not numerically warranted, it is our opinion that traffic signals should be installed at this intersection beyond the 2021 horizon to facilitate safe pedestrian and cyclist crossing the intersection, as well as the turning movements and potentially reduce speeding on Essa Road.

Active Transportation Mode Assessment

The communities within the Salem Secondary Plan Area will be developed based on a modified grid street system and related off-street pathway system, designed to provide for a full range of transportation options with a focus on maximizing the potential for transit service and active transportation.

Nextrans has proposed an active transportation network based on the principles outlined in the Salem Secondary Plan Area, Salem Transportation Plan, the City of Barrie's Multi-Modal Active Transportation Master Plan, as well as our review of the proposed development context.

Transit Mode Assessment

Currently, there is no transit route serving in the vicinity of the proposed development. The closest bus routes are Route 7 (Bell Farm/Bear Creek) and Route 8 (RVH/Yonge and Crosstown/Essa). Route 7 generally runs in the east-west to north-south direction, connecting Park Place and Georgian College. Similarly, Route 8 generally runs in the east-west to north-south direction, connecting Barrie South GO Train Station and Livingstone and Bayfield area. The service frequency for both routes are approximately 30 minutes during the peak periods.

Currently, the GO Train service on the Toronto-Barrie line is serving two GO Train Stations in Barrie. The service connects Barrie to the GTA and terminates at Toronto's Union Station. GO Bus services also operate from the Barrie bus terminal to the Newmarket Bus Terminal with stops at the Allandale Waterfront GO Train Station and Barrie South GO Train Station. Passengers can transfer to other GO Transit services or York Region Transit (YRT) / Viva buses at the Newmarket Bus Terminal on Eagle Street.

In the future with the Metrolinx Regional Express Rail (RER) projects, the Toronto-Barrie line will see all day service with 15 minutes frequency during the peak periods. This service will provide an attractive option for commuters from Barrie to other areas in the GTA, and vice versa.

Based on our review of the 2031 Transit Route Network Concept excerpt from the City of Barrie's Multi-Modal Active Transportation Master Plan, we strongly encourage the City of Barrie to review the extension of existing Route 8 to McKay Road to service the Salem Secondary Plan Area in the interim. More specifically to service the proposed Di Poce and Crisdawn subdivisions. The implementation of the proposed new Routes 5, 6 and 10 is also important to service the full buildout of the Salem Secondary Plan Area.

Various Cities in Canada are starting to test autonomous vehicles to provide the last mile services for the residents. This could be an option for the City to consider in the future to promote and encourage more sustainable mode of transportation such as public transit.

Transportation Demand Management Measures

The TDM measures and incentives related to the proposed development have been assessed and recommended in Section 7 of this report to support active transportation and transit, to meet the objectives and requirements of the Salem Secondary Plan Area.

Study Recommendations

Based on the assessment, our report recommends that:

- The proposed development considers implement the TDM measures identified in this Study to support active transportation and transit, to meet the objectives and requirements of the Salem Secondary Plan Area.
- The proposed development considers implement the active transportation network identified in this Study;
- The proposed development considers implement the intersection lane configurations and traffic control as identified in the Study;
 - County Road 27 / Mabern Street - Stop sign on Mabern Street westbound, exclusive northbound right turn (15 m storage), southbound right turn (15 m storage) and eastbound left turn (15 m storage);
 - County Road 27/Commercial Access - Stop sign at the access westbound, exclusive northbound right turn (15 m storage) and southbound right turn (15 m storage)
- The City of Barrie considers the extension of existing Route 8 to service the Salem Secondary Plan Area in the interim and proposed new Routes 5, 6 and 10 to service the full buildout of the Salem Secondary Plan in the future.

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1.0 INTRODUCTION

Nextrans Consulting Engineers (A Division of NextEng Consulting Group Inc.) is pleased to present the enclosed Transportation Study for the above noted site in support of the above referenced Di Poce proposed draft plan of subdivision. The subject land is located north-east of County Road 27 and Salem Road within the Salem Secondary Plan Area, in the City of Barrie. The subject land is currently vacant.

The location of the proposed development is illustrated in **Figure 1**.

Figure 1 – Proposed Development Location



Source: Google Map

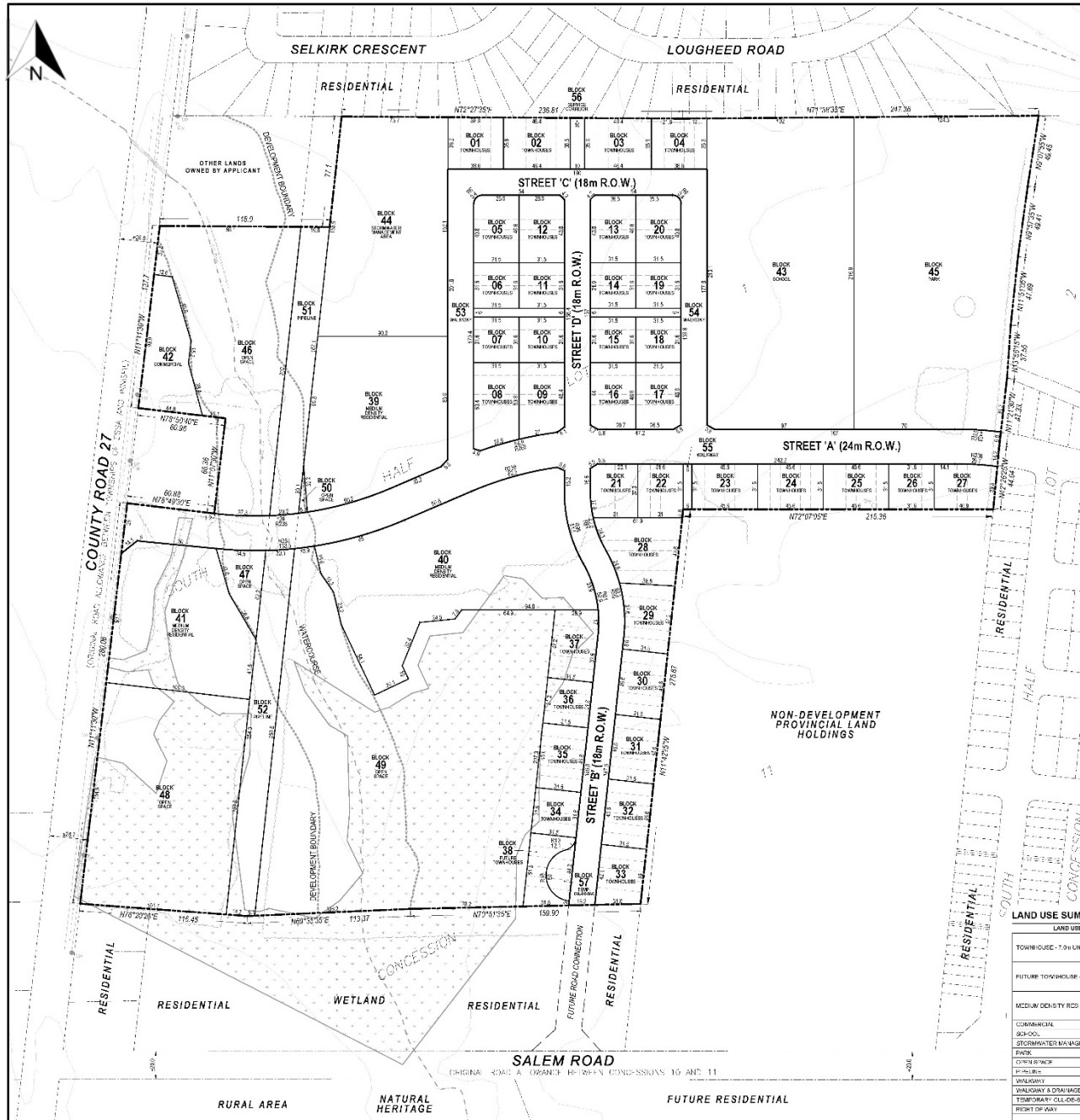
The proposed development consists of approximately 199 townhouse residential units, up to 242 mid-rise residential units, 0.28 hectares of neighbourhood commercial and an elementary school.

The proposed development will be constructed in two phases, with the townhouse units will be constructed in the first phase and the remaining land uses will be constructed in the later phase.

Two full moves accesses will be provided via County Road 27, one access will accommodate the proposed neighbourhood commercial and the second access (Mabern Street) will accommodate the residential and school components. Mabern Street will connect with the proposed Crisdawn subdivision to the east and eventually to Essa Road. It should be noted that the proposed development also protects for additional accesses onto Salem Road and to Crisdawn subdivision to the south, when these lands redeveloped in the future.

Figure 2 illustrates the Di Poce proposed draft plan of subdivision.

Figure 2 – Di Poce Proposed Draft Plan of Subdivision



2.0 EXISTING CONDITIONS

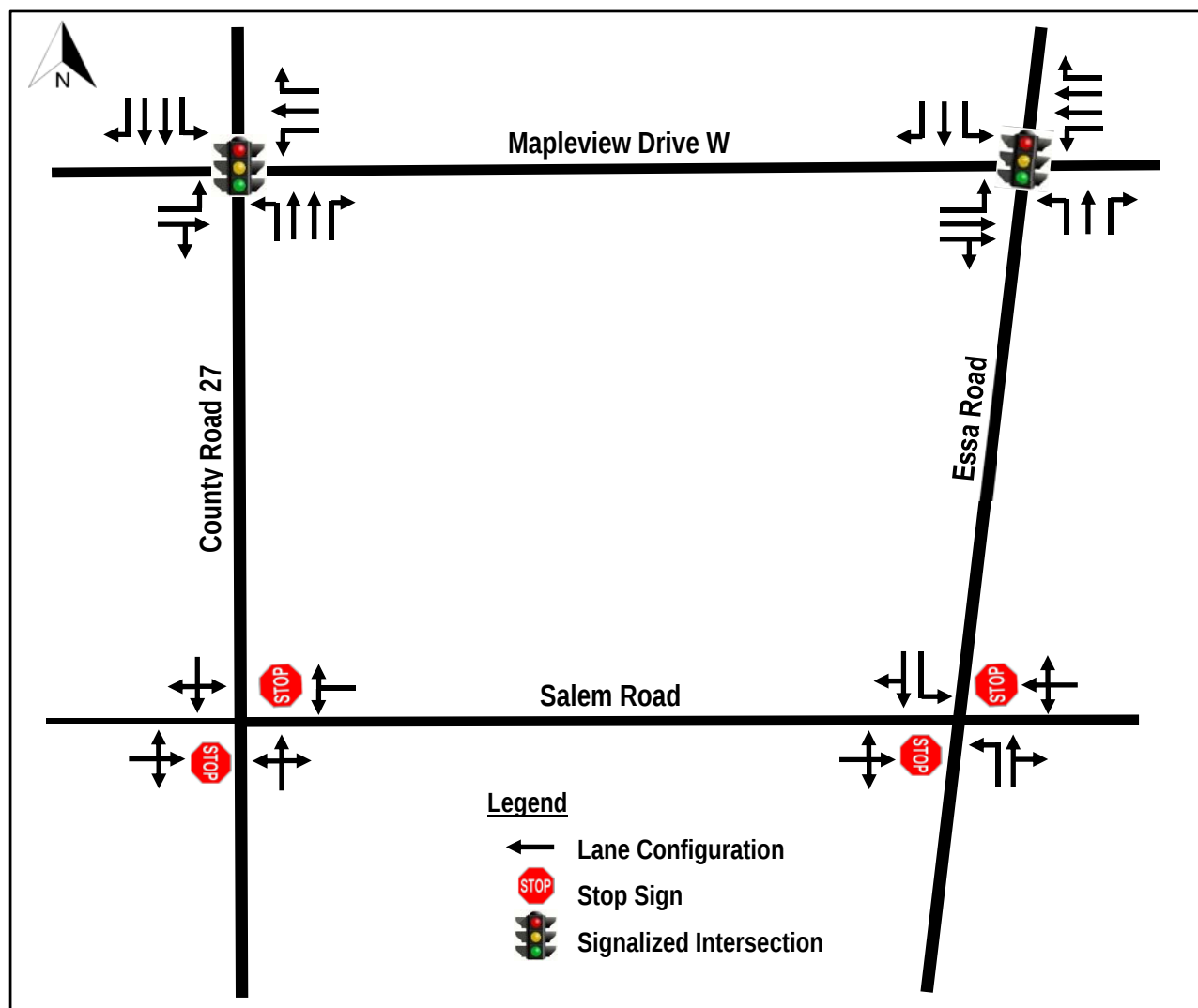
2.1. Existing Road Network

The existing road network, lane configuration and existing traffic control for the study area are shown in **Figure 3**. The detailed road descriptions are summarized in **Table 1** below.

Table 1 – Existing Road Network in the Study Area

Road Name	General Description	Active Transportation Facility	Speed Limit
County Road 27	- Arterial road - 2 lane paved rural cross section at mid-block - Exclusive left turn and right turn lanes at Mapleview Dr	No sidewalk/cycling lanes	80 km/h
Essa Road	- Arterial road - 2 lane paved rural cross section at mid-block - Exclusive left turn and right turn lanes at Mapleview Dr - Exclusive left turn lanes at Salem Road	No sidewalk/cycling lanes	80 km/h
Salem Road	- Arterial road - 2 lane paved rural cross section	No sidewalk/cycling lanes	80 km/h
Mapleview Drive	- Arterial road - 4 lane paved urbanized arterial road - Exclusive left turn lanes at Essa Road and County Road 27	Sidewalk and Multi-use Path	60 km/h

Figure 3 – Existing Lane Configurations and Traffic Control

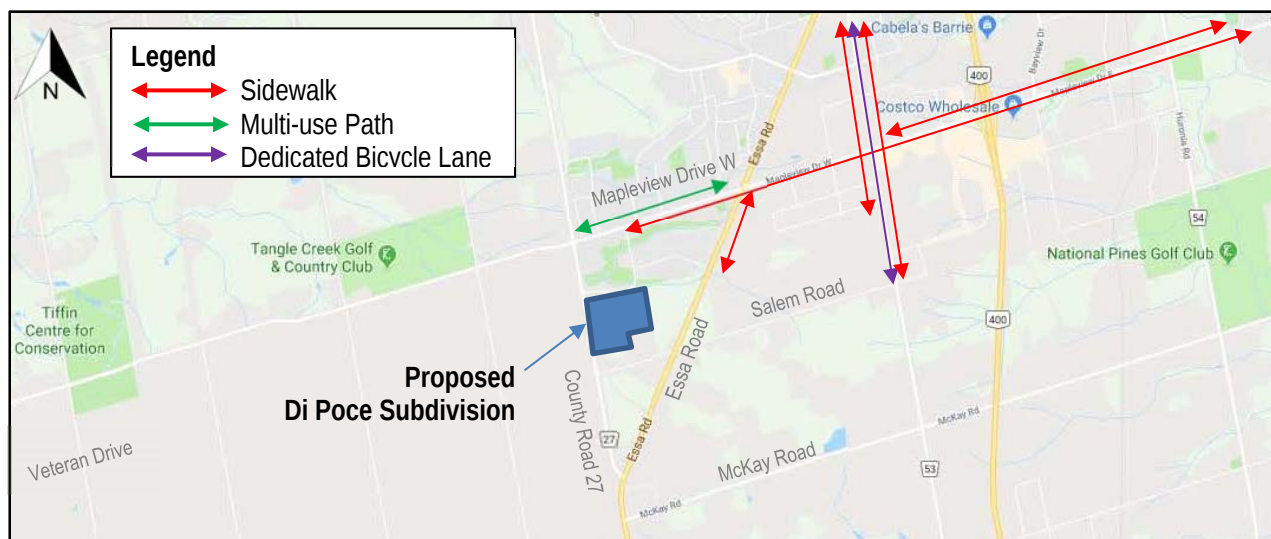


2.2. Existing Active Transportation Network and Assessment

Figure 4 illustrates the existing sidewalk and cycling network in the study area. A review of the existing sidewalk and cycling network in the study area indicates that there are some sidewalks available along the urbanized portion of Mapleview Drive and Essa Road. There is an existing multi-use path along the north side of Mapleview Drive, east of County Road 27 and west of Essa Road. In addition, there are dedicated bicycle lanes along Veterans Drive between Harvie Road to the north to Salem Road to the south.

In the future, there will be opportunities to construct more sidewalks, multi-use paths or dedicated bicycle lanes on Essa Road, Salem Road or County Road 27, as part of the capital or urbanization projects.

Figure 4 – Existing Sidewalk and Bicycle Network in the Study Area



Source: Google Map

2.3. Existing Transit Network and Assessment

Barrie Transit

Currently, there is no transit route serving the area in the vicinity of the proposed development. The closest bus routes are Route 7 (Bell Farm/Bear Creek) and Route 8 (RVH/Yonge and Crosstown/Essa). The existing transit network in the area is illustrated in **Figure 5**. Route 7 generally runs in the east-west to north-south direction, connecting Park Place and Georgian College. Similarly, Route 8 generally runs in the east-west to north-south direction, connecting Barrie South GO Train Station and Livingstone and Bayfield area. The service frequency for both routes are approximately 30 minutes during the peak periods.

GO Transit

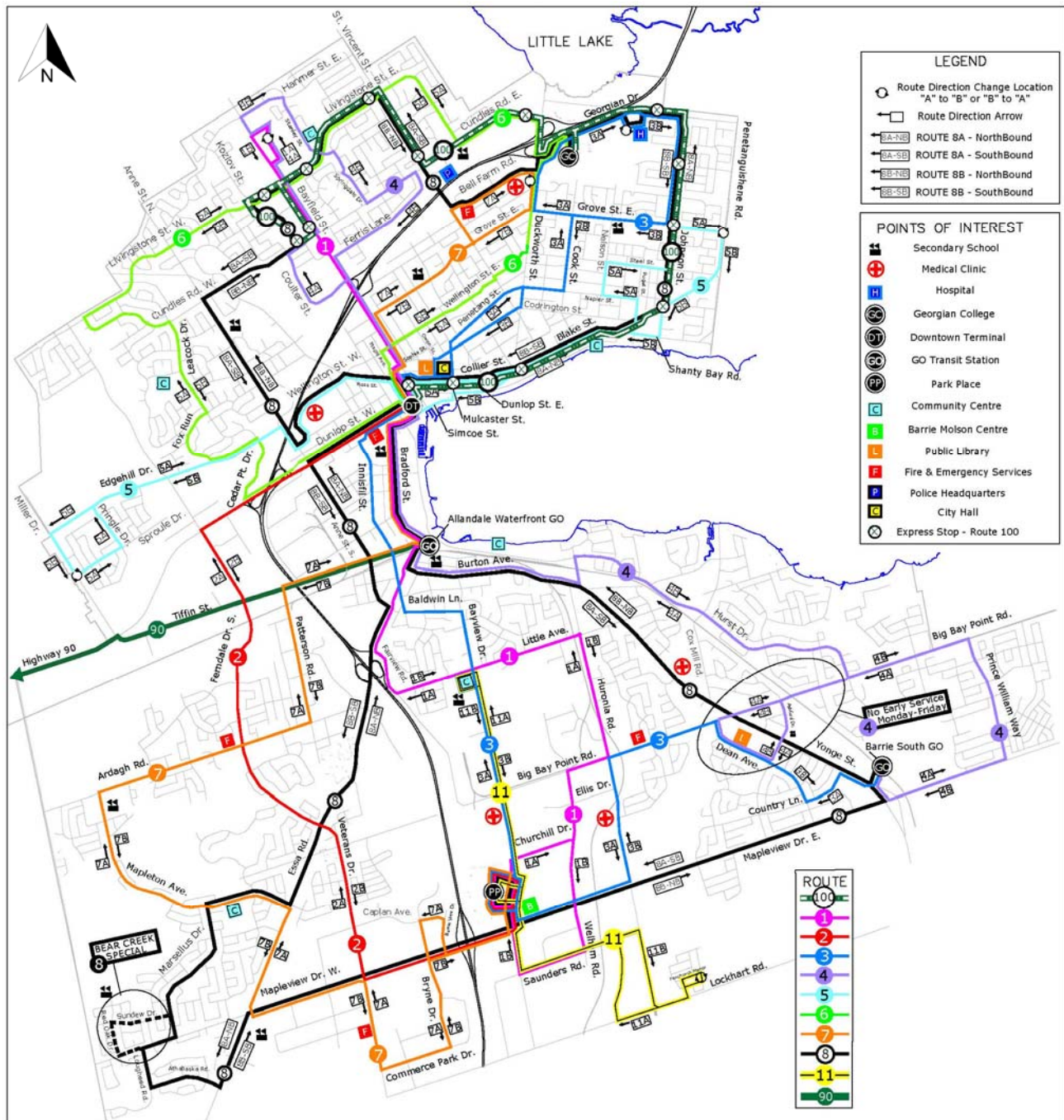
Currently, the GO Train service on the Toronto-Barrie line is serving two GO Train Stations in Barrie. The service connects Barrie to the GTA and terminates at Toronto's Union Station:

- The new Allandale Waterfront GO Station near the intersection of Lakeshore Drive, Essa Road and Tiffin Street (opened in January 2012). This station is located within the Barrie Urban Growth Centre and is planned to be surrounded by low- to mid-rise, mixed-use development. About 200 parking spaces are provided.
- The Barrie South GO Station at Mapleview Drive East is in the southern area of Barrie.

This station is situated in a low-density residential area with the Annexed Lands to the south. About 600 parking spaces are provided. Five southbound AM trips and five northbound PM trips serve both GO Train Stations.

GO Bus services also operate from the Barrie bus terminal to the Newmarket Bus Terminal with stops at the Allandale Waterfront GO Train Station and Barrie South GO Train Station. Passengers can transfer to other GO Transit services or York Region Transit (YRT) / Viva buses at the Newmarket Bus Terminal on Eagle Street.

Figure 5 – City of Barrie Existing Transit Routes



Source: City of Barrie website

2.3. Existing Traffic Volumes

Existing traffic volumes at the study area intersections were undertaken by Spectrum during the morning (7:00 a.m. to 10:00 a.m.) and afternoon (4:00 p.m. to 7:00 p.m.) peak periods on Thursday September 13, 2018. Turning movement count summaries are provided in **Appendix A**. **Figure 6** illustrates the existing traffic volumes.

The signal timing plans for the signalized intersections were obtained from the City of Barrie and incorporated into the analysis.

2.4. Existing Traffic Assessment

The existing volumes are illustrated in **Figure 6**, and were analyzed using Synchro Version 10 software. The methodology of the software follows the procedures described and outlined in the Highway Capacity Manual, HCM 2000, published by the Transportation Research Board. The detailed results are provided in **Appendix B** and summarized in **Table 2**.

Table 2 – Existing Levels of Service

Intersection	Key Movement	Weekday AM Peak Hour			Weekday PM Peak Hour		
		LOS (v/c)	Delay (s)	95 th Queue	LOS (v/c)	Delay (s)	95 th Queue
County Road 27 / Mapleview Drive (signalized)	Overall	B (0.61)	16		B (0.64)	17	
	EB – L	B (0.18)	19	13	C (0.36)	23	19
	EB – TR	C (0.61)	31	46	C (0.52)	27	51
	WB – L	C (0.25)	21	13	B (0.10)	17	8
	WB – T	C (0.34)	26	29	C (0.64)	33	57
	WB – R	A (0.37)	7	11	A (0.43)	6	14
	NB – L	A (0.04)	7	5	A (0.09)	8	10
	NB – T	B (0.09)	12	10	B (0.18)	13	22
	NB – R	A (0.03)	0	0	A (0.10)	1	2
	SB – L	A (0.29)	9	24	B (0.30)	10	25
	SB – T	B (0.10)	10	13	B (0.09)	13	13
	SB – R	A (0.08)	0	0	A (0.07)	0	0
Mapleview Drive / Essa Road (Signalized)	Overall	B (0.70)	19		C (0.90)	21	
	EB – L	C (0.32)	22	25	F (0.90)	85	50
	EB – TR	C (0.70)	27	68	C (0.44)	20	46
	WB – L	D (0.63)	50	26	D (0.76)	45	57
	WB – T	B (0.22)	20	20	C (0.65)	24	73
	WB – R	A (0.12)	2	3	A (0.47)	4	17
	NB – L	A (0.07)	8	8	A (0.10)	10	11
	NB – T	B (0.21)	16	32	B (0.35)	19	53
	NB – R	A (0.22)	4	12	A (0.22)	4	12
	SB – L	A (0.24)	9	24	B (0.19)	10	17
	SB – T	B (0.24)	16	40	B (0.29)	19	43
	SB – R	A (0.14)	4	10	A (0.26)	4	13
Essa Road / Salem Road (unsignalized)	EB – LTR	B (0.10)	14	3	C (0.08)	16	2
	WB – LTR	B (0.06)	11	1	C (0.36)	17	13
	NB – LTR	A (0.00)	8	0	A (0.00)	8	0
	SB – LTR	A (0.02)	8	1	A (0.04)	8	1
County Road 27 / Salem Road (unsignalized)	EB – LTR	B (0.00)	13	0	A (0.00)	9	0
	WB – LTR	B (0.01)	10	0	B (0.13)	11	3
	NB – LTR	A (0.00)	0	0	A (0.00)	0	0
	SB – LTR	A (0.01)	1	0	A (0.03)	1	0

The analysis indicates that, under the existing conditions, all of the intersections considered are currently operating at acceptable levels of service. The eastbound left turn at the Mapleview Drive W/Essa Road intersection is currently operating at a slightly higher level of service, however, an eastbound advance phase can be added to the existing signal timing plan to correct this. Nextrans will recommend some potential signal timing optimization measures under the future background and future total conditions for this intersection.

3.0 AREA LAND USE CONTEXT

3.1. Annexed Land – Barrie South End

In 2010, the Barrie-Innisfil Boundary Adjustment Act, 2009 (Bill 196) came into effect, extending the southern boundary of the City of Barrie to include 2,293 hectares (about 5,700 acres) of land previously in the Town of Innisfil.

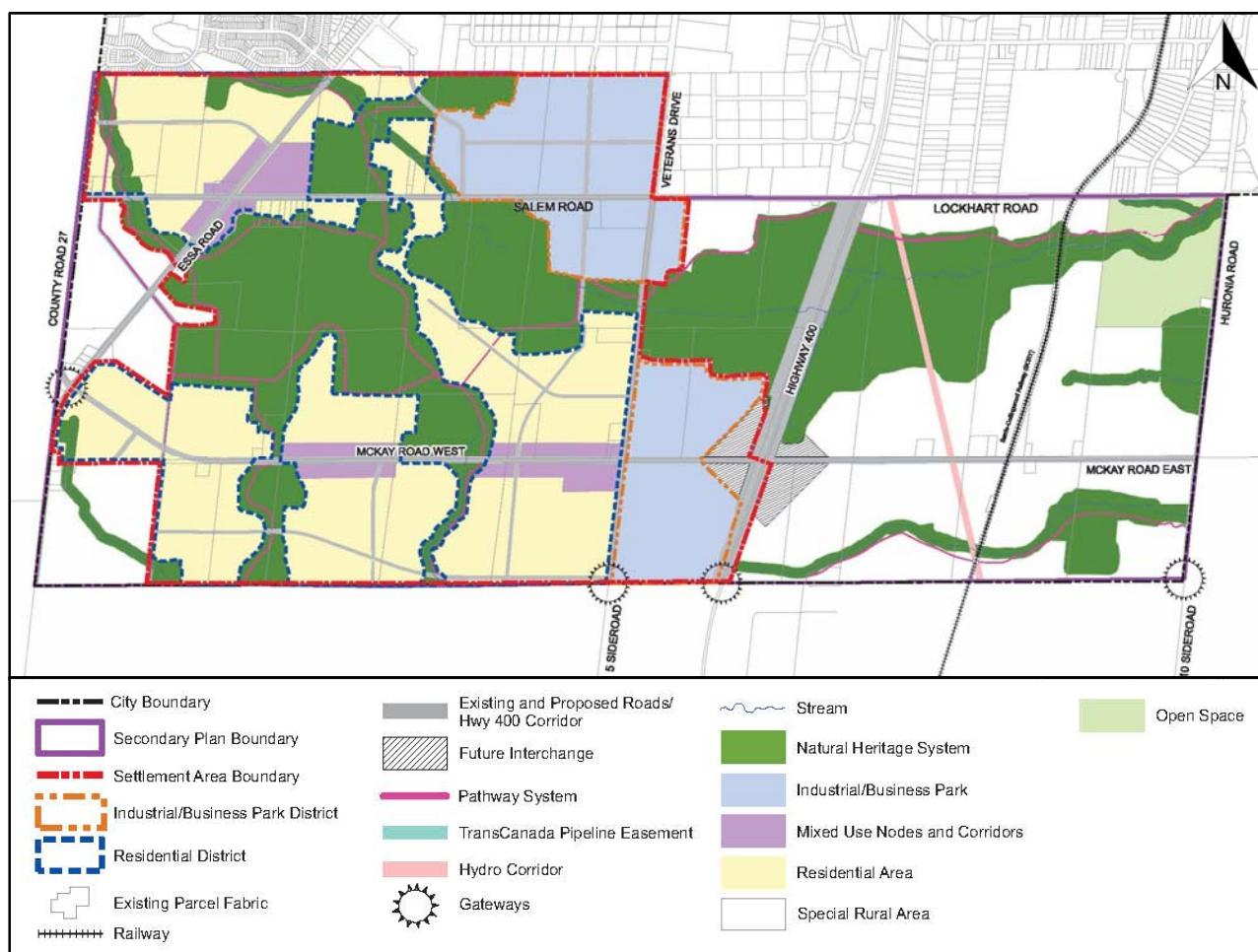
The annexed land boundary expansion provides opportunities for the City of Barrie to plan for and manage growth to support a strong and competitive economy, build a compact, vibrant and complete community; and create a sustainable future while addressing provincial growth management initiatives.

3.2. Salem Secondary Plan Area

The Salem Secondary Plan is part of the annexed land west. The Salem Secondary Plan establishes a detailed planning framework for the future urban development of the Secondary Plan Area. The Salem Secondary Plan Area is comprised of two industrial/business park districts and four residential districts as identified on Schedule 8A, Salem Secondary Plan Community Structure Plan (Salem Community Structure Plan).

Figure 7 illustrates the Schedule 8A (Land Use) of the Salem Secondary Plan.

Figure 7 – Salem Secondary Plan (Schedule 8A)



Salem and Hewitt's Secondary Plan Areas will be gateways to the City of Barrie, providing a range of employment, housing, and a mix of other uses that allow residents to live, work and play in their community. These areas will be developed based

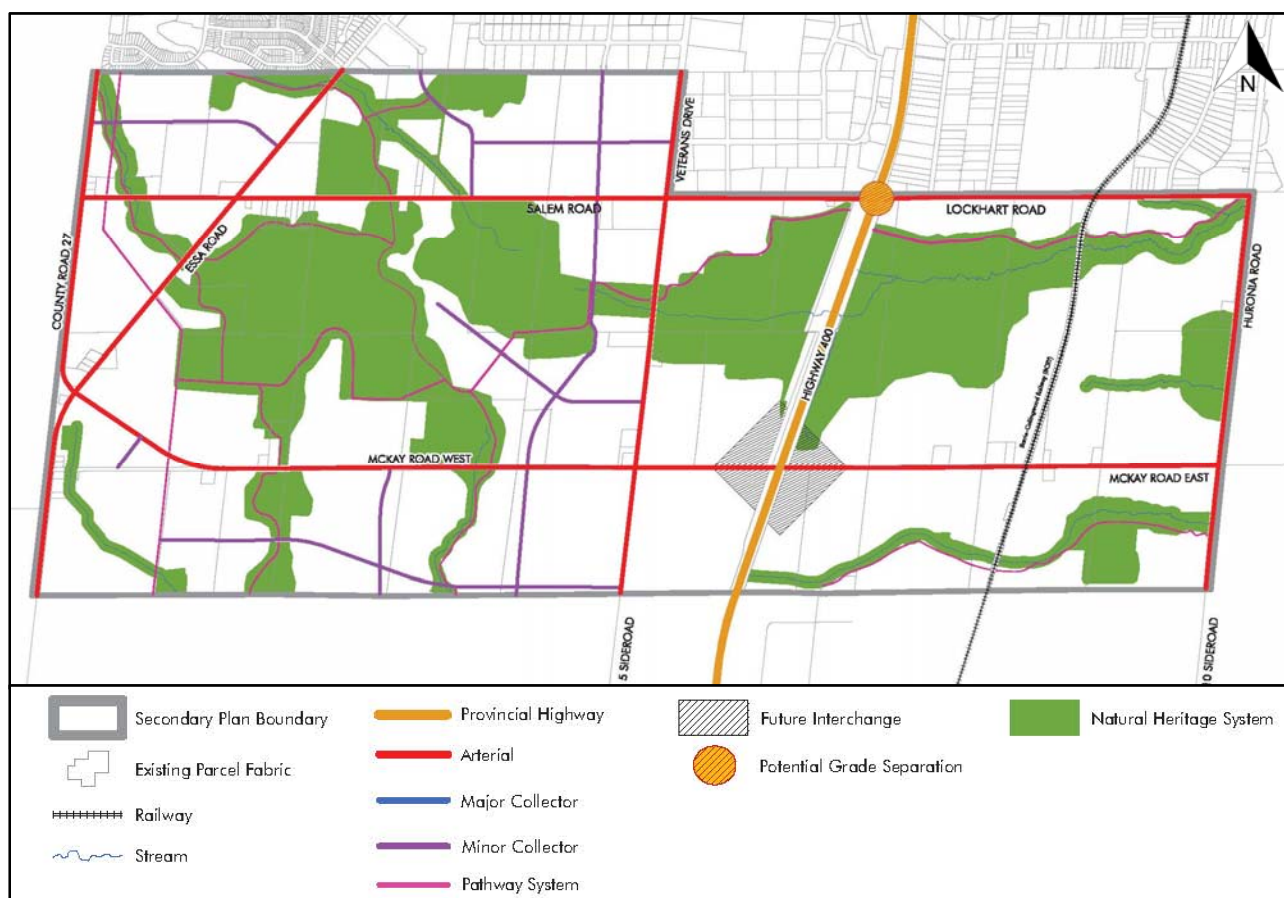
on an interconnected natural heritage system, open space network and transportation system that seamlessly incorporates the Salem and Hewitt's Secondary Plan Areas into the Barrie community, and encourages active transportation and transit.

3.3. Salem Transportation Plan

The communities within the Salem Secondary Plan Area will be developed based on a modified grid street system and related off-street pathway system, designed to provide for a full range of transportation options with a focus on maximizing the potential for transit service and active transportation.

Figure 8 illustrates the transportation plan (Schedule 8D-1) for the Salem Secondary Plan Area.

Figure 8 – Transportation Plan for the Salem Secondary Plan (Schedule 8D-1)



3.4. Proposed Capital Road Improvements

A number of capital road improvement projects related to development of the Salem and Hewitt's Secondary Plans have been committed to by the City of Barrie over the upcoming years.

Table 3 summarizes the proposed capital road improvements by the City of Barrie.

Table 3 – Proposed Capital Road Improvements

Road Name	General Description	Year
Salem Road	3 lane road (with cycling lanes) west from Veterans Drive to County Road 27 - Salem Road crossing of Highway 400	2021 2026
Essa Road	3 lane road (with cycling lanes) from the former Barrie city limits to about 660 metres south of Salem Road	2021
McKay Road	5 lane road (with cycling lanes) from Highway 400, west past Veterans Drive to Street “3” as designated in the Watersand Draft Plan 3 lane road (with cycling lanes) west from Street “3” to west of the Watersand Draft Plan - McKay Road interchange with Highway 400	2022 2024 2022
Veterans Drive	5 lane road (with cycling lanes) south from Salem Road to McKay Road West 3 lane road (with cycling lanes) south from McKay Road West to the City Limits	2021 2021

These proposed improvements will be reflected in the future background and future total condition analyses for the associated horizon years, where appropriate.

3.5. Background Transportation Studies

Nextrans has reviewed the relevant transportation planning/engineering studies completed in the study area. These studies include but not limited to:

1. City of Barrie's Multi-Modal Active Transportation Master Plan, Genivar, January, 2014;
2. Salem Secondary Plan Transportation Improvements Environmental Study Report, Stantec, October 12, 2017;
3. Crisdawn Draft Plan Traffic Study, BA Group, October, 2017;
4. Crisdawn Draft Plan Traffic Study, BA Group, October, 2016;
5. Traffic Analysis – County Road 27 Lane Improvements, JD Engineering, June 21, 2018;
6. Traffic Impact Study- H&H Capital Salem Subdivision Residential Development, C.F. Crozier & Associates Inc., February, 2018;

The information of these reports will be referenced in the report where appropriate, with relevant excerpts are included in **Appendix C**.

4.0 FUTURE BACKGROUND CONDITIONS

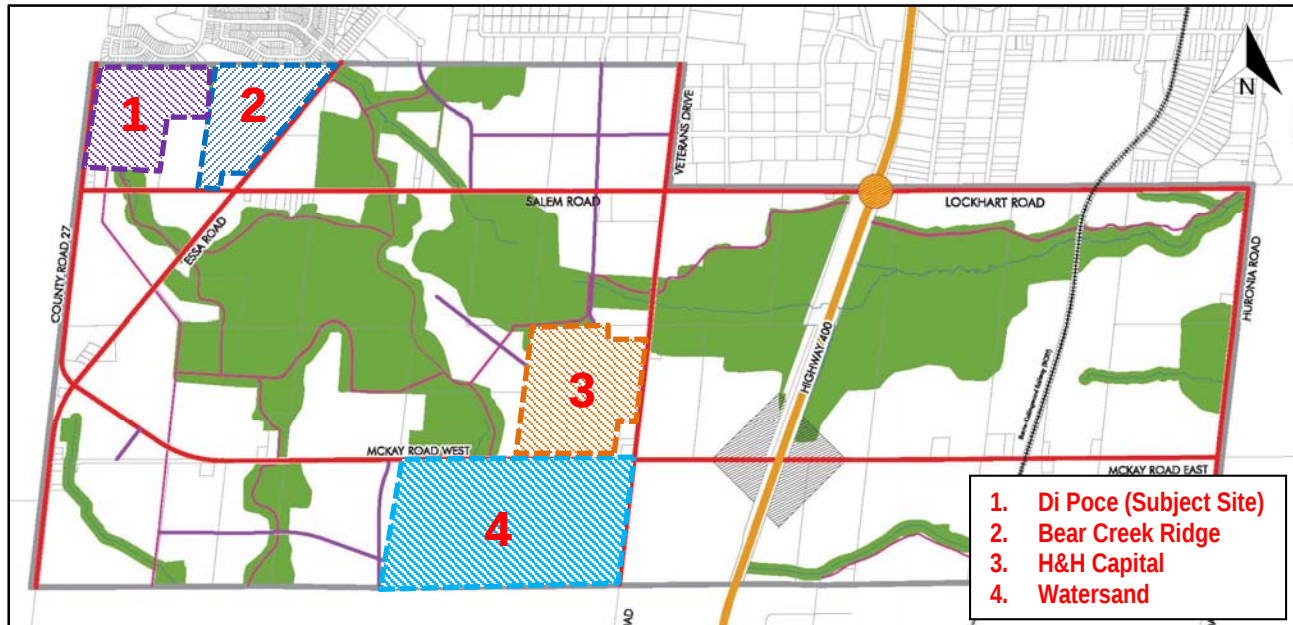
4.1. Analysis Horizon

For the purposes of this assessment, it is assumed that the first phase (Phase 1) of the proposed development will be completed by 2021 and full built-out will be completed beyond 2021 (i.e. 2031 horizon). This is also consistent with the horizon years considered in the Traffic Operations Report, Salem Road Class EA (Stantec – October, 2017).

4.2. Background Developments in the Area

A full review of active developments within the study area was conducted using the City of Barrie development portal (<https://www.barrie.ca/City%20Hall/Planning-and-Development/Proposed-Developments/Pages/default.aspx>).

It should be noted that the proposed development (Di Poce) is one of the four proposed subdivisions, as illustrated in **Figure 9**.

Figure 9 – Anticipated Developments in the Area

Nextrans has reviewed the Crisdawn Draft Plan Traffic Studies prepared by BA Group dated October, 2016 and October, 2017, Traffic Analysis – County Road 27 Lane Improvements for Bear Creek Ridge Development prepared by JD Northcote Engineering Inc. (JD Engineering) dated June 21, 2018, as well as the Traffic Impact Study- H&H Capital Salem Subdivision Residential Development prepared by C.F. Crozier & Associates Inc. dated February, 2018. In general, we concur with the methodologies used in the Studies noted.

We have noted that both the BA Group and C.F. Crozier & Associates Inc. Studies assumed the first phase of Di Poce (the subject development) with 600 residential dwelling units. However, as indicated in the previous sections of the report, the proposed development only contemplated 199 residential dwelling units in the first phase of the proposed development.

Our review of the City's Development Portal also indicates that there are some other smaller developments along Essa Road, Mapleview Drive and Salem Road. However, since these background developments are not significant trip generations and located further away from the intersections considered in the analysis, it is our opinion that the site trips generated by these proposed background developments will be captured through the background traffic corridor growth rate that will be applied to the existing traffic volumes for both the 2021 and 2031 analysis horizons.

Figure 10 illustrates the proposed background development traffic volumes for 2021, with **Figure 11** illustrating the proposed background development for 2031.

4.3. Background Corridor Through Traffic Growth

Under the current conditions (i.e. without the developments within the Salem Secondary Plan Area), it is expected that the background corridor growth is moderate given that the area is mostly greenfield and the existing transportation network and intersection configurations/control are not fully built-out to their ultimate conditions. As such, the main corridor background traffic growth is dependent on the Salem Secondary Plan Area and the remainder of the Annexed Lands. It is anticipated that the implementation of each subdivision in the Salem Secondary Plan Area will be based on phase by phase basis and dependent on the available servicing infrastructure and allocations.

The corridor traffic growth rates were reviewed based on Section 3.1 of the Traffic Operations Report, Salem Road Class EA (Stantec – October, 2017). It is our understanding that these growth rates were calculated from the City of Barrie transportation forecasting model and were based on the model volumes from the 2011, 2016, 2021 and 2031 horizon years scenarios. Although this information is reasonable for the Salem Secondary Plan Area and the City of Barrie's Multi-

Modal Active Transportation Master Plan, it is our opinion that for the short-term horizon and the background developments in the area should be used to estimate the background traffic.

As such, a 2% growth per annum in background through traffic growth is applied to the existing through traffic volumes for the 2021 and 2031 horizons. This assumed growth will take into considerations the variations in development levels for each draft plan of subdivision within the Salem Secondary Plan Area. This is consistent with the assumptions outlined in Crisdawn Draft Plan Traffic Study prepared by BA Group dated October, 2017, and higher than the growth rates assumed in the Traffic Operations Report, Salem Road Class EA (Stantec – October, 2017).

4.4. Future Lane Configurations (2021 and 2031)

The following lane configurations were obtained from the Salem Secondary Plan Transportation Improvements Environmental Study Report, Stantec, October 12, 2017, as well as the background transportation studies prepared for various proposed development in the area. These proposed improvements will be reflected in the intersection capacity analysis.

- **Salem Road at Essa Road** – a new proposed roundabout with one entry lane in all directions and channelized right turn lanes for the westbound and eastbound directions;
- **Salem Road at County Road 27** – an exclusive westbound left turn lane and a shared through/right turn lane. The stop-controlled is provided on minor approach (i.e. Salem Road). No modifications to County Road 27;
- **Essa Road at Mapleview Drive W** – generally no major modifications to this intersection;
- **Mapleview Drive at County Road 27** – generally no modifications to the intersections;
- **Proposed Mabern Street at Essa Road** – a northbound exclusive left turn, a southbound exclusive right turn and exclusive eastbound left turn and right turn lanes are provided for this proposed intersection. Based on our review of the BA Studies prepared for Crisdawn Development, this intersection is proposed to be signalized in the future. Nexttrans will provide signal warrant analysis for this intersection under both the future total conditions.
- **Mabern Street at Essa Road** – Proposed traffic signal with exclusive northbound left turn, southbound right turn, eastbound left and right turn lanes

4.5. Future Background Assessment for Auto Mode

The estimated 2021 and 2031 future background traffic volumes are illustrated in **Figures 14** and **15**, which were analyzed using Synchro Version 10 software. The detailed calculations are provided in **Appendices D** and **E** and summarized in **Tables 4** and **5**, respectively.

2021 Horizon Assessment Findings

The analysis indicates that, under the 2021 future background conditions, all of the intersections considered are expected to operate at acceptable levels of service. The delays and volume-to-capacity ratios (v/c) are expected to be higher than the existing conditions.

As indicated under the existing conditions the eastbound left turn at the Mapleview Drive W/Essa Road intersection is currently operating at a slightly higher level of service. For this reason, an eastbound advance phase (10 seconds advance green arrow for a total cycle length of 93 seconds) has been added to improve the operation of this movement. The analysis indicates that with this signal timing modification, this movement along with the overall intersection level of service have been improved, while maintaining the balance for other critical movements.

Table 4 – 2021 Future Background Levels of Service

Intersection	Key Movement	Weekday AM Peak Hour			Weekday PM Peak Hour		
		LOS (v/c)	Delay (s)	95 th Queue	LOS (v/c)	Delay (s)	95 th Queue
County Road 27 / Mapleview Drive (signalized)	Overall	B (0.62)	16		B (0.66)	17	
	EB – L	C (0.17)	19	13	C (0.27)	23	18
	EB – TR	C (0.62)	32	48	C (0.53)	27	53
	WB – L	C (0.25)	21	13	B (0.10)	17	7
	WB – T	C (0.35)	26	31	C (0.66)	33	61
	WB – R	A (0.37)	7	11	A (0.42)	6	14
	NB – L	A (0.04)	8	5	A (0.10)	19	10
	NB – T	B (0.10)	12	12	B (0.20)	14	24
	NB – R	A (0.03)	0	0	A (0.10)	1	2
	SB – L	A (0.30)	9	25	B (0.32)	11	26
Mapleview Drive / Essa Road (Signalized)	Overall	C (0.72)	21		C (0.91)	28	
	EB – L	C (0.32)	22	26	C (0.49)	22	23
	EB – TR	C (0.72)	27	73	C (0.44)	22	54
	WB – L	E (0.70)	61	29	D (0.74)	46	64
	WB – T	B (0.23)	20	21	C (0.74)	32	93
	WB – R	A (0.12)	2	3	A (0.50)	7	25
	NB – L	A (0.08)	9	8	B (0.29)	17	14
	NB – T	C (0.60)	23	95	C (0.73)	34	124
	NB – R	A (0.24)	6	15	A (0.24)	3	8
	SB – L	B (0.36)	11	24	B (0.37)	17	22
Essa Road / Mabern Street (Signalized)	Overall	A (0.32)	6		A (0.42)	6	
	EB – L	C (0.28)	21	16	B (0.15)	17	11
	EB – R	A (0.18)	7	7	A (0.11)	8	6
	NB – L	A (0.03)	4	3	A (0.10)	4	6
	NB – T	A (0.32)	5	31	A (0.42)	5	46
	SB – T	A (0.24)	4	22	A (0.40)	5	42
	SB – R	A (0.02)	2	2	A (0.07)	2	4
Essa Road / Salem Road (Roundabout)	EB – LTR	0.06	NA	NA	0.04	NA	NA
	WB – LTR	0.03	NA	NA	0.18	NA	NA
	NB – LTR	0.54	NA	NA	0.55	NA	NA
	SB – LTR	0.42	NA	NA	0.58	NA	NA
County Road 27 / Salem Road (unsignalized)	EB – LTR	B (0.00)	13	0	A (0.00)	9	0
	WB – LTR	B (0.01)	13	0	B (0.01)	15	0
	NB – LTR	A (0.00)	0	0	A (0.00)	0	0
	SB – LTR	A (0.03)	1	0	A (0.02)	1	1

2031 Horizon Assessment Findings

The analysis indicates that, under the 2031 future background conditions, all of the intersections considered are expected to operate at acceptable levels of service. The delays and volume-to-capacity ratios (v/c) are expected to be higher than the existing and 2021 future background traffic conditions.

In order to improve all critical left turn movements, advance green arrow minimum of 7 seconds have been added to all left turns at the Mapleview Drive W/Essa Road intersection. The total cycle length has been increased from 83 seconds under the existing conditions to 96 seconds. The analysis indicates that with the proposed signal timing modifications, all critical movements along with the overall intersection level of service have been maintain similar to the 2021 future background conditions despite much higher traffic volumes.

Table 5 – 2031 Future Background Levels of Service

Intersection	Key Movement	Weekday AM Peak Hour			Weekday PM Peak Hour		
		LOS (v/c)	Delay (s)	95 th Queue	LOS (v/c)	Delay (s)	95 th Queue
County Road 27 / Mapleview Drive (signalized)	Overall	B (0.67)	17		B (0.71)	18	
	EB – L	B (0.17)	18	12	C (0.41)	23	18
	EB – TR	C (0.67)	33	57	C (0.58)	27	64
	WB – L	C (0.28)	21	13	B (0.11)	16	7
	WB – T	C (0.42)	27	36	C (0.71)	34	74
	WB – R	A (0.36)	6	11	A (0.39)	5	13
	NB – L	A (0.04)	9	5	B (0.10)	10	12
	NB – T	B (0.12)	13	15	B (0.25)	16	32
	NB – R	A (0.03)	0	0	A (0.10)	1	3
	SB – L	B (0.32)	11	27	B (0.35)	13	29
Mapleview Drive / Essa Road (Signalized)	Overall	C (0.86)	31		C (0.92)	34	
	EB – L	C (0.33)	26	30	D (0.73)	47	32
	EB – TR	D (0.84)	37	110	C (0.59)	30	70
	WB – L	C (0.47)	27	16	C (0.65)	31	36
	WB – T	B (0.23)	19	27	D (0.83)	36	112
	WB – R	A (0.10)	2	4	B (0.53)	14	48
	NB – L	B (0.21)	14	10	B (0.39)	20	13
	NB – T	D (0.86)	41	169	D (0.91)	45	201
	NB – R	A (0.25)	7	17	A (0.21)	6	15
	SB – L	C (0.62)	24	31	D (0.68)	38	28
Essa Road / Mabern Street (Signalized)	Overall	A (0.50)	7		A (0.58)	6	
	EB – L	C (0.28)	21	21	C (0.21)	22	12
	EB – R	A (0.18)	7	7	A (0.14)	9	6
	NB – L	A (0.04)	4	4	A (0.12)	4	6
	NB – T	A (0.44)	6	6	A (0.58)	7	87
	SB – T	A (0.50)	7	7	A (0.49)	5	62
	SB – R	A (0.02)	3	3	A (0.07)	2	4
Essa Road / Salem Road (Roundabout)	EB – LTR	0.10	NA	NA	0.06	NA	NA
	WB – LTR	0.04	NA	NA	0.25	NA	NA
	NB – LTR	0.71	NA	NA	0.81	NA	NA
	SB – LTR	0.78	NA	NA	0.75	NA	NA
County Road 27 / Salem Road (unsignalized)	EB – LTR	B (0.00)	14	0	A (0.00)	10	0
	WB – LTR	B (0.01)	14	0	C (0.01)	17	0
	NB – LTR	A (0.00)	0	0	A (0.00)	0	0
	SB – LTR	A (0.01)	1	0	A (0.02)	1	1

5.0 SITE TRAFFIC

5.1. Proposed Development

As indicated, the proposed development consists of:

- 199 Townhouse residential dwelling units;
- Up to 242 Medium density residential dwelling units;
- An elementary school (2.21 ha or 237,882 ft²); and
- Neighbourhood commercial (0.28 ha or 30,139 ft²)

It is our understanding that the proposed development will be constructed in two phases, with the townhouse units will be constructed in the first phase (by 2021 horizon), and the balance of land uses will be constructed in later phase (beyond 2021 horizon).

The 2011 Transportation Tomorrow Survey (TTS) and the Trip Generation Manual, 9th Edition published by the Institute of Transportation Engineers (ITE) information was reviewed to estimate the modal split, trip distribution and trip generation for the proposed development.

This approach is consistent with the background transportation studies prepared in the area.

5.2. Site Trip Generation

The trip generation forecasts were undertaken using the information contained in the *Trip Generation Manual, 9th Edition* published by the Institute of Transportation Engineers (ITE). Based on our review, the selected corresponding land uses are: “Low-rise Residential Condominium/Townhouse” (LUC 231) and “Apartment” (LUC 220) for the residential components, “Shopping Centre” (LUC 820) for the retail component, and “Elementary School” (LUC 520) for the school component of the proposed development.

As indicated, Nextrans has reviewed the Crisdawn Draft Plan Traffic Studies prepared by BA Group dated October, 2016 and October, 2017, Traffic Analysis – County Road 27 Lane Improvements for Bear Creek Ridge Development prepared by JD Northcote Engineering Inc. (JD Engineering) dated June 21, 2018, as well as the Traffic Impact Study- H&H Capital Salem Subdivision Residential Development prepared by C.F. Crozier & Associates Inc. dated February, 2018.

Given that these proposed background developments are located within the Salem Secondary Plan and especially, the Crisdawn proposed development is located adjacent to the subject site, for the purposes of this assessment and consistency, similar trip rates used in the Crisdawn Draft Plan Traffic Study prepared by BA Group dated October, 2017 have been utilized in this Study.

Table 6 summarizes the site trip generation for Phase 1 (townhouse development by 2021), with **Table 7** illustrating site trip generation for Phase 2 (remainder of the proposed development beyond 2021).

Table 6 – Site Traffic Trip Generation for Phase 1

ITE Land Use	Magnitude	Parameter	Morning Peak			Afternoon Peak		
			In	Out	Total	In	Out	Total
Low-rise Residential Townhouse (LUC 231)	199 units	Rate (trips/unit)	0.1	0.44	0.54	0.35	0.29	0.64
		Total Trips	20	88	108	70	58	128
		Modal Split (5%)	1	4	5	4	3	7
		New Auto Trips	19	84	103	66	55	121

The proposed Phase 1 development is expected to generate 103 new two-way auto trips (19 inbound and 84 outbound) during the weekday morning peak hour and 121 new two-way trips (66 inbound and 55 outbound) during the afternoon peak hour. The proposed development is also expected to generate 5 new two-way transit/active mode trips (1 inbound and 4 outbound) and 7 new two-way transit/active mode trips (4 inbound and 3 outbound) during the morning and afternoon peak hours, respectively.

As indicated, the proposed neighbourhood commercial developable area is approximately 0.28 ha or 30,139 ft². For the purposes of this assessment, up to 40% site coverage is assumed for the proposed neighbourhood commercial. It is our opinion that this assumption is conservative and represents worst case scenario.

Table 7 – Site Traffic Trip Generation for Phase 2

ITE Land Use	Magnitude	Parameter	Morning Peak			Afternoon Peak		
			In	Out	Total	In	Out	Total
Residential Apartment (LUC 220)	242 units	Rate (trips/unit)	0.16	0.39	0.55	0.41	0.26	0.67
		Total Trips	39	94	133	99	63	162
		Modal Split (5%)	2	5	7	5	3	8
		New Auto Trips	37	89	126	94	60	154
Retail (LUC 820)	12,270 ft²	Rate (trips/unit)	0.59	0.37	0.96	1.78	1.93	3.71
		Total Trips	7	5	12	22	24	46
		Modal Split (5%)	0	0	0	1	1	2
		New Auto Trips	7	5	12	21	23	44
Elementary School (LUC 520)	47,576 ft²	Rate (trips/unit)	2.91	2.29	5.20	0.54	0.67	1.21
		Total Trips	138	109	247	26	32	58
		Modal Split (20%)	28	22	50	5	6	11
		New Auto Trips	110	87	197	21	26	47
TOTAL		New Auto Trips	154	181	335	136	109	245
		Total Non-Auto Trips	30	27	57	11	10	21

The remainder phase of the proposed development is expected to generate 335 new two-way auto trips (154 inbound and 181 outbound) during the weekday morning peak hour and 245 new two-way trips (136 inbound and 109 outbound) during the afternoon peak hour. The proposed development is also expected to generate 57 new two-way transit/active mode trips (30 inbound and 27 outbound) and 21 new two-way transit/active mode trips (11 inbound and 10 outbound) during the morning and afternoon peak hours, respectively.

5.3. Site Trip Distribution and Assignment

The 2011 Transportation Tomorrow Survey (TTS) data was reviewed for the area and the City of Barrie in order to estimate the general trip distribution for the residential and office component of the proposed development.

As indicated, Nextrans has reviewed the Crisdawn Draft Plan Traffic Studies prepared by BA Group dated October, 2016 and October, 2017, Traffic Analysis – County Road 27 Lane Improvements for Bear Creek Ridge Development prepared by JD Northcote Engineering Inc. (JD Engineering) dated June 21, 2018, as well as the Traffic Impact Study- H&H Capital Salem Subdivision Residential Development prepared by C.F. Crozier & Associates Inc. dated February, 2018.

Given that these proposed background developments are located within the Salem Secondary Plan and especially, the Crisdawn proposed development is located adjacent to the subject site, for the purposes of this assessment and consistency, similar trip distribution used in the Crisdawn Draft Plan Traffic Study prepared by BA Group dated October, 2017 have been utilized in this Study. It should be noted that since the proposed development is located closer to County Road 27 and the Crisdawn proposed development is located closer to Essa Road, it is anticipated that the trip assignment will be slightly different between the two proposed subdivisions.

Table 8 summarizes the proposed development trip assignment for the proposed residential components that takes the existing and proposed road network into considerations.

Table 8 – Trip Distribution and Assignment for Residential Component

Direction of Travel To/From	Potential Routing	Inbound	Outbound
North	via County Road 27, Essa Road and Hwy 400	53% (53%)	63% (63%)
South	via County Road 27, Essa Road and Hwy 400	26% (26%)	26% (26%)
East	via Salem Road and McKay Road	21% (21%)	11% (11%)
Total		100%	100%

Table 9 summarizes the proposed development trip assignment for the proposed retail component. It should be noted that this is anticipated to be a neighbourhood retail/commercial, as such, the majority of the trips are anticipated coming from the two proposed subdivisions (Di Poce and Crisdawn) and existing communities located immediately to the north.

Table 9 – Trip Distribution and Assignment for Retail Component

Direction of Travel To/From	Potential Routing	Inbound	Outbound
North	via County Road 27	35% (35%)	35% (35%)
South	via County Road 27	5% (5%)	5% (5%)
East	via Mabern Street	60% (60%)	60% (60%)
Total		100%	100%

Table 10 summarizes the proposed development trip assignment for the proposed elementary school. It is anticipated that the proposed elementary school will primarily serve the two proposed subdivisions (Di Poce and Crisdawn), existing communities located immediately to the north and the Salem Secondary Plan. As such, the trip distribution is based on the location of the proposed developments and surrounding catchment area. A more detailed assessment can be provided for the later phase of the proposed Di Poce subdivision, when more detailed and accurate information is available from the School Board.

Table 10 – Trip Distribution and Assignment for Elementary School

Direction of Travel To/From	Potential Routing	Inbound	Outbound
North	via County Road 27 and Essa Road	25% (25%)	25% (25%)
South	via County Road 27 and Essa Road	15% (15%)	15% (15%)
East	via Mabern Street and Salem Road	60% (60%)	60% (60%)
Total		100%	100%

6.0 FUTURE TOTAL TRAFFIC CONDITIONS

6.1. Future Total Traffic Assessment for Auto Mode

The estimated future total traffic volumes for 2021 horizon are illustrated in **Figure 20**, and were analyzed using Synchro 10 software. The detailed calculations are provided in **Appendix F** and summarized in **Table 11**.

Table 11 – 2021 Future Total Levels of Service

Intersection	Key Movement	Weekday AM Peak Hour			Weekday PM Peak Hour		
		LOS (v/c)	Delay (s)	95 th Queue	LOS (v/c)	Delay (s)	95 th Queue
County Road 27 / Mapleview Drive (signalized)	Overall	B (0.62)	16		B (0.66)	17	
	EB – L	B (0.17)	19	13	C (0.37)	23	18
	EB – TR	C (0.62)	32	48	C (0.53)	27	53
	WB – L	C (0.25)	21	13	B (0.10)	17	7
	WB – T	C (0.35)	26	31	C (0.66)	33	61
	WB – R	A (0.37)	7	11	A (0.42)	6	14
	NB – L	A (0.04)	8	5	A (0.10)	9	10
	NB – T	B (0.12)	12	14	B (0.21)	14	26
	NB – R	A (0.03)	0	0	A (0.10)	1	2
	SB – L	A (0.31)	10	25	B (0.32)	11	26
Mapleview Drive / Essa Road (Signalized)	Overall	C (0.72)	21		C (0.93)	29	
	EB – L	C (0.32)	22	26	C (0.51)	22	23
	EB – TR	C (0.72)	27	73	B (0.37)	18	48
	WB – L	E (0.71)	62	30	D (0.75)	48	66
	WB – T	B (0.23)	20	21	C (0.74)	32	93
	WB – R	A (0.12)	2	3	A (0.51)	7	28
	NB – L	A (0.09)	9	8	B (0.29)	17	14
	NB – T	C (0.63)	24	100	D (0.75)	35	136
	NB – R	A (0.25)	6	16	A (0.26)	7	17
	SB – L	B (0.38)	11	24	B (0.39)	18	22
Essa Road / Mabern Street (Signalized)	Overall	A (0.34)	7		A (0.48)	7	
	EB – L	C (0.34)	21	20	B (0.21)	17	13
	EB – R	A (0.21)	7	8	A (0.13)	7	6
	NB – L	A (0.03)	4	3	A (0.14)	5	7
	NB – T	A (0.33)	5	33	A (0.48)	7	49
	SB – T	A (0.24)	5	23	A (0.45)	7	45
	SB – R	A (0.03)	2	2	A (0.09)	2	5
Essa Road / Salem Road (Roundabout)	EB – LTR	0.07	NA	NA	0.05	NA	NA
	WB – LTR	0.04	NA	NA	0.19	NA	NA
	NB – LTR	0.54	NA	NA	0.56	NA	NA
	SB – LTR	0.44	NA	NA	0.59	NA	NA
County Road 27 / Salem Road (unsignalized)	EB – LTR	B (0.00)	13	0	A (0.00)	9	0
	WB – LTR	B (0.02)	10	0	B (0.15)	12	4
	NB – LTR	A (0.00)	0	0	A (0.00)	0	0
	SB – LTR	A (0.02)	1	0	A (0.02)	1	1
County Road 27 / Mabern Street (unsignalized)	WB – L	B (0.03)	12		B (0.03)	14	
	WB – R	A (0.03)	9	1	B (0.03)	11	1
	NB – T	A (0.11)	0	1	A (0.26)	0	1
	NB – R	A (0.00)	0	0	A (0.01)	0	0
	SB – L	A (0.00)	8	0	A (0.02)	8	0
	SB – T	A (0.15)	0	0	A (0.12)	0	0

The estimated future total traffic volumes (future background traffic volumes plus current site generated traffic volumes and previously approved development proposal traffic volumes) are illustrated in **Figure 21**, and were analyzed using Synchro 10 software. The detailed calculations are provided in **Appendix G** and summarized in **Table 12**.

Table 12 – 2031 Future Total Levels of Service

Intersection	Key Movement	Weekday AM Peak Hour			Weekday PM Peak Hour		
		LOS (v/c)	Delay (s)	95 th Queue	LOS (v/c)	Delay (s)	95 th Queue
County Road 27 / Mapleview Drive (signalized)	Overall	B (0.67)	17		B (0.71)	19	
	EB – L	B (0.17)	18	12	C (0.42)	24	18
	EB – TR	C (0.67)	33	57	C (0.60)	29	64
	WB – L	C (0.35)	23	15	B (0.14)	17	9
	WB – T	C (0.42)	27	36	C (0.71)	34	74
	WB – R	A (0.36)	6	11	A (0.39)	5	13
	NB – L	A (0.04)	9	5	B (0.11)	10	12
	NB – T	B (0.17)	13	20	B (0.28)	16	36
	NB – R	A (0.05)	0	0	A (0.12)	2	4
	SB – L	A (0.34)	11	27	B (0.37)	13	29
Mapleview Drive / Essa Road (Signalized)	Overall	C (0.88)	34		D (0.93)	36	
	EB – L	C (0.33)	28	32	D (0.73)	49	34
	EB – TR	D (0.87)	40	120	C (0.62)	31	72
	WB – L	C (0.51)	31	17	D (0.76)	43	50
	WB – T	C (0.23)	20	28	D (0.86)	40	116
	WB – R	A (0.11)	2	4	B (0.55)	16	50
	NB – L	B (0.27)	15	11	B (0.42)	20	13
	NB – T	D (0.88)	42	186	D (0.91)	44	206
	NB – R	A (0.26)	8	19	A (0.22)	6	15
	SB – L	C (0.68)	28	38	D (0.70)	39	27
Essa Road / Mabern Street (Signalized)	Overall	A (0.52)	9		A (0.65)	9	
	EB – L	C (0.41)	21	25	C (0.32)	22	18
	EB – R	A (0.23)	6	9	A (0.19)	7	7
	NB – L	A (0.06)	5	4	A (0.20)	6	10
	NB – T	A (0.46)	7	55	A (0.65)	10	111
	SB – T	A (0.52)	8	67	A (0.55)	7	71
	SB – R	A (0.05)	3	4	A (0.11)	2	7
Essa Road / Salem Road (Roundabout)	EB – LTR	0.15	NA	NA	0.08	NA	NA
	WB – LTR	0.08	NA	NA	0.29	NA	NA
	NB – LTR	0.75	NA	NA	0.84	NA	NA
	SB – LTR	0.83	NA	NA	0.79	NA	NA
County Road 27 / Salem Road (unsignalized)	EB – LTR	B (0.00)	15	0	A (0.00)	10	0
	WB – LTR	B (0.05)	10	1	B (0.02)	13	6
	NB – LTR	A (0.00)	0	0	A (0.00)	0	0
	SB – LTR	A (0.03)	1	1	A (0.03)	1	1
County Road 27 / Mabern Street (unsignalized)	WB – L	B (0.11)	14		C (0.09)	19	
	WB – R	A (0.10)	10	3	B (0.11)	12	2
	NB – T	A (0.14)	0	3	A (0.31)	0	3
	NB – R	A (0.02)	0	0	A (0.04)	0	0
	SB – L	A (0.03)	8	1	A (0.06)	9	2
	SB – T	A (0.18)	0	0	A (0.14)	0	0
County Road 27 / Commercial Access (unsignalized)	WB – LR	B (0.01)	12		C (0.07)	15	
	NB – T	B (0.18)	0	0	A (0.33)	0	2
	NB – R	A (0.00)	0	0	A (0.01)	0	0
	SB – L	A (0.00)	8	0	A (0.01)	9	0
	SB – T	A (0.20)	0	0	A (0.17)	0	0

2021 Horizon Assessment Findings

The analysis indicates that, under the 2021 future total conditions, all of the intersections considered are expected to operate at acceptable levels of service. The delays and volume-to-capacity ratios (v/c) are expected to be marginally higher or similar to the 2021 future background conditions. **Table 13** summarizes the potential intersection improvements.

Table 13 – 2021 Potential Intersection Improvements

Intersection	Improvement Description
County Road 27 / Mapleview Drive (signalized)	No physical improvements or signal timing modifications are required
Mapleview Drive / Essa Road (Signalized)	- No physical improvements are required - Add 10 seconds advance green arrow to the eastbound left turn and increase total cycle length from 83 seconds to 93 seconds
Essa Road / Mabern Street (Signalized)	- Provide traffic signals and use the same exist signal timing plan as the Mapleview Drive/Essa Road intersection - Exclusive northbound left turn (30 m storage), southbound right turn (15 m storage) and eastbound left turn (30 m storage)
Essa Road / Salem Road (Roundabout)	Roundabout configurations as recommended in the Salem Road EA
County Road 27 / Salem Road (unsignalized)	Similar configurations as recommended in the Salem Road EA
County Road 27 / Mabern Street (unsignalized)	- Stop sign on Mabern Street westbound - Exclusive northbound right turn (15 m storage), southbound right turn (15 m storage) and eastbound left turn (15 m storage)

2031 Horizon Assessment Findings

The analysis indicates that, under the 2031 future total conditions, all of the intersections considered are expected to operate at acceptable levels of service. The delays and volume-to-capacity ratios (v/c) are expected to be marginally higher than the 2031 future background traffic conditions. **Table 14** summarizes the potential intersection improvements.

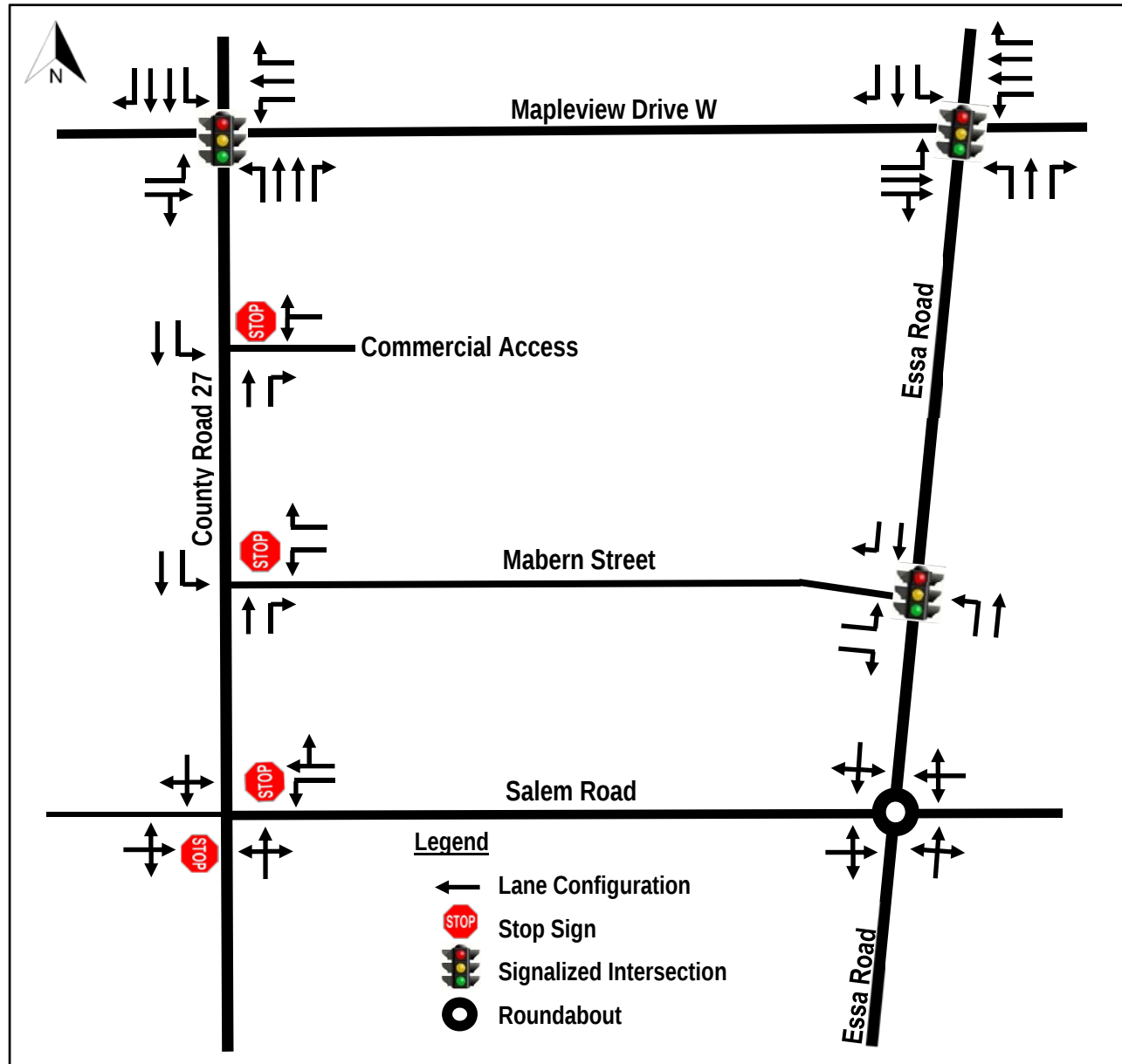
Table 14 – 2031 Potential Intersection Improvements

Intersection	Improvement Description
County Road 27 / Mapleview Drive (signalized)	No physical improvements or signal timing modifications are required
Mapleview Drive / Essa Road (Signalized)	- No physical improvements are required - Add minimum 7 seconds advance green arrow to all left turn movements and increase total cycle length from 83 seconds to 96 seconds
Essa Road / Mabern Street (Signalized)	- Provide traffic signals and use the same exist signal timing plan as the Mapleview Drive/Essa Road intersection - Exclusive northbound left turn (30 m storage), southbound right turn (15 m storage) and eastbound left turn (30 m storage)
Essa Road / Salem Road (Roundabout)	Roundabout configurations as recommended in the Salem Road EA
County Road 27 / Salem Road (unsignalized)	Similar configurations as recommended in the Salem Road EA
County Road 27 / Mabern Street (unsignalized)	- Stop sign on Mabern Street westbound - Exclusive northbound right turn (15 m storage), southbound right turn (15 m storage) and eastbound left turn (15 m storage)
County Road 27 / Commercial Access (unsignalized)	Exclusive northbound right turn (15 m storage) and southbound right turn (15 m storage)

6.1.1. Potential Intersection Improvements

Figure 22 illustrates the potential intersection lane configurations. It should be noted that, based on the analysis findings, the proposed development is only responsible for the improvements at the Mabern Street/County Road 27 intersection and County Road 27/Proposed Commercial Driveway intersection. Other improvements are required by the proposed buildout of the Salem Secondary Plan.

Figure 22 – Potential Intersection Lane Configurations



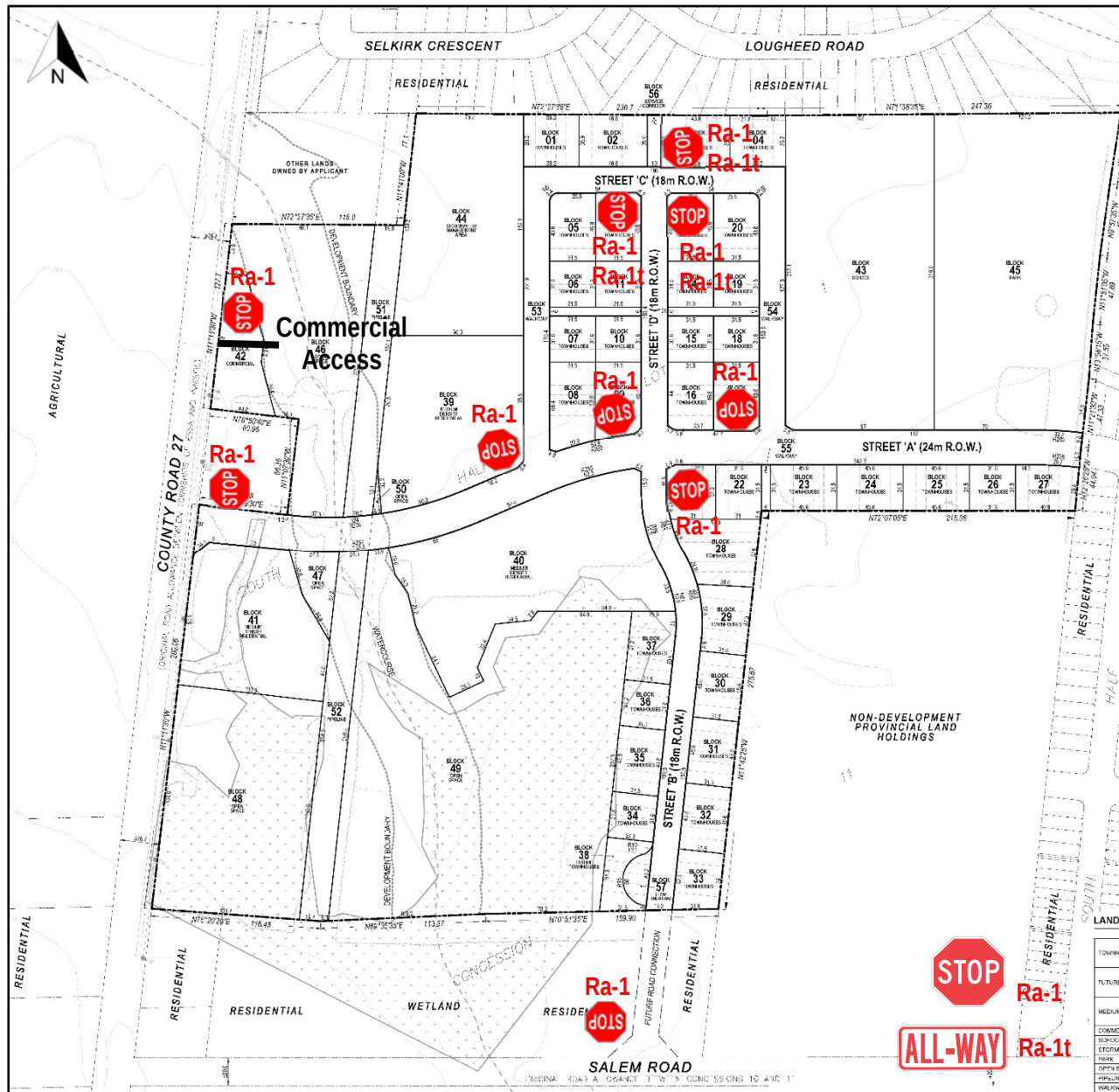
6.1.2. Traffic Signal Warrant Analysis for the Essa Road/Mabern Street Intersection

Traffic signal warrant analysis has been conducted for the Essa Road/Mabern Street intersection for both 2021 and 2031 horizon (**Appendix F**). The analysis indicates that traffic signals are not numerically warranted based combined traffic volumes, but warranted based on traffic crossing major street under both horizons. Although traffic signals are not numerically warranted, it is our opinion that traffic signals should be installed at this intersection beyond the 2021 horizon to facilitate safe pedestrian and cyclist crossing the intersection, as well as the turning movements and potentially reduce speeding on Essa Road.

6.1.3. Internal Road Intersection Traffic Controls

The proposed internal road intersection lane configurations and traffic control are illustrated in **Figure 23**, based on the forecast traffic volumes and intersection functionality. It should be noted that these intersection lane configurations and traffic controls can be further reviewed and fine-tuned in the subsequent phase of the proposed development.

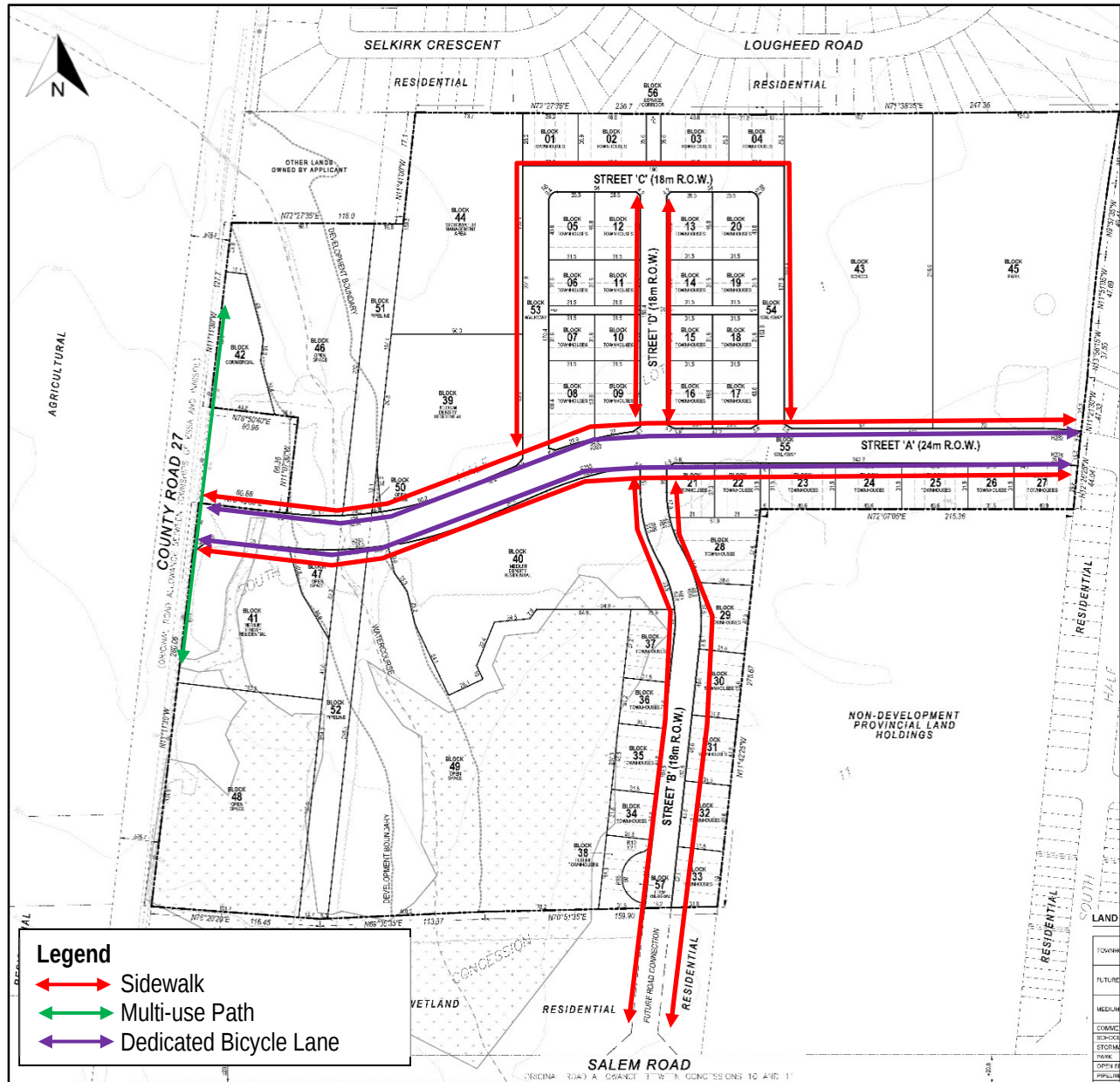
Figure 23 – Internal Road Intersection Traffic Controls



6.2. Active Transportation Network for the Proposed Development

The communities within the Salem Secondary Plan Area will be developed based on a modified grid street system and related off-street pathway system, designed to provide for a full range of transportation options with a focus on maximizing the potential for transit service and active transportation. **Figure 24** illustrates the proposed active transportation network based on the principles outlined in the Salem Secondary Plan Area, Salem Transportation Plan, the City of Barrie's Multi-Modal Active Transportation Master Plan, as well as Nextrans' review of the proposed development context.

Figure 24 – Proposed Active Transportation Network for the Proposed Development



6.3. Transit Mode Assessment

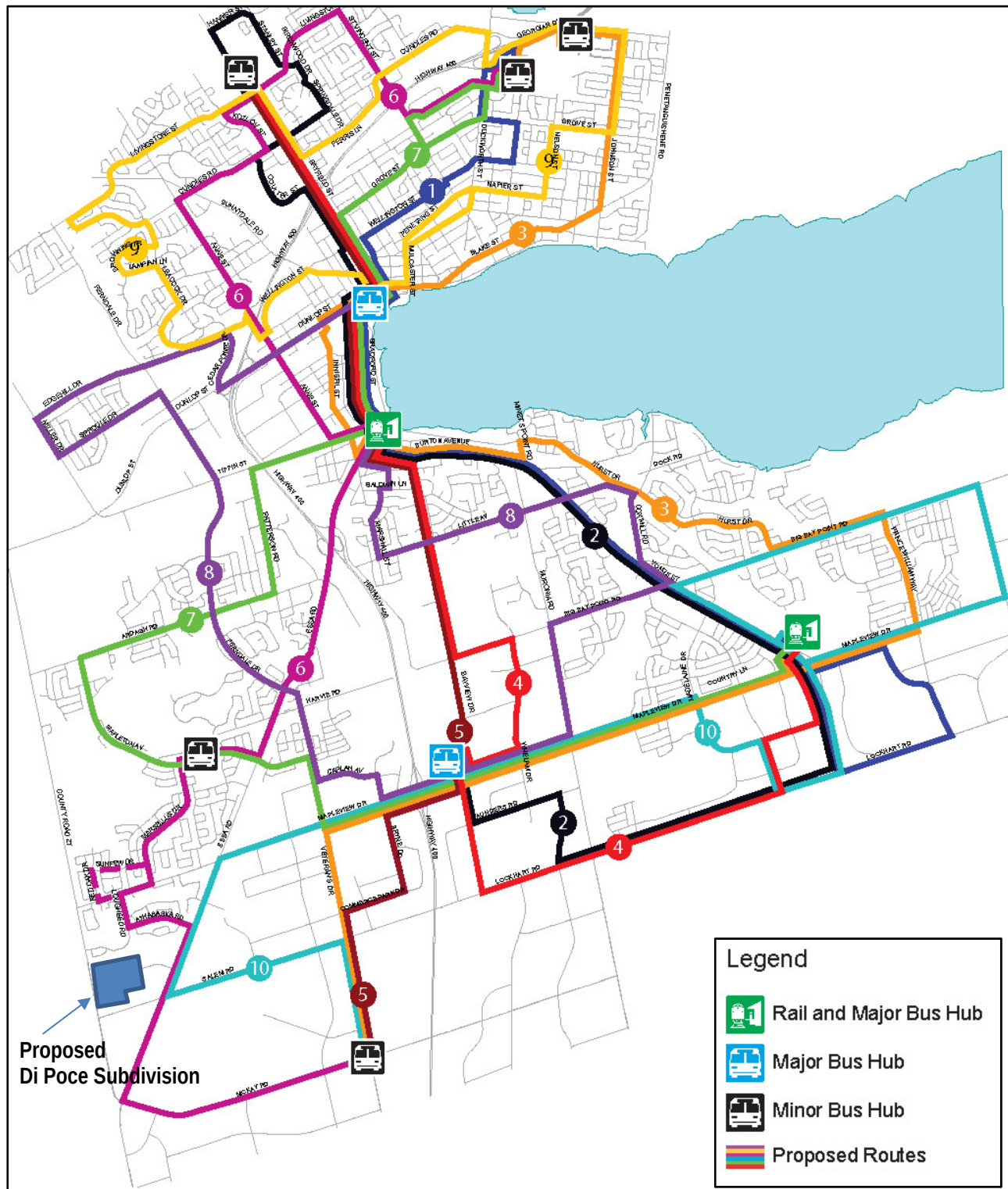
As indicated in Section 2.3 of the Study, currently, there is no transit route serving the area in the vicinity of the proposed development. The closest bus routes are Route 7 (Bell Farm/Bear Creek) and Route 8 (RVH/Yonge and Crosstown/Essa). Route 7 generally runs in the east-west to north-south direction, connecting Park Place and Georgian College. Similarly, Route 8 generally runs in the east-west to north-south direction, connecting Barrie South GO Train Station and Livingstone and Bayfield area. The service frequency for both routes are approximately 30 minutes during the peak periods.

Currently, the GO Train service on the Toronto-Barrie line is serving two GO Train Stations in Barrie. The service connects Barrie to the GTA and terminates at Toronto's Union Station. GO Bus services also operate from the Barrie bus terminal to the Newmarket Bus Terminal with stops at the Allandale Waterfront GO Train Station and Barrie South GO Train Station. Passengers can transfer to other GO Transit services or York Region Transit (YRT) / Viva buses at the Newmarket Bus Terminal on Eagle Street.

In the future with the Metrolinx Regional Express Rail (RER) projects, the Toronto-Barrie line will see all day service with 15 minutes frequency during the peak periods. This service will provide an attractive option for commuters from Barrie to other areas in the GTA, and vice versa.

Figure 25 illustrates the 2031 transit route network concept excerpt from the City of Barrie's Multi-Modal Active Transportation Master Plan (MATMP).

Figure 25 – 2031 Transit Route Network Concept Excerpt from Barrie's MATMP



Based on our review of the 2031 Transit Route Network Concept excerpt from the City of Barrie's Multi-Modal Active Transportation Master Plan, we strongly encourage the City of Barrie to review the extension of existing Route 8 to McKay Road to service the Salem Secondary Plan Area in the interim. More specifically to service the proposed Di Poce and Crisdawn subdivisions. The implementation of the proposed new Routes 5, 6 and 10 is also important to service the full buildout of the Salem Secondary Plan Area.

Various Cities in Canada are starting to test autonomous vehicles to provide the last mile services for the residents. This could be an option for the City to consider in the future to promote and encourage more sustainable mode of transportation such as public transit.

7.0 TRANSPORTATION DEMAND MANAGEMENT

Transportation Demand Management (TDM) is a co-ordinated series of actions aimed at maximizing the people moving capability of the transportation system. It is intended help reduce single-occupant auto use. Potential TDM measures may include but not limited to: TDM supportive land use, bicycle and pedestrian programs and facilities, public transit improvements, preferential treatments for buses and high occupancy vehicles (if applicable), ridesharing, and employee incentives.

Based on the review of the principles outlined in the Salem Secondary Plan Area, Salem Transportation Plan, the City of Barrie's Multi-Modal Active Transportation Master Plan, as well as Nextrans' review of the proposed development context; the following TDM measures and incentives are recommended for the proposed development:

- Provide sidewalks along all internal streets within the proposed Di Poce subdivision;
- Provide dedicated bicycle lanes on Mabern Street from County Road 27 to the easterly limit of the proposed subdivision;
- Provide multi-use path along the east side of County Road 27 connecting the proposed medium density blocks south of Mabern Street to the proposed retail/commercial block. This multi-use path will also provide access for the residents from the proposed subdivision to bike/walk to the proposed retail/commercial block;

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1. Study Conclusions

The findings and conclusions of the analysis are as follows:

- The proposed Phase 1 development is expected to generate 103 new two-way auto trips (19 inbound and 84 outbound) during the weekday morning peak hour and 121 new two-way trips (66 inbound and 55 outbound) during the afternoon peak hour. The proposed development is also expected to generate 5 new two-way transit/active mode trips (1 inbound and 4 outbound) and 7 new two-way transit/active mode trips (4 inbound and 3 outbound) during the morning and afternoon peak hours, respectively.
- The remainder phase of the proposed development is expected to generate 335 new two-way auto trips (154 inbound and 181 outbound) during the weekday morning peak hour and 245 new two-way trips (136 inbound and 109 outbound) during the afternoon peak hour. The proposed development is also expected to generate 57 new two-way transit/active mode trips (30 inbound and 27 outbound) and 21 new two-way transit/active mode trips (11 inbound and 10 outbound) during the morning and afternoon peak hours, respectively.
- The analysis indicates that, under the existing conditions, all of the intersections considered are currently operating at acceptable levels of service. The eastbound left turn at the Mapleview Drive W/Essa Road intersection is currently operating at a slightly higher level of service, however, an eastbound advance phase can be added to the existing signal timing plan to correct this. Nextrans will recommend some potential signal timing optimization measures under the future background and future total conditions for this intersection.

- The analysis indicates that, under the 2021 and 2031 future background conditions, all of the intersections considered are expected to operate at acceptable levels of service. The delays and volume-to-capacity ratios (v/c) are expected to be higher than the existing conditions. Some of the mitigation measures include signal timing optimizations at the Mapleview Drive/Essa Road intersection, along with the proposed improvements identified in the Salem Secondary Plan Transportation Improvements Environmental Study Report (Stantec, October 12, 2017) and by other adjacent proposed developments within the Salem Secondary Plan Area.
- The analysis indicates that, under the 2021 and 2031 future total conditions, all of the intersections considered are expected to operate at acceptable levels of service. The delays and volume-to-capacity ratios (v/c) are expected to be higher than the 2021 and 2031 future background conditions, respectively. Similarly, some of the mitigation measures include signal timing optimizations at the Mapleview Drive/Essa Road intersection, along with the proposed improvements identified in the Salem Secondary Plan Transportation Improvements Environmental Study Report (Stantec, October 12, 2017) and by other adjacent proposed developments within the Salem Secondary Plan Area.
- Traffic signal warrant analysis has been conducted for the Essa Road/Mabern Street intersection for both 2021 and 2031 horizon. Although traffic signals are not numerically warranted, it is our opinion that traffic signals should be installed at this intersection beyond the 2021 horizon to facilitate safe pedestrian and cyclist crossing the intersection, as well as the turning movements and potentially reduce speeding on Essa Road.
- The potential road network improvements include:

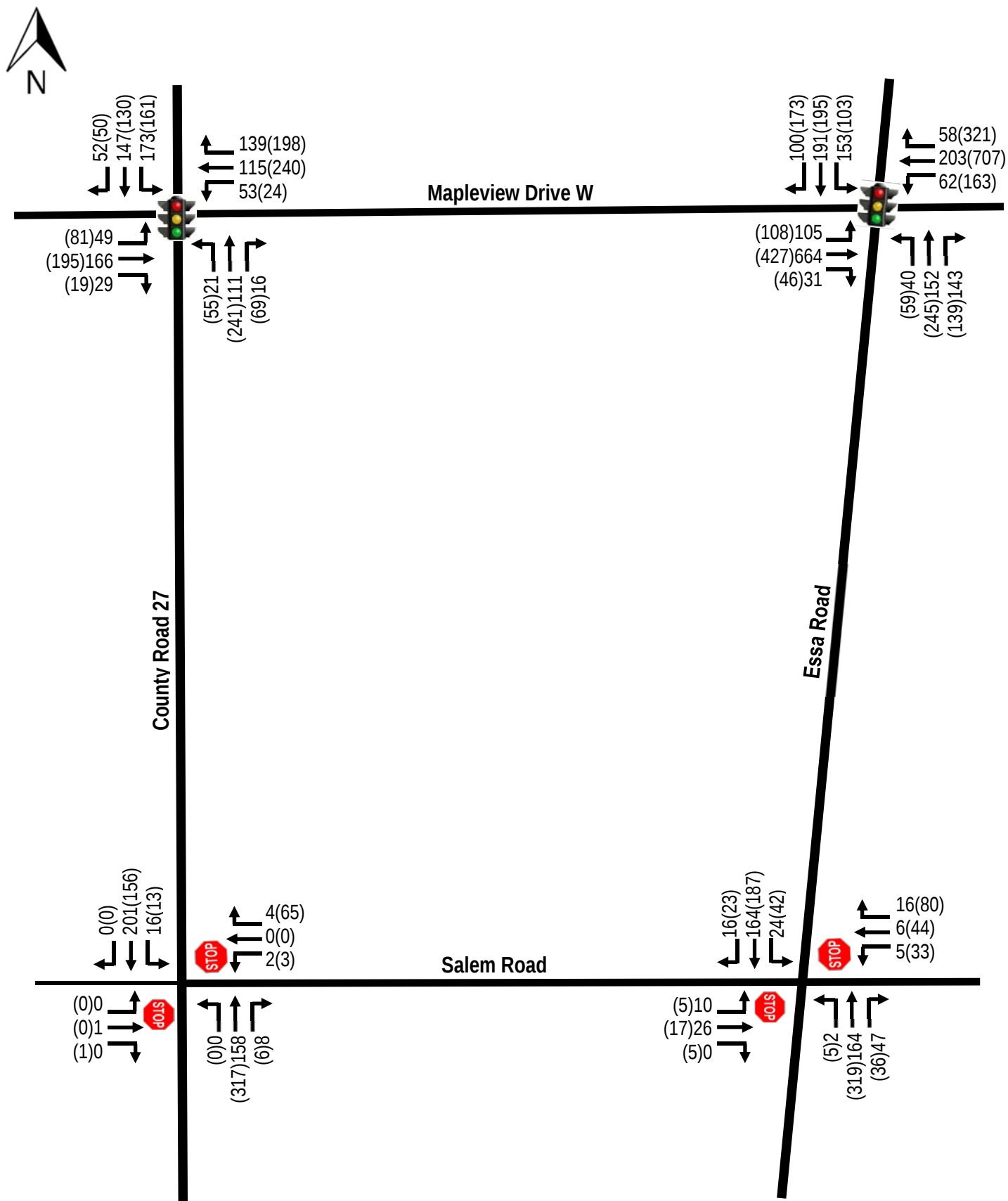
Intersection	Improvement Description
County Road 27 / Mapleview Drive (signalized)	• No physical improvements or signal timing modifications are required
Mapleview Drive / Essa Road (Signalized)	• No physical improvements are required • Add minimum 7 seconds advance green arrow to all left turn movements and increase total cycle length from 83 seconds to 96 seconds
Essa Road / Mabern Street (Signalized)	• Provide traffic signals and use the same exist signal timing plan as the Mapleview Drive/Essa Road intersection • Exclusive northbound left turn (30 m storage), southbound right turn (15 m storage) and eastbound left turn (30 m storage)
Essa Road / Salem Road (Roundabout)	• Roundabout configurations as recommended in the Salem Road EA
County Road 27 / Salem Road (unsignalized)	• Similar configurations as recommended in the Salem Road EA
County Road 27 / Mabern Street (unsignalized)	• Stop sign on Mabern Street westbound • Exclusive northbound right turn (15 m storage), southbound right turn (15 m storage) and eastbound left turn (15 m storage)
County Road 27 / Commercial Access (unsignalized)	• Stop sign at the access westbound • Exclusive northbound right turn (15 m storage) and southbound right turn (15 m storage)

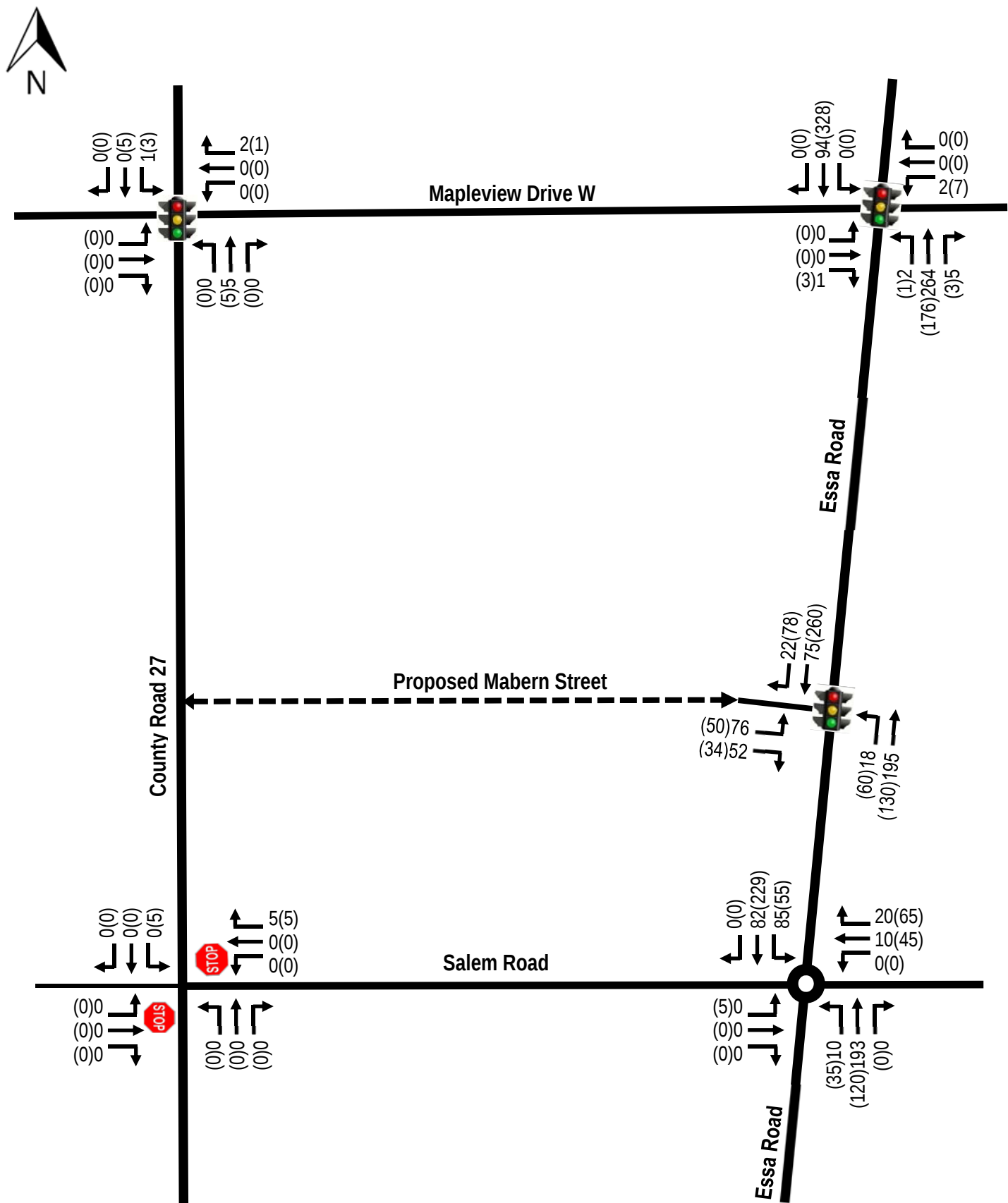
8.2. Study Recommendations

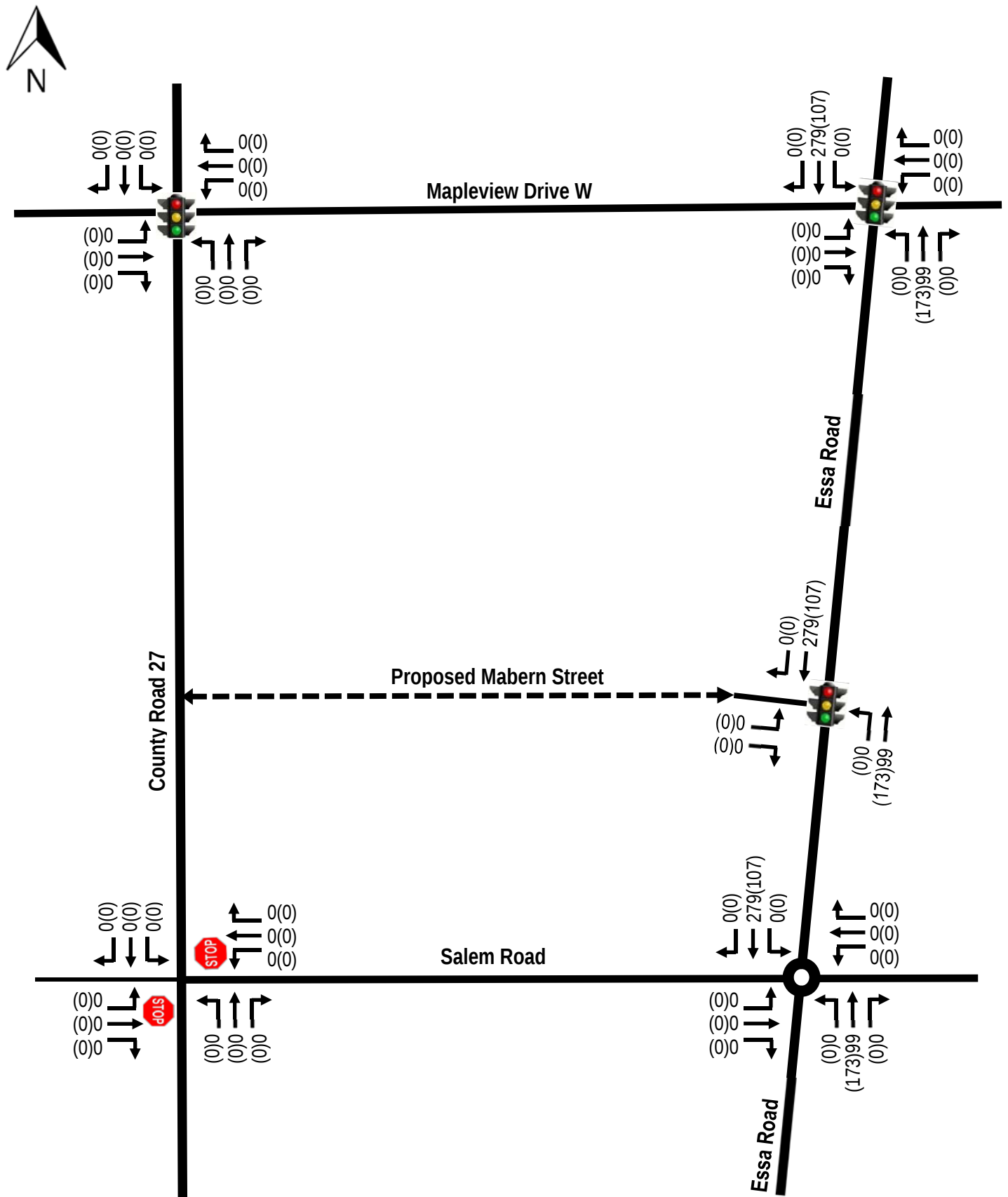
Based on the assessment, our report recommends that:

- The proposed development considers implement the TDM measures identified in this Study to support active transportation and transit, to meet the objectives and requirements of the Salem Secondary Plan Area.
- The proposed development considers implement the active transportation network identified in this Study;

- The proposed development considers implement the intersection lane configurations and traffic control as identified in the Study;
 - o County Road 27 / Mabern Street - Stop sign on Mabern Street westbound, exclusive northbound right turn (15 m storage), southbound right turn (15 m storage) and eastbound left turn (15 m storage);
 - o County Road 27/Commercial Access - Stop sign at the access westbound, exclusive northbound right turn (15 m storage) and southbound right turn (15 m storage)
- The City of Barrie considers the extension of existing Route 8 to service the Salem Secondary Plan Area in the interim and proposed new Routes 5, 6 and 10 to service the full buildout of the Salem Secondary Plan in the future.



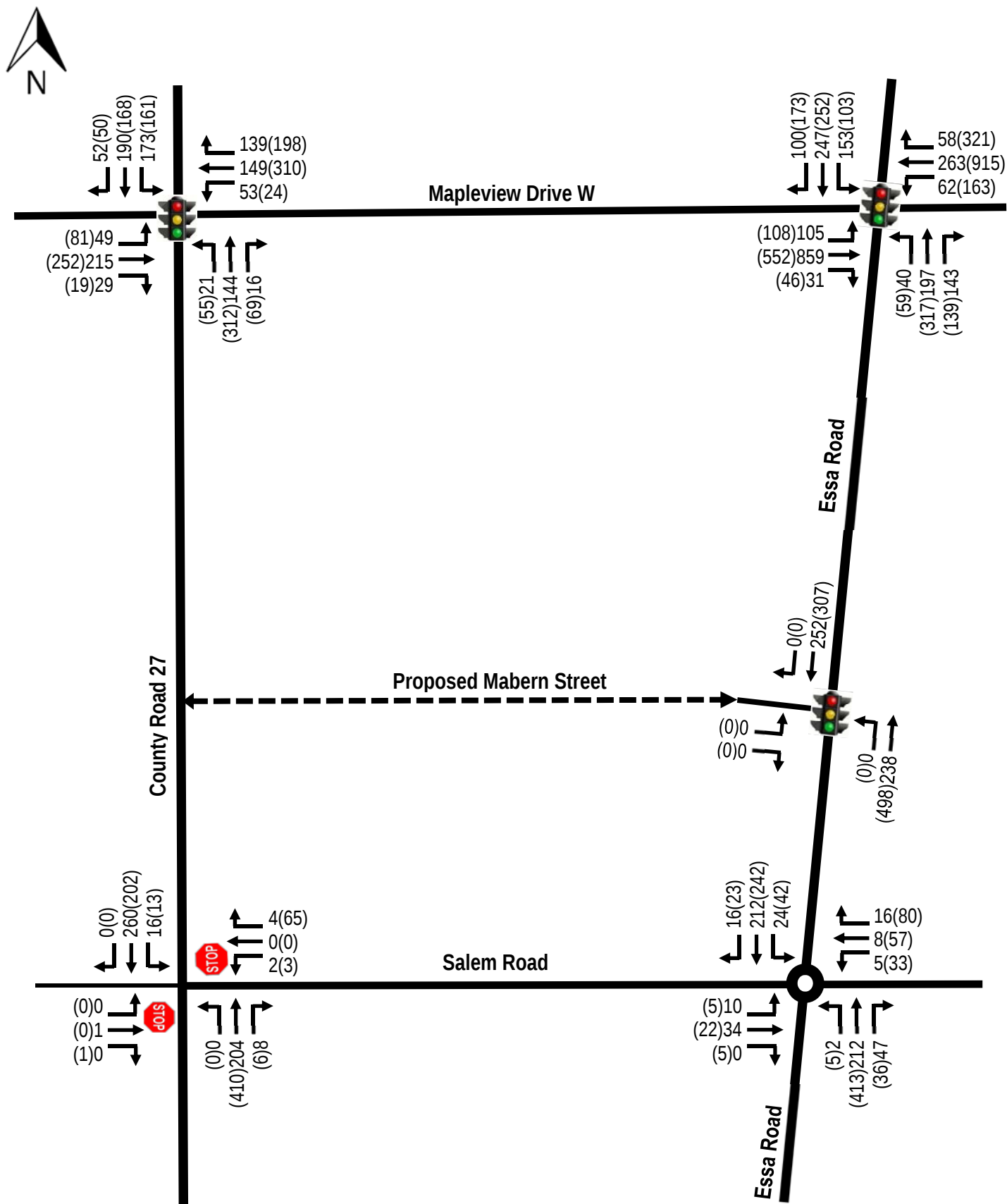


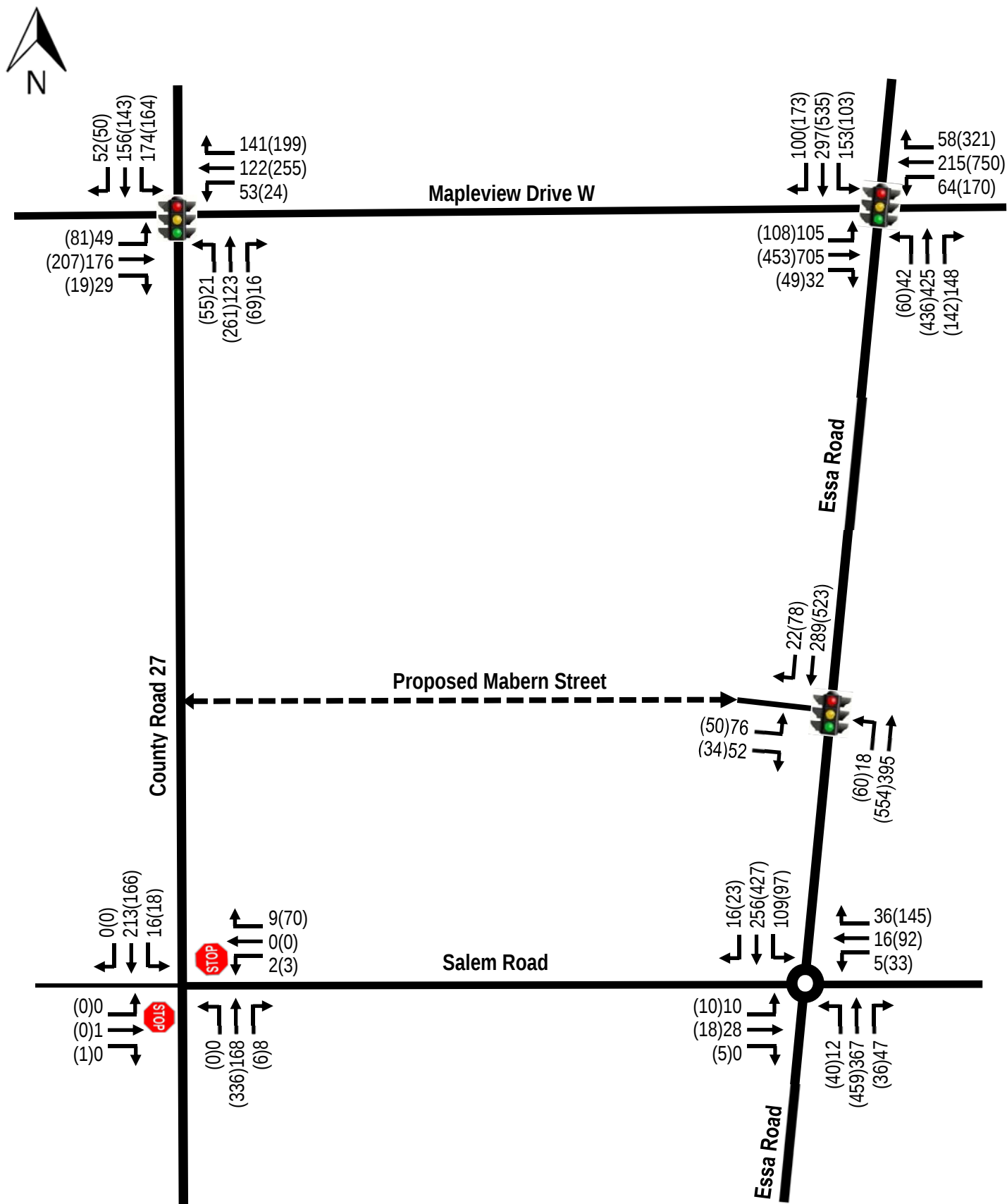


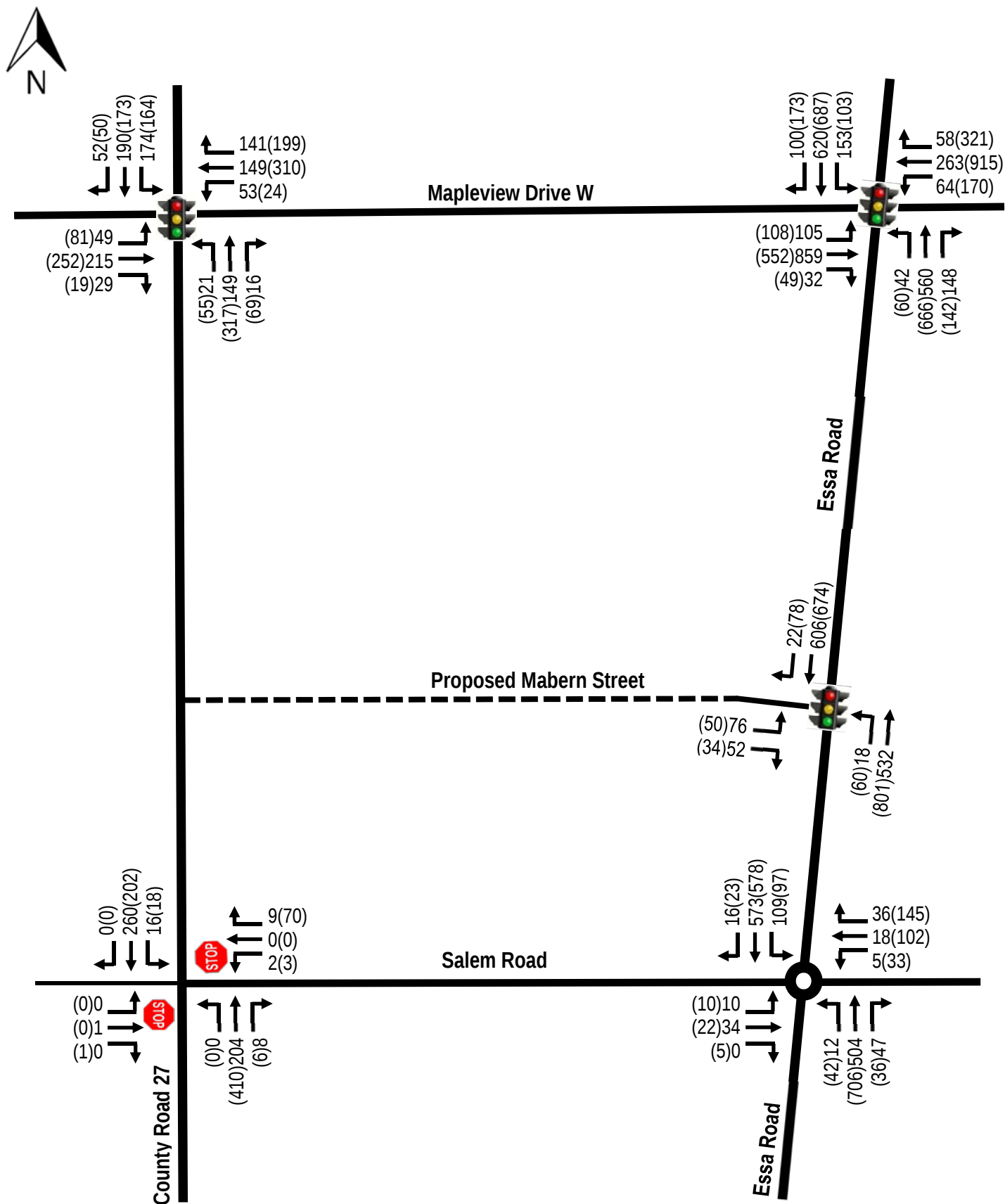
2031 Background Developments

1. Watersand Draft Plans
2. H&H Capital Draft Plans









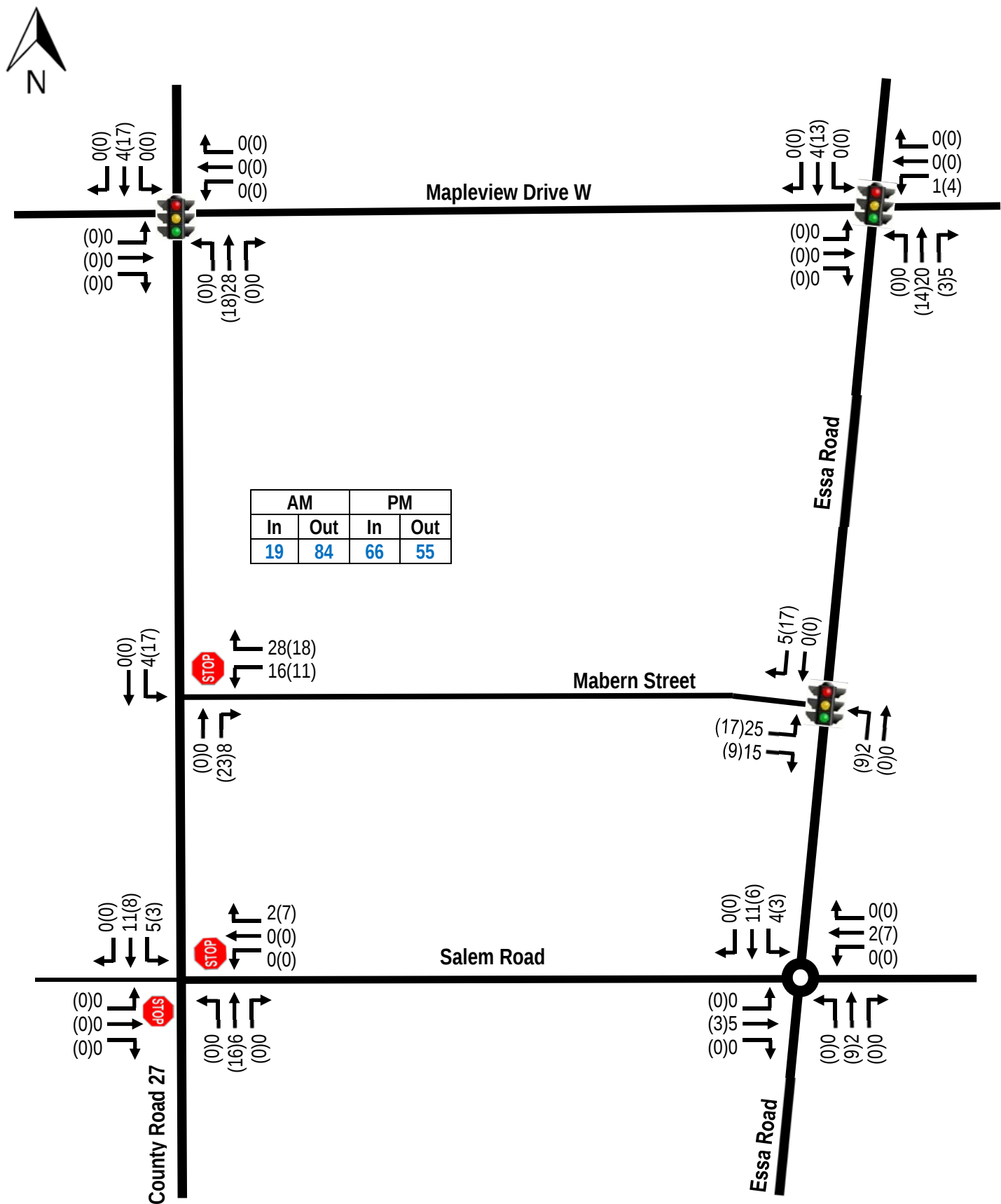
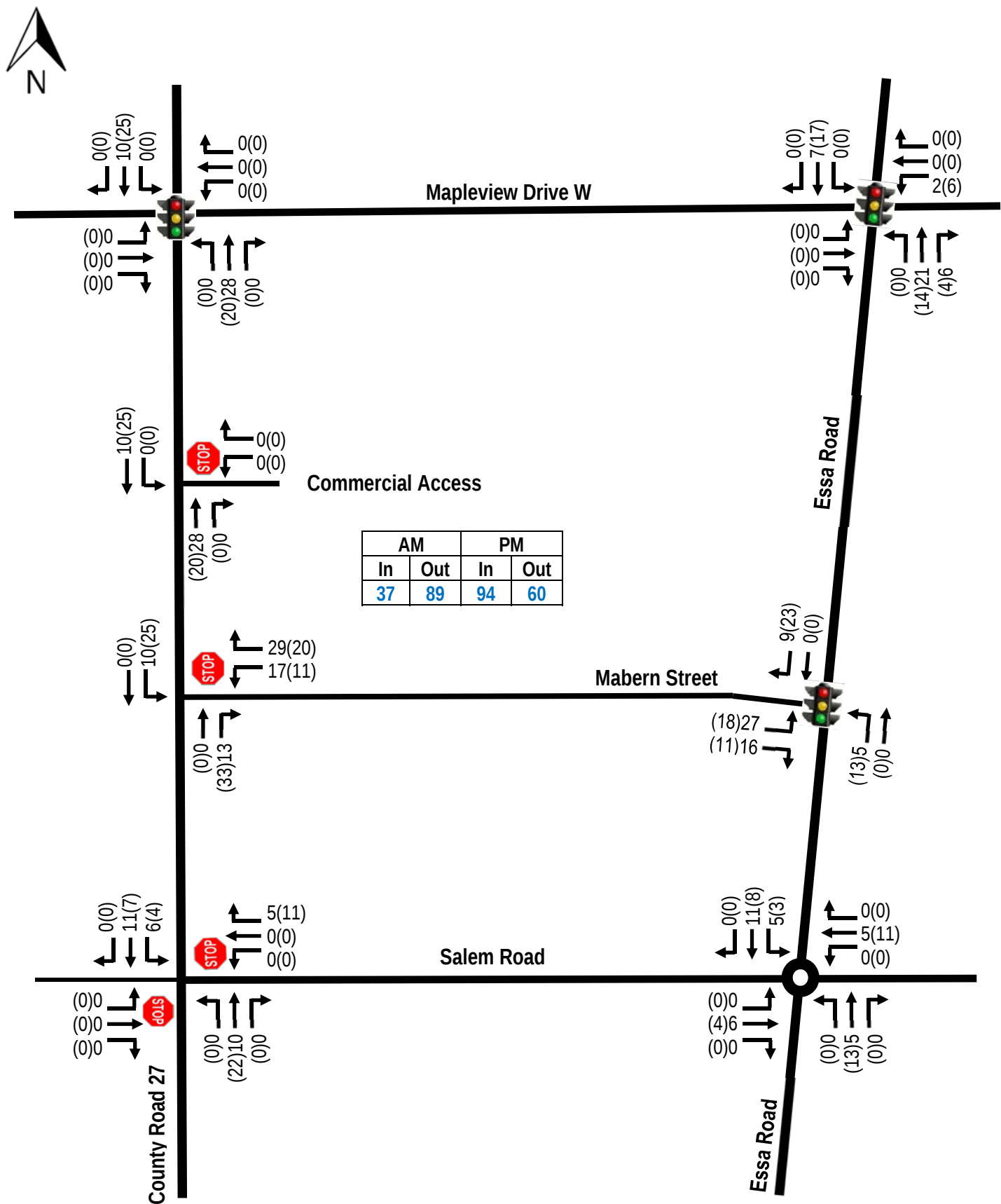
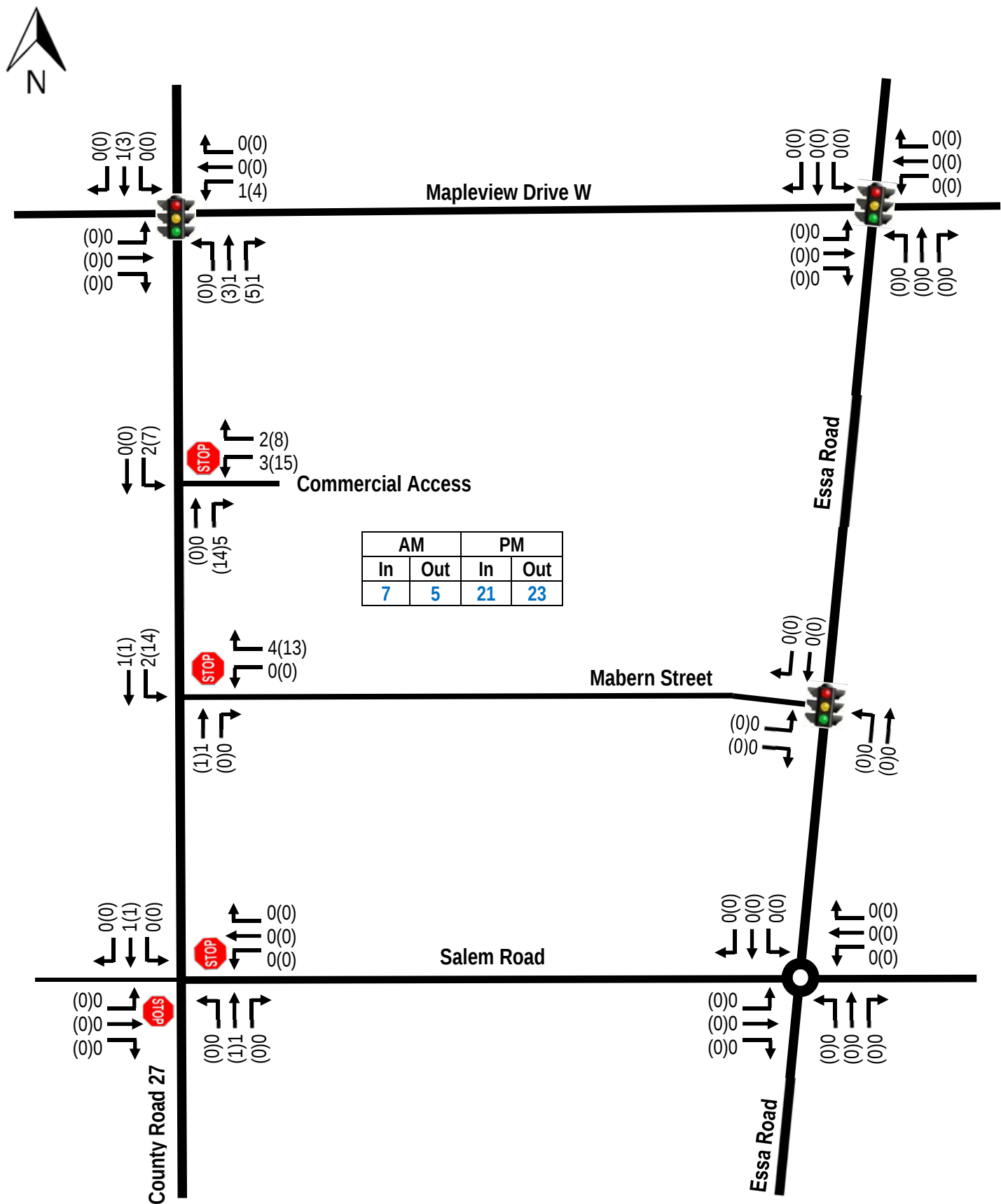
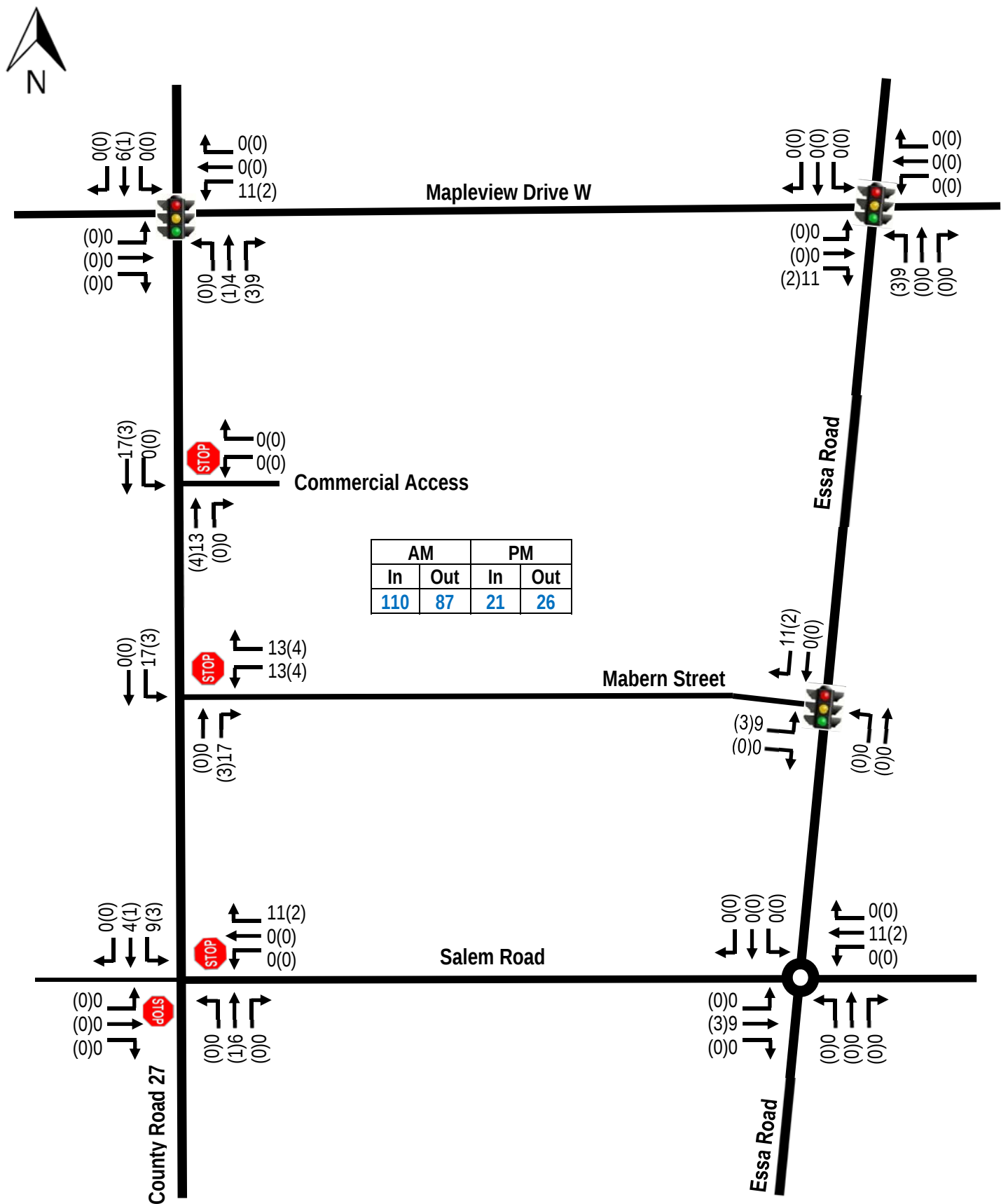
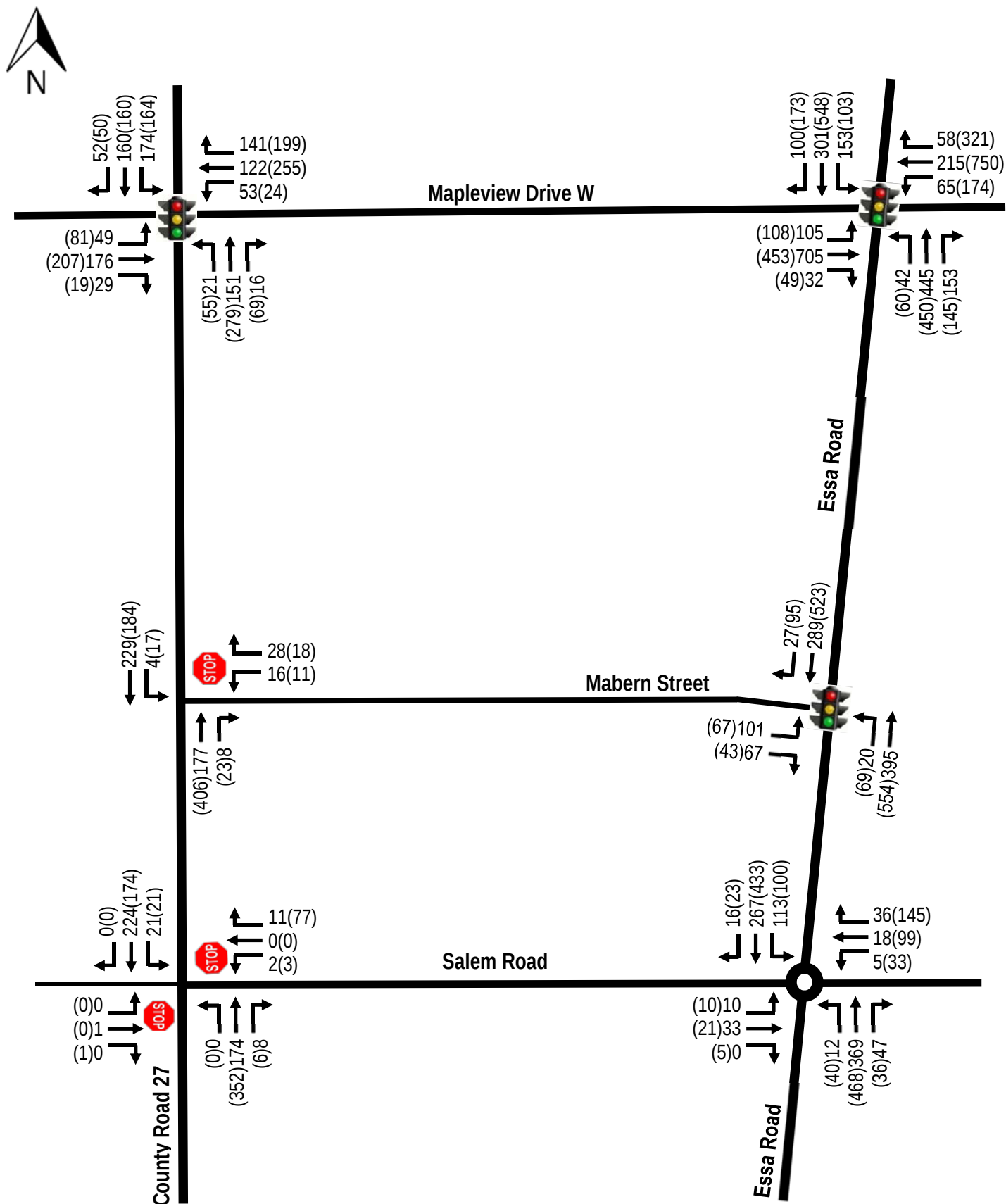


Figure 16
Phase 1 Site Traffic Volumes
(Di Poce Residential)











Appendix A

Existing Traffic Data and Signal Timing Plans

August 28, 2018

File: T07-SI

Mr. Bilawejian
520 Industrial Parkway South
Unit 201
Aurora, ON L4G 6W8

Dear Mr. Bilawejian,

RE: Traffic Signal Timings – Mapleview Drive at Essa Road

With respect to your inquiry on August 28th, 2018, the above intersection traffic signal timings are as follows:

Roadway	Direction	Vehicular Indications				Pedestrian Indications	
		Minimum Green	Maximum Green	Amber	All Red	Walk	Flashing Don't Walk
Essa Rd (Main Street)	Advanced Southbound Left Turn	7	10	3	1	N/A	N/A
Essa Rd (Main Street)	Southbound/ Northbound	30	30	5	2	13	17
Mapleview Dr. (Side Street)	Advanced Eastbound/ Westbound Left Turn	7	10	3	1	N/A	N/A
Mapleview Dr. (Side Street)	Westbound/ Eastbound	12	30	4	2	11	17

NOTE: All times are recorded in seconds, based on full demand.

The side street phases are actuated; meaning a vehicle or pedestrian must be present on the side street before the side street is given a green indication. Actuation at this intersection occurs in two ways: first, for vehicles a loop detector is imbedded into the roadway at the painted stop bar; and secondly, pushbuttons are located on each corner for pedestrians to activate their movement. Vehicle presence only on the side street would result in a possible green time of between the minimum and maximum times noted above, depending on demand.

Pedestrian "Walk" and "Flashing Don't Walk" times on the side street as noted would be used in the event that the pedestrian push button was activated. Should there be no demand on the actuated phases; the signals would rest in a green indication for the main street.

Should you require any further information please feel free to contact me at (705) 739-4220 ext. 4284.

Yours truly,

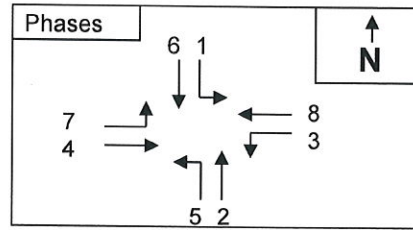
THE CITY OF BARRIE



Tyler Martin
Traffic Systems Operator

Traffic Signal Timing Plan

Intersection: County Road 27 & Mapleview Drive / 25th Sideroad
Town/City: Barrie (Simcoe County)
Date: 27-Jan-15



Startup of signals to be set to flashing Amber on County Road 27 (north/south) and flashing Red on Mapleview Drive/25th Sideroad (east/west).

Signal Operation	County Road 27 Advanced Left Southbound	County Road 27 Northbound	Mapleview Drive Advanced Left Westbound	25th Sideroad Eastbound	County Road 27 Advanced Left Northbound	County Road 27 Southbound	25th Sideroad Advanced Left Eastbound	Mapleview Drive Westbound
Phase #	1	2	3	4	5	6	7	8
Minimum Green	7	22	5	7	7	22	5	7
Extension	--	--	--	3	--	--	--	3
Maximum Green	7	33	5	24	7	33	5	24
Amber Clearance	3	4.6	3	3.7	3	4.6	3	3.7
All Red	1	1.9	1	3.1	1	1.9	1	3.1
Walk	--	9	--	14	--	9	--	14
Ped Clearance (FDW)	--	19	--	27	--	19	--	27

Minimum Cycle Length: 53.3 seconds
Maximum Cycle Length without Pedestrian Actuation: 70.3 seconds
Maximum Cycle Length with Pedestrian Actuation: 100.4 seconds

- Notes: -Signals operate under semi-actuated control (loop detectors and/or video detection on Mapleview Drive/25th Sideroad)
-Rest in Green for North/South
-Advanced left-turn phases only provided upon actuation
-Pedestrian phases only provided upon pushbutton actuation
-5 second delay to be used on right-turn lane loops on 10th Sideroad
-Amber Clearance and All Red from MTO Book 12



Turning Movement Count (3 . MAPLEVIEW RD & ESSA RD)

Start Time	N Approach ESSA RD						E Approach MAPLEVIEW RD						S Approach ESSA RD						W Approach MAPLEVIEW RD						Int. Total (15 min)	Int. Total (1 hr)	
	Right N:W	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	U-Turn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	U-Turn W:W	Peds W:	Approach Total			
07:00:00	20	33	21	0	2	74	8	40	15	0	0	63	19	27	8	0	1	54	2	103	9	0	0	114	305		
07:15:00	11	31	27	0	0	69	9	53	14	0	0	76	24	33	8	0	4	65	5	108	8	0	0	121	331		
07:30:00	29	50	45	0	1	124	11	51	8	0	1	70	32	25	11	0	0	68	7	177	29	0	0	213	475		
07:45:00	32	48	50	0	2	130	11	50	23	0	0	84	35	39	12	0	0	86	10	202	23	0	0	235	535	1646	
08:00:00	21	45	29	0	0	95	19	48	19	0	1	86	42	47	11	0	0	100	9	136	25	0	0	170	451	1792	
08:15:00	18	48	29	0	1	95	17	54	12	0	0	83	34	41	6	0	3	81	5	149	28	0	0	182	441	1902	
08:30:00	27	48	35	0	0	110	16	44	11	0	1	71	49	42	10	0	2	101	6	134	24	1	1	165	447	1874	
08:45:00	15	36	39	0	0	90	21	45	12	0	0	78	34	55	10	0	3	99	8	138	22	0	0	168	435	1774	
09:00:00	19	26	28	0	1	73	10	49	19	0	1	78	27	25	4	0	1	56	7	107	22	0	2	136	343	1666	
09:15:00	12	26	33	0	0	71	21	59	15	0	0	95	27	26	10	0	0	63	4	98	18	0	2	120	349	1574	
09:30:00	16	35	32	0	0	83	16	68	8	0	0	92	31	32	5	0	0	68	5	96	21	0	0	122	365	1492	
09:45:00	20	26	28	0	0	74	17	65	12	0	0	94	31	37	6	0	0	74	5	121	17	0	0	143	385	1442	
BREAK																											
16:00:00	28	59	43	0	1	130	69	143	31	0	0	243	30	62	12	0	0	104	8	86	25	0	0	119	596		
16:15:00	31	57	38	0	3	126	67	177	29	0	0	273	33	46	12	0	0	91	7	114	22	0	2	143	633		
16:30:00	26	48	28	0	2	102	76	177	22	0	0	275	40	62	9	0	0	111	9	111	19	0	1	139	627		
16:45:00	37	52	21	0	0	110	68	156	46	0	1	270	30	53	17	0	0	100	15	107	29	0	2	151	631	2487	
17:00:00	42	37	31	0	1	110	98	197	40	0	0	335	37	76	13	0	0	126	12	94	24	0	4	130	701	2592	
17:15:00	51	55	14	0	0	120	77	189	45	1	0	312	31	67	18	0	0	116	10	126	29	0	1	165	713	2672	
17:30:00	43	51	37	0	1	131	78	165	32	0	0	275	41	49	11	0	0	101	9	100	26	0	3	135	642	2687	
17:45:00	43	49	26	0	1	118	58	162	22	0	1	242	29	51	16	0	0	96	9	113	26	0	0	148	604	2660	
18:00:00	26	30	36	0	0	92	58	169	26	0	0	253	33	49	23	0	2	105	7	88	21	0	0	116	566	2525	
18:15:00	28	32	31	0	0	91	65	172	22	0	0	259	25	40	8	0	0	73	6	120	24	0	0	150	573	2385	
18:30:00	26	29	22	0	0	77	47	148	26	0	0	221	22	43	10	0	3	75	10	102	23	0	0	135	508	2251	
18:45:00	26	37	26	0	0	89	44	125	24	0	0	193	29	44	17	0	0	90	10	111	25	0	0	146	518	2165	
Grand Total	647	988	749	0	16	2384	981	2606	533	1	6	4121	765	1071	267	0	19	2103	185	2841	539	1	18	3566	12174	-	
Approach%	27.1%	41.4%	31.4%	0%		-	23.8%	63.2%	12.9%	0%		-	36.4%	50.9%	12.7%	0%		-	5.2%	79.7%	15.1%	0%		-	-	-	
Totals %	5.3%	8.1%	6.2%	0%		19.6%	8.1%	21.4%	4.4%	0%		33.9%	6.3%	8.8%	2.2%	0%		17.3%	1.5%	23.3%	4.4%	0%		29.3%	-	-	
Heavy	19	32	26	0		-	25	65	38	0		-	51	21	15	0		-	12	46	12	0		-	-	-	
Heavy %	2.9%	3.2%	3.5%	0%		-	2.5%	2.5%	7.1%	0%		-	6.7%	2%	5.6%	0%		-	6.5%	1.6%	2.2%	0%		-	-	-	
Bicycles	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	
Bicycle %	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	



Turning Movement Count
Location Name: MAPLEVIEW RD & ESSA RD
Date: Thu, Sep 13, 2018 Deployment Lead: Theo Daglis

NexTrans
4261-A14 Highway 7 East
Suite 489
Markham ON, CANADA, L3R 9W6



Peak Hour: 07:30 AM - 08:30 AM Weather: Partly Cloudy (14.8 °C)

Start Time	N Approach ESSA RD						E Approach MAPLEVIEW RD						S Approach ESSA RD						W Approach MAPLEVIEW RD						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
07:30:00	29	50	45	0	1	124	11	51	8	0	1	70	32	25	11	0	0	68	7	177	29	0	0	213	475
07:45:00	32	48	50	0	2	130	11	50	23	0	0	84	35	39	12	0	0	86	10	202	23	0	0	235	535
08:00:00	21	45	29	0	0	95	19	48	19	0	1	86	42	47	11	0	0	100	9	136	25	0	0	170	451
08:15:00	18	48	29	0	1	95	17	54	12	0	0	83	34	41	6	0	3	81	5	149	28	0	0	182	441
Grand Total	100	191	153	0	4	444	58	203	62	0	2	323	143	152	40	0	3	335	31	664	105	0	0	800	1902
Approach%	22.5%	43%	34.5%	0%		-	18%	62.8%	19.2%	0%		-	42.7%	45.4%	11.9%	0%		-	3.9%	83%	13.1%	0%		-	-
Totals %	5.3%	10%	8%	0%		23.3%	3%	10.7%	3.3%	0%		17%	7.5%	8%	2.1%	0%		17.6%	1.6%	34.9%	5.5%	0%		42.1%	-
PHF	0.78	0.96	0.77	0		0.85	0.76	0.94	0.67	0		0.94	0.85	0.81	0.83	0		0.84	0.78	0.82	0.91	0		0.85	-
Heavy	6	8	4	0		18	5	23	8	0		36	15	4	8	0		27	5	7	1	0		13	-
Heavy %	6%	4.2%	2.6%	0%		4.1%	8.6%	11.3%	12.9%	0%		11.1%	10.5%	2.6%	20%	0%		8.1%	16.1%	1.1%	1%	0%		1.6%	-
Lights	94	183	149	0		426	53	180	54	0		287	128	148	32	0		308	26	657	104	0		787	-
Lights %	94%	95.8%	97.4%	0%		95.9%	91.4%	88.7%	87.1%	0%		88.9%	89.5%	97.4%	80%	0%		91.9%	83.9%	98.9%	99%	0%		98.4%	-
Single-Unit Trucks	3	1	2	0		6	2	13	3	0		18	4	0	5	0		9	2	5	0	0		7	-
Single-Unit Trucks %	3%	0.5%	1.3%	0%		1.4%	3.4%	6.4%	4.8%	0%		5.6%	2.8%	0%	12.5%	0%		2.7%	6.5%	0.8%	0%	0%		0.9%	-
Buses	3	4	2	0		9	2	7	5	0		14	6	3	2	0		11	3	0	1	0		4	-
Buses %	3%	2.1%	1.3%	0%		2%	3.4%	3.4%	8.1%	0%		4.3%	4.2%	2%	5%	0%		3.3%	9.7%	0%	1%	0%		0.5%	-
Articulated Trucks	0	3	0	0		3	1	3	0	0		4	5	1	1	0		7	0	2	0	0		2	-
Articulated Trucks %	0%	1.6%	0%	0%		0.7%	1.7%	1.5%	0%	0%		1.2%	3.5%	0.7%	2.5%	0%		2.1%	0%	0.3%	0%	0%		0.3%	-
Bicycles on Road	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	-
Bicycles on Road %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	-
Pedestrians	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	3	-	-	-	-	-	0	-	-
Pedestrians%	-	-	-	-	22.2%	-	-	-	-	-	0%	-	-	-	-	-	33.3%	-	-	-	-	-	0%	-	-
Bicycles on Crosswalk	-	-	-	-	2	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	-	22.2%	-	-	-	-	-	22.2%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-



Peak Hour: 04:45 PM - 05:45 PM Weather: Clear (24.3 °C)

Start Time	N Approach ESSA RD						E Approach MAPLEVIEW RD						S Approach ESSA RD						W Approach MAPLEVIEW RD						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
16:45:00	37	52	21	0	0	110	68	156	46	0	1	270	30	53	17	0	0	100	15	107	29	0	2	151	631
17:00:00	42	37	31	0	1	110	98	197	40	0	0	335	37	76	13	0	0	126	12	94	24	0	4	130	701
17:15:00	51	55	14	0	0	120	77	189	45	1	0	312	31	67	18	0	0	116	10	126	29	0	1	165	713
17:30:00	43	51	37	0	1	131	78	165	32	0	0	275	41	49	11	0	0	101	9	100	26	0	3	135	642
Grand Total	173	195	103	0	2	471	321	707	163	1	1	1192	139	245	59	0	0	443	46	427	108	0	10	581	2687
Approach%	36.7%	41.4%	21.9%	0%	-	-	26.9%	59.3%	13.7%	0.1%	-	-	31.4%	55.3%	13.3%	0%	-	-	7.9%	73.5%	18.6%	0%	-	-	-
Totals %	6.4%	7.3%	3.8%	0%	-	17.5%	11.9%	26.3%	6.1%	0%	-	44.4%	5.2%	9.1%	2.2%	0%	-	16.5%	1.7%	15.9%	4%	0%	-	21.6%	-
PHF	0.85	0.89	0.7	0	-	0.9	0.82	0.9	0.89	0.25	-	0.89	0.85	0.81	0.82	0	-	0.88	0.77	0.85	0.93	0	-	0.88	-
Heavy	1	4	3	0	-	8	2	4	4	0	-	10	6	1	0	0	-	7	0	8	4	0	-	12	-
Heavy %	0.6%	2.1%	2.9%	0%	-	1.7%	0.6%	0.6%	2.5%	0%	-	0.8%	4.3%	0.4%	0%	0%	-	1.6%	0%	1.9%	3.7%	0%	-	2.1%	-
Lights	171	191	100	0	-	462	319	703	159	1	-	1182	133	243	59	0	-	435	46	419	104	0	-	569	-
Lights %	98.8%	97.9%	97.1%	0%	-	98.1%	99.4%	99.4%	97.5%	100%	-	99.2%	95.7%	99.2%	100%	0%	-	98.2%	100%	98.1%	96.3%	0%	-	97.9%	-
Single-Unit Trucks	0	3	2	0	-	5	0	4	1	0	-	5	4	1	0	0	-	5	0	5	2	0	-	7	-
Single-Unit Trucks %	0%	1.5%	1.9%	0%	-	1.1%	0%	0.6%	0.6%	0%	-	0.4%	2.9%	0.4%	0%	0%	-	1.1%	0%	1.2%	1.9%	0%	-	1.2%	-
Buses	0	0	1	0	-	1	2	0	3	0	-	5	2	0	0	0	-	2	0	3	1	0	-	4	-
Buses %	0%	0%	1%	0%	-	0.2%	0.6%	0%	1.8%	0%	-	0.4%	1.4%	0%	0%	0%	-	0.5%	0%	0.7%	0.9%	0%	-	0.7%	-
Articulated Trucks	1	1	0	0	-	2	0	0	0	0	-	0	0	0	0	0	-	0	0	0	1	0	-	1	-
Articulated Trucks %	0.6%	0.5%	0%	0%	-	0.4%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0.9%	0%	-	0.2%	-
Bicycles on Road	1	0	0	0	-	1	0	0	0	0	-	0	0	1	0	0	-	1	0	0	0	0	-	0	-
Bicycles on Road %	0.6%	0%	0%	0%	-	0.2%	0%	0%	0%	0%	-	0%	0%	0.4%	0%	0%	-	0.2%	0%	0%	0%	0%	-	0%	-
Pedestrians	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	10	-	-
Pedestrians%	-	-	-	-	15.4%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	76.9%	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	-	0%	-	-	-	-	-	7.7%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-

Peak Hour: 07:30 AM - 08:30 AM Weather: Partly Cloudy (14.8 °C)



Peak Hour: 04:45 PM - 05:45 PM Weather: Clear (24.3 °C)





Turning Movement Count (4 . MAPLEVIEW RD / SIDE RD 25 & COUNTRY RD 27)

Start Time	N Approach COUNTRY RD 27						E Approach MAPLEVIEW RD						S Approach COUNTRY RD 27						W Approach SIDE RD 25						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	U-Turn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	U-Turn W:W	Peds W:	Approach Total		
07:00:00	12	26	13	0	0	51	19	23	10	0	0	52	1	28	4	0	0	33	1	20	7	0	0	28	164	
07:15:00	10	29	23	0	0	62	13	38	9	0	0	60	3	32	3	0	0	38	3	42	4	0	0	49	209	
07:30:00	8	36	32	0	0	76	34	43	15	0	1	92	1	34	4	0	0	39	6	45	13	0	0	64	271	
07:45:00	21	51	72	0	0	144	52	29	11	0	0	92	7	46	6	0	0	59	9	45	24	0	0	78	373	1017
08:00:00	19	29	30	0	0	78	26	23	14	0	0	63	4	18	5	0	0	27	7	30	9	0	0	46	214	1067
08:15:00	4	31	39	1	0	75	27	20	13	0	0	60	4	13	6	0	0	23	7	46	3	0	0	56	214	1072
08:30:00	7	32	41	0	0	80	26	18	7	0	1	51	6	22	3	0	0	31	4	42	6	0	0	52	214	1015
08:45:00	7	42	35	0	0	84	23	23	15	0	0	61	3	17	4	0	0	24	7	42	7	0	0	56	225	867
09:00:00	4	27	27	0	0	58	19	20	10	0	0	49	4	23	0	0	0	27	5	32	7	0	0	44	178	831
09:15:00	6	32	28	0	0	66	25	27	7	0	0	59	4	17	0	0	0	21	4	38	7	0	0	49	195	812
09:30:00	8	30	36	0	0	74	22	24	6	0	0	52	6	22	4	0	0	32	2	32	6	0	0	40	198	796
09:45:00	8	21	29	0	0	58	16	22	5	0	0	43	5	18	2	0	0	25	2	29	4	0	0	35	161	732

BREAK

16:00:00	14	25	37	0	0	76	47	50	10	0	0	107	17	44	9	0	0	70	5	57	17	0	0	79	332	
16:15:00	6	33	33	0	0	72	53	47	5	0	0	105	17	46	7	0	0	70	6	66	12	0	0	84	331	
16:30:00	9	31	43	0	0	83	45	62	6	0	0	113	10	54	10	0	0	74	1	46	29	0	0	76	346	
16:45:00	7	31	33	0	0	71	31	48	3	0	0	82	22	57	14	0	0	93	11	60	22	0	0	93	339	1348
17:00:00	13	34	41	0	0	88	70	69	12	0	0	151	23	72	16	0	0	111	5	49	14	0	0	68	418	1434
17:15:00	21	34	44	0	0	99	52	61	3	0	0	116	14	58	15	0	0	87	2	40	16	0	0	58	360	1463
17:30:00	10	25	35	0	0	70	55	65	4	0	0	124	18	63	12	0	0	93	7	37	8	1	0	53	340	1457
17:45:00	13	30	31	0	0	74	44	54	5	0	0	103	25	35	10	0	0	70	5	47	9	0	0	61	308	1426
18:00:00	6	19	28	0	1	53	44	48	3	0	0	95	14	46	8	0	0	68	1	35	7	0	0	43	259	1267
18:15:00	18	10	22	0	0	50	45	48	4	0	0	97	11	42	5	0	0	58	5	47	8	0	0	60	265	1172
18:30:00	15	15	36	0	0	66	37	53	4	0	0	94	4	24	5	0	0	33	8	25	0	0	0	33	226	1058
18:45:00	10	17	30	0	0	57	36	44	2	0	0	82	7	29	6	0	0	42	3	42	4	0	0	49	230	980
Grand Total	256	690	818	1	1	1765	861	959	183	0	2	2003	230	860	158	0	0	1248	116	994	243	1	0	1354	6370	-

Approach%	14.5%	39.1%	46.3%	0.1%	-	43%	47.9%	9.1%	0%	-	18.4%	68.9%	12.7%	0%	-	8.6%	73.4%	17.9%	0.1%	-	-	-
Totals %	4%	10.8%	12.8%	0%	27.7%	13.5%	15.1%	2.9%	0%	31.4%	3.6%	13.5%	2.5%	0%	19.6%	1.8%	15.6%	3.8%	0%	21.3%	-	-
Heavy	11	44	28	0	-	55	16	18	0	-	8	61	5	0	-	5	16	9	0	-	-	-
Heavy %	4.3%	6.4%	3.4%	0%	-	6.4%	1.7%	9.8%	0%	-	3.5%	7.1%	3.2%	0%	-	4.3%	1.6%	3.7%	0%	-	-	-
Bicycles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycle %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Turning Movement Count
Location Name: MAPLEVIEW RD / SIDE RD 25 & COUNTRY RD 27
Date: Thu, Sep 13, 2018 Deployment Lead: Theo Daglis

NexTrans
4261-A14 Highway 7 East
Suite 489
Markham ON, CANADA, L3R 9W6



Peak Hour: 07:30 AM - 08:30 AM Weather: Partly Cloudy (14.8 °C)

Start Time	N Approach COUNTRY RD 27						E Approach MAPLEVIEW RD						S Approach COUNTRY RD 27						W Approach SIDE RD 25						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
07:30:00	8	36	32	0	0	76	34	43	15	0	1	92	1	34	4	0	0	39	6	45	13	0	0	64	271
07:45:00	21	51	72	0	0	144	52	29	11	0	0	92	7	46	6	0	0	59	9	45	24	0	0	78	373
08:00:00	19	29	30	0	0	78	26	23	14	0	0	63	4	18	5	0	0	27	7	30	9	0	0	46	214
08:15:00	4	31	39	1	0	75	27	20	13	0	0	60	4	13	6	0	0	23	7	46	3	0	0	56	214
Grand Total	52	147	173	1	0	373	139	115	53	0	1	307	16	111	21	0	0	148	29	166	49	0	0	244	1072
Approach%	13.9%	39.4%	46.4%	0.3%	-	-	45.3%	37.5%	17.3%	0%	-	-	10.8%	75%	14.2%	0%	-	-	11.9%	68%	20.1%	0%	-	-	-
Totals %	4.9%	13.7%	16.1%	0.1%	-	34.8%	13%	10.7%	4.9%	0%	-	28.6%	1.5%	10.4%	2%	0%	-	13.8%	2.7%	15.5%	4.6%	0%	-	22.8%	-
PHF	0.62	0.72	0.6	0.25	-	0.65	0.67	0.67	0.88	0	-	0.83	0.57	0.6	0.88	0	-	0.63	0.81	0.9	0.51	0	-	0.78	-
Heavy	8	12	6	0	-	26	18	5	5	0	-	28	3	12	1	0	-	16	3	2	3	0	-	8	-
Heavy %	15.4%	8.2%	3.5%	0%	-	7%	12.9%	4.3%	9.4%	0%	-	9.1%	18.8%	10.8%	4.8%	0%	-	10.8%	10.3%	1.2%	6.1%	0%	-	3.3%	-
Lights	44	135	167	1	-	347	121	110	48	0	-	279	13	99	20	0	-	132	26	164	46	0	-	236	-
Lights %	84.6%	91.8%	96.5%	100%	-	93%	87.1%	95.7%	90.6%	0%	-	90.9%	81.3%	89.2%	95.2%	0%	-	89.2%	89.7%	98.8%	93.9%	0%	-	96.7%	-
Single-Unit Trucks	0	8	1	0	-	9	6	2	4	0	-	12	3	8	1	0	-	12	1	1	0	0	-	2	-
Single-Unit Trucks %	0%	5.4%	0.6%	0%	-	2.4%	4.3%	1.7%	7.5%	0%	-	3.9%	18.8%	7.2%	4.8%	0%	-	8.1%	3.4%	0.6%	0%	0%	-	0.8%	-
Buses	8	4	5	0	-	17	9	2	1	0	-	12	0	3	0	0	-	3	2	1	3	0	-	6	-
Buses %	15.4%	2.7%	2.9%	0%	-	4.6%	6.5%	1.7%	1.9%	0%	-	3.9%	0%	2.7%	0%	0%	-	2%	6.9%	0.6%	6.1%	0%	-	2.5%	-
Articulated Trucks	0	0	0	0	-	0	3	1	0	0	-	4	0	1	0	0	-	1	0	0	0	0	-	0	-
Articulated Trucks %	0%	0%	0%	0%	-	0%	2.2%	0.9%	0%	0%	-	1.3%	0%	0.9%	0%	0%	-	0.7%	0%	0%	0%	0%	-	0%	-
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	-
Bicycles on Road %	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Pedestrians%	-	-	-	-	0%	-	-	-	-	-	100%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-



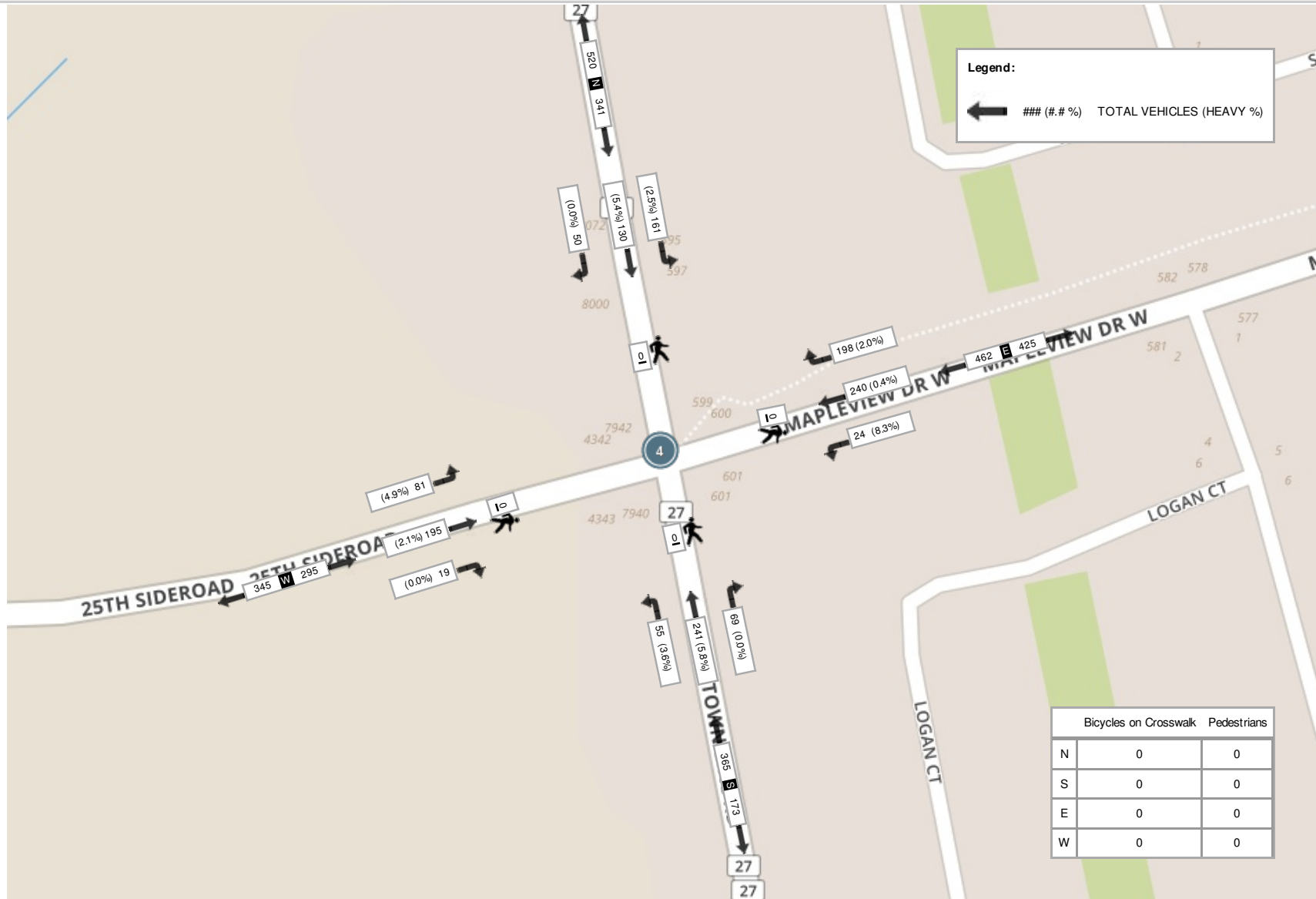
Peak Hour: 04:30 PM - 05:30 PM Weather: Clear (24.3 °C)

Start Time	N Approach COUNTRY RD 27						E Approach MAPLEVIEW RD						S Approach COUNTRY RD 27						W Approach SIDE RD 25						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
16:30:00	9	31	43	0	0	83	45	62	6	0	0	113	10	54	10	0	0	74	1	46	29	0	0	76	346
16:45:00	7	31	33	0	0	71	31	48	3	0	0	82	22	57	14	0	0	93	11	60	22	0	0	93	339
17:00:00	13	34	41	0	0	88	70	69	12	0	0	151	23	72	16	0	0	111	5	49	14	0	0	68	418
17:15:00	21	34	44	0	0	99	52	61	3	0	0	116	14	58	15	0	0	87	2	40	16	0	0	58	360
Grand Total	50	130	161	0	0	341	198	240	24	0	0	462	69	241	55	0	0	365	19	195	81	0	0	295	1463
Approach%	14.7%	38.1%	47.2%	0%		-	42.9%	51.9%	5.2%	0%		-	18.9%	66%	15.1%	0%		-	6.4%	66.1%	27.5%	0%		-	-
Totals %	3.4%	8.9%	11%	0%		23.3%	13.5%	16.4%	1.6%	0%		31.6%	4.7%	16.5%	3.8%	0%		24.9%	1.3%	13.3%	5.5%	0%		20.2%	-
PHF	0.6	0.96	0.91	0		0.86	0.71	0.87	0.5	0		0.76	0.75	0.84	0.86	0		0.82	0.43	0.81	0.7	0		0.79	-
Heavy	0	7	4	0		11	4	1	2	0		7	0	14	2	0		16	0	4	4	0		8	-
Heavy %	0%	5.4%	2.5%	0%		3.2%	2%	0.4%	8.3%	0%		1.5%	0%	5.8%	3.6%	0%		4.4%	0%	2.1%	4.9%	0%		2.7%	-
Lights	50	122	157	0		329	194	239	22	0		455	69	226	53	0		348	19	190	77	0		286	-
Lights %	100%	93.8%	97.5%	0%		96.5%	98%	99.6%	91.7%	0%		98.5%	100%	93.8%	96.4%	0%		95.3%	100%	97.4%	95.1%	0%		96.9%	-
Single-Unit Trucks	0	5	4	0		9	2	1	2	0		5	0	7	0	0		7	0	2	1	0		3	-
Single-Unit Trucks %	0%	3.8%	2.5%	0%		2.6%	1%	0.4%	8.3%	0%		1.1%	0%	2.9%	0%	0%		1.9%	0%	1%	1.2%	0%		1%	-
Buses	0	0	0	0		0	1	0	0	0		1	0	0	2	0		2	0	2	3	0		5	-
Buses %	0%	0%	0%	0%		0%	0.5%	0%	0%	0%		0.2%	0%	0%	3.6%	0%		0.5%	0%	1%	3.7%	0%		1.7%	-
Articulated Trucks	0	2	0	0		2	1	0	0	0		1	0	7	0	0		7	0	0	0	0		0	-
Articulated Trucks %	0%	1.5%	0%	0%		0.6%	0.5%	0%	0%	0%		0.2%	0%	2.9%	0%	0%		1.9%	0%	0%	0%	0%		0%	-
Bicycles on Road	0	1	0	0		1	0	0	0	0		0	0	1	0	0		1	0	1	0	0		1	-
Bicycles on Road %	0%	0.8%	0%	0%		0.3%	0%	0%	0%	0%		0%	0%	0.4%	0%	0%		0.3%	0%	0.5%	0%	0%		0.3%	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Pedestrians%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-

Peak Hour: 07:30 AM - 08:30 AM Weather: Partly Cloudy (14.8 °C)



Peak Hour: 04:30 PM - 05:30 PM Weather: Clear (24.3 °C)





Turning Movement Count (1 . ESSA RD & SALEM RD)

Start Time	N Approach ESSA RD						E Approach SALEM RD						S Approach ESSA RD						W Approach SALEM RD						Int. Total (15 min)	Int. Total (1 hr)	
	Right N:W	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	U-Turn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	U-Turn W:W	Peds W:	Approach Total			
07:00:00	3	48	6	0	0	57	4	1	3	1	0	9	2	31	3	0	0	36	0	3	1	0	0	4	106		
07:15:00	4	42	5	0	0	51	0	1	0	0	0	1	3	28	0	0	0	31	0	3	1	0	0	4	87		
07:30:00	3	47	11	0	0	61	2	0	2	0	0	4	3	36	0	0	0	39	0	5	1	0	0	6	110		
07:45:00	1	48	15	0	0	64	1	1	1	0	0	3	16	29	0	0	0	45	0	13	6	0	0	19	131	434	
08:00:00	3	48	3	0	0	54	0	0	0	0	0	0	18	49	0	0	0	67	0	8	1	0	0	9	130	458	
08:15:00	4	32	5	0	0	41	1	1	3	0	0	5	9	37	0	0	0	46	0	4	2	0	0	6	98	469	
08:30:00	4	35	6	0	0	45	9	1	1	0	0	11	12	42	0	0	0	54	0	5	3	0	0	8	118	477	
08:45:00	5	49	10	0	0	64	6	4	1	0	0	11	8	36	2	0	0	46	0	9	4	0	0	13	134	480	
09:00:00	4	29	8	0	0	41	4	3	2	0	0	9	3	25	4	0	0	32	6	2	3	0	0	11	93	443	
09:15:00	5	22	8	0	0	35	1	1	2	0	0	4	5	34	1	0	0	40	0	5	4	0	0	9	88	433	
09:30:00	6	32	3	0	0	41	0	0	2	0	0	2	4	39	1	0	0	44	0	6	3	0	0	9	96	411	
09:45:00	1	25	7	0	0	33	3	3	1	0	0	7	4	29	0	0	0	33	0	5	3	0	0	8	81	358	
BREAK																											
16:00:00	4	49	8	0	0	61	11	3	6	0	0	20	7	68	1	0	0	76	1	1	6	0	0	8	165		
16:15:00	4	46	4	0	0	54	16	5	11	0	0	32	8	63	0	0	0	71	1	2	3	0	0	6	163		
16:30:00	8	45	10	0	0	63	22	7	8	0	0	37	8	77	1	0	0	86	0	2	0	0	0	2	188		
16:45:00	3	49	13	0	0	65	19	8	6	0	0	33	14	81	1	0	0	96	4	7	3	0	0	14	208	724	
17:00:00	5	33	7	0	0	45	21	22	12	0	0	55	5	77	1	0	0	83	1	4	1	0	0	6	189	748	
17:15:00	7	60	12	0	0	79	18	7	7	0	0	32	9	84	2	0	0	95	0	4	1	0	0	5	211	796	
17:30:00	3	47	3	0	0	53	14	10	9	0	0	33	6	65	3	0	0	74	8	11	5	0	0	24	184	792	
17:45:00	3	35	12	0	0	50	8	6	8	0	0	22	5	69	2	0	0	76	3	2	4	0	0	9	157	741	
18:00:00	1	31	5	0	0	37	11	5	5	0	0	21	9	63	1	0	0	73	1	1	4	0	0	6	137	689	
18:15:00	4	28	4	0	0	36	14	1	3	0	0	18	5	40	1	0	0	46	0	3	1	0	0	4	104	582	
18:30:00	0	34	7	0	0	41	16	2	5	0	0	23	4	60	0	0	0	64	0	3	0	0	0	3	131	529	
18:45:00	0	20	13	0	0	33	12	2	5	0	0	19	10	44	0	0	0	54	0	3	3	0	0	6	112	484	
Grand Total	85	934	185	0	0	1204	213	94	103	1	0	411	177	1206	24	0	0	1407	25	111	63	0	0	199	3221	-	
Approach%	7.1%	77.6%	15.4%	0%		-	51.8%	22.9%	25.1%	0.2%		-	12.6%	85.7%	1.7%	0%		-	12.6%	55.8%	31.7%	0%		-	-	-	
Totals %	2.6%	29%	5.7%	0%		37.4%	6.6%	2.9%	3.2%	0%		12.8%	5.5%	37.4%	0.7%	0%		43.7%	0.8%	3.4%	2%	0%		6.2%	-	-	
Heavy	20	31	2	0		-	1	3	4	0		-	8	45	4	0		-	6	2	16	0		-	-	-	
Heavy %	23.5%	3.3%	1.1%	0%		-	0.5%	3.2%	3.9%	0%		-	4.5%	3.7%	16.7%	0%		-	24%	1.8%	25.4%	0%		-	-	-	
Bicycles	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	
Bicycle %	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	



Turning Movement Count
Location Name: ESSA RD & SALEM RD
Date: Thu, Sep 13, 2018 Deployment Lead: Theo Daglis

NexTrans
4261-A14 Highway 7 East
Suite 489
Markham ON, CANADA, L3R 9W6



Peak Hour: 08:00 AM - 09:00 AM Weather: Partly Cloudy (14.8 °C)

Start Time	N Approach ESSA RD						E Approach SALEM RD						S Approach ESSA RD						W Approach SALEM RD						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
08:00:00	3	48	3	0	0	54	0	0	0	0	0	0	18	49	0	0	0	67	0	8	1	0	0	9	130
08:15:00	4	32	5	0	0	41	1	1	3	0	0	5	9	37	0	0	0	46	0	4	2	0	0	6	98
08:30:00	4	35	6	0	0	45	9	1	1	0	0	11	12	42	0	0	0	54	0	5	3	0	0	8	118
08:45:00	5	49	10	0	0	64	6	4	1	0	0	11	8	36	2	0	0	46	0	9	4	0	0	13	134
Grand Total	16	164	24	0	0	204	16	6	5	0	0	27	47	164	2	0	0	213	0	26	10	0	0	36	480
Approach%	7.8%	80.4%	11.8%	0%		-	59.3%	22.2%	18.5%	0%		-	22.1%	77%	0.9%	0%		-	0%	72.2%	27.8%	0%		-	-
Totals %	3.3%	34.2%	5%	0%		42.5%	3.3%	1.3%	1%	0%		5.6%	9.8%	34.2%	0.4%	0%		44.4%	0%	5.4%	2.1%	0%		7.5%	-
PHF	0.8	0.84	0.6	0		0.8	0.44	0.38	0.42	0		0.61	0.65	0.84	0.25	0		0.79	0	0.72	0.63	0		0.69	-
Heavy	2	13	0	0		15	1	0	0	0		1	3	10	1	0		14	0	0	0	0		0	-
Heavy %	12.5%	7.9%	0%	0%		7.4%	6.3%	0%	0%	0%		3.7%	6.4%	6.1%	50%	0%		6.6%	0%	0%	0%	0%		0%	-
Lights	14	151	24	0		189	15	6	5	0		26	44	154	1	0		199	0	26	10	0		36	-
Lights %	87.5%	92.1%	100%	0%		92.6%	93.8%	100%	100%	0%		96.3%	93.6%	93.9%	50%	0%		93.4%	0%	100%	100%	0%		100%	-
Single-Unit Trucks	1	5	0	0		6	1	0	0	0		1	2	7	1	0		10	0	0	0	0		0	-
Single-Unit Trucks %	6.3%	3%	0%	0%		2.9%	6.3%	0%	0%	0%		3.7%	4.3%	4.3%	50%	0%		4.7%	0%	0%	0%	0%		0%	-
Buses	0	4	0	0		4	0	0	0	0		0	1	3	0	0		4	0	0	0	0		0	-
Buses %	0%	2.4%	0%	0%		2%	0%	0%	0%	0%		0%	2.1%	1.8%	0%	0%		1.9%	0%	0%	0%	0%		0%	-
Articulated Trucks	1	4	0	0		5	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	-
Articulated Trucks %	6.3%	2.4%	0%	0%		2.5%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	-
Bicycles on Road	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	-
Bicycles on Road %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	-



Peak Hour: 04:30 PM - 05:30 PM Weather: Clear (24.3 °C)

Start Time	N Approach ESSA RD						E Approach SALEM RD						S Approach ESSA RD						W Approach SALEM RD						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
16:30:00	8	45	10	0	0	63	22	7	8	0	0	37	8	77	1	0	0	86	0	2	0	0	0	2	188
16:45:00	3	49	13	0	0	65	19	8	6	0	0	33	14	81	1	0	0	96	4	7	3	0	0	14	208
17:00:00	5	33	7	0	0	45	21	22	12	0	0	55	5	77	1	0	0	83	1	4	1	0	0	6	189
17:15:00	7	60	12	0	0	79	18	7	7	0	0	32	9	84	2	0	0	95	0	4	1	0	0	5	211
Grand Total	23	187	42	0	0	252	80	44	33	0	0	157	36	319	5	0	0	360	5	17	5	0	0	27	796
Approach%	9.1%	74.2%	16.7%	0%		-	51%	28%	21%	0%		-	10%	88.6%	1.4%	0%		-	18.5%	63%	18.5%	0%		-	-
Totals %	2.9%	23.5%	5.3%	0%		31.7%	10.1%	5.5%	4.1%	0%		19.7%	4.5%	40.1%	0.6%	0%		45.2%	0.6%	2.1%	0.6%	0%		3.4%	-
PHF	0.72	0.78	0.81	0		0.8	0.91	0.5	0.69	0		0.71	0.64	0.95	0.63	0		0.94	0.31	0.61	0.42	0		0.48	-
Heavy	3	3	1	0		7	0	2	1	0		3	3	3	1	0		7	1	0	0	0		1	-
Heavy %	13%	1.6%	2.4%	0%		2.8%	0%	4.5%	3%	0%		1.9%	8.3%	0.9%	20%	0%		1.9%	20%	0%	0%	0%		3.7%	-
Lights	20	184	40	0		244	80	42	32	0		154	33	315	4	0		352	4	17	5	0		26	-
Lights %	87%	98.4%	95.2%	0%		96.8%	100%	95.5%	97%	0%		98.1%	91.7%	98.7%	80%	0%		97.8%	80%	100%	100%	0%		96.3%	-
Single-Unit Trucks	1	3	0	0		4	0	2	1	0		3	2	3	1	0		6	1	0	0	0		1	-
Single-Unit Trucks %	4.3%	1.6%	0%	0%		1.6%	0%	4.5%	3%	0%		1.9%	5.6%	0.9%	20%	0%		1.7%	20%	0%	0%	0%		3.7%	-
Buses	0	0	0	0		0	0	0	0	0		0	1	0	0	0		1	0	0	0	0		0	-
Buses %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	2.8%	0%	0%	0%		0.3%	0%	0%	0%	0%		0%	-
Articulated Trucks	2	0	1	0		3	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	-
Articulated Trucks %	8.7%	0%	2.4%	0%		1.2%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	-
Bicycles on Road	0	0	1	0		1	0	0	0	0		0	0	1	0	0		1	0	0	0	0		0	-
Bicycles on Road %	0%	0%	2.4%	0%		0.4%	0%	0%	0%	0%		0%	0%	0.3%	0%	0%		0.3%	0%	0%	0%	0%		0%	-

Peak Hour: 08:00 AM - 09:00 AM Weather: Partly Cloudy (14.8 °C)



Peak Hour: 04:30 PM - 05:30 PM Weather: Clear (24.3 °C)





Turning Movement Count (2 . COUNTRY RD 27 & SALEM RD)

Start Time	N Approach COUNTRY RD 27						E Approach SALEM RD						S Approach COUNTRY RD 27						W Approach SALEM RD						Int. Total (15 min)	Int. Total (1 hr)	
	Right N:W	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	U-Turn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	U-Turn W:W	Peds W:	Approach Total			
07:00:00	0	40	1	0	0	41	1	0	0	0	0	1	3	33	0	0	0	36	0	0	0	0	0	0	78		
07:15:00	0	43	2	0	0	45	1	0	1	0	0	2	2	34	0	0	0	36	0	0	0	0	0	0	83		
07:30:00	0	55	5	0	0	60	1	0	1	0	0	2	1	43	0	0	0	44	0	0	0	0	0	0	106		
07:45:00	0	63	8	0	0	71	1	0	0	0	0	1	2	48	0	0	0	50	0	1	0	0	0	1	123	390	
08:00:00	0	43	7	0	0	50	1	0	0	0	0	1	0	25	0	0	0	25	0	0	0	0	0	0	76	388	
08:15:00	0	46	5	0	0	51	1	0	0	0	0	1	1	27	0	0	0	28	0	0	0	0	0	0	80	385	
08:30:00	0	34	9	0	0	43	1	0	1	0	0	2	0	29	0	0	0	29	0	0	0	0	0	0	74	353	
08:45:00	0	56	10	0	0	66	2	0	0	0	0	2	0	18	0	0	0	18	1	0	0	0	0	1	87	317	
09:00:00	0	35	4	0	0	39	5	0	1	0	0	6	0	23	0	0	0	23	0	0	0	0	0	0	68	309	
09:15:00	0	42	4	0	0	46	0	0	0	0	0	0	0	27	0	0	0	27	0	0	0	0	0	0	73	302	
09:30:00	0	36	6	0	0	42	4	0	0	0	0	4	1	20	0	0	0	21	0	0	0	0	0	0	67	295	
09:45:00	0	23	6	0	0	29	2	0	1	0	0	3	0	21	0	0	0	21	0	0	0	0	0	0	53	261	
BREAK																											
16:00:00	0	34	2	0	0	36	5	0	1	0	0	6	0	55	0	0	0	55	0	0	0	0	0	0	97		
16:15:00	0	39	5	0	0	44	7	0	0	0	0	7	1	67	1	0	0	69	0	0	0	0	0	0	120		
16:30:00	0	39	2	0	0	41	12	0	2	0	0	14	1	67	0	0	0	68	0	0	0	0	0	0	123		
16:45:00	0	36	4	0	0	40	13	0	0	0	0	13	1	74	0	0	0	75	0	0	0	0	0	0	128	468	
17:00:00	0	49	3	0	0	52	26	0	2	0	0	28	1	95	0	0	0	96	0	0	0	0	0	0	176	547	
17:15:00	0	38	3	0	0	41	15	0	1	0	0	16	2	68	0	0	0	70	1	0	0	0	0	1	128	555	
17:30:00	0	33	3	0	0	36	11	0	0	0	0	11	2	80	0	0	0	82	0	0	0	0	0	0	129	561	
17:45:00	0	38	2	0	0	40	8	0	2	0	0	10	0	64	0	0	0	64	0	0	0	0	0	0	114	547	
18:00:00	0	23	0	0	0	23	8	0	0	0	0	8	1	56	0	0	0	57	0	0	0	0	0	0	88	459	
18:15:00	0	18	2	0	0	20	5	0	1	0	0	6	0	50	0	0	0	50	0	0	0	0	0	0	76	407	
18:30:00	0	25	1	0	0	26	2	0	1	0	0	3	1	30	0	0	0	31	0	0	0	0	0	0	60	338	
18:45:00	0	18	4	0	0	22	4	0	0	0	0	4	1	31	0	0	0	32	0	0	0	0	0	0	58	282	
Grand Total	0	906	98	0	0	1004	136	0	15	0	0	151	21	1085	1	0	0	1107	2	1	0	0	0	3	2265	-	
Approach%	0%	90.2%	9.8%	0%		-	90.1%	0%	9.9%	0%		-	1.9%	98%	0.1%	0%		-	66.7%	33.3%	0%	0%		-	-	-	
Totals %	0%	40%	4.3%	0%		44.3%	6%	0%	0.7%	0%		6.7%	0.9%	47.9%	0%	0%		48.9%	0.1%	0%	0%	0%		0.1%	-	-	
Heavy	0	65	6	0		-	7	0	1	0		-	2	74	0	0		-	0	0	0	0		-	-	-	
Heavy %	0%	7.2%	6.1%	0%		-	5.1%	0%	6.7%	0%		-	9.5%	6.8%	0%	0%		-	0%	0%	0%	0%		-	-	-	
Bicycles	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	
Bicycle %	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	



Turning Movement Count
Location Name: COUNTRY RD 27 & SALEM RD
Date: Thu, Sep 13, 2018 Deployment Lead: Theo Daglis

NexTrans
4261-A14 Highway 7 East
Suite 489
Markham ON, CANADA, L3R 9W6



Peak Hour: 07:00 AM - 08:00 AM Weather: Partly Cloudy (14.8 °C)

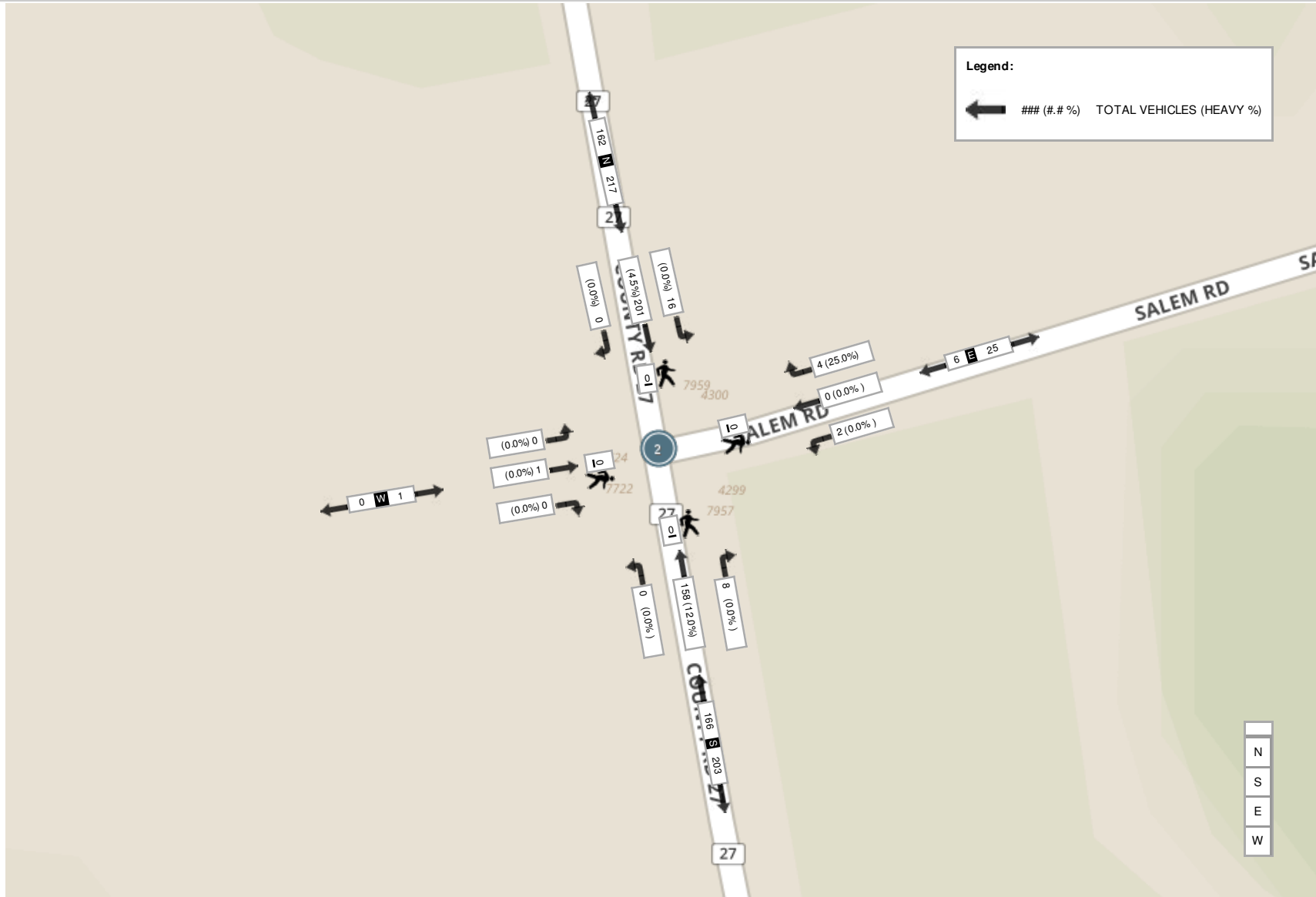
Start Time	N Approach COUNTRY RD 27						E Approach SALEM RD						S Approach COUNTRY RD 27						W Approach SALEM RD						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
07:00:00	0	40	1	0	0	41	1	0	0	0	0	1	3	33	0	0	0	36	0	0	0	0	0	0	78
07:15:00	0	43	2	0	0	45	1	0	1	0	0	2	2	34	0	0	0	36	0	0	0	0	0	0	83
07:30:00	0	55	5	0	0	60	1	0	1	0	0	2	1	43	0	0	0	44	0	0	0	0	0	0	106
07:45:00	0	63	8	0	0	71	1	0	0	0	0	1	2	48	0	0	0	50	0	1	0	0	0	1	123
Grand Total	0	201	16	0	0	217	4	0	2	0	0	6	8	158	0	0	0	166	0	1	0	0	0	1	390
Approach%	0%	92.6%	7.4%	0%		-	66.7%	0%	33.3%	0%		-	4.8%	95.2%	0%	0%		-	0%	100%	0%	0%		-	-
Totals %	0%	51.5%	4.1%	0%		55.6%	1%	0%	0.5%	0%		1.5%	2.1%	40.5%	0%	0%		42.6%	0%	0.3%	0%	0%		0.3%	-
PHF	0	0.8	0.5	0		0.76	1	0	0.5	0		0.75	0.67	0.82	0	0		0.83	0	0.25	0	0		0.25	-
Heavy	0	9	0	0		9	1	0	0	0		1	0	19	0	0		19	0	0	0	0		0	-
Heavy %	0%	4.5%	0%	0%		4.1%	25%	0%	0%	0%		16.7%	0%	12%	0%	0%		11.4%	0%	0%	0%	0%		0%	-
Lights	0	192	16	0		208	3	0	2	0		5	8	139	0	0		147	0	1	0	0		1	-
Lights %	0%	95.5%	100%	0%		95.9%	75%	0%	100%	0%		83.3%	100%	88%	0%	0%		88.6%	0%	100%	0%	0%		100%	-
Single-Unit Trucks	0	4	0	0		4	1	0	0	0		1	0	12	0	0		12	0	0	0	0		0	-
Single-Unit Trucks %	0%	2%	0%	0%		1.8%	25%	0%	0%	0%		16.7%	0%	7.6%	0%	0%		7.2%	0%	0%	0%	0%		0%	-
Buses	0	4	0	0		4	0	0	0	0		0	0	3	0	0		3	0	0	0	0		0	-
Buses %	0%	2%	0%	0%		1.8%	0%	0%	0%	0%		0%	0%	1.9%	0%	0%		1.8%	0%	0%	0%	0%		0%	-
Articulated Trucks	0	1	0	0		1	0	0	0	0		0	0	4	0	0		4	0	0	0	0		0	-
Articulated Trucks %	0%	0.5%	0%	0%		0.5%	0%	0%	0%	0%		0%	0%	2.5%	0%	0%		2.4%	0%	0%	0%	0%		0%	-
Bicycles on Road	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	-
Bicycles on Road %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	-



Peak Hour: 04:45 PM - 05:45 PM Weather: Clear (24.3 °C)

Start Time	N Approach COUNTRY RD 27						E Approach SALEM RD						S Approach COUNTRY RD 27						W Approach SALEM RD						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
16:45:00	0	36	4	0	0	40	13	0	0	0	0	13	1	74	0	0	0	75	0	0	0	0	0	0	128
17:00:00	0	49	3	0	0	52	26	0	2	0	0	28	1	95	0	0	0	96	0	0	0	0	0	0	176
17:15:00	0	38	3	0	0	41	15	0	1	0	0	16	2	68	0	0	0	70	1	0	0	0	0	1	128
17:30:00	0	33	3	0	0	36	11	0	0	0	0	11	2	80	0	0	0	82	0	0	0	0	0	0	129
Grand Total	0	156	13	0	0	169	65	0	3	0	0	68	6	317	0	0	0	323	1	0	0	0	0	1	561
Approach%	0%	92.3%	7.7%	0%		-	95.6%	0%	4.4%	0%		-	1.9%	98.1%	0%	0%		-	100%	0%	0%	0%		-	-
Totals %	0%	27.8%	2.3%	0%		30.1%	11.6%	0%	0.5%	0%		12.1%	1.1%	56.5%	0%	0%		57.6%	0.2%	0%	0%	0%		0.2%	-
PHF	0	0.8	0.81	0		0.81	0.63	0	0.38	0		0.61	0.75	0.83	0	0		0.84	0.25	0	0	0		0.25	-
Heavy	0	10	1	0		11	2	0	0	0		2	1	9	0	0		10	0	0	0	0		0	-
Heavy %	0%	6.4%	7.7%	0%		6.5%	3.1%	0%	0%	0%		2.9%	16.7%	2.8%	0%	0%		3.1%	0%	0%	0%	0%		0%	-
Lights	0	143	12	0		155	63	0	3	0		66	5	307	0	0		312	1	0	0	0		1	-
Lights %	0%	91.7%	92.3%	0%		91.7%	96.9%	0%	100%	0%		97.1%	83.3%	96.8%	0%	0%		96.6%	100%	0%	0%	0%		100%	-
Single-Unit Trucks	0	10	0	0		10	0	0	0	0		0	1	6	0	0		7	0	0	0	0		0	-
Single-Unit Trucks %	0%	6.4%	0%	0%		5.9%	0%	0%	0%	0%		0%	16.7%	1.9%	0%	0%		2.2%	0%	0%	0%	0%		0%	-
Buses	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	-
Buses %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	-
Articulated Trucks	0	0	1	0		1	2	0	0	0		2	0	3	0	0		3	0	0	0	0		0	-
Articulated Trucks %	0%	0%	7.7%	0%		0.6%	3.1%	0%	0%	0%		2.9%	0%	0.9%	0%	0%		0.9%	0%	0%	0%	0%		0%	-
Bicycles on Road	0	3	0	0		3	0	0	0	0		0	0	1	0	0		1	0	0	0	0		0	-
Bicycles on Road %	0%	1.9%	0%	0%		1.8%	0%	0%	0%	0%		0%	0%	0.3%	0%	0%		0.3%	0%	0%	0%	0%		0%	-

Peak Hour: 07:00 AM - 08:00 AM Weather: Partly Cloudy (14.8 °C)





Turning Movement Count

Location Name: COUNTRY RD 27 & SALEM RD
Date: Thu, Sep 13, 2018 Deployment Lead: Theo Daglis

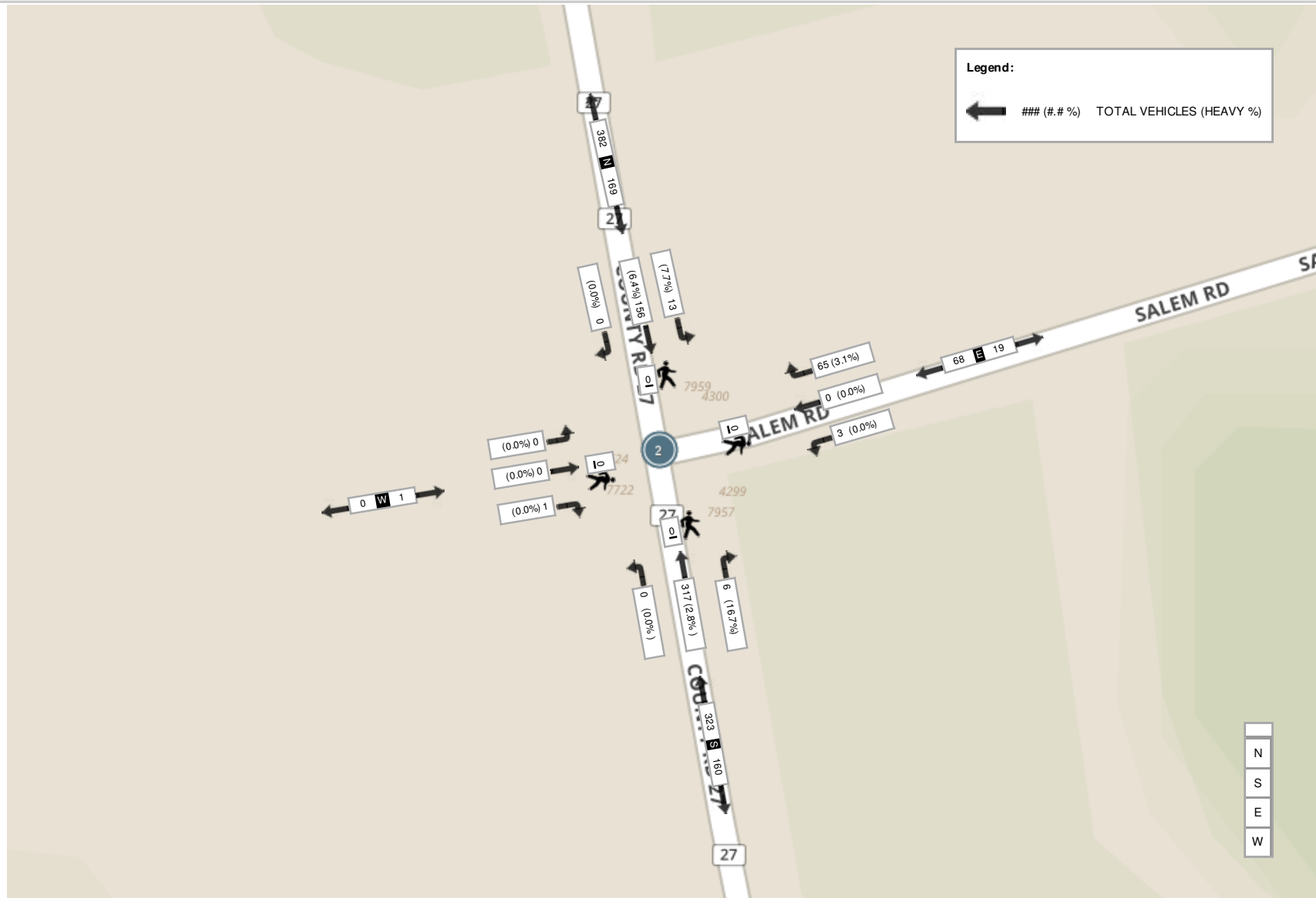
NexTrans

4261-A14 Highway 7 East

Suite 489

Markham ON, CANADA, L3R 9W6

Peak Hour: 04:45 PM - 05:45 PM Weather: Clear (24.3 °C)



Appendix B

Existing Traffic Level of Service Calculations

Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	166	29	53	115	139	21	111	16	173	147	52
Future Volume (vph)	49	166	29	53	115	139	21	111	16	173	147	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	50.0		0.0	140.0		0.0	100.0		100.0	80.0		80.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor									0.99	1.00		
Frt		0.978				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1684	1796	0	1638	1807	1413	1700	3216	1342	1716	3305	1389
Flt Permitted	0.668			0.484			0.640			0.634		
Satd. Flow (perm)	1184	1796	0	834	1807	1413	1145	3216	1325	1144	3305	1389
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11				167			128			128
Link Speed (k/h)		60			50			80			80	
Link Distance (m)		163.9			1746.1			1328.1			632.7	
Travel Time (s)		9.8			125.7			59.8			28.5	
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	1%	10%	9%	4%	13%	5%	11%	19%	4%	8%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	59	200	35	64	139	167	25	134	19	208	177	63
Shared Lane Traffic (%)												
Lane Group Flow (vph)	59	235	0	64	139	167	25	134	19	208	177	63
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4		3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	1.0	5.0		1.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	5.0	47.8		5.0	47.8	47.8	7.0	34.5	34.5	7.0	34.5	34.5
Total Split (s)	5.0	48.9		5.0	48.9	48.9	7.0	39.5	39.5	7.0	39.5	39.5
Total Split (%)	5.0%	48.7%		5.0%	48.7%	48.7%	7.0%	39.3%	39.3%	7.0%	39.3%	39.3%

Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	3.7		3.0	3.7	3.7	3.0	4.6	4.6	3.0	4.6	4.6
All-Red Time (s)	1.0	3.1		1.0	3.1	3.1	1.0	1.9	1.9	1.0	1.9	1.9
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	5.8		3.0	5.8	5.8	3.0	5.5	5.5	3.0	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	19.5	15.1		20.1	16.1	16.1	40.7	34.2	34.2	42.6	38.6	38.6
Actuated g/C Ratio	0.27	0.21		0.28	0.22	0.22	0.57	0.48	0.48	0.59	0.54	0.54
v/c Ratio	0.18	0.61		0.25	0.34	0.37	0.04	0.09	0.03	0.29	0.10	0.08
Control Delay	19.1	31.4		20.7	26.0	6.8	7.3	11.8	0.1	9.1	10.4	0.3
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.1	31.4		20.7	26.0	6.8	7.3	11.8	0.1	9.1	10.4	0.3
LOS	B	C		C	C	A	A	B	A	A	B	A
Approach Delay	29.0			16.4			9.9			8.4		
Approach LOS	C			B			A			A		
Queue Length 50th (m)	5.9	29.2		6.5	17.2	0.0	1.3	5.3	0.0	12.1	5.5	0.0
Queue Length 95th (m)	12.5	45.6		13.3	29.3	11.1	4.5	10.4	0.0	23.8	13.1	0.0
Internal Link Dist (m)	139.9			1722.1			1304.1			608.7		
Turn Bay Length (m)	50.0			140.0			100.0		100.0	80.0		80.0
Base Capacity (vph)	336	1091		256	1093	921	682	1535	699	712	1782	807
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.22		0.25	0.13	0.18	0.04	0.09	0.03	0.29	0.10	0.08

Intersection Summary

Area Type: Other

Cycle Length: 100.4

Actuated Cycle Length: 71.6

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 15.6

Intersection LOS: B

Intersection Capacity Utilization 56.2%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 8: County Road 27 & Side Road 25/Mapleview Dr W

			
7 s	39.5 s	5 s	48.9 s
			
7 s	39.5 s	5 s	48.9 s

Lanes, Volumes, Timings
5: Essa Rd & Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	664	31	62	203	58	40	152	143	153	191	100
Future Volume (vph)	105	664	31	62	203	58	40	152	143	153	191	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	100.0		0.0	300.0		300.0	60.0		50.0	80.0		50.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00		1.00		0.97			0.99	1.00		
Frt		0.993				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1767	3483	0	1580	3216	1465	1487	1824	1439	1733	1807	1507
Flt Permitted	0.617			0.210			0.630			0.608		
Satd. Flow (perm)	1143	3483	0	349	3216	1427	986	1824	1419	1108	1807	1507
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6				105			152			106
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		1746.1			305.4			1710.9			359.4	
Travel Time (s)		104.8			18.3			102.7			21.6	
Confl. Peds. (#/hr)	4		3	3		4			2	2		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	16%	13%	11%	9%	20%	3%	11%	3%	4%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	112	706	33	66	216	62	43	162	152	163	203	106
Shared Lane Traffic (%)												
Lane Group Flow (vph)	112	739	0	66	216	62	43	162	152	163	203	106
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	34.0	34.0		34.0	34.0	34.0	7.0	37.0	37.0	7.0	37.0	37.0
Total Split (s)	36.0	36.0		36.0	36.0	36.0	10.0	37.0	37.0	10.0	37.0	37.0
Total Split (%)	43.4%	43.4%		43.4%	43.4%	43.4%	12.0%	44.6%	44.6%	12.0%	44.6%	44.6%

Lanes, Volumes, Timings

5: Essa Rd & Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	3.0	6.0	6.0	3.0	6.0	6.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	22.7	22.7		22.7	22.7	22.7	41.1	31.2	31.2	42.5	35.5	35.5
Actuated g/C Ratio	0.30	0.30		0.30	0.30	0.30	0.55	0.42	0.42	0.57	0.47	0.47
v/c Ratio	0.32	0.70		0.63	0.22	0.12	0.07	0.21	0.22	0.24	0.24	0.14
Control Delay	22.4	26.5		49.7	19.6	1.7	8.4	16.4	4.1	9.2	15.6	4.3
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.4	26.5		49.7	19.6	1.7	8.4	16.4	4.1	9.2	15.6	4.3
LOS	C	C		D	B	A	A	B	A	A	B	A
Approach Delay		25.9			22.1			10.2			10.8	
Approach LOS		C			C			B			B	
Queue Length 50th (m)	12.7	50.0		8.3	12.4	0.0	2.4	14.7	0.0	9.7	19.0	0.0
Queue Length 95th (m)	25.4	67.9		#25.9	20.3	2.8	8.1	32.4	11.6	23.6	39.9	9.8
Internal Link Dist (m)		1722.1			281.4			1686.9			335.4	
Turn Bay Length (m)	100.0			300.0		300.0	60.0		50.0	80.0		50.0
Base Capacity (vph)	474	1450		145	1336	654	588	757	678	686	854	768
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.51		0.46	0.16	0.09	0.07	0.21	0.22	0.24	0.24	0.14

Intersection Summary

Area Type: Other

Cycle Length: 83

Actuated Cycle Length: 75

Natural Cycle: 80

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 19.0

Intersection LOS: B

Intersection Capacity Utilization 74.0%

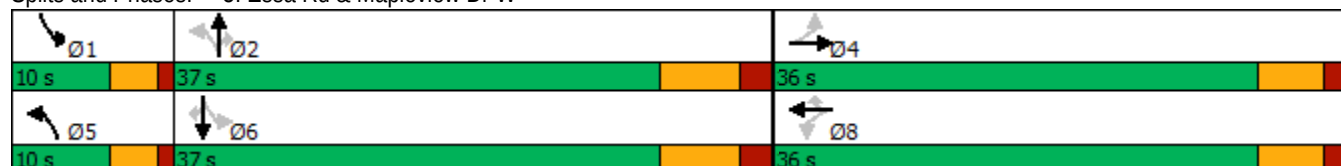
ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 5: Essa Rd & Mapleview Dr W



HCM Unsignalized Intersection Capacity Analysis

13: Essa Rd & Salem Rd

10-28-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	26	0	5	6	16	2	164	47	24	164	16
Future Volume (Veh/h)	10	26	0	5	6	16	2	164	47	24	164	16
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	13	33	0	6	8	20	3	205	59	30	205	20
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None						None					
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	510	545	215	522	526	234	225	264				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	510	545	215	522	526	234	225	264				
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.3	4.6	4.1				
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.7	2.2				
p0 queue free %	97	92	100	99	98	97	100	98				
cM capacity (veh/h)	450	437	830	433	448	795	1106	1312				
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	46	34	3	264	30	225						
Volume Left	13	6	3	0	30	0						
Volume Right	0	20	0	59	0	20						
cSH	441	598	1106	1700	1312	1700						
Volume to Capacity	0.10	0.06	0.00	0.16	0.02	0.13						
Queue Length 95th (m)	2.8	1.4	0.1	0.0	0.6	0.0						
Control Delay (s)	14.1	11.4	8.3	0.0	7.8	0.0						
Lane LOS	B	B	A	A								
Approach Delay (s)	14.1	11.4	0.1	0.9								
Approach LOS	B	B										
Intersection Summary												
Average Delay	2.2											
Intersection Capacity Utilization	28.2%			ICU Level of Service					A			
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

14: County Road 27 & Private Access/Salem Rd

10-28-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1	0	2	0	4	0	158	8	16	201	0
Future Volume (Veh/h)	0	1	0	2	0	4	0	158	8	16	201	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	0	1	0	2	0	5	0	190	10	19	242	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	480	480	242	476	475	195	242				200	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	480	480	242	476	475	195	242				200	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.5	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.5	2.2				2.2	
p0 queue free %	100	100	100	100	100	99	100				99	
cM capacity (veh/h)	491	481	802	497	485	791	1336				1384	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	7	200	261								
Volume Left	0	2	0	19								
Volume Right	0	5	10	0								
cSH	481	677	1336	1384								
Volume to Capacity	0.00	0.01	0.00	0.01								
Queue Length 95th (m)	0.0	0.3	0.0	0.3								
Control Delay (s)	12.5	10.4	0.0	0.7								
Lane LOS	B	B		A								
Approach Delay (s)	12.5	10.4	0.0	0.7								
Approach LOS	B	B										
Intersection Summary												
Average Delay				0.6								
Intersection Capacity Utilization				33.6%	ICU Level of Service				A			
Analysis Period (min)				15								

Lanes, Volumes, Timings
5: Essa Rd & Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	427	46	163	707	321	59	245	139	103	195	173
Future Volume (vph)	108	427	46	163	707	321	59	245	139	103	195	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	100.0		0.0	300.0		300.0	60.0		50.0	80.0		50.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.98	0.99		0.99	1.00		0.98
Frt		0.985				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1716	3454	0	1733	3535	1581	1785	1879	1536	1733	1842	1581
Flt Permitted	0.216			0.383			0.617			0.552		
Satd. Flow (perm)	390	3454	0	699	3535	1545	1152	1879	1516	1006	1842	1549
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16				357			154			192
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		1746.1			305.4			1710.9			359.4	
Travel Time (s)		104.8			18.3			102.7			21.6	
Confl. Peds. (#/hr)	2					2	10		1	1		10
Confl. Bikes (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	2%	0%	3%	1%	1%	0%	0%	4%	3%	2%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	120	474	51	181	786	357	66	272	154	114	217	192
Shared Lane Traffic (%)												
Lane Group Flow (vph)	120	525	0	181	786	357	66	272	154	114	217	192
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	34.0	34.0		34.0	34.0	34.0	7.0	37.0	37.0	7.0	37.0	37.0
Total Split (s)	36.0	36.0		36.0	36.0	36.0	10.0	37.0	37.0	10.0	37.0	37.0
Total Split (%)	43.4%	43.4%		43.4%	43.4%	43.4%	12.0%	44.6%	44.6%	12.0%	44.6%	44.6%

Lanes, Volumes, Timings
5: Essa Rd & Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	3.0	6.0	6.0	3.0	6.0	6.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	26.2	26.2		26.2	26.2	26.2	39.9	31.6	31.6	39.9	31.6	31.6
Actuated g/C Ratio	0.34	0.34		0.34	0.34	0.34	0.52	0.41	0.41	0.52	0.41	0.41
v/c Ratio	0.90	0.44		0.76	0.65	0.47	0.10	0.35	0.22	0.19	0.29	0.26
Control Delay	84.8	20.1		44.6	24.1	4.4	9.8	19.4	4.1	10.4	18.7	3.9
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	84.8	20.1		44.6	24.1	4.4	9.8	19.4	4.1	10.4	18.7	3.9
LOS	F	C		D	C	A	A	B	A	B	B	A
Approach Delay		32.1			21.6			13.3			11.5	
Approach LOS		C			C			B			B	
Queue Length 50th (m)	17.8	32.1		25.0	54.3	0.0	5.0	32.5	0.0	9.0	25.2	0.0
Queue Length 95th (m)	#50.0	45.7		#57.4	73.0	16.9	11.1	53.0	11.5	17.2	42.5	12.8
Internal Link Dist (m)		1722.1			281.4			1686.9			335.4	
Turn Bay Length (m)	100.0			300.0		300.0	60.0		50.0	80.0		50.0
Base Capacity (vph)	160	1434		288	1458	847	659	774	715	592	759	751
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.37		0.63	0.54	0.42	0.10	0.35	0.22	0.19	0.29	0.26

Intersection Summary

Area Type: Other

Cycle Length: 83

Actuated Cycle Length: 76.6

Natural Cycle: 80

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 20.7

Intersection LOS: C

Intersection Capacity Utilization 73.1%

ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 5: Essa Rd & Mapleview Dr W

 Ø1	 Ø2	 Ø4
10 s	37 s	36 s
 Ø5	 Ø6	 Ø8
10 s	37 s	36 s

Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	81	195	19	24	240	198	55	241	69	161	130	50
Future Volume (vph)	81	195	19	24	240	198	55	241	69	161	130	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	50.0		0.0	140.0		0.0	100.0		100.0	80.0		80.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor									0.99	1.00		
Frt		0.987				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1700	1821	0	1653	1879	1566	1716	3368	1597	1733	3400	1597
Flt Permitted	0.427			0.506			0.656			0.568		
Satd. Flow (perm)	764	1821	0	880	1879	1566	1185	3368	1576	1035	3400	1597
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6				230			128			128
Link Speed (k/h)		60			50			80			80	
Link Distance (m)		163.9			1746.1			1328.1			632.7	
Travel Time (s)		9.8			125.7			59.8			28.5	
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	5%	2%	0%	8%	0%	2%	4%	6%	0%	3%	5%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	94	227	22	28	279	230	64	280	80	187	151	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	94	249	0	28	279	230	64	280	80	187	151	58
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4		3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	1.0	5.0		1.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	5.0	47.8		5.0	47.8	47.8	7.0	34.5	34.5	7.0	34.5	34.5
Total Split (s)	5.0	48.9		5.0	48.9	48.9	7.0	39.5	39.5	7.0	39.5	39.5
Total Split (%)	5.0%	48.7%		5.0%	48.7%	48.7%	7.0%	39.3%	39.3%	7.0%	39.3%	39.3%

Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	3.7		3.0	3.7	3.7	3.0	4.6	4.6	3.0	4.6	4.6
All-Red Time (s)	1.0	3.1		1.0	3.1	3.1	1.0	1.9	1.9	1.0	1.9	1.9
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	5.8		3.0	5.8	5.8	3.0	5.5	5.5	3.0	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	22.7	19.2		21.5	17.2	17.2	40.8	34.2	34.2	41.5	35.9	35.9
Actuated g/C Ratio	0.31	0.26		0.29	0.23	0.23	0.55	0.46	0.46	0.56	0.49	0.49
v/c Ratio	0.36	0.52		0.10	0.64	0.43	0.09	0.18	0.10	0.30	0.09	0.07
Control Delay	22.6	27.2		17.1	32.6	6.1	8.4	13.1	1.2	10.2	12.6	0.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.6	27.2		17.1	32.6	6.1	8.4	13.1	1.2	10.2	12.6	0.2
LOS	C	C		B	C	A	A	B	A	B	B	A
Approach Delay	25.9			20.4			10.2			9.7		
Approach LOS	C			C			B			A		
Queue Length 50th (m)	9.6	28.9		2.8	37.4	0.0	3.7	12.3	0.0	11.6	6.3	0.0
Queue Length 95th (m)	18.5	50.5		7.5	57.4	13.6	10.1	21.9	2.4	24.8	12.8	0.0
Internal Link Dist (m)	139.9			1722.1			1304.1			608.7		
Turn Bay Length (m)	50.0			140.0			100.0		100.0	80.0		80.0
Base Capacity (vph)	261	1074		278	1106	1016	684	1564	800	620	1654	842
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.23		0.10	0.25	0.23	0.09	0.18	0.10	0.30	0.09	0.07

Intersection Summary

Area Type: Other

Cycle Length: 100.4

Actuated Cycle Length: 73.7

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 16.5

Intersection LOS: B

Intersection Capacity Utilization 65.5%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 8: County Road 27 & Side Road 25/Mapleview Dr W

			
7 s	39.5 s	5 s	48.9 s
			
7 s	39.5 s	5 s	48.9 s

HCM Unsignalized Intersection Capacity Analysis

13: Essa Rd & Salem Rd

10-28-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	17	5	33	44	80	5	319	36	42	187	23
Future Volume (Veh/h)	5	17	5	33	44	80	5	319	36	42	187	23
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	5	18	5	35	47	85	5	339	38	45	199	24
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None						None					
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	758	688	211	671	681	358	223				377	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	758	688	211	671	681	358	223				377	
tC, single (s)	7.1	6.5	6.4	7.1	6.5	6.2	4.3				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.5	3.5	4.0	3.3	2.4				2.2	
p0 queue free %	98	95	99	90	87	88	100				96	
cM capacity (veh/h)	249	356	786	341	353	691	1246				1181	
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	28	167	5	377	45	223						
Volume Left	5	35	5	0	45	0						
Volume Right	5	85	0	38	0	24						
cSH	364	466	1246	1700	1181	1700						
Volume to Capacity	0.08	0.36	0.00	0.22	0.04	0.13						
Queue Length 95th (m)	2.0	12.9	0.1	0.0	0.9	0.0						
Control Delay (s)	15.7	17.0	7.9	0.0	8.2	0.0						
Lane LOS	C	C	A	A								
Approach Delay (s)	15.7	17.0	0.1	1.4								
Approach LOS	C	C										
Intersection Summary												
Average Delay			4.4									
Intersection Capacity Utilization			45.0%	ICU Level of Service					A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

14: County Road 27 & Private Access/Salem Rd

10-28-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	3	0	65	0	317	6	13	156	0
Future Volume (Veh/h)	0	0	1	3	0	65	0	317	6	13	156	0
Sign Control	Stop				Stop				Free		Free	
Grade	0%				0%				0%		0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	0	1	4	0	77	0	377	7	15	186	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	674	600	186	598	596	380	186				384	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	674	600	186	598	596	380	186				384	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.2	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.3	
p0 queue free %	100	100	100	99	100	88	100				99	
cM capacity (veh/h)	325	412	861	413	414	664	1401				1142	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1	81	384	201								
Volume Left	0	4	0	15								
Volume Right	1	77	7	0								
cSH	861	645	1401	1142								
Volume to Capacity	0.00	0.13	0.00	0.01								
Queue Length 95th (m)	0.0	3.4	0.0	0.3								
Control Delay (s)	9.2	11.4	0.0	0.7								
Lane LOS	A	B		A								
Approach Delay (s)	9.2	11.4	0.0	0.7								
Approach LOS	A	B										
Intersection Summary												
Average Delay				1.6								
Intersection Capacity Utilization				32.5%	ICU Level of Service				A			
Analysis Period (min)				15								

Appendix C

Relevant Excerpts from Background Transportation Studies in the Area

4.5 TRIP DISTRIBUTION

The distribution of trips to and from the four Phase 1 Draft Plan areas assessed in this study was based on information from the 2011 Transportation Tomorrow Survey (TTS). All of the TTS zones comprising the south part of Barrie were aggregated to create a proxy zone for this purpose.

The TTS distribution was then mapped to the road network in the Salem Secondary Plan area. The results of this assessment are documented in the following table (Table 2).

TABLE 2 TRIP DISTRIBUTION

Crisdawn Draft Plan

Direction (to / from)	Inbound	Outbound
North on Essa Road	44% (44%)	44% (44%)
East on McKay Road	21% (21%)	21% (21%)
South on Veterans Drive	3% (3%)	3% (3%)
North on County Road 27	2% (2%)	2% (2%)
North on Highway 400	6% (6%)	6% (6%)
South on Highway 400	23% (23%)	23% (23%)
Total	100% (100%)	100% (100%)

Watersand & H&H Capital Draft Plans

Direction (to / from)	Inbound	Outbound
North on Veterans Drive	17% (17%)	17% (17%)
North on Essa	27% (27%)	27% (27%)
South on Veterans Drive	3% (3%)	3% (3%)
East on McKay Road	21% (21%)	21% (21%)
West on McKay Road	2% (2%)	2% (2%)
North on Highway 400	6% (6%)	6% (6%)
South on Highway 400	23% (23%)	23% (23%)
Total	100% (100%)	100% (100%)

DiPoce Draft Plan

Direction (to / from)	Inbound	Outbound
North on Essa Road	44% (44%)	25% (25%)
East on McKay Road	21% (21%)	11% (11%)
North on County Road 27	32% (32%)	32% (32%)
South on County Road 27	3% (3%)	3% (3%)
North on Highway 400	6% (6%)	6% (6%)
South on Highway 400	23% (23%)	23% (23%)
Total	100% (100%)	100% (100%)

The trip distribution for the Crisdawn community is also illustrated in Figure 8

One of the key trip distribution and assignment decisions with respect to the Phase 1 Salem Secondary Plan draft plans is the allocation to and utilization of the available Highway 400 interchanges, namely the Mapleview Drive and Innisfil Beach Road interchanges.

As noted above (section 3.4.2) the distance from the Crisdawn community is about 4.2 kilometres to the Mapleview interchange, and 7.0 kilometres to the Innisfil Beach Road interchange. While the Mapleview Drive interchange is somewhat closer, given that it is already a busy interchange today and that it is located to the north of the Crisdawn subdivision, it is reasonable to assume that traffic bound to and from the south will utilize the Innisfil Beach Road interchange, as reflected in the distribution numbers in the above table and in Figure 8. The modest assignment of Crisdawn trips to the Mapleview Drive interchange reflects a small component of traffic directed to the north part of the City of Barrie.

4.6 2021 SITE TRAFFIC VOLUMES

Total site traffic volumes, including each of the four draft plans assessed herein, have been calculated on the basis of the trip generation, distribution, and assignment assumptions indicated in the previous two sections.

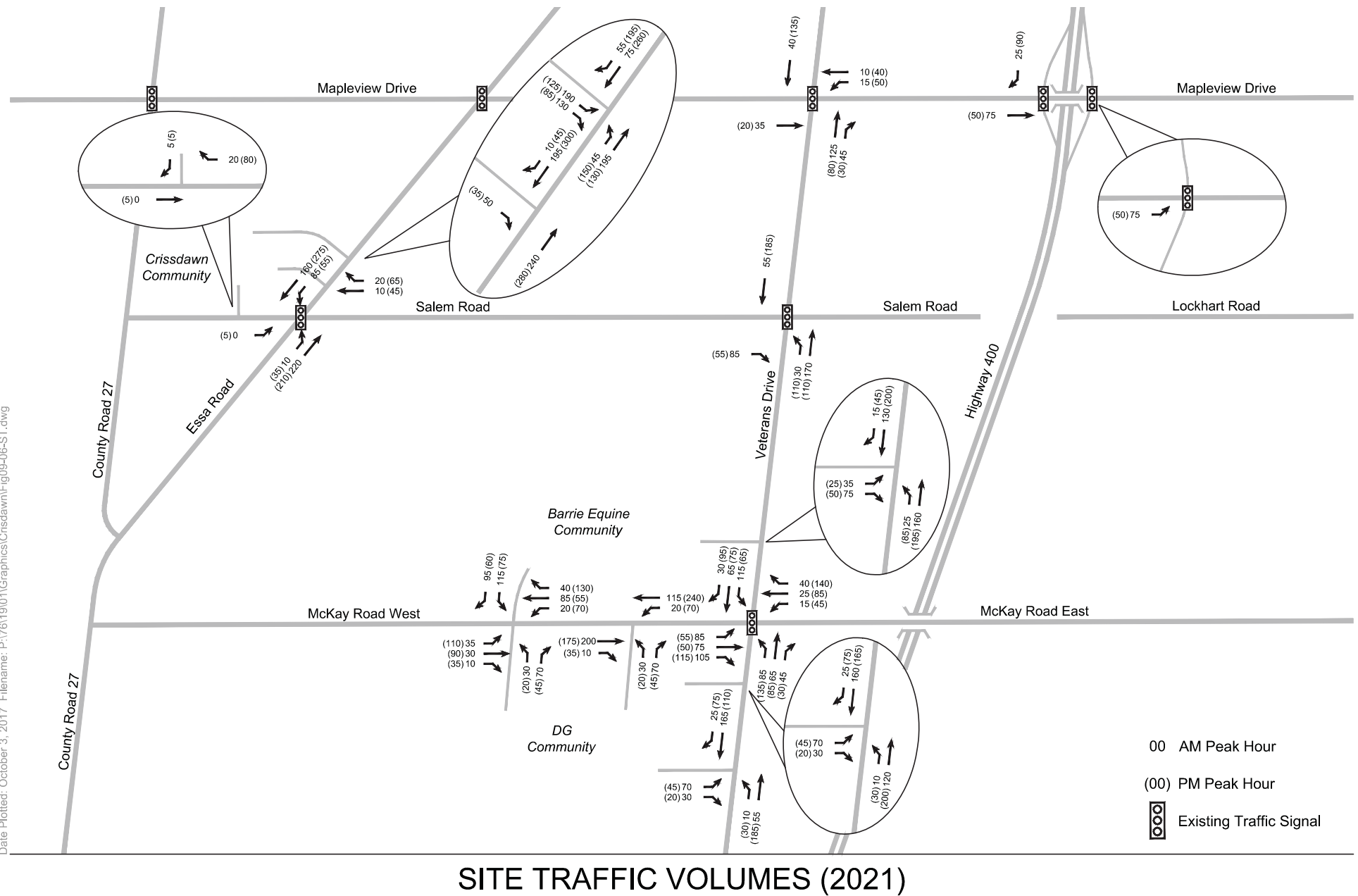
Figure 9 illustrates the assignment of the total site traffic from the four draft plan areas to the area road network.

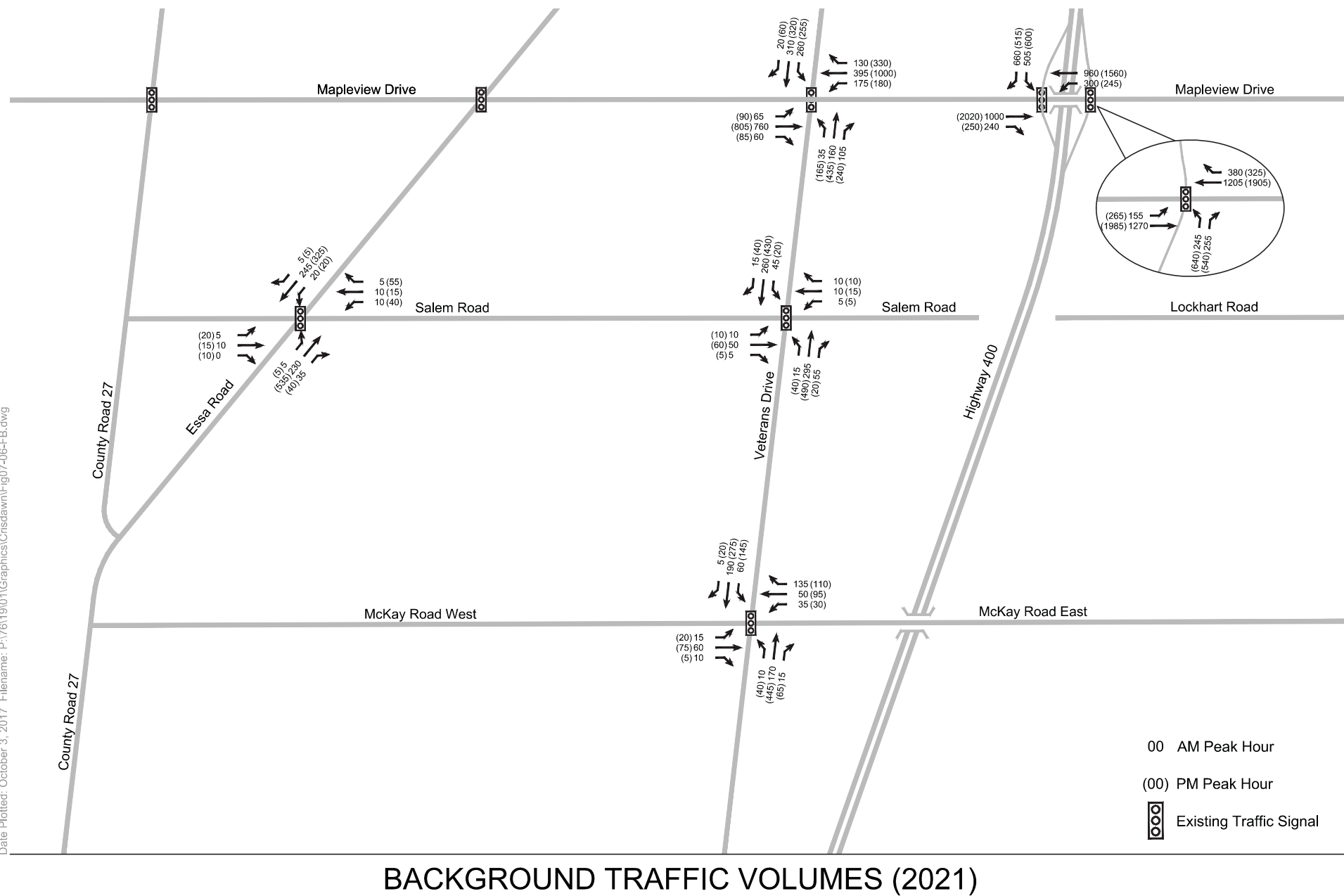
4.7 2021 TOTAL TRAFFIC VOLUMES

Figure 10 shows the addition of the 2021 site traffic volumes to the 2021 background traffic volumes.

TABLE 1 TRIP GENERATION – 2021 SCENARIO

		AM Peak Hour			PM Peak Hour		
		In	Out	2-Way	In	Out	2-Way
ITE LUC 210	Units	0.2	0.57	0.77	0.65	0.37	1.02
ITE LUC 231	Units	0.1	0.44	0.54	0.35	0.29	0.64
ITE LUC 220	Units	0.16	0.39	0.55	0.41	0.26	0.67
Crisdawn							
Single Family / Semi Detached	250	49	139	187	158	90	248
Townhouse	132	13	58	71	46	38	84
Apartment	96	15	37	53	39	35	64
5% Transit Reduction		4	12	16	12	8	20
Crisdawn Total		73	222	296	231	145	377
Watersand							
Single Family / Semi Detached	580	116	331	447	377	215	592
Townhouse	220	22	97	119	77	64	141
5% Transit Reduction		7	21	28	23	14	37
Watersand Total		131	406	537	431	264	696
H&H Capital							
Single Family / Semi Detached	600	120	342	462	390	222	612
5% Transit Reduction		6	17	23	20	11	31
H&H Capital Total		114	325	439	371	211	581
DiPoce							
Single Family / Semi Detached	600	120	342	462	390	222	612
5% Transit Reduction		6	17	23	20	11	31
DiPoce Total		114	325	439	371	211	581
Sum Total							
Total Residential Trips	2352	432	1278	1711	1404	832	2235





5.0 2026 HORIZON YEAR TRAFFIC ASSESSMENT

5.1 HORIZON YEAR

Full Phase 1 buildout of the Watersand Employment draft plan is anticipated to occur by about 2026. An additional full buildout analysis of Phase 1 traffic has therefore also been conducted using a 2026 horizon year.

Longer term traffic analysis has not been conducted for this draft plan application. This is in part because the longer term road infrastructure needs for full buildout of the Salem Secondary Plan have already been tested through the MMATMP process. Additionally, completion of the Harvie Road / Big Bay Point Road crossing in 2021 and the McKay Road interchange in about 2022 will have a substantial, and beneficial, impact on the traffic volumes and patterns in south Barrie. It is therefore more appropriate to deal with traffic in forecasts in the 2026 to 2031 time frame as part of the Phase 2 and 3 traffic studies

5.2 TRIP GENERATION

The trip generation assumptions used in this longer term analysis are shown in Table 5 below. Note that while the Watersand Employment draft plan proposes substantial development beyond 2021, the Watersand Residential draft plan is the only one of the four residential plans assessed herein which proposes additional development beyond the 2021 horizon year used in the previous analysis.

TABLE 5 VEHICLE TRIP GENERATION – 2026

	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
ITE Land Use Code 770	16.03	2.83	18.86	3.37	13.47	16.84
Total Rounded Trips (74.90 Acres)	1200	210	1410	250	1010	1260
Transit Reduction (5%)	60	10	70	15	50	65
Net Total Trips	1140	200	1340	235	960	1195

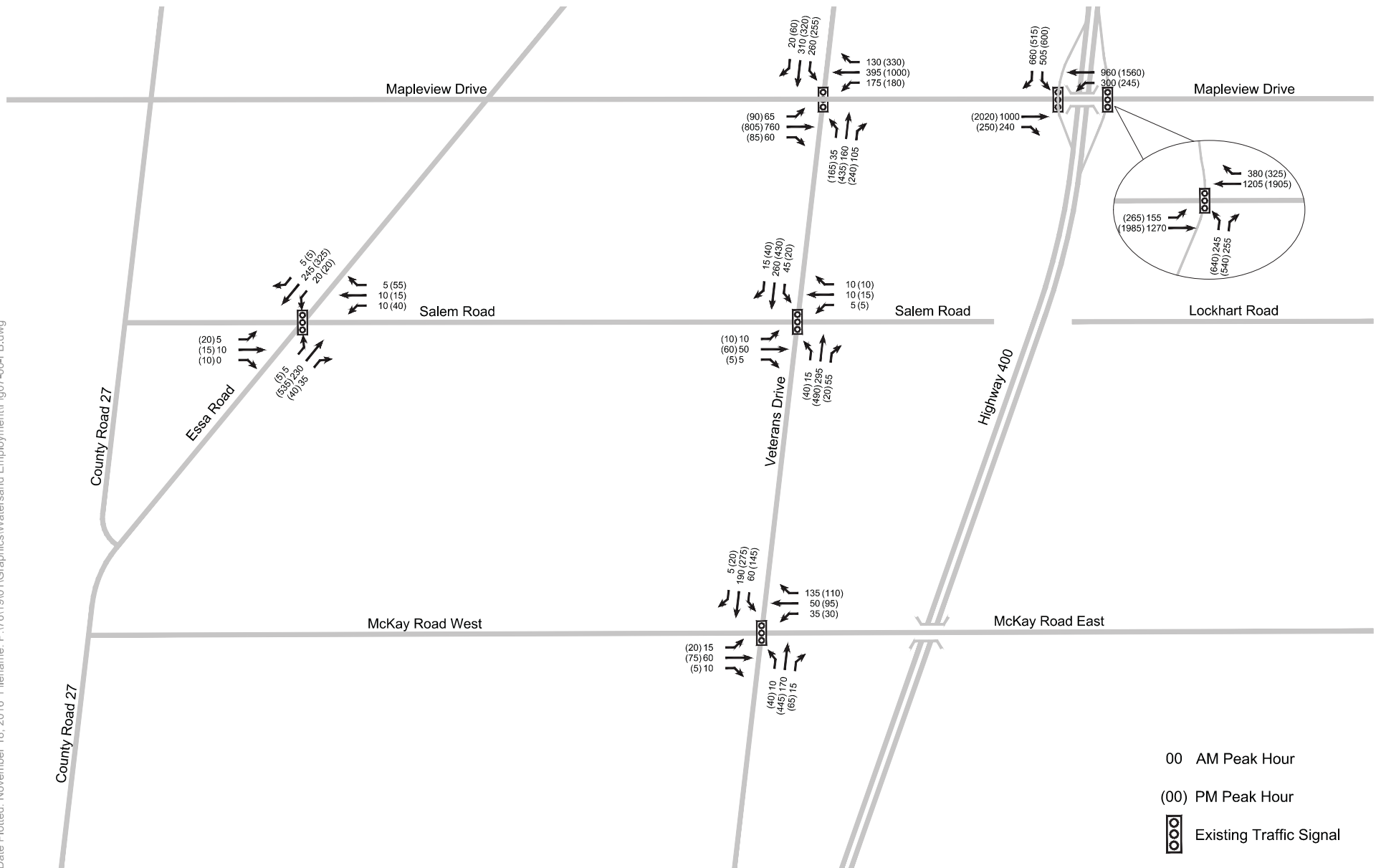


TABLE 6 TRIP GENERATION – 2025 ULTIMATE SCENARIO

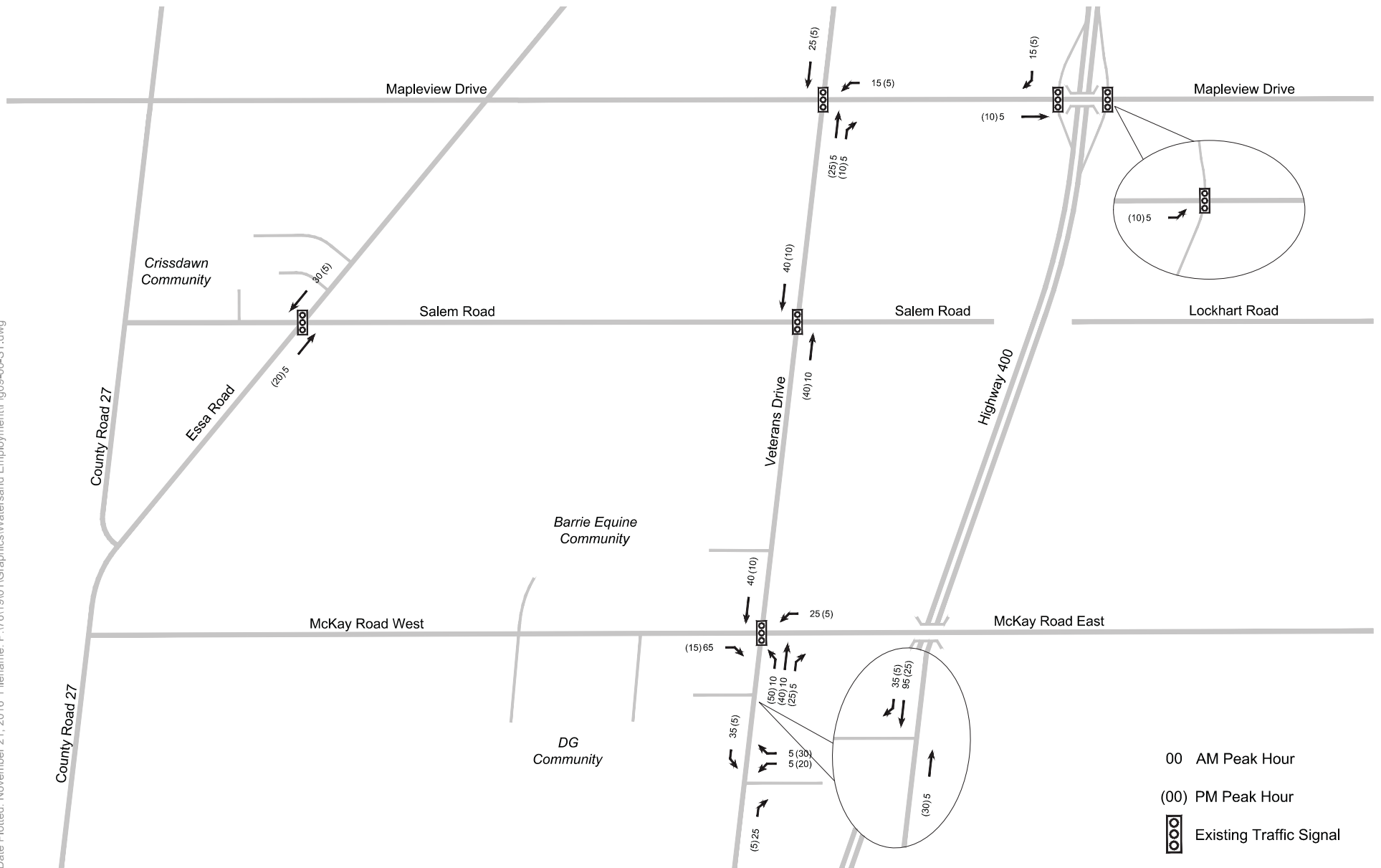
		AM Peak Hour			PM Peak Hour		
		In	Out	2-Way	In	Out	2-Way
ITE LUC 210	Units	0.2	0.57	0.77	0.65	0.37	1.02
ITE LUC 231	Units	0.1	0.44	0.54	0.35	0.29	0.64
ITE LUC 220	Units	0.16	0.39	0.55	0.41	0.26	0.67
Watersand							
Single Family / Semi Detached	1047	208	594	802	677	386	1063
Townhouse	398	40	174	214	139	115	253
5% Transit Reduction		12	38	51	41	25	66
Watersand Total		236	730	965	775	475	1250
Crisdawn							
Single Family / Semi Detached	250	49	139	187	158	90	248
Townhouse	132	13	58	71	46	38	84
Apartment	96	15	37	53	39	35	64
5% Transit Reduction		4	12	16	12	8	20
Crisdawn Total		73	222	296	231	145	377
H&H Capital							
Single Family / Semi Detached	600	120	342	462	390	222	612
5% Transit Reduction		6	17	23	20	11	31
H&H Capital Total		114	325	439	371	211	581
DiPoce							
Single Family / Semi Detached	600	120	342	462	390	222	612
5% Transit Reduction		6	17	23	20	11	31
DiPoce Total		114	325	439	371	211	581
Sum Total							
Total Residential Trips	2352	432	1278	1711	1404	832	2235

5.3 2025 SITE AND TOTAL TRAFFIC VOLUMES

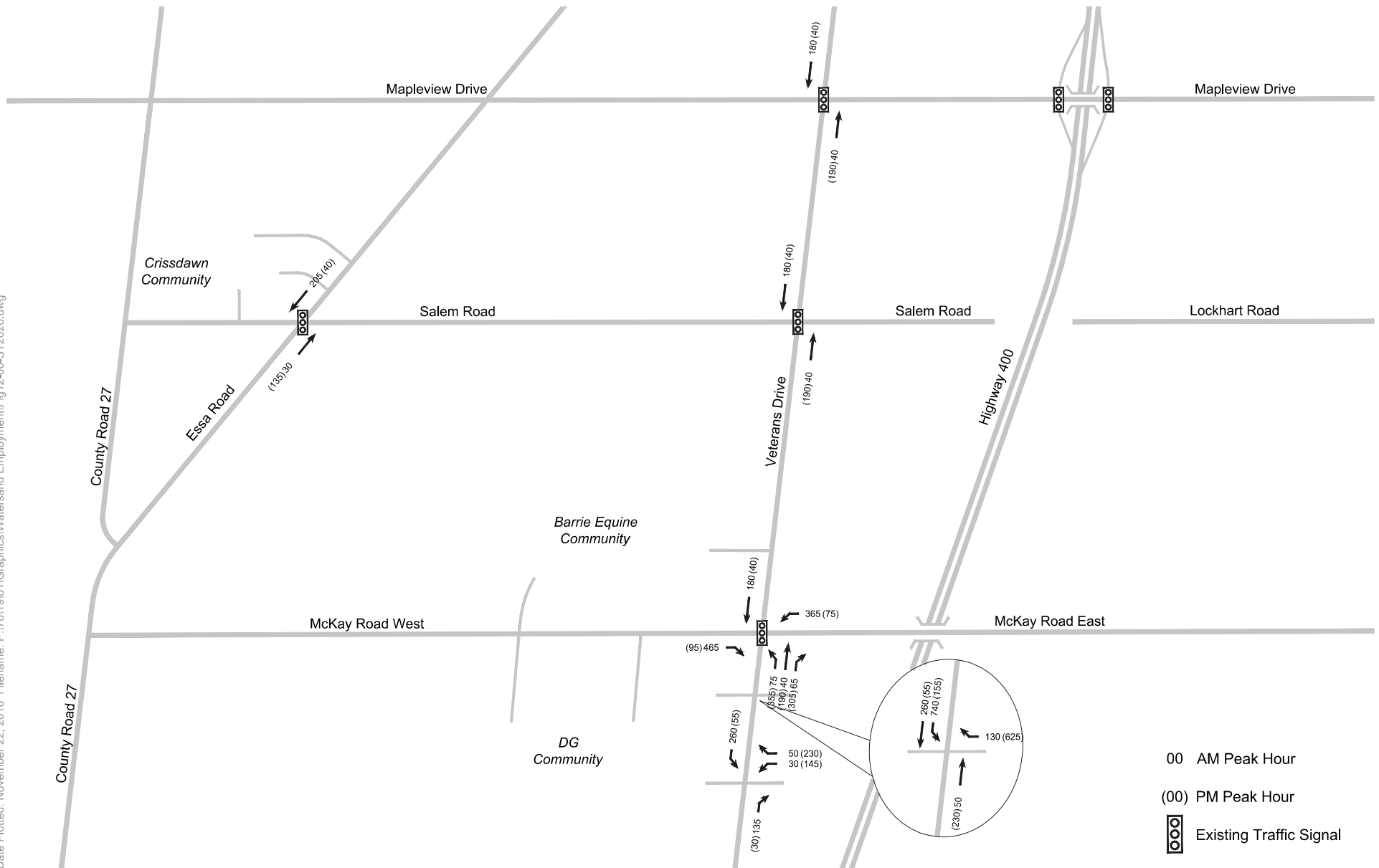
The same trip distribution assumptions have been used in the 2025 assessment as were used in the 2021 assessment. The resulting site traffic volumes are shown in Figure 12



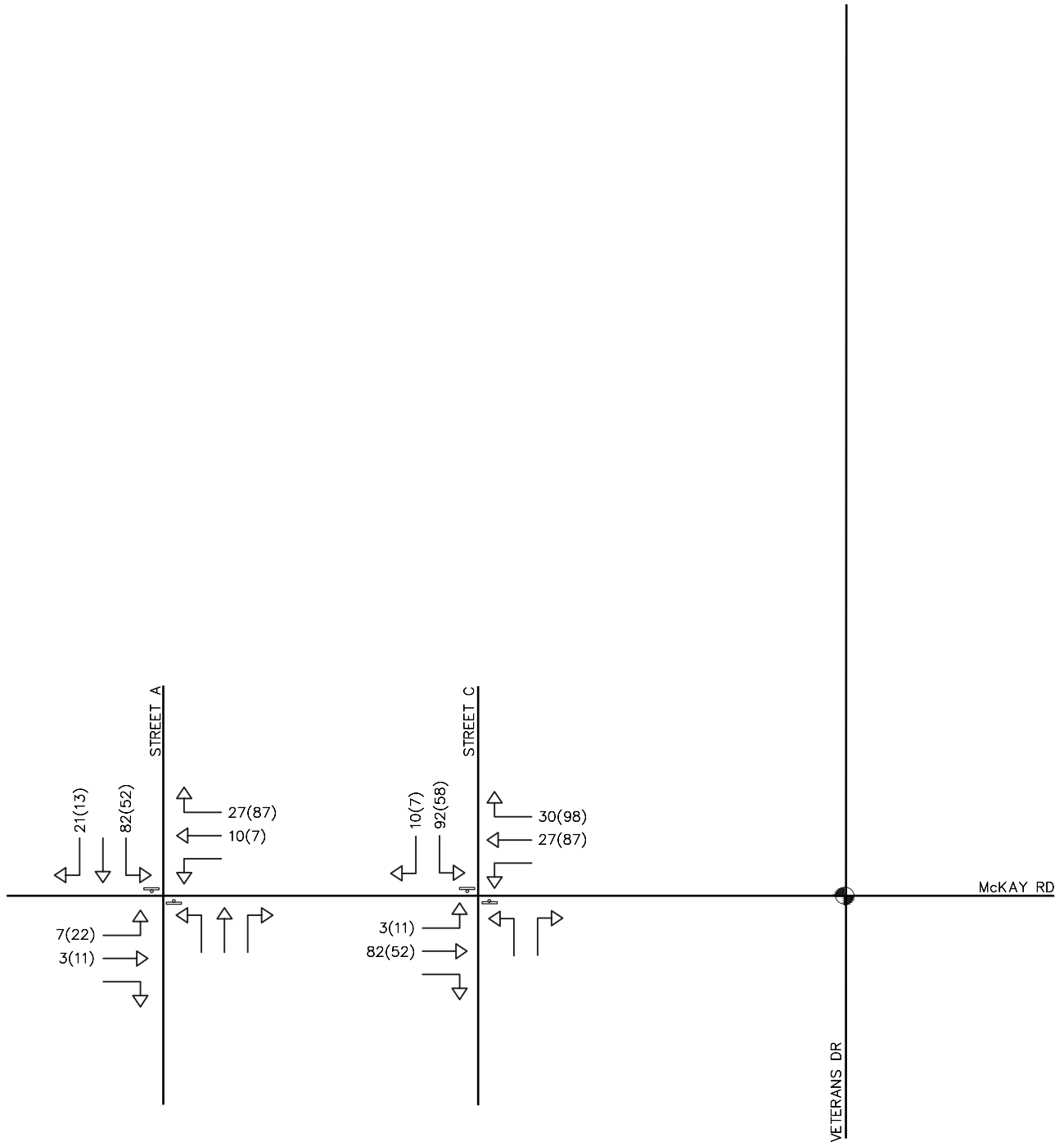
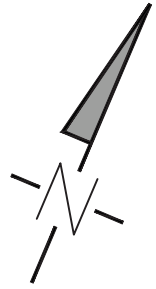
BACKGROUND TRAFFIC VOLUMES (2021)



SITE TRAFFIC VOLUMES (2021)

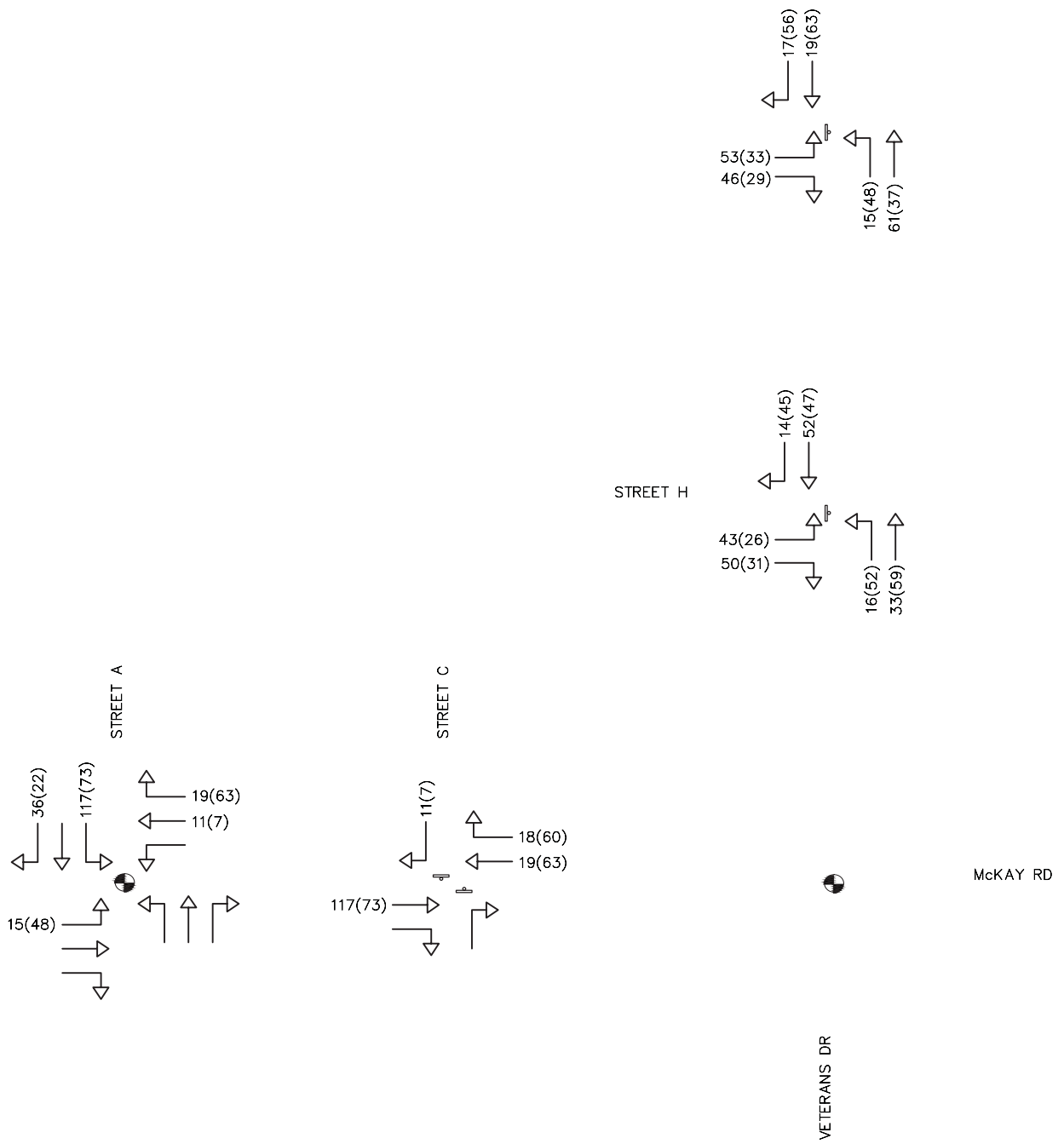
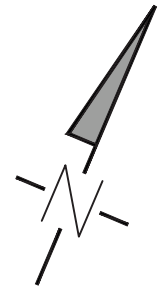


SITE TRAFFIC VOLUMES (2026)



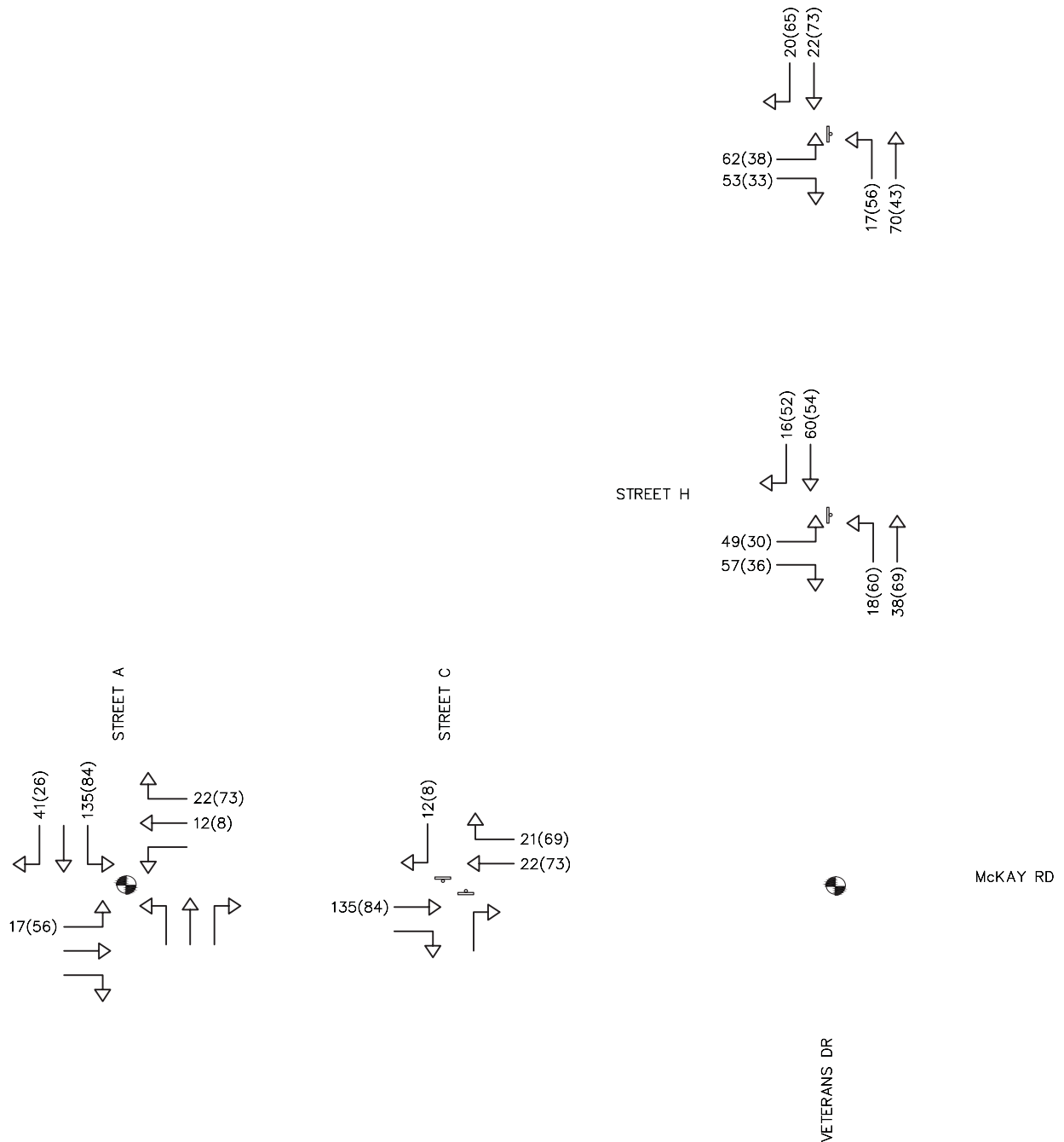
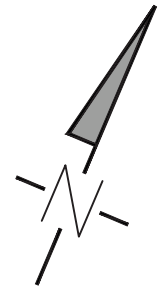
NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend  SIGNAL CONTROL  STOP CONTROL xx(yy) WEEKDAY AM (WEEKDAY PM)	Project H&H CAPITAL	 CROZIER & ASSOCIATES Consulting Engineers THE HARBOUREDGE BUILDING, 40 HURON STREET, SUITE 301, COLLINGWOOD, ON L9Y 4R3 705-446-3510 T 705-446-3520 F WWW.CFCROZIER.CA INFO@CFCROZIER.CA			
	Drawing RESIDENTIAL TRIP ASSIGNMENT (PHASE 1A)	Drawn By J.I.M. Design By J.I.M. Project 1412-4669	Scale N.T.S. Date JAN. 29, 2018 Check By M.N.F. Drawing FIG. 12		



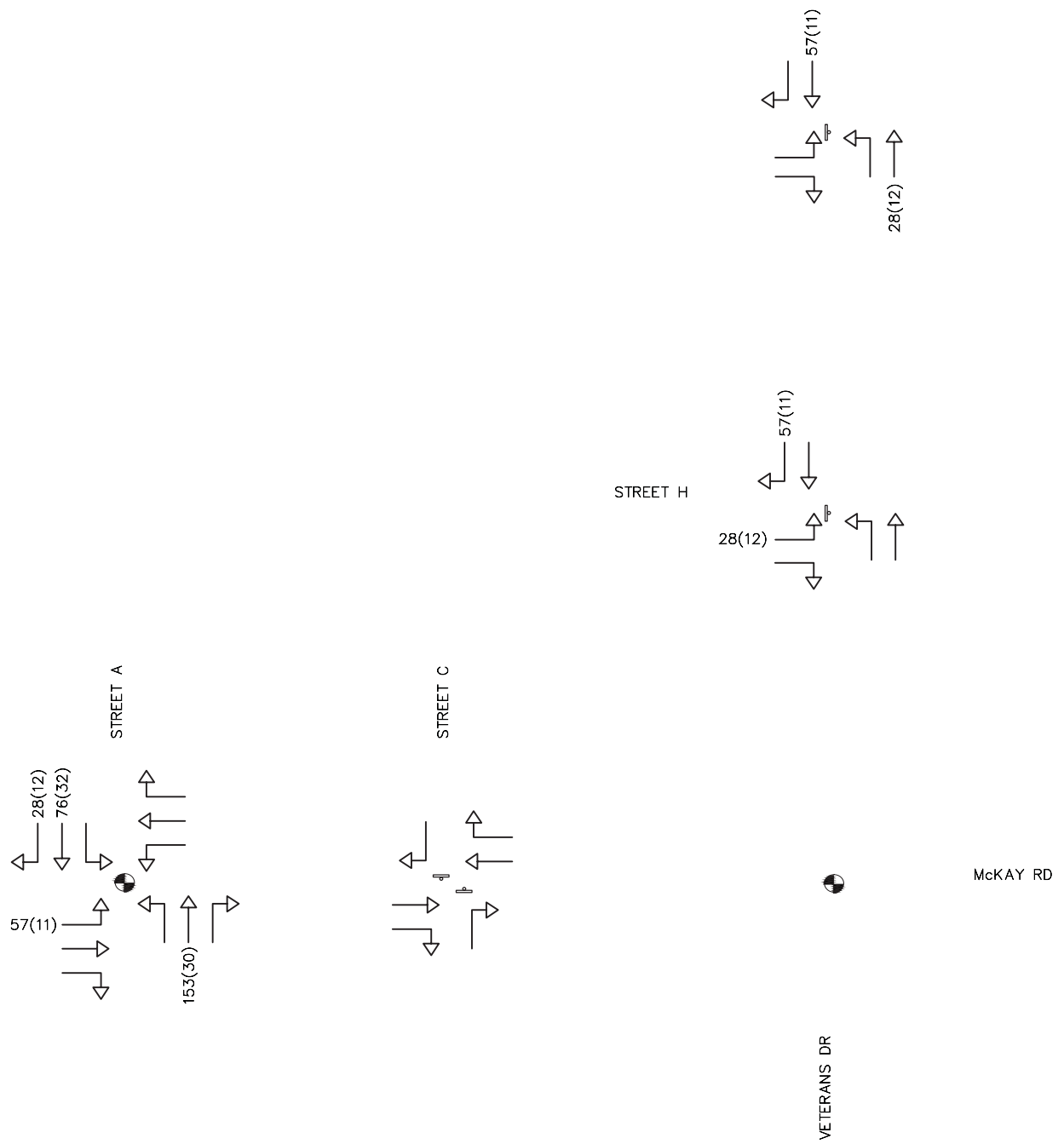
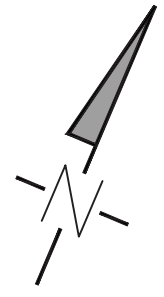
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Legend  SIGNAL CONTROL  STOP CONTROL WEEKDAY AM (WEEKDAY PM)	Project	 CROZIER & ASSOCIATES Consulting Engineers THE HARBOUREDGE BUILDING, 40 HURON STREET, SUITE 301, COLLINGWOOD, ON L9Y 4R3 705-446-3510 T 705-446-3520 F WWW.CFCROZIER.CA INFO@CFCROZIER.CA			
	Drawing				
	Drawn By	Design By	Project		
	Scale	Date	Check By	Drawing	
	N.T.S.				



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend SIGNAL CONTROL STOP CONTROL WEEKDAY AM (WEEKDAY PM)	Project		CROZIER & ASSOCIATES Consulting Engineers THE HARBOUREDGE BUILDING, 40 HURON STREET, SUITE 301, COLLINGWOOD, ON L9Y 4R3 705-446-3510 T 705-446-3520 F WWW.CFCROZIER.CA INFO@CFCROZIER.CA						
	Drawing								
	Drawn By		Design By		Project				
Scale		N.T.S.		Date		Check By		Drawing	



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend  SIGNAL CONTROL  STOP CONTROL WEEKDAY AM (WEEKDAY PM)	Project		 CROZIER & ASSOCIATES Consulting Engineers THE HARBOUREDGE BUILDING, 40 HURON STREET, SUITE 301, COLLINGWOOD, ON L9Y 4R3 705-446-3510 T 705-446-3520 F WWW.CFCROZIER.CA INFO@CFCROZIER.CA
	Drawing		
Drawn By		Design By	Project
Scale	N.T.S.	Date	Check By
		Drawing	

Appendix D

Future Background Level of Service Calculations

Lanes, Volumes, Timings
5: Essa Rd & Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	705	32	64	215	58	42	425	148	153	297	100
Future Volume (vph)	105	705	32	64	215	58	42	425	148	153	297	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	100.0		0.0	300.0		300.0	60.0		50.0	80.0		50.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00		1.00		0.97			0.99	1.00		
Frt		0.993				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1767	3484	0	1580	3216	1465	1487	1824	1439	1733	1807	1507
Flt Permitted	0.609			0.189			0.561			0.339		
Satd. Flow (perm)	1128	3484	0	314	3216	1427	878	1824	1419	618	1807	1507
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6				105			134			106
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		1746.1			305.4			1265.8			359.4	
Travel Time (s)		104.8			18.3			75.9			21.6	
Confl. Peds. (#/hr)	4		3	3		4			2	2		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	16%	13%	11%	9%	20%	3%	11%	3%	4%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	112	750	34	68	229	62	45	452	157	163	316	106
Shared Lane Traffic (%)												
Lane Group Flow (vph)	112	784	0	68	229	62	45	452	157	163	316	106
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	34.0	34.0		34.0	34.0	34.0	7.0	37.0	37.0	7.0	37.0	37.0
Total Split (s)	36.0	36.0		36.0	36.0	36.0	10.0	37.0	37.0	10.0	37.0	37.0
Total Split (%)	43.4%	43.4%		43.4%	43.4%	43.4%	12.0%	44.6%	44.6%	12.0%	44.6%	44.6%

Lanes, Volumes, Timings

5: Essa Rd & Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	3.0	6.0	6.0	3.0	6.0	6.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	23.6	23.6		23.6	23.6	23.6	41.0	31.1	31.1	42.4	35.4	35.4
Actuated g/C Ratio	0.31	0.31		0.31	0.31	0.31	0.54	0.41	0.41	0.56	0.47	0.47
v/c Ratio	0.32	0.72		0.70	0.23	0.12	0.08	0.60	0.24	0.36	0.37	0.14
Control Delay	22.2	26.9		60.7	19.5	1.7	8.8	22.9	5.6	10.9	17.4	4.3
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.2	26.9		60.7	19.5	1.7	8.8	22.9	5.6	10.9	17.4	4.3
LOS	C	C		E	B	A	A	C	A	B	B	A
Approach Delay		26.3			24.2			17.8			13.2	
Approach LOS		C			C			B			B	
Queue Length 50th (m)	12.7	53.9		8.9	13.2	0.0	2.6	51.4	2.0	10.2	32.8	0.0
Queue Length 95th (m)	25.5	72.6		#28.9	21.4	2.8	8.4	94.6	14.6	23.6	62.7	9.8
Internal Link Dist (m)		1722.1			281.4			1241.8			335.4	
Turn Bay Length (m)	100.0			300.0		300.0	60.0		50.0	80.0		50.0
Base Capacity (vph)	463	1433		129	1320	647	533	748	661	449	843	760
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.55		0.53	0.17	0.10	0.08	0.60	0.24	0.36	0.37	0.14

Intersection Summary

Area Type: Other

Cycle Length: 83

Actuated Cycle Length: 75.8

Natural Cycle: 80

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 20.7

Intersection LOS: C

Intersection Capacity Utilization 75.1%

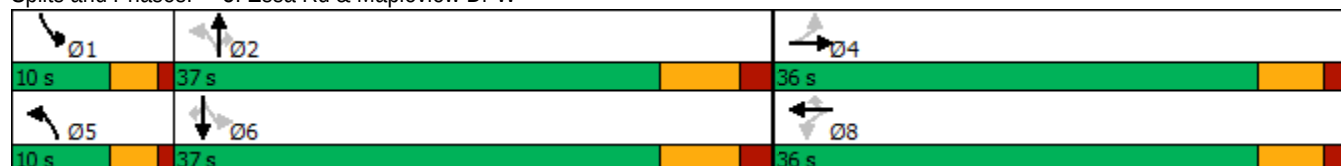
ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 5: Essa Rd & Mapleview Dr W



Lanes, Volumes, Timings
7: Essa Rd & Mabern St

10-28-2018

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	76	52	18	395	289	22
Future Volume (vph)	76	52	18	395	289	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)	0%			0%	0%	
Storage Length (m)	30.0	0.0	30.0			30.0
Storage Lanes	1	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1750	1566	1750	1842	1842	1566
Flt Permitted	0.950		0.570			
Satd. Flow (perm)	1750	1566	1050	1842	1842	1566
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		57				24
Link Speed (k/h)	40			60	60	
Link Distance (m)	432.4			445.0	1265.8	
Travel Time (s)	38.9			26.7	75.9	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	83	57	20	429	314	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	83	57	20	429	314	24
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.5			3.5	3.5	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25	15	25			15
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.0	32.0	37.0	37.0	37.0	37.0
Total Split (s)	32.0	32.0	37.0	37.0	37.0	37.0
Total Split (%)	46.4%	46.4%	53.6%	53.6%	53.6%	53.6%

Lanes, Volumes, Timings

7: Essa Rd & Mabern St

10-28-2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Yellow Time (s)	3.0	3.0	5.0	5.0	5.0	5.0
All-Red Time (s)	1.0	1.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	3.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effect Green (s)	8.9	8.9	38.2	38.2	38.2	38.2
Actuated g/C Ratio	0.17	0.17	0.72	0.72	0.72	0.72
v/c Ratio	0.28	0.18	0.03	0.32	0.24	0.02
Control Delay	20.6	7.4	3.9	4.9	4.4	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.6	7.4	3.9	4.9	4.4	2.0
LOS	C	A	A	A	A	A
Approach Delay	15.2			4.9	4.2	
Approach LOS	B			A	A	
Queue Length 50th (m)	6.7	0.0	0.5	14.5	9.8	0.0
Queue Length 95th (m)	15.9	7.1	2.5	30.8	21.6	1.9
Internal Link Dist (m)	408.4			421.0	1241.8	
Turn Bay Length (m)	30.0		30.0			30.0
Base Capacity (vph)	966	890	756	1327	1327	1135
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.06	0.03	0.32	0.24	0.02

Intersection Summary

Area Type: Other

Cycle Length: 69

Actuated Cycle Length: 53

Natural Cycle: 70

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.32

Intersection Signal Delay: 6.2

Intersection LOS: A

Intersection Capacity Utilization 33.3%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 7: Essa Rd & Mabern St

 02 37 s	 04 32 s
 06 37 s	

Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

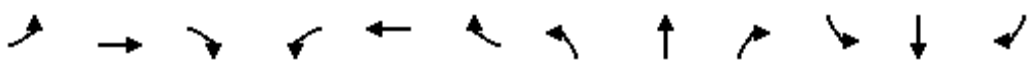
10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	176	29	53	122	141	21	123	16	174	156	52
Future Volume (vph)	49	176	29	53	122	141	21	123	16	174	156	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	50.0		0.0	140.0		0.0	100.0		100.0	80.0		80.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor									0.99	1.00		
Frt		0.979				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1684	1799	0	1638	1807	1413	1700	3216	1342	1716	3305	1389
Flt Permitted	0.663			0.464			0.633			0.626		
Satd. Flow (perm)	1175	1799	0	800	1807	1413	1133	3216	1325	1130	3305	1389
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10				170			128			128
Link Speed (k/h)		60			50			80			80	
Link Distance (m)		163.9			1746.1			1328.1			632.7	
Travel Time (s)		9.8			125.7			59.8			28.5	
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	1%	10%	9%	4%	13%	5%	11%	19%	4%	8%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	59	212	35	64	147	170	25	148	19	210	188	63
Shared Lane Traffic (%)												
Lane Group Flow (vph)	59	247	0	64	147	170	25	148	19	210	188	63
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4		3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	1.0	5.0		1.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	5.0	47.8		5.0	47.8	47.8	7.0	34.5	34.5	7.0	34.5	34.5
Total Split (s)	5.0	48.9		5.0	48.9	48.9	7.0	39.5	39.5	7.0	39.5	39.5
Total Split (%)	5.0%	48.7%		5.0%	48.7%	48.7%	7.0%	39.3%	39.3%	7.0%	39.3%	39.3%

Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	3.7		3.0	3.7	3.7	3.0	4.6	4.6	3.0	4.6	4.6
All-Red Time (s)	1.0	3.1		1.0	3.1	3.1	1.0	1.9	1.9	1.0	1.9	1.9
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	5.8		3.0	5.8	5.8	3.0	5.5	5.5	3.0	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	20.0	15.7		20.7	16.7	16.7	40.8	34.2	34.2	42.7	38.7	38.7
Actuated g/C Ratio	0.28	0.22		0.29	0.23	0.23	0.57	0.47	0.47	0.59	0.54	0.54
v/c Ratio	0.17	0.62		0.25	0.35	0.37	0.04	0.10	0.03	0.30	0.11	0.08
Control Delay	18.9	31.8		20.6	26.0	6.7	7.5	12.1	0.1	9.4	10.7	0.3
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.9	31.8		20.6	26.0	6.7	7.5	12.1	0.1	9.4	10.7	0.3
LOS	B	C		C	C	A	A	B	A	A	B	A
Approach Delay	29.4			16.5			10.3			8.7		
Approach LOS	C			B			B			A		
Queue Length 50th (m)	5.9	31.2		6.5	18.3	0.0	1.3	6.0	0.0	12.5	6.0	0.0
Queue Length 95th (m)	12.5	48.0		13.3	30.7	11.1	4.6	11.5	0.0	24.7	14.0	0.0
Internal Link Dist (m)	139.9			1722.1			1304.1			608.7		
Turn Bay Length (m)	50.0			140.0			100.0		100.0	80.0		80.0
Base Capacity (vph)	340	1085		252	1085	916	671	1524	695	700	1769	803
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.23		0.25	0.14	0.19	0.04	0.10	0.03	0.30	0.11	0.08

Intersection Summary

Area Type: Other

Cycle Length: 100.4

Actuated Cycle Length: 72.2

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 15.8

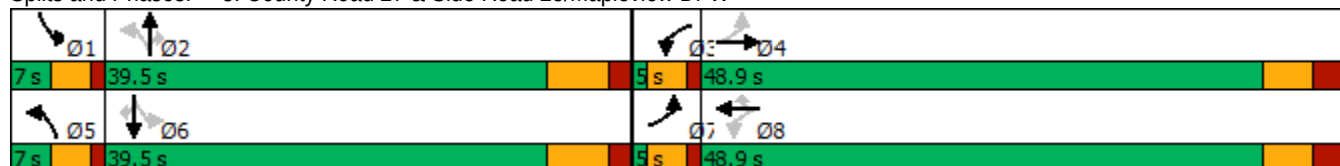
Intersection LOS: B

Intersection Capacity Utilization 63.4%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 8: County Road 27 & Side Road 25/Mapleview Dr W



HCM Unsignalized Intersection Capacity Analysis

13: Essa Rd & Salem Rd

10-28-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized			MOYes			MOYes						
Traffic Volume (veh/h)	10	28	0	5	16	36	12	367	47	109	256	16
Future Volume (veh/h)	10	28	0	5	16	36	12	367	47	109	256	16
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	13	35	0	6	20	45	15	459	59	136	320	20
Approach Volume (veh/h)		48			26			533			476	
Crossing Volume (veh/h)		462			487			184			41	
High Capacity (veh/h)		962			943			1199			1341	
High v/c (veh/h)		0.05			0.03			0.44			0.35	
Low Capacity (veh/h)		780			763			993			1122	
Low v/c (veh/h)		0.06			0.03			0.54			0.42	
Intersection Summary												
Maximum v/c High			0.44									
Maximum v/c Low			0.54									
Intersection Capacity Utilization			57.6%			ICU Level of Service				B		

HCM Unsignalized Intersection Capacity Analysis

14: County Road 27 & Private Access/Salem Rd

10-28-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1	0	2	0	9	0	168	8	16	213	0
Future Volume (Veh/h)	0	1	0	2	0	9	0	168	8	16	213	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	0	1	0	2	0	11	0	202	10	19	257	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	513	507	257	502	502	207	257				212	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	513	507	257	502	502	207	257				212	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.5	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.5	2.2				2.2	
p0 queue free %	100	100	100	100	100	99	100				99	
cM capacity (veh/h)	463	465	787	477	468	779	1320				1370	
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total	1	2	11	212	276							
Volume Left	0	2	0	0	19							
Volume Right	0	0	11	10	0							
cSH	465	477	779	1320	1370							
Volume to Capacity	0.00	0.00	0.01	0.00	0.01							
Queue Length 95th (m)	0.1	0.1	0.3	0.0	0.3							
Control Delay (s)	12.8	12.6	9.7	0.0	0.6							
Lane LOS	B	B	A		A							
Approach Delay (s)	12.8	10.1		0.0	0.6							
Approach LOS	B	B										
Intersection Summary												
Average Delay				0.6								
Intersection Capacity Utilization				34.4%	ICU Level of Service				A			
Analysis Period (min)				15								

Lanes, Volumes, Timings
5: Essa Rd & Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	453	49	170	750	321	60	436	142	103	535	173
Future Volume (vph)	108	453	49	170	750	321	60	436	142	103	535	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	100.0		0.0	300.0		300.0	60.0		50.0	80.0		50.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.98	1.00		0.99	1.00		0.98
Frt		0.985				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1716	3454	0	1733	3535	1581	1785	1879	1536	1733	1842	1581
Flt Permitted	0.160			0.443			0.128			0.250		
Satd. Flow (perm)	289	3454	0	808	3535	1544	240	1879	1516	456	1842	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		14				322			199			199
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		1746.1			305.4			1257.3			359.4	
Travel Time (s)		104.8			18.3			75.4			21.6	
Confl. Peds. (#/hr)	2					2	10		1	1		10
Confl. Bikes (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	2%	0%	3%	1%	1%	0%	0%	4%	3%	2%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	120	503	54	189	833	357	67	484	158	114	594	192
Shared Lane Traffic (%)												
Lane Group Flow (vph)	120	557	0	189	833	357	67	484	158	114	594	192
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	2.5	5.0		5.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	7.0	40.0		34.0	34.0	34.0	7.0	37.0	37.0	7.0	37.0	37.0
Total Split (s)	10.0	46.0		36.0	36.0	36.0	10.0	37.0	37.0	10.0	37.0	37.0
Total Split (%)	10.8%	49.5%		38.7%	38.7%	38.7%	10.8%	39.8%	39.8%	10.8%	39.8%	39.8%

Lanes, Volumes, Timings

5: Essa Rd & Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	10.0		4.0	4.0	4.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	2.0		2.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	11.0		5.0	5.0	5.0	3.0	6.0	6.0	3.0	6.0	6.0
Lead/Lag	Lead			Lag			Lag			Lead		
Lead-Lag Optimize?	Yes			Yes			Yes			Yes		
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	40.1	32.0		28.0	28.0	28.0	39.7	31.3	31.3	39.7	31.3	31.3
Actuated g/C Ratio	0.46	0.36		0.32	0.32	0.32	0.45	0.36	0.36	0.45	0.36	0.36
v/c Ratio	0.49	0.44		0.74	0.74	0.50	0.29	0.73	0.24	0.37	0.91	0.28
Control Delay	21.6	22.1		46.4	31.7	6.8	16.8	34.0	2.5	17.3	49.1	4.4
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.6	22.1		46.4	31.7	6.8	16.8	34.0	2.5	17.3	49.1	4.4
LOS	C	C		D	C	A	B	C	A	B	D	A
Approach Delay	22.0			27.3			25.3			35.6		
Approach LOS	C			C			C			D		
Queue Length 50th (m)	12.6	39.2		30.7	71.4	4.5	6.7	81.3	0.0	11.7	109.2	0.0
Queue Length 95th (m)	23.3	54.0		#64.3	93.2	25.4	14.1	#123.7	7.7	21.7	#178.9	13.6
Internal Link Dist (m)	1722.1			281.4			1233.3			335.4		
Turn Bay Length (m)	100.0			300.0		300.0	60.0		50.0	80.0		50.0
Base Capacity (vph)	246	1392		286	1254	755	232	666	666	307	654	677
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.40		0.66	0.66	0.47	0.29	0.73	0.24	0.37	0.91	0.28

Intersection Summary

Area Type: Other

Cycle Length: 93

Actuated Cycle Length: 88.1

Natural Cycle: 85

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 28.0

Intersection LOS: C

Intersection Capacity Utilization 76.7%

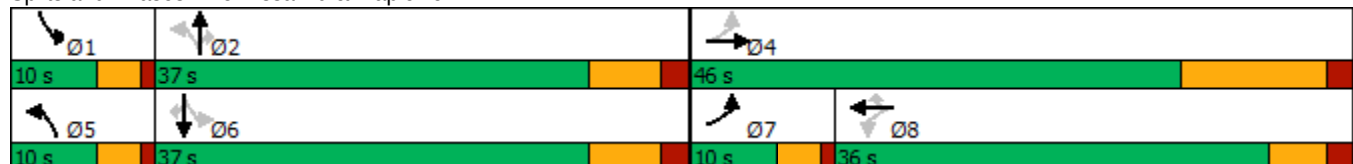
ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 5: Essa Rd & Mapleview Dr W



Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	81	207	19	24	255	199	55	261	69	164	143	50
Future Volume (vph)	81	207	19	24	255	199	55	261	69	164	143	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	50.0		0.0	140.0		0.0	100.0		100.0	80.0		80.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor									0.99	1.00		
Frt		0.987				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1700	1821	0	1653	1879	1566	1716	3368	1597	1733	3400	1597
Flt Permitted	0.402			0.484			0.647			0.556		
Satd. Flow (perm)	719	1821	0	842	1879	1566	1169	3368	1576	1014	3400	1597
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6				231			128			128
Link Speed (k/h)		60			50			80			80	
Link Distance (m)		163.9			1746.1			1328.1			632.7	
Travel Time (s)		9.8			125.7			59.8			28.5	
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	5%	2%	0%	8%	0%	2%	4%	6%	0%	3%	5%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	94	241	22	28	297	231	64	303	80	191	166	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	94	263	0	28	297	231	64	303	80	191	166	58
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4		3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	1.0	5.0		1.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	5.0	47.8		5.0	47.8	47.8	7.0	34.5	34.5	7.0	34.5	34.5
Total Split (s)	5.0	48.9		5.0	48.9	48.9	7.0	39.5	39.5	7.0	39.5	39.5
Total Split (%)	5.0%	48.7%		5.0%	48.7%	48.7%	7.0%	39.3%	39.3%	7.0%	39.3%	39.3%

Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	3.7		3.0	3.7	3.7	3.0	4.6	4.6	3.0	4.6	4.6
All-Red Time (s)	1.0	3.1		1.0	3.1	3.1	1.0	1.9	1.9	1.0	1.9	1.9
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	5.8		3.0	5.8	5.8	3.0	5.5	5.5	3.0	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	23.5	20.0		22.3	18.0	18.0	40.8	34.2	34.2	41.5	35.9	35.9
Actuated g/C Ratio	0.32	0.27		0.30	0.24	0.24	0.55	0.46	0.46	0.56	0.48	0.48
v/c Ratio	0.37	0.53		0.10	0.66	0.42	0.10	0.20	0.10	0.32	0.10	0.07
Control Delay	22.7	27.2		16.9	32.9	5.9	8.7	13.6	1.3	10.8	13.0	0.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.7	27.2		16.9	32.9	5.9	8.7	13.6	1.3	10.8	13.0	0.2
LOS	C	C		B	C	A	A	B	A	B	B	A
Approach Delay	26.0			20.9			10.7			10.2		
Approach LOS	C			C			B			B		
Queue Length 50th (m)	9.6	30.8		2.8	40.2	0.0	3.8	13.6	0.0	12.3	7.2	0.0
Queue Length 95th (m)	18.4	53.4		7.4	60.9	13.5	10.4	24.1	2.3	26.1	14.2	0.0
Internal Link Dist (m)	139.9			1722.1			1304.1			608.7		
Turn Bay Length (m)	50.0			140.0			100.0		100.0	80.0		80.0
Base Capacity (vph)	253	1063		274	1094	1008	669	1547	793	603	1636	835
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.25		0.10	0.27	0.23	0.10	0.20	0.10	0.32	0.10	0.07

Intersection Summary

Area Type: Other

Cycle Length: 100.4

Actuated Cycle Length: 74.5

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 16.9

Intersection LOS: B

Intersection Capacity Utilization 66.4%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 8: County Road 27 & Side Road 25/Mapleview Dr W

			
7 s	39.5 s	5 s	48.9 s
			
7 s	39.5 s	5 s	48.9 s

Lanes, Volumes, Timings
9: Essa Rd & Mabern St

10-28-2018

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	50	34	60	554	523	78
Future Volume (vph)	50	34	60	554	523	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)	0%			0%	0%	
Storage Length (m)	30.0	0.0	30.0			30.0
Storage Lanes	1	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1750	1566	1750	1842	1842	1566
Flt Permitted	0.950		0.443			
Satd. Flow (perm)	1750	1566	816	1842	1842	1566
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		37				67
Link Speed (k/h)	40			60	60	
Link Distance (m)	429.9			453.6	1257.3	
Travel Time (s)	38.7			27.2	75.4	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	54	37	65	602	568	85
Shared Lane Traffic (%)						
Lane Group Flow (vph)	54	37	65	602	568	85
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.5			3.5	3.5	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25	15	25			15
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.0	32.0	37.0	37.0	37.0	37.0
Total Split (s)	32.0	32.0	37.0	37.0	37.0	37.0
Total Split (%)	46.4%	46.4%	53.6%	53.6%	53.6%	53.6%

Lanes, Volumes, Timings

9: Essa Rd & Mabern St

10-28-2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Yellow Time (s)	3.0	3.0	5.0	5.0	5.0	5.0
All-Red Time (s)	1.0	1.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	3.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Min	Min	Min	Min
Act Effect Green (s)	8.2	8.2	31.6	31.6	31.6	31.6
Actuated g/C Ratio	0.20	0.20	0.77	0.77	0.77	0.77
v/c Ratio	0.15	0.11	0.10	0.42	0.40	0.07
Control Delay	16.9	7.6	4.2	5.3	5.1	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.9	7.6	4.2	5.3	5.1	1.9
LOS	B	A	A	A	A	A
Approach Delay	13.1			5.2	4.7	
Approach LOS	B			A	A	
Queue Length 50th (m)	4.2	0.0	1.8	22.3	20.5	0.5
Queue Length 95th (m)	11.0	5.6	5.8	46.0	42.2	4.0
Internal Link Dist (m)	405.9			429.6	1233.3	
Turn Bay Length (m)	30.0		30.0			30.0
Base Capacity (vph)	1298	1171	644	1453	1453	1249
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.03	0.10	0.41	0.39	0.07

Intersection Summary

Area Type: Other

Cycle Length: 69

Actuated Cycle Length: 40.9

Natural Cycle: 70

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.42

Intersection Signal Delay: 5.5

Intersection LOS: A

Intersection Capacity Utilization 49.2%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 9: Essa Rd & Mabern St

 02 37 s	 04 32 s
 06 37 s	

HCM Unsignalized Intersection Capacity Analysis

13: Essa Rd & Salem Rd

10-28-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized			MOYes			MOYes						
Traffic Volume (veh/h)	10	18	5	33	92	145	40	459	36	97	427	23
Future Volume (veh/h)	10	18	5	33	92	145	40	459	36	97	427	23
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	11	19	5	35	98	154	43	488	38	103	454	24
Approach Volume (veh/h)		30			133			569			581	
Crossing Volume (veh/h)		592			542			133			176	
High Capacity (veh/h)		867			903			1248			1207	
High v/c (veh/h)		0.03			0.15			0.46			0.48	
Low Capacity (veh/h)		696			727			1037			999	
Low v/c (veh/h)		0.04			0.18			0.55			0.58	
Intersection Summary												
Maximum v/c High			0.48									
Maximum v/c Low			0.58									
Intersection Capacity Utilization			76.4%			ICU Level of Service				D		

HCM Unsignalized Intersection Capacity Analysis

14: County Road 27 & Private Access/Salem Rd

10-28-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	3	0	70	0	336	6	18	166	0
Future Volume (Veh/h)	0	0	1	3	0	70	0	336	6	18	166	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	0	1	4	0	83	0	400	7	21	198	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	726	647	198	644	644	404	198				407	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	726	647	198	644	644	404	198				407	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.2	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.3	
p0 queue free %	100	100	100	99	100	87	100				98	
cM capacity (veh/h)	294	385	848	382	387	645	1387				1120	
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total	1	4	83	407	219							
Volume Left	0	4	0	0	21							
Volume Right	1	0	83	7	0							
cSH	848	382	645	1387	1120							
Volume to Capacity	0.00	0.01	0.13	0.00	0.02							
Queue Length 95th (m)	0.0	0.3	3.5	0.0	0.5							
Control Delay (s)	9.2	14.5	11.4	0.0	1.0							
Lane LOS	A	B	B		A							
Approach Delay (s)	9.2	11.5		0.0	1.0							
Approach LOS	A	B										
Intersection Summary												
Average Delay	1.7											
Intersection Capacity Utilization	34.8%			ICU Level of Service				A				
Analysis Period (min)	15											

Lanes, Volumes, Timings
5: Essa Rd & Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	859	32	64	263	58	42	560	148	153	620	100
Future Volume (vph)	105	859	32	64	263	58	42	560	148	153	620	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	100.0		0.0	300.0		300.0	60.0		50.0	80.0		50.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00		1.00		0.97			0.99	1.00		
Frt		0.995				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1767	3495	0	1580	3216	1465	1487	1824	1439	1733	1807	1507
Flt Permitted	0.580			0.126			0.156			0.163		
Satd. Flow (perm)	1074	3495	0	209	3216	1426	244	1824	1419	297	1807	1507
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				94			129			129
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		1746.1			305.4			1265.8			359.4	
Travel Time (s)		104.8			18.3			75.9			21.6	
Confl. Peds. (#/hr)	4		3	3		4			2	2		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	16%	13%	11%	9%	20%	3%	11%	3%	4%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	112	914	34	68	280	62	45	596	157	163	660	106
Shared Lane Traffic (%)												
Lane Group Flow (vph)	112	948	0	68	280	62	45	596	157	163	660	106
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	34.0	34.0		7.0	34.0	34.0	7.0	37.0	37.0	7.0	37.0	37.0
Total Split (s)	36.0	36.0		7.0	43.0	43.0	10.0	40.0	40.0	10.0	40.0	40.0
Total Split (%)	38.7%	38.7%		7.5%	46.2%	46.2%	10.8%	43.0%	43.0%	10.8%	43.0%	43.0%

Lanes, Volumes, Timings

5: Essa Rd & Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	4.0	4.0		3.0	4.0	4.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	2.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0		3.0	5.0	5.0	3.0	6.0	6.0	3.0	6.0	6.0
Lead/Lag	Lag	Lag		Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes			Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	28.7	28.7		36.1	34.1	34.1	44.1	34.2	34.2	45.5	38.5	38.5
Actuated g/C Ratio	0.32	0.32		0.40	0.38	0.38	0.49	0.38	0.38	0.51	0.43	0.43
v/c Ratio	0.33	0.84		0.47	0.23	0.10	0.21	0.86	0.25	0.62	0.85	0.15
Control Delay	26.4	36.5		26.9	18.8	2.0	14.1	40.6	6.9	24.2	38.6	3.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.4	36.5		26.9	18.8	2.0	14.1	40.6	6.9	24.2	38.6	3.0
LOS	C	D		C	B	A	B	D	A	C	D	A
Approach Delay	35.4			17.6			32.5			32.0		
Approach LOS	D			B			C			C		
Queue Length 50th (m)	15.6	84.7		7.4	17.5	0.0	4.1	104.3	3.4	16.0	122.5	0.0
Queue Length 95th (m)	30.3	109.8		15.7	26.6	3.9	9.9	#169.2	16.6	#31.2	#198.2	7.5
Internal Link Dist (m)	1722.1			281.4			1241.8			335.4		
Turn Bay Length (m)	100.0			300.0		300.0	60.0		50.0	80.0		50.0
Base Capacity (vph)	374	1221		145	1374	663	218	697	622	264	777	721
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.78		0.47	0.20	0.09	0.21	0.86	0.25	0.62	0.85	0.15

Intersection Summary

Area Type: Other

Cycle Length: 93

Actuated Cycle Length: 89.4

Natural Cycle: 85

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 31.4

Intersection LOS: C

Intersection Capacity Utilization 82.1%

ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 5: Essa Rd & Mapleview Dr W

 Ø1	 Ø2	 Ø3	 Ø4
10 s	40 s	7 s	36 s
 Ø5	 Ø6	 Ø8	
10 s	40 s	43 s	

Lanes, Volumes, Timings
7: Essa Rd & Mabern St

10-28-2018

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	76	52	18	532	606	22
Future Volume (vph)	76	52	18	532	606	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)	0%			0%	0%	
Storage Length (m)	30.0	0.0	30.0			30.0
Storage Lanes	1	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1750	1566	1750	1842	1842	1566
Flt Permitted	0.950		0.373			
Satd. Flow (perm)	1750	1566	687	1842	1842	1566
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		57				16
Link Speed (k/h)	40			60	60	
Link Distance (m)	432.4			445.0	1265.8	
Travel Time (s)	38.9			26.7	75.9	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	83	57	20	578	659	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	83	57	20	578	659	24
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.5			3.5	3.5	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25	15	25			15
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.0	32.0	37.0	37.0	37.0	37.0
Total Split (s)	32.0	32.0	37.0	37.0	37.0	37.0
Total Split (%)	46.4%	46.4%	53.6%	53.6%	53.6%	53.6%

Lanes, Volumes, Timings

7: Essa Rd & Mabern St

10-28-2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Yellow Time (s)	3.0	3.0	5.0	5.0	5.0	5.0
All-Red Time (s)	1.0	1.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	3.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effect Green (s)	8.9	8.9	38.2	38.2	38.2	38.2
Actuated g/C Ratio	0.17	0.17	0.72	0.72	0.72	0.72
v/c Ratio	0.28	0.18	0.04	0.44	0.50	0.02
Control Delay	20.6	7.4	4.1	5.9	6.5	2.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.6	7.4	4.1	5.9	6.5	2.5
LOS	C	A	A	A	A	A
Approach Delay	15.2			5.8	6.4	
Approach LOS	B			A	A	
Queue Length 50th (m)	6.7	0.0	0.5	21.8	26.6	0.3
Queue Length 95th (m)	15.9	7.1	2.6	46.0	56.3	2.2
Internal Link Dist (m)	408.4			421.0	1241.8	
Turn Bay Length (m)	30.0		30.0			30.0
Base Capacity (vph)	966	890	495	1327	1327	1133
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.06	0.04	0.44	0.50	0.02

Intersection Summary

Area Type: Other

Cycle Length: 69

Actuated Cycle Length: 53

Natural Cycle: 70

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 7.0

Intersection LOS: A

Intersection Capacity Utilization 44.4%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 7: Essa Rd & Mabern St

 02 37 s	 04 32 s
 06 37 s	

Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	215	29	53	149	141	21	149	16	174	190	52
Future Volume (vph)	49	215	29	53	149	141	21	149	16	174	190	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	50.0		0.0	140.0		0.0	100.0		100.0	80.0		80.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor									0.99	1.00		
Frt		0.982				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1684	1808	0	1638	1807	1413	1700	3216	1342	1716	3305	1389
Flt Permitted	0.613			0.388			0.609			0.607		
Satd. Flow (perm)	1087	1808	0	669	1807	1413	1090	3216	1325	1096	3305	1389
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8				170			128			128
Link Speed (k/h)		60			50			80			80	
Link Distance (m)		163.9			1746.1			1328.1			632.7	
Travel Time (s)		9.8			125.7			59.8			28.5	
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	1%	10%	9%	4%	13%	5%	11%	19%	4%	8%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	59	259	35	64	180	170	25	180	19	210	229	63
Shared Lane Traffic (%)												
Lane Group Flow (vph)	59	294	0	64	180	170	25	180	19	210	229	63
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4		3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	1.0	5.0		1.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	5.0	47.8		5.0	47.8	47.8	7.0	34.5	34.5	7.0	34.5	34.5
Total Split (s)	5.0	48.9		5.0	48.9	48.9	7.0	39.5	39.5	7.0	39.5	39.5
Total Split (%)	5.0%	48.7%		5.0%	48.7%	48.7%	7.0%	39.3%	39.3%	7.0%	39.3%	39.3%

Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	3.7		3.0	3.7	3.7	3.0	4.6	4.6	3.0	4.6	4.6
All-Red Time (s)	1.0	3.1		1.0	3.1	3.1	1.0	1.9	1.9	1.0	1.9	1.9
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	5.8		3.0	5.8	5.8	3.0	5.5	5.5	3.0	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	22.2	17.8		22.2	17.8	17.8	40.8	34.2	34.2	42.7	38.7	38.7
Actuated g/C Ratio	0.30	0.24		0.30	0.24	0.24	0.55	0.46	0.46	0.57	0.52	0.52
v/c Ratio	0.17	0.67		0.28	0.42	0.36	0.04	0.12	0.03	0.32	0.13	0.08
Control Delay	18.3	33.0		20.8	26.9	6.3	8.5	13.2	0.1	10.7	11.7	0.3
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.3	33.0		20.8	26.9	6.3	8.5	13.2	0.1	10.7	11.7	0.3
LOS	B	C		C	C	A	A	B	A	B	B	A
Approach Delay	30.5			17.5			11.5			9.9		
Approach LOS	C			B			B			A		
Queue Length 50th (m)	5.9	38.8		6.5	22.8	0.0	1.4	7.8	0.0	13.7	8.1	0.0
Queue Length 95th (m)	12.4	57.1		13.1	36.3	10.8	5.0	14.5	0.0	26.9	17.8	0.0
Internal Link Dist (m)	139.9			1722.1			1304.1			608.7		
Turn Bay Length (m)	50.0			140.0			100.0		100.0	80.0		80.0
Base Capacity (vph)	340	1058		225	1054	895	630	1480	678	662	1718	783
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.28		0.28	0.17	0.19	0.04	0.12	0.03	0.32	0.13	0.08

Intersection Summary

Area Type: Other

Cycle Length: 100.4

Actuated Cycle Length: 74.4

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 17.1

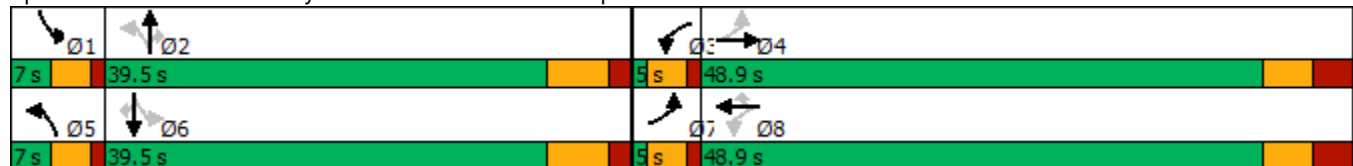
Intersection LOS: B

Intersection Capacity Utilization 65.5%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 8: County Road 27 & Side Road 25/Mapleview Dr W



HCM Unsignalized Intersection Capacity Analysis

13: Essa Rd & Salem Rd

10-28-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized			MOYes			MOYes						
Traffic Volume (veh/h)	10	34	0	5	18	36	12	504	47	109	573	16
Future Volume (veh/h)	10	34	0	5	18	36	12	504	47	109	573	16
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	13	43	0	6	23	45	15	630	59	136	716	20
Approach Volume (veh/h)		56			29			704			872	
Crossing Volume (veh/h)		858			658			192			44	
High Capacity (veh/h)		699			822			1192			1338	
High v/c (veh/h)		0.08			0.04			0.59			0.65	
Low Capacity (veh/h)		549			656			986			1119	
Low v/c (veh/h)		0.10			0.04			0.71			0.78	
Intersection Summary												
Maximum v/c High			0.65									
Maximum v/c Low			0.78									
Intersection Capacity Utilization			81.8%			ICU Level of Service				D		

HCM Unsignalized Intersection Capacity Analysis

14: County Road 27 & Private Access/Salem Rd

10-28-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1	0	2	0	9	0	204	8	16	260	0
Future Volume (Veh/h)	0	1	0	2	0	9	0	204	8	16	260	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	0	1	0	2	0	11	0	246	10	19	313	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	613	607	313	602	602	251	313				256	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	613	607	313	602	602	251	313				256	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.5	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.5	2.2				2.2	
p0 queue free %	100	100	100	100	100	99	100				99	
cM capacity (veh/h)	397	408	732	409	410	735	1259				1321	
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total	1	2	11	256	332							
Volume Left	0	2	0	0	19							
Volume Right	0	0	11	10	0							
cSH	408	409	735	1259	1321							
Volume to Capacity	0.00	0.00	0.01	0.00	0.01							
Queue Length 95th (m)	0.1	0.1	0.4	0.0	0.4							
Control Delay (s)	13.9	13.8	10.0	0.0	0.6							
Lane LOS	B	B	A		A							
Approach Delay (s)	13.9	10.6		0.0	0.6							
Approach LOS	B	B										
Intersection Summary												
Average Delay				0.6								
Intersection Capacity Utilization				36.8%	ICU Level of Service				A			
Analysis Period (min)				15								

Lanes, Volumes, Timings
5: Essa Rd & Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	552	49	170	915	321	60	666	142	103	687	173
Future Volume (vph)	108	552	49	170	915	321	60	666	142	103	687	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	100.0		0.0	300.0		300.0	60.0		50.0	80.0		50.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.98			0.99			0.98
Frt		0.988				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1716	3463	0	1733	3535	1581	1785	1879	1536	1733	1842	1581
Flt Permitted	0.140			0.254			0.103			0.103		
Satd. Flow (perm)	253	3463	0	463	3535	1544	194	1879	1516	188	1842	1547
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10				183			125			125
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		1746.1			305.4			1257.3			359.4	
Travel Time (s)		104.8			18.3			75.4			21.6	
Confl. Peds. (#/hr)	2					2	10		1	1		10
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	2%	0%	3%	1%	1%	0%	0%	4%	3%	2%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	113	575	51	177	953	334	63	694	148	107	716	180
Shared Lane Traffic (%)												
Lane Group Flow (vph)	113	626	0	177	953	334	63	694	148	107	716	180
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4		3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	2.5	5.0		2.5	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	7.0	34.0		7.0	34.0	34.0	7.0	37.0	37.0	7.0	37.0	37.0
Total Split (s)	7.0	36.0		9.0	38.0	38.0	7.0	44.0	44.0	7.0	44.0	44.0
Total Split (%)	7.3%	37.5%		9.4%	39.6%	39.6%	7.3%	45.8%	45.8%	7.3%	45.8%	45.8%

Lanes, Volumes, Timings

5: Essa Rd & Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	4.0		3.0	4.0	4.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	5.0		3.0	5.0	5.0	3.0	6.0	6.0	3.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	34.5	28.5		38.5	30.5	30.5	45.1	38.1	38.1	45.7	39.6	39.6
Actuated g/C Ratio	0.37	0.30		0.41	0.33	0.33	0.48	0.41	0.41	0.49	0.42	0.42
v/c Ratio	0.73	0.59		0.65	0.83	0.53	0.39	0.91	0.21	0.68	0.92	0.25
Control Delay	47.1	29.6		30.7	36.2	14.4	19.6	44.8	5.9	37.7	46.1	7.7
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.1	29.6		30.7	36.2	14.4	19.6	44.8	5.9	37.7	46.1	7.7
LOS	D	C		C	D	B	B	D	A	D	D	A
Approach Delay	32.2			30.5			36.7			38.3		
Approach LOS	C			C			D			D		
Queue Length 50th (m)	12.9	51.8		21.1	87.0	21.3	6.1	127.2	2.7	10.7	135.3	6.6
Queue Length 95th (m)	#32.4	69.6		#36.3	112.0	47.9	13.0	#200.9	14.9	#27.8	#213.8	20.5
Internal Link Dist (m)	1722.1			281.4			1233.3			335.4		
Turn Bay Length (m)	100.0			300.0		300.0	60.0		50.0	80.0		50.0
Base Capacity (vph)	155	1155		272	1248	663	161	764	690	158	778	725
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.54		0.65	0.76	0.50	0.39	0.91	0.21	0.68	0.92	0.25

Intersection Summary

Area Type: Other

Cycle Length: 96

Actuated Cycle Length: 93.6

Natural Cycle: 85

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 34.1

Intersection LOS: C

Intersection Capacity Utilization 87.9%

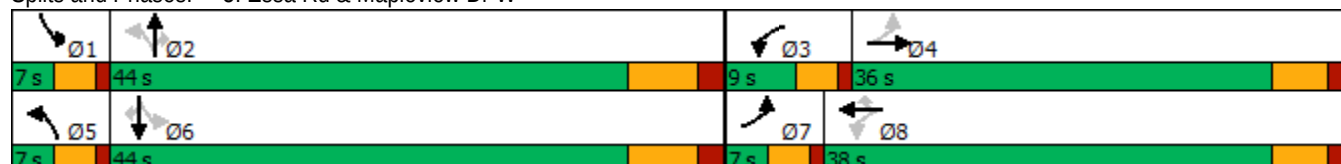
ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 5: Essa Rd & Mapleview Dr W



Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

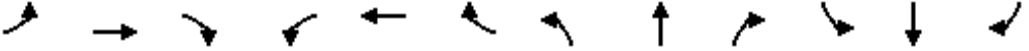
10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	81	252	19	24	310	199	55	317	69	164	173	50
Future Volume (vph)	81	252	19	24	310	199	55	317	69	164	173	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	50.0		0.0	140.0		0.0	100.0		100.0	80.0		80.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor									0.99	1.00		
Frt		0.990				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1700	1826	0	1653	1879	1566	1716	3368	1597	1733	3400	1597
Flt Permitted	0.330			0.417			0.626			0.521		
Satd. Flow (perm)	591	1826	0	725	1879	1566	1131	3368	1576	950	3400	1597
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5				231			128			128
Link Speed (k/h)		60			50			80			80	
Link Distance (m)		163.9			1746.1			1328.1			632.7	
Travel Time (s)		9.8			125.7			59.8			28.5	
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	5%	2%	0%	8%	0%	2%	4%	6%	0%	3%	5%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	94	293	22	28	360	231	64	369	80	191	201	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	94	315	0	28	360	231	64	369	80	191	201	58
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4		3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	1.0	5.0		1.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	5.0	47.8		5.0	47.8	47.8	7.0	34.5	34.5	7.0	34.5	34.5
Total Split (s)	5.0	48.9		5.0	48.9	48.9	7.0	39.5	39.5	7.0	39.5	39.5
Total Split (%)	5.0%	48.7%		5.0%	48.7%	48.7%	7.0%	39.3%	39.3%	7.0%	39.3%	39.3%

Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

10-28-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	3.7		3.0	3.7	3.7	3.0	4.6	4.6	3.0	4.6	4.6
All-Red Time (s)	1.0	3.1		1.0	3.1	3.1	1.0	1.9	1.9	1.0	1.9	1.9
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	5.8		3.0	5.8	5.8	3.0	5.5	5.5	3.0	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	26.7	23.2		25.5	21.2	21.2	40.9	34.3	34.3	41.6	36.0	36.0
Actuated g/C Ratio	0.34	0.30		0.33	0.27	0.27	0.53	0.44	0.44	0.53	0.46	0.46
v/c Ratio	0.41	0.58		0.11	0.71	0.39	0.10	0.25	0.10	0.35	0.13	0.07
Control Delay	23.2	27.4		16.2	33.5	5.2	10.3	15.6	1.4	12.9	14.6	0.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.2	27.4		16.2	33.5	5.2	10.3	15.6	1.4	12.9	14.6	0.2
LOS	C	C		B	C	A	B	B	A	B	B	A
Approach Delay	26.4			22.2			12.7			12.1		
Approach LOS	C			C			B			B		
Queue Length 50th (m)	9.6	38.5		2.8	50.8	0.0	4.3	18.5	0.0	13.7	9.5	0.0
Queue Length 95th (m)	18.2	64.0		7.3	74.0	13.0	11.6	31.8	2.5	29.2	18.2	0.0
Internal Link Dist (m)	139.9			1722.1			1304.1			608.7		
Turn Bay Length (m)	50.0			140.0			100.0		100.0	80.0		80.0
Base Capacity (vph)	231	1023		262	1050	977	624	1485	766	548	1571	806
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.41	0.31		0.11	0.34	0.24	0.10	0.25	0.10	0.35	0.13	0.07

Intersection Summary

Area Type: Other

Cycle Length: 100.4

Actuated Cycle Length: 77.8

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 18.3

Intersection LOS: B

Intersection Capacity Utilization 69.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 8: County Road 27 & Side Road 25/Mapleview Dr W

 Ø1	 Ø2	 Ø3	 Ø4
7 s	39.5 s	5 s	48.9 s
 Ø5	 Ø6	 Ø7	 Ø8
7 s	39.5 s	5 s	48.9 s

Lanes, Volumes, Timings
9: Essa Rd & Mabern St

10-28-2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	50	34	60	801	674	78
Future Volume (vph)	50	34	60	801	674	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)	0%			0%	0%	
Storage Length (m)	30.0	0.0	30.0			30.0
Storage Lanes	1	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1750	1566	1750	1842	1842	1566
Flt Permitted	0.950		0.349			
Satd. Flow (perm)	1750	1566	643	1842	1842	1566
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		37				52
Link Speed (k/h)	40			60	60	
Link Distance (m)	429.9			453.6	1257.3	
Travel Time (s)	38.7			27.2	75.4	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	54	37	65	871	733	85
Shared Lane Traffic (%)						
Lane Group Flow (vph)	54	37	65	871	733	85
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.5			3.5	3.5	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25	15	25			15
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.0	32.0	37.0	37.0	37.0	37.0
Total Split (s)	32.0	32.0	37.0	37.0	37.0	37.0
Total Split (%)	46.4%	46.4%	53.6%	53.6%	53.6%	53.6%

Lanes, Volumes, Timings

9: Essa Rd & Mabern St

10-28-2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Yellow Time (s)	3.0	3.0	5.0	5.0	5.0	5.0
All-Red Time (s)	1.0	1.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	3.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Min	Min	Min	Min
Act Effect Green (s)	8.2	8.2	44.8	44.8	44.8	44.8
Actuated g/C Ratio	0.15	0.15	0.81	0.81	0.81	0.81
v/c Ratio	0.21	0.14	0.12	0.58	0.49	0.07
Control Delay	22.4	9.1	3.9	6.7	5.3	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.4	9.1	3.9	6.7	5.3	1.9
LOS	C	A	A	A	A	A
Approach Delay	17.0			6.5	4.9	
Approach LOS	B			A	A	
Queue Length 50th (m)	6.1	0.0	1.8	41.7	30.7	0.9
Queue Length 95th (m)	12.2	6.0	6.0	87.3	62.1	4.4
Internal Link Dist (m)	405.9			429.6	1233.3	
Turn Bay Length (m)	30.0		30.0			30.0
Base Capacity (vph)	922	843	521	1492	1492	1278
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.04	0.12	0.58	0.49	0.07

Intersection Summary

Area Type: Other

Cycle Length: 69

Actuated Cycle Length: 55.3

Natural Cycle: 80

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 6.3

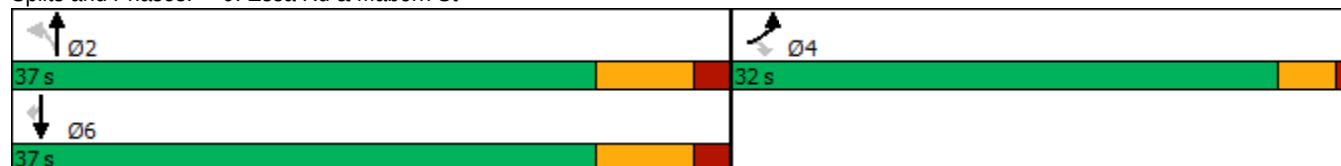
Intersection LOS: A

Intersection Capacity Utilization 57.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 9: Essa Rd & Mabern St



HCM Unsignalized Intersection Capacity Analysis

13: Essa Rd & Salem Rd

10-28-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized			MOYes			MOYes						
Traffic Volume (veh/h)	10	22	5	33	102	145	42	706	36	97	578	23
Future Volume (veh/h)	10	22	5	33	102	145	42	706	36	97	578	23
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	11	23	5	35	109	154	45	751	38	103	615	24
Approach Volume (veh/h)		34			144			834			742	
Crossing Volume (veh/h)		753			807			137			189	
High Capacity (veh/h)		761			729			1244			1194	
High v/c (veh/h)		0.04			0.20			0.67			0.62	
Low Capacity (veh/h)		603			575			1033			988	
Low v/c (veh/h)		0.06			0.25			0.81			0.75	
Intersection Summary												
Maximum v/c High			0.67									
Maximum v/c Low			0.81									
Intersection Capacity Utilization			90.7%			ICU Level of Service				E		

HCM Unsignalized Intersection Capacity Analysis

14: County Road 27 & Private Access/Salem Rd

10-28-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	3	0	70	0	410	6	18	202	0
Future Volume (Veh/h)	0	0	1	3	0	70	0	410	6	18	202	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	0	1	4	0	83	0	488	7	21	240	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	856	777	240	774	774	492	240			495		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	856	777	240	774	774	492	240			495		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	100	100	100	99	100	86	100			98		
cM capacity (veh/h)	236	324	804	313	325	575	1339			1038		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total	1	4	83	495	261							
Volume Left	0	4	0	0	21							
Volume Right	1	0	83	7	0							
cSH	804	313	575	1339	1038							
Volume to Capacity	0.00	0.01	0.14	0.00	0.02							
Queue Length 95th (m)	0.0	0.3	4.0	0.0	0.5							
Control Delay (s)	9.5	16.7	12.3	0.0	0.9							
Lane LOS	A	C	B		A							
Approach Delay (s)	9.5	12.5		0.0	0.9							
Approach LOS	A	B										
Intersection Summary												
Average Delay			1.6									
Intersection Capacity Utilization			36.5%			ICU Level of Service				A		
Analysis Period (min)			15									

Appendix E

Future Total Level of Service Calculations

Lanes, Volumes, Timings
5: Essa Rd & Mapleview Dr W

12-12-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	705	32	65	215	58	42	445	153	153	301	100
Future Volume (vph)	105	705	32	65	215	58	42	445	153	153	301	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	100.0		0.0	300.0		300.0	60.0		50.0	80.0		50.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00		1.00		0.97			0.99	1.00		
Frt		0.993				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1767	3484	0	1580	3216	1465	1487	1824	1439	1733	1807	1507
Flt Permitted	0.609			0.189			0.556			0.320		
Satd. Flow (perm)	1128	3484	0	314	3216	1427	871	1824	1419	583	1807	1507
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6				105			132			106
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		1746.1			305.4			1265.8			359.4	
Travel Time (s)		104.8			18.3			75.9			21.6	
Confl. Peds. (#/hr)	4		3	3		4			2	2		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	16%	13%	11%	9%	20%	3%	11%	3%	4%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	112	750	34	69	229	62	45	473	163	163	320	106
Shared Lane Traffic (%)												
Lane Group Flow (vph)	112	784	0	69	229	62	45	473	163	163	320	106
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	34.0	34.0		34.0	34.0	34.0	7.0	37.0	37.0	7.0	37.0	37.0
Total Split (s)	36.0	36.0		36.0	36.0	36.0	10.0	37.0	37.0	10.0	37.0	37.0
Total Split (%)	43.4%	43.4%		43.4%	43.4%	43.4%	12.0%	44.6%	44.6%	12.0%	44.6%	44.6%

Lanes, Volumes, Timings
5: Essa Rd & Mapleview Dr W

12-12-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	3.0	6.0	6.0	3.0	6.0	6.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	23.6	23.6		23.6	23.6	23.6	41.0	31.1	31.1	42.4	35.4	35.4
Actuated g/C Ratio	0.31	0.31		0.31	0.31	0.31	0.54	0.41	0.41	0.56	0.47	0.47
v/c Ratio	0.32	0.72		0.71	0.23	0.12	0.09	0.63	0.25	0.38	0.38	0.14
Control Delay	22.2	26.9		62.0	19.5	1.7	8.8	23.6	6.0	11.2	17.5	4.3
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.2	26.9		62.0	19.5	1.7	8.8	23.6	6.0	11.2	17.5	4.3
LOS	C	C		E	B	A	A	C	A	B	B	A
Approach Delay		26.3			24.6			18.4			13.4	
Approach LOS		C			C			B			B	
Queue Length 50th (m)	12.7	53.9		9.1	13.2	0.0	2.6	54.5	2.7	10.2	33.2	0.0
Queue Length 95th (m)	25.5	72.6		#29.7	21.4	2.8	8.4	100.3	15.8	23.6	63.7	9.8
Internal Link Dist (m)		1722.1			281.4			1241.8			335.4	
Turn Bay Length (m)	100.0			300.0		300.0	60.0		50.0	80.0		50.0
Base Capacity (vph)	463	1433		129	1320	647	529	748	660	432	843	760
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.55		0.53	0.17	0.10	0.09	0.63	0.25	0.38	0.38	0.14

Intersection Summary

Area Type: Other

Cycle Length: 83

Actuated Cycle Length: 75.8

Natural Cycle: 80

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 20.9

Intersection LOS: C

Intersection Capacity Utilization 75.1%

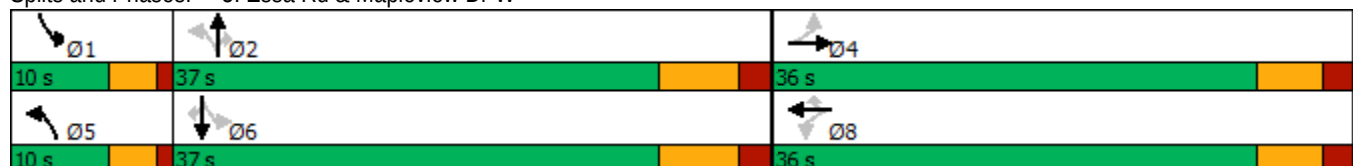
ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 5: Essa Rd & Mapleview Dr W



Lanes, Volumes, Timings
7: Essa Rd & Mabern St

12-12-2018

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	101	67	20	395	289	27
Future Volume (vph)	101	67	20	395	289	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)	0%			0%	0%	
Storage Length (m)	30.0	0.0	30.0			30.0
Storage Lanes	1	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1750	1566	1750	1842	1842	1566
Flt Permitted	0.950		0.570			
Satd. Flow (perm)	1750	1566	1050	1842	1842	1566
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		73				29
Link Speed (k/h)	40			60	60	
Link Distance (m)	432.4			445.0	1265.8	
Travel Time (s)	38.9			26.7	75.9	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	110	73	22	429	314	29
Shared Lane Traffic (%)						
Lane Group Flow (vph)	110	73	22	429	314	29
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.5			3.5	3.5	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25	15	25			15
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.0	32.0	37.0	37.0	37.0	37.0
Total Split (s)	32.0	32.0	37.0	37.0	37.0	37.0
Total Split (%)	46.4%	46.4%	53.6%	53.6%	53.6%	53.6%

Lanes, Volumes, Timings

7: Essa Rd & Mabern St

12-12-2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Yellow Time (s)	3.0	3.0	5.0	5.0	5.0	5.0
All-Red Time (s)	1.0	1.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	3.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effect Green (s)	9.5	9.5	36.2	36.2	36.2	36.2
Actuated g/C Ratio	0.18	0.18	0.70	0.70	0.70	0.70
v/c Ratio	0.34	0.21	0.03	0.33	0.24	0.03
Control Delay	20.5	6.8	4.3	5.4	4.9	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.5	6.8	4.3	5.4	4.9	2.0
LOS	C	A	A	A	A	A
Approach Delay	15.1			5.4	4.6	
Approach LOS	B			A	A	
Queue Length 50th (m)	8.9	0.0	0.6	15.4	10.4	0.0
Queue Length 95th (m)	19.8	7.9	2.9	33.4	23.4	2.3
Internal Link Dist (m)	408.4			421.0	1241.8	
Turn Bay Length (m)	30.0		30.0			30.0
Base Capacity (vph)	984	913	736	1292	1292	1107
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.08	0.03	0.33	0.24	0.03

Intersection Summary

Area Type: Other

Cycle Length: 69

Actuated Cycle Length: 51.6

Natural Cycle: 70

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.34

Intersection Signal Delay: 6.9

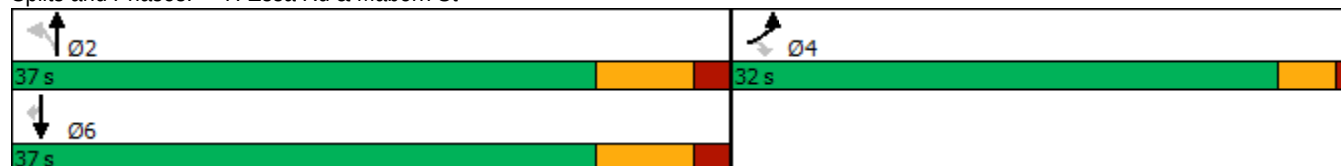
Intersection LOS: A

Intersection Capacity Utilization 34.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 7: Essa Rd & Mabern St



Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

12-12-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	176	29	53	122	141	21	151	16	174	160	52
Future Volume (vph)	49	176	29	53	122	141	21	151	16	174	160	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	50.0		0.0	140.0		0.0	100.0		100.0	80.0		80.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor									0.99	1.00		
Frt		0.979				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1684	1799	0	1638	1807	1413	1700	3216	1342	1716	3305	1389
Flt Permitted	0.663			0.464			0.630			0.606		
Satd. Flow (perm)	1175	1799	0	800	1807	1413	1127	3216	1325	1094	3305	1389
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10				170			128			128
Link Speed (k/h)		60			50			80			80	
Link Distance (m)		163.9			1746.1			953.0			632.7	
Travel Time (s)		9.8			125.7			42.9			28.5	
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	1%	10%	9%	4%	13%	5%	11%	19%	4%	8%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	59	212	35	64	147	170	25	182	19	210	193	63
Shared Lane Traffic (%)												
Lane Group Flow (vph)	59	247	0	64	147	170	25	182	19	210	193	63
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4		3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	1.0	5.0		1.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	5.0	47.8		5.0	47.8	47.8	7.0	34.5	34.5	7.0	34.5	34.5
Total Split (s)	5.0	48.9		5.0	48.9	48.9	7.0	39.5	39.5	7.0	39.5	39.5
Total Split (%)	5.0%	48.7%		5.0%	48.7%	48.7%	7.0%	39.3%	39.3%	7.0%	39.3%	39.3%

Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

12-12-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	3.7		3.0	3.7	3.7	3.0	4.6	4.6	3.0	4.6	4.6
All-Red Time (s)	1.0	3.1		1.0	3.1	3.1	1.0	1.9	1.9	1.0	1.9	1.9
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	5.8		3.0	5.8	5.8	3.0	5.5	5.5	3.0	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	20.0	15.7		20.7	16.7	16.7	40.8	34.2	34.2	42.7	38.7	38.7
Actuated g/C Ratio	0.28	0.22		0.29	0.23	0.23	0.57	0.47	0.47	0.59	0.54	0.54
v/c Ratio	0.17	0.62		0.25	0.35	0.37	0.04	0.12	0.03	0.31	0.11	0.08
Control Delay	18.9	31.8		20.6	26.0	6.7	7.5	12.1	0.1	9.6	10.7	0.3
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.9	31.8		20.6	26.0	6.7	7.5	12.1	0.1	9.6	10.7	0.3
LOS	B	C		C	C	A	A	B	A	A	B	A
Approach Delay	29.4			16.5			10.6			8.8		
Approach LOS	C			B			B			A		
Queue Length 50th (m)	5.9	31.2		6.5	18.3	0.0	1.3	7.4	0.0	12.5	6.2	0.0
Queue Length 95th (m)	12.5	48.0		13.3	30.7	11.1	4.6	13.7	0.0	24.7	14.3	0.0
Internal Link Dist (m)	139.9			1722.1			929.0			608.7		
Turn Bay Length (m)	50.0			140.0			100.0		100.0	80.0		80.0
Base Capacity (vph)	340	1085		252	1085	916	668	1524	695	681	1769	803
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.23		0.25	0.14	0.19	0.04	0.12	0.03	0.31	0.11	0.08

Intersection Summary

Area Type: Other

Cycle Length: 100.4

Actuated Cycle Length: 72.2

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 15.8

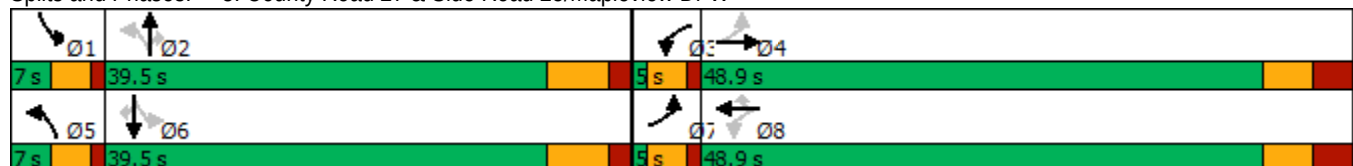
Intersection LOS: B

Intersection Capacity Utilization 63.4%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 8: County Road 27 & Side Road 25/Mapleview Dr W



HCM Unsignalized Intersection Capacity Analysis

13: Essa Rd & Salem Rd

12-12-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized			MOYes			MOYes						
Traffic Volume (veh/h)	10	33	0	5	18	36	12	369	47	113	267	16
Future Volume (veh/h)	10	33	0	5	18	36	12	369	47	113	267	16
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	13	41	0	6	23	45	15	461	59	141	334	20
Approach Volume (veh/h)		54			29			535			495	
Crossing Volume (veh/h)		481			489			195			44	
High Capacity (veh/h)		948			942			1189			1338	
High v/c (veh/h)		0.06			0.03			0.45			0.37	
Low Capacity (veh/h)		767			762			983			1119	
Low v/c (veh/h)		0.07			0.04			0.54			0.44	
Intersection Summary												
Maximum v/c High			0.45									
Maximum v/c Low			0.54									
Intersection Capacity Utilization			58.8%			ICU Level of Service				B		

HCM Unsignalized Intersection Capacity Analysis

14: County Road 27 & Private Access/Salem Rd

12-12-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1	0	2	0	11	0	174	8	21	224	0
Future Volume (Veh/h)	0	1	0	2	0	11	0	174	8	21	224	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	0	1	0	2	0	13	0	210	10	25	270	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	548	540	270	536	535	215	270				220	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	548	540	270	536	535	215	270				220	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.5	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.5	2.2				2.2	
p0 queue free %	100	100	100	100	100	98	100				98	
cM capacity (veh/h)	436	443	774	452	446	770	1305				1361	
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total	1	2	13	220	295							
Volume Left	0	2	0	0	25							
Volume Right	0	0	13	10	0							
cSH	443	452	770	1305	1361							
Volume to Capacity	0.00	0.00	0.02	0.00	0.02							
Queue Length 95th (m)	0.1	0.1	0.4	0.0	0.4							
Control Delay (s)	13.1	13.0	9.8	0.0	0.8							
Lane LOS	B	B	A		A							
Approach Delay (s)	13.1	10.2		0.0	0.8							
Approach LOS	B	B										
Intersection Summary												
Average Delay				0.8								
Intersection Capacity Utilization				35.9%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

17: County Road 27 & Mabern St

12-12-2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	16	28	177	8	4	229
Future Volume (Veh/h)	16	28	177	8	4	229
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	30	192	9	4	249
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	449	192			201	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	449	192			201	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	96			100	
cM capacity (veh/h)	566	850			1371	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	17	30	192	9	4	249
Volume Left	17	0	0	0	4	0
Volume Right	0	30	0	9	0	0
cSH	566	850	1700	1700	1371	1700
Volume to Capacity	0.03	0.04	0.11	0.01	0.00	0.15
Queue Length 95th (m)	0.7	0.9	0.0	0.0	0.1	0.0
Control Delay (s)	11.6	9.4	0.0	0.0	7.6	0.0
Lane LOS	B	A			A	
Approach Delay (s)	10.2		0.0		0.1	
Approach LOS	B					
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			22.1%		ICU Level of Service	A
Analysis Period (min)			15			

Lanes, Volumes, Timings
5: Essa Rd & Mapleview Dr W

12-12-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	453	49	174	750	321	60	450	145	103	548	173
Future Volume (vph)	108	453	49	174	750	321	60	450	145	103	548	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	100.0		0.0	300.0		300.0	60.0		50.0	80.0		50.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.98	1.00		0.99	1.00		0.98
Frt		0.985				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1716	3454	0	1733	3535	1581	1785	1879	1536	1733	1842	1581
Flt Permitted	0.146			0.443			0.128			0.232		
Satd. Flow (perm)	264	3454	0	808	3535	1544	240	1879	1516	423	1842	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16				312			136			133
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		1746.1			305.4			1257.3			359.4	
Travel Time (s)		104.8			18.3			75.4			21.6	
Confl. Peds. (#/hr)	2					2	10		1	1		10
Confl. Bikes (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	2%	0%	3%	1%	1%	0%	0%	4%	3%	2%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	120	503	54	193	833	357	67	500	161	114	609	192
Shared Lane Traffic (%)												
Lane Group Flow (vph)	120	557	0	193	833	357	67	500	161	114	609	192
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	9.5	34.0		34.0	34.0	34.0	7.0	37.0	37.0	7.0	37.0	37.0
Total Split (s)	10.0	46.0		36.0	36.0	36.0	10.0	37.0	37.0	10.0	37.0	37.0
Total Split (%)	10.8%	49.5%		38.7%	38.7%	38.7%	10.8%	39.8%	39.8%	10.8%	39.8%	39.8%

Lanes, Volumes, Timings

5: Essa Rd & Mapleview Dr W

12-12-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	4.0		4.0	4.0	4.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	2.0		2.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	5.0		5.0	5.0	5.0	3.0	6.0	6.0	3.0	6.0	6.0
Lead/Lag	Lead			Lag			Lag			Lead		
Lead-Lag Optimize?	Yes			Yes			Yes			Yes		
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	40.1	38.1		28.0	28.0	28.0	39.7	31.3	31.3	39.7	31.3	31.3
Actuated g/C Ratio	0.46	0.43		0.32	0.32	0.32	0.45	0.36	0.36	0.45	0.36	0.36
v/c Ratio	0.51	0.37		0.75	0.74	0.51	0.29	0.75	0.26	0.39	0.93	0.30
Control Delay	22.4	17.5		47.8	31.7	7.3	16.8	35.2	7.1	17.6	52.6	9.5
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.4	17.5		47.8	31.7	7.3	16.8	35.2	7.1	17.6	52.6	9.5
LOS	C	B		D	C	A	B	D	A	B	D	A
Approach Delay	18.3			27.6			27.3			39.2		
Approach LOS	B			C			C			D		
Queue Length 50th (m)	12.6	34.6		31.6	71.4	5.8	6.7	84.8	3.2	11.7	113.4	7.6
Queue Length 95th (m)	23.3	47.5		#66.2	93.2	27.5	14.1	#135.7	17.1	21.7	#185.6	23.8
Internal Link Dist (m)	1722.1			281.4			1233.3			335.4		
Turn Bay Length (m)	100.0			300.0		300.0	60.0		50.0	80.0		50.0
Base Capacity (vph)	236	1629		286	1254	749	232	666	625	295	654	634
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.34		0.67	0.66	0.48	0.29	0.75	0.26	0.39	0.93	0.30

Intersection Summary

Area Type: Other

Cycle Length: 93

Actuated Cycle Length: 88.1

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 28.7

Intersection LOS: C

Intersection Capacity Utilization 74.9%

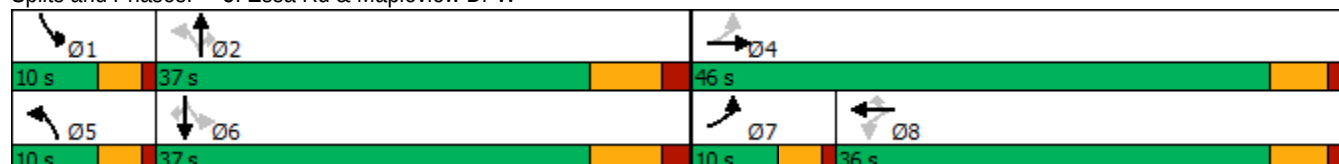
ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 5: Essa Rd & Mapleview Dr W



Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

12-12-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	81	207	19	24	255	199	55	279	69	164	160	50
Future Volume (vph)	81	207	19	24	255	199	55	279	69	164	160	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	50.0		0.0	140.0		0.0	100.0		100.0	80.0		80.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor									0.99	1.00		
Frt		0.987				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1700	1821	0	1653	1879	1566	1716	3368	1597	1733	3400	1597
Flt Permitted	0.402			0.484			0.635			0.545		
Satd. Flow (perm)	719	1821	0	842	1879	1566	1147	3368	1576	994	3400	1597
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6				231			128			128
Link Speed (k/h)		60			50			80			80	
Link Distance (m)		163.9			1746.1			958.7			632.7	
Travel Time (s)		9.8			125.7			43.1			28.5	
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	5%	2%	0%	8%	0%	2%	4%	6%	0%	3%	5%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	94	241	22	28	297	231	64	324	80	191	186	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	94	263	0	28	297	231	64	324	80	191	186	58
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4		3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	1.0	5.0		1.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	5.0	47.8		5.0	47.8	47.8	7.0	34.5	34.5	7.0	34.5	34.5
Total Split (s)	5.0	48.9		5.0	48.9	48.9	7.0	39.5	39.5	7.0	39.5	39.5
Total Split (%)	5.0%	48.7%		5.0%	48.7%	48.7%	7.0%	39.3%	39.3%	7.0%	39.3%	39.3%

Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

12-12-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	3.7		3.0	3.7	3.7	3.0	4.6	4.6	3.0	4.6	4.6
All-Red Time (s)	1.0	3.1		1.0	3.1	3.1	1.0	1.9	1.9	1.0	1.9	1.9
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	5.8		3.0	5.8	5.8	3.0	5.5	5.5	3.0	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	23.5	20.0		22.3	18.0	18.0	40.8	34.2	34.2	41.5	35.9	35.9
Actuated g/C Ratio	0.32	0.27		0.30	0.24	0.24	0.55	0.46	0.46	0.56	0.48	0.48
v/c Ratio	0.37	0.53		0.10	0.66	0.42	0.10	0.21	0.10	0.32	0.11	0.07
Control Delay	22.7	27.2		16.9	32.9	5.9	8.8	13.7	1.3	10.9	13.0	0.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.7	27.2		16.9	32.9	5.9	8.8	13.7	1.3	10.9	13.0	0.2
LOS	C	C		B	C	A	A	B	A	B	B	A
Approach Delay	26.0			20.9			10.9			10.3		
Approach LOS	C			C			B			B		
Queue Length 50th (m)	9.6	30.8		2.8	40.2	0.0	3.8	14.7	0.0	12.3	8.1	0.0
Queue Length 95th (m)	18.4	53.4		7.4	60.9	13.5	10.4	25.6	2.3	26.1	15.6	0.0
Internal Link Dist (m)	139.9			1722.1			934.7			608.7		
Turn Bay Length (m)	50.0			140.0			100.0		100.0	80.0		80.0
Base Capacity (vph)	253	1063		274	1094	1008	658	1547	793	593	1636	835
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.25		0.10	0.27	0.23	0.10	0.21	0.10	0.32	0.11	0.07

Intersection Summary

Area Type: Other

Cycle Length: 100.4

Actuated Cycle Length: 74.5

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 16.8

Intersection LOS: B

Intersection Capacity Utilization 66.4%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 8: County Road 27 & Side Road 25/Mapleview Dr W

			
7 s	39.5 s	5 s	48.9 s
			
7 s	39.5 s	5 s	48.9 s

Lanes, Volumes, Timings
9: Essa Rd & Mabern St

12-12-2018

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	67	43	69	554	523	95
Future Volume (vph)	67	43	69	554	523	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)	0%			0%	0%	
Storage Length (m)	30.0	0.0	30.0			30.0
Storage Lanes	1	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1750	1566	1750	1842	1842	1566
Flt Permitted	0.950		0.428			
Satd. Flow (perm)	1750	1566	788	1842	1842	1566
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		47				82
Link Speed (k/h)	40			60	60	
Link Distance (m)	429.9			453.6	1257.3	
Travel Time (s)	38.7			27.2	75.4	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	73	47	75	602	568	103
Shared Lane Traffic (%)						
Lane Group Flow (vph)	73	47	75	602	568	103
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.5			3.5	3.5	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25	15	25			15
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.0	32.0	37.0	37.0	37.0	37.0
Total Split (s)	32.0	32.0	37.0	37.0	37.0	37.0
Total Split (%)	46.4%	46.4%	53.6%	53.6%	53.6%	53.6%

Lanes, Volumes, Timings

9: Essa Rd & Mabern St

12-12-2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Yellow Time (s)	3.0	3.0	5.0	5.0	5.0	5.0
All-Red Time (s)	1.0	1.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	3.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Min	Min	Min	Min
Act Effect Green (s)	8.6	8.6	29.0	29.0	29.0	29.0
Actuated g/C Ratio	0.20	0.20	0.68	0.68	0.68	0.68
v/c Ratio	0.21	0.13	0.14	0.48	0.45	0.09
Control Delay	16.7	6.8	5.1	6.8	6.5	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.7	6.8	5.1	6.8	6.5	2.0
LOS	B	A	A	A	A	A
Approach Delay	12.8			6.6	5.8	
Approach LOS	B			A	A	
Queue Length 50th (m)	5.3	0.0	2.2	23.2	21.4	0.6
Queue Length 95th (m)	13.3	6.0	7.0	48.8	44.5	4.7
Internal Link Dist (m)	405.9			429.6	1233.3	
Turn Bay Length (m)	30.0		30.0			30.0
Base Capacity (vph)	1226	1111	586	1370	1370	1186
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.04	0.13	0.44	0.41	0.09

Intersection Summary

Area Type: Other

Cycle Length: 69

Actuated Cycle Length: 42.5

Natural Cycle: 70

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.48

Intersection Signal Delay: 6.8

Intersection LOS: A

Intersection Capacity Utilization 49.2%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 9: Essa Rd & Mabern St

 02 37 s	 04 32 s
 06 37 s	

HCM Unsignalized Intersection Capacity Analysis

13: Essa Rd & Salem Rd

12-12-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized			MOYes			MOYes						
Traffic Volume (veh/h)	10	21	5	33	99	145	40	468	36	100	433	23
Future Volume (veh/h)	10	21	5	33	99	145	40	468	36	100	433	23
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	11	22	5	35	105	154	43	498	38	106	461	24
Approach Volume (veh/h)		33			140			579			591	
Crossing Volume (veh/h)		602			552			139			183	
High Capacity (veh/h)		860			895			1242			1200	
High v/c (veh/h)		0.04			0.16			0.47			0.49	
Low Capacity (veh/h)		690			721			1032			993	
Low v/c (veh/h)		0.05			0.19			0.56			0.59	
Intersection Summary												
Maximum v/c High			0.49									
Maximum v/c Low			0.59									
Intersection Capacity Utilization			78.6%			ICU Level of Service				D		

HCM Unsignalized Intersection Capacity Analysis

14: County Road 27 & Private Access/Salem Rd

12-12-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	3	0	77	0	352	6	21	174	0
Future Volume (Veh/h)	0	0	1	3	0	77	0	352	6	21	174	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	0	1	4	0	92	0	419	7	25	207	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	772	683	207	680	680	422	207				426	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	772	683	207	680	680	422	207				426	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.2	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.3	
p0 queue free %	100	100	100	99	100	85	100				98	
cM capacity (veh/h)	268	366	839	361	367	629	1376				1102	
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total	1	4	92	426	232							
Volume Left	0	4	0	0	25							
Volume Right	1	0	92	7	0							
cSH	839	361	629	1376	1102							
Volume to Capacity	0.00	0.01	0.15	0.00	0.02							
Queue Length 95th (m)	0.0	0.3	4.1	0.0	0.6							
Control Delay (s)	9.3	15.1	11.7	0.0	1.1							
Lane LOS	A	C	B		A							
Approach Delay (s)	9.3	11.8		0.0	1.1							
Approach LOS	A	B										
Intersection Summary												
Average Delay	1.9											
Intersection Capacity Utilization	38.2%			ICU Level of Service				A				
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

17: County Road 27 & Mabern St

12-12-2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	11	18	406	23	17	184
Future Volume (Veh/h)	11	18	406	23	17	184
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	20	441	25	18	200
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	677	441			466	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	677	441			466	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	97			98	
cM capacity (veh/h)	411	616			1095	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	12	20	441	25	18	200
Volume Left	12	0	0	0	18	0
Volume Right	0	20	0	25	0	0
cSH	411	616	1700	1700	1095	1700
Volume to Capacity	0.03	0.03	0.26	0.01	0.02	0.12
Queue Length 95th (m)	0.7	0.8	0.0	0.0	0.4	0.0
Control Delay (s)	14.0	11.0	0.0	0.0	8.3	0.0
Lane LOS	B	B			A	
Approach Delay (s)	12.2		0.0		0.7	
Approach LOS	B					
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			31.4%		ICU Level of Service	A
Analysis Period (min)			15			

Lanes, Volumes, Timings
5: Essa Rd & Mapleview Dr W

12-12-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	859	43	67	263	58	51	601	159	153	631	100
Future Volume (vph)	105	859	43	67	263	58	51	601	159	153	631	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	100.0		0.0	300.0		300.0	60.0		50.0	80.0		50.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00		1.00		0.97			0.99	1.00		
Frt		0.993				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1767	3481	0	1580	3216	1465	1487	1824	1439	1733	1807	1507
Flt Permitted	0.580			0.123			0.134			0.138		
Satd. Flow (perm)	1074	3481	0	204	3216	1426	210	1824	1419	252	1807	1507
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6				91			125			125
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		1746.1			305.4			1265.8			359.4	
Travel Time (s)		104.8			18.3			75.9			21.6	
Confl. Peds. (#/hr)	4		3	3		4			2	2		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	16%	13%	11%	9%	20%	3%	11%	3%	4%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	112	914	46	71	280	62	54	639	169	163	671	106
Shared Lane Traffic (%)												
Lane Group Flow (vph)	112	960	0	71	280	62	54	639	169	163	671	106
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	34.0	34.0		7.0	34.0	34.0	7.0	37.0	37.0	7.0	37.0	37.0
Total Split (s)	36.0	36.0		7.0	43.0	43.0	10.0	43.0	43.0	10.0	43.0	43.0
Total Split (%)	37.5%	37.5%		7.3%	44.8%	44.8%	10.4%	44.8%	44.8%	10.4%	44.8%	44.8%

Lanes, Volumes, Timings
5: Essa Rd & Mapleview Dr W

12-12-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	4.0	4.0		3.0	4.0	4.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	2.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0		3.0	5.0	5.0	3.0	6.0	6.0	3.0	6.0	6.0
Lead/Lag	Lag	Lag		Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes			Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	29.4	29.4		36.9	34.9	34.9	47.1	37.2	37.2	47.9	39.4	39.4
Actuated g/C Ratio	0.32	0.32		0.40	0.37	0.37	0.51	0.40	0.40	0.51	0.42	0.42
v/c Ratio	0.33	0.87		0.51	0.23	0.11	0.27	0.88	0.26	0.68	0.88	0.15
Control Delay	28.0	39.9		30.8	20.2	2.3	15.0	42.3	7.6	28.4	41.9	3.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.0	39.9		30.8	20.2	2.3	15.0	42.3	7.6	28.4	41.9	3.2
LOS	C	D		C	C	A	B	D	A	C	D	A
Approach Delay	38.6			19.3			33.8			35.2		
Approach LOS	D			B			C			D		
Queue Length 50th (m)	16.4	90.8		8.3	18.6	0.0	5.0	116.0	5.4	16.0	125.8	0.0
Queue Length 95th (m)	31.7	#120.0		17.1	28.1	4.3	11.1	#185.5	19.1	#38.2	#200.8	7.9
Internal Link Dist (m)	1722.1			281.4			1241.8			335.4		
Turn Bay Length (m)	100.0			300.0		300.0	60.0		50.0	80.0		50.0
Base Capacity (vph)	358	1168		140	1318	638	202	728	641	241	765	710
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.82		0.51	0.21	0.10	0.27	0.88	0.26	0.68	0.88	0.15

Intersection Summary

Area Type: Other

Cycle Length: 96

Actuated Cycle Length: 93.1

Natural Cycle: 85

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 33.9

Intersection LOS: C

Intersection Capacity Utilization 84.8%

ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 5: Essa Rd & Mapleview Dr W

			
Ø1	Ø2	Ø3	Ø4
10 s	43 s	7 s	36 s
			
Ø5	Ø6	Ø8	
10 s	43 s	43 s	

Lanes, Volumes, Timings

7: Essa Rd & Mabern St

12-12-2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	137	83	25	532	606	47
Future Volume (vph)	137	83	25	532	606	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)	0%			0%	0%	
Storage Length (m)	30.0	0.0	30.0			30.0
Storage Lanes	1	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1750	1566	1750	1842	1842	1566
Flt Permitted	0.950		0.359			
Satd. Flow (perm)	1750	1566	661	1842	1842	1566
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		90				35
Link Speed (k/h)	40			60	60	
Link Distance (m)	432.4			445.0	1265.8	
Travel Time (s)	38.9			26.7	75.9	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	149	90	27	578	659	51
Shared Lane Traffic (%)						
Lane Group Flow (vph)	149	90	27	578	659	51
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.5			3.5	3.5	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25	15	25			15
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.0	32.0	37.0	37.0	37.0	37.0
Total Split (s)	32.0	32.0	37.0	37.0	37.0	37.0
Total Split (%)	46.4%	46.4%	53.6%	53.6%	53.6%	53.6%

Lanes, Volumes, Timings

7: Essa Rd & Mabern St

12-12-2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Yellow Time (s)	3.0	3.0	5.0	5.0	5.0	5.0
All-Red Time (s)	1.0	1.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	3.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Max	Max	Max	Max
Act Effect Green (s)	10.6	10.6	35.2	35.2	35.2	35.2
Actuated g/C Ratio	0.21	0.21	0.68	0.68	0.68	0.68
v/c Ratio	0.41	0.23	0.06	0.46	0.52	0.05
Control Delay	20.9	6.2	5.2	7.2	8.0	2.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.9	6.2	5.2	7.2	8.0	2.7
LOS	C	A	A	A	A	A
Approach Delay	15.4			7.1	7.6	
Approach LOS	B			A	A	
Queue Length 50th (m)	12.3	0.0	0.9	25.4	30.8	0.5
Queue Length 95th (m)	25.4	8.5	3.8	55.1	67.3	4.0
Internal Link Dist (m)	408.4			421.0	1241.8	
Turn Bay Length (m)	30.0		30.0			30.0
Base Capacity (vph)	985	921	451	1257	1257	1080
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.10	0.06	0.46	0.52	0.05

Intersection Summary

Area Type: Other

Cycle Length: 69

Actuated Cycle Length: 51.5

Natural Cycle: 70

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.52

Intersection Signal Delay: 8.6

Intersection LOS: A

Intersection Capacity Utilization 47.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 7: Essa Rd & Mabern St

 02 37 s	 04 32 s
 06 37 s	

Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

12-12-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	215	29	65	149	141	21	209	26	174	209	52
Future Volume (vph)	49	215	29	65	149	141	21	209	26	174	209	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	50.0		0.0	140.0		0.0	100.0		100.0	80.0		80.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor									0.99	1.00		
Frt		0.982				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1684	1808	0	1638	1807	1413	1700	3216	1342	1716	3305	1389
Flt Permitted	0.613			0.388			0.596			0.566		
Satd. Flow (perm)	1087	1808	0	669	1807	1413	1066	3216	1325	1022	3305	1389
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8				170			128			128
Link Speed (k/h)		60			50			80			80	
Link Distance (m)		163.9			1746.1			833.0			632.7	
Travel Time (s)		9.8			125.7			37.5			28.5	
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	1%	10%	9%	4%	13%	5%	11%	19%	4%	8%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	59	259	35	78	180	170	25	252	31	210	252	63
Shared Lane Traffic (%)												
Lane Group Flow (vph)	59	294	0	78	180	170	25	252	31	210	252	63
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4		3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	1.0	5.0		1.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	5.0	47.8		5.0	47.8	47.8	7.0	34.5	34.5	7.0	34.5	34.5
Total Split (s)	5.0	48.9		5.0	48.9	48.9	7.0	39.5	39.5	7.0	39.5	39.5
Total Split (%)	5.0%	48.7%		5.0%	48.7%	48.7%	7.0%	39.3%	39.3%	7.0%	39.3%	39.3%

Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

12-12-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	3.7		3.0	3.7	3.7	3.0	4.6	4.6	3.0	4.6	4.6
All-Red Time (s)	1.0	3.1		1.0	3.1	3.1	1.0	1.9	1.9	1.0	1.9	1.9
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	5.8		3.0	5.8	5.8	3.0	5.5	5.5	3.0	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	22.2	17.8		22.2	17.8	17.8	40.8	34.2	34.2	42.7	38.7	38.7
Actuated g/C Ratio	0.30	0.24		0.30	0.24	0.24	0.55	0.46	0.46	0.57	0.52	0.52
v/c Ratio	0.17	0.67		0.35	0.42	0.36	0.04	0.17	0.05	0.34	0.15	0.08
Control Delay	18.3	33.0		22.5	26.9	6.3	8.5	13.4	0.1	11.0	11.7	0.3
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.3	33.0		22.5	26.9	6.3	8.5	13.4	0.1	11.0	11.7	0.3
LOS	B	C		C	C	A	A	B	A	B	B	A
Approach Delay	30.5			17.9			11.7			10.1		
Approach LOS	C			B			B			B		
Queue Length 50th (m)	5.9	38.8		8.0	22.8	0.0	1.4	11.2	0.0	13.7	9.0	0.0
Queue Length 95th (m)	12.4	57.1		15.3	36.3	10.8	5.0	19.5	0.0	26.9	19.4	0.0
Internal Link Dist (m)	139.9			1722.1			809.0			608.7		
Turn Bay Length (m)	50.0			140.0			100.0		100.0	80.0		80.0
Base Capacity (vph)	340	1058		225	1054	895	618	1480	678	624	1718	783
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.28		0.35	0.17	0.19	0.04	0.17	0.05	0.34	0.15	0.08

Intersection Summary

Area Type: Other

Cycle Length: 100.4

Actuated Cycle Length: 74.4

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 16.9

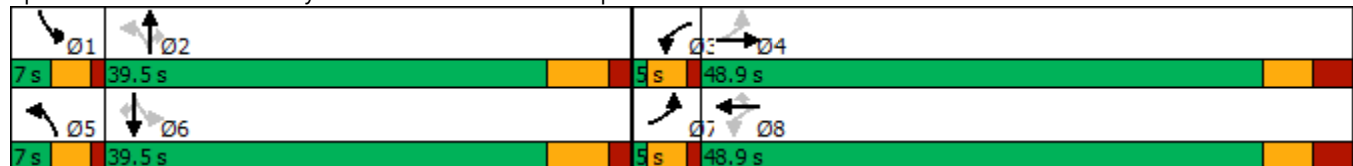
Intersection LOS: B

Intersection Capacity Utilization 65.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 8: County Road 27 & Side Road 25/Mapleview Dr W



HCM Unsignalized Intersection Capacity Analysis

13: Essa Rd & Salem Rd

12-12-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized			MOYes			MOYes						
Traffic Volume (veh/h)	10	54	0	5	36	36	12	511	47	118	595	16
Future Volume (veh/h)	10	54	0	5	36	36	12	511	47	118	595	16
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	13	68	0	6	45	45	15	639	59	148	744	20
Approach Volume (veh/h)		81			51			713			912	
Crossing Volume (veh/h)		898			667			229			66	
High Capacity (veh/h)		677			816			1157			1315	
High v/c (veh/h)		0.12			0.06			0.62			0.69	
Low Capacity (veh/h)		529			651			955			1098	
Low v/c (veh/h)		0.15			0.08			0.75			0.83	
Intersection Summary												
Maximum v/c High			0.69									
Maximum v/c Low			0.83									
Intersection Capacity Utilization			85.2%			ICU Level of Service				E		

HCM Unsignalized Intersection Capacity Analysis

14: County Road 27 & Private Access/Salem Rd

12-12-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1	0	2	0	27	0	226	8	36	286	0
Future Volume (Veh/h)	0	1	0	2	0	27	0	226	8	36	286	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	0	1	0	2	0	33	0	272	10	43	345	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	741	713	345	708	708	277	345				282	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	741	713	345	708	708	277	345				282	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.5	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.5	2.2				2.2	
p0 queue free %	100	100	100	99	100	95	100				97	
cM capacity (veh/h)	311	348	702	342	350	710	1225				1292	
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total	1	2	33	282	388							
Volume Left	0	2	0	0	43							
Volume Right	0	0	33	10	0							
cSH	348	342	710	1225	1292							
Volume to Capacity	0.00	0.01	0.05	0.00	0.03							
Queue Length 95th (m)	0.1	0.1	1.2	0.0	0.8							
Control Delay (s)	15.4	15.6	10.3	0.0	1.2							
Lane LOS	C	C	B		A							
Approach Delay (s)	15.4	10.6		0.0	1.2							
Approach LOS	C	B										
Intersection Summary												
Average Delay	1.2											
Intersection Capacity Utilization	42.8%			ICU Level of Service					A			
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

17: County Road 27 & Mabern St

12-12-2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	45	72	216	37	33	277
Future Volume (Veh/h)	45	72	216	37	33	277
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	49	78	235	40	36	301
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	608	235			275	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	608	235			275	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	90			97	
cM capacity (veh/h)	446	804			1288	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	49	78	235	40	36	301
Volume Left	49	0	0	0	36	0
Volume Right	0	78	0	40	0	0
cSH	446	804	1700	1700	1288	1700
Volume to Capacity	0.11	0.10	0.14	0.02	0.03	0.18
Queue Length 95th (m)	2.9	2.6	0.0	0.0	0.7	0.0
Control Delay (s)	14.1	10.0	0.0	0.0	7.9	0.0
Lane LOS	B	A			A	
Approach Delay (s)	11.5		0.0		0.8	
Approach LOS	B					
Intersection Summary						
Average Delay			2.4			
Intersection Capacity Utilization			28.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

18: County Road 27 & Commercial Access

12-12-2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	3	2	283	5	2	307
Future Volume (Veh/h)	3	2	283	5	2	307
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	2	308	5	2	334
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	646	308			313	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	646	308			313	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	435	732			1247	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	5	308	5	2	334	
Volume Left	3	0	0	2	0	
Volume Right	2	0	5	0	0	
cSH	520	1700	1700	1247	1700	
Volume to Capacity	0.01	0.18	0.00	0.00	0.20	
Queue Length 95th (m)	0.2	0.0	0.0	0.0	0.0	
Control Delay (s)	12.0	0.0	0.0	7.9	0.0	
Lane LOS	B			A		
Approach Delay (s)	12.0	0.0		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			26.2%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
5: Essa Rd & Mapleview Dr W

12-12-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	552	51	180	915	321	63	694	149	103	717	173
Future Volume (vph)	108	552	51	180	915	321	63	694	149	103	717	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	100.0		0.0	300.0		300.0	60.0		50.0	80.0		50.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.98			0.99			0.98
Frt		0.987				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1716	3460	0	1733	3535	1581	1785	1879	1536	1733	1842	1581
Flt Permitted	0.144			0.243			0.098			0.096		
Satd. Flow (perm)	260	3460	0	443	3535	1544	184	1879	1516	175	1842	1547
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10				181			125			125
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		1746.1			305.4			1257.3			359.4	
Travel Time (s)		104.8			18.3			75.4			21.6	
Confl. Peds. (#/hr)	2					2	10		1	1		10
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	2%	0%	3%	1%	1%	0%	0%	4%	3%	2%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	113	575	53	188	953	334	66	723	155	107	747	180
Shared Lane Traffic (%)												
Lane Group Flow (vph)	113	628	0	188	953	334	66	723	155	107	747	180
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4		3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	3.0	5.0		2.5	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	7.0	34.0		7.0	34.0	34.0	7.0	37.0	37.0	7.0	37.0	37.0
Total Split (s)	7.0	34.0		9.0	36.0	36.0	7.0	46.0	46.0	7.0	46.0	46.0
Total Split (%)	7.3%	35.4%		9.4%	37.5%	37.5%	7.3%	47.9%	47.9%	7.3%	47.9%	47.9%

Lanes, Volumes, Timings
5: Essa Rd & Mapleview Dr W

12-12-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	4.0		3.5	4.0	4.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	5.0		3.5	5.0	5.0	3.0	6.0	6.0	3.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	33.8	27.8		36.8	29.8	29.8	47.0	40.0	40.0	47.7	41.5	41.5
Actuated g/C Ratio	0.36	0.29		0.39	0.31	0.31	0.50	0.42	0.42	0.50	0.44	0.44
v/c Ratio	0.73	0.62		0.76	0.86	0.55	0.42	0.91	0.22	0.70	0.93	0.24
Control Delay	49.4	31.4		42.8	39.7	15.5	19.7	44.0	5.9	39.0	46.0	7.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.4	31.4		42.8	39.7	15.5	19.7	44.0	5.9	39.0	46.0	7.2
LOS	D	C		D	D	B	B	D	A	D	D	A
Approach Delay	34.1			34.6			36.1			38.5		
Approach LOS	C			C			D			D		
Queue Length 50th (m)	13.5	53.8		23.7	90.0	22.6	6.1	130.7	3.4	10.2	139.9	6.3
Queue Length 95th (m)	#34.1	72.2		#49.7	115.8	50.1	12.8	#206.0	15.4	#27.2	#219.4	19.7
Internal Link Dist (m)	1722.1			281.4			1233.3			335.4		
Turn Bay Length (m)	100.0			300.0		300.0	60.0		50.0	80.0		50.0
Base Capacity (vph)	154	1066		246	1156	627	158	793	712	153	806	747
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.59		0.76	0.82	0.53	0.42	0.91	0.22	0.70	0.93	0.24

Intersection Summary

Area Type: Other

Cycle Length: 96

Actuated Cycle Length: 94.8

Natural Cycle: 85

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 35.8

Intersection LOS: D

Intersection Capacity Utilization 89.3%

ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 5: Essa Rd & Mapleview Dr W

							
Ø1	Ø2		Ø3	Ø4		Ø5	Ø6
7 s	46 s		9 s	34 s		7 s	36 s
							
Ø5	Ø6		Ø7	Ø8		Ø9	Ø10
7 s	46 s		7 s	36 s		7 s	36 s

Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

12-12-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	81	252	19	30	310	199	55	358	77	164	219	50
Future Volume (vph)	81	252	19	30	310	199	55	358	77	164	219	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	50.0		0.0	140.0		0.0	100.0		100.0	80.0		80.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor								0.99	1.00			
Frt		0.990				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1700	1826	0	1653	1879	1566	1716	3368	1597	1733	3400	1597
Flt Permitted	0.325			0.406			0.594			0.488		
Satd. Flow (perm)	582	1826	0	706	1879	1566	1073	3368	1576	890	3400	1597
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5				231			128			128
Link Speed (k/h)		60			50			80			80	
Link Distance (m)		163.9			1746.1			833.4			632.7	
Travel Time (s)		9.8			125.7			37.5			28.5	
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	5%	2%	0%	8%	0%	2%	4%	6%	0%	3%	5%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	94	293	22	35	360	231	64	416	90	191	255	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	94	315	0	35	360	231	64	416	90	191	255	58
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	7	4		3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	1.0	5.0		1.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Split (s)	5.0	47.8		5.0	47.8	47.8	7.0	34.5	34.5	7.0	34.5	34.5
Total Split (s)	5.0	48.9		5.0	48.9	48.9	7.0	39.5	39.5	7.0	39.5	39.5
Total Split (%)	5.0%	48.7%		5.0%	48.7%	48.7%	7.0%	39.3%	39.3%	7.0%	39.3%	39.3%

Lanes, Volumes, Timings

8: County Road 27 & Side Road 25/Mapleview Dr W

12-12-2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Yellow Time (s)	3.0	3.7		3.0	3.7	3.7	3.0	4.6	4.6	3.0	4.6	4.6
All-Red Time (s)	1.0	3.1		1.0	3.1	3.1	1.0	1.9	1.9	1.0	1.9	1.9
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	5.8		3.0	5.8	5.8	3.0	5.5	5.5	3.0	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	Max
Act Effect Green (s)	26.1	22.2		25.5	21.2	21.2	40.9	34.3	34.3	41.6	36.0	36.0
Actuated g/C Ratio	0.34	0.29		0.33	0.27	0.27	0.53	0.44	0.44	0.53	0.46	0.46
v/c Ratio	0.42	0.60		0.14	0.71	0.39	0.11	0.28	0.12	0.37	0.16	0.07
Control Delay	23.9	28.9		16.7	33.5	5.2	10.3	15.9	1.8	13.3	14.8	0.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.9	28.9		16.7	33.5	5.2	10.3	15.9	1.8	13.3	14.8	0.2
LOS	C	C		B	C	A	B	B	A	B	B	A
Approach Delay	27.7			22.1			13.0			12.5		
Approach LOS	C			C			B			B		
Queue Length 50th (m)	9.6	42.7		3.5	50.8	0.0	4.3	21.2	0.0	13.7	12.3	0.0
Queue Length 95th (m)	18.2	64.0		8.6	74.0	13.0	11.6	35.8	3.8	29.2	22.5	0.0
Internal Link Dist (m)	139.9			1722.1			809.4			608.7		
Turn Bay Length (m)	50.0			140.0			100.0		100.0	80.0		80.0
Base Capacity (vph)	224	1023		256	1050	977	597	1485	766	519	1571	806
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.31		0.14	0.34	0.24	0.11	0.28	0.12	0.37	0.16	0.07

Intersection Summary

Area Type: Other

Cycle Length: 100.4

Actuated Cycle Length: 77.8

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 18.5

Intersection LOS: B

Intersection Capacity Utilization 69.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 8: County Road 27 & Side Road 25/Mapleview Dr W

 Ø1	 Ø2	 Ø3	 Ø4
7 s	39.5 s	5 s	48.9 s
 Ø5	 Ø6	 Ø7	 Ø8
7 s	39.5 s	5 s	48.9 s

Lanes, Volumes, Timings
9: Essa Rd & Mabern St

12-12-2018

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	88	54	82	801	674	120
Future Volume (vph)	88	54	82	801	674	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)	0%			0%	0%	
Storage Length (m)	30.0	0.0	30.0			30.0
Storage Lanes	1	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1750	1566	1750	1842	1842	1566
Flt Permitted	0.950		0.329			
Satd. Flow (perm)	1750	1566	606	1842	1842	1566
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		59				80
Link Speed (k/h)	40			60	60	
Link Distance (m)	429.9			453.6	1257.3	
Travel Time (s)	38.7			27.2	75.4	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	96	59	89	871	733	130
Shared Lane Traffic (%)						
Lane Group Flow (vph)	96	59	89	871	733	130
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.5			3.5	3.5	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25	15	25			15
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.0	32.0	37.0	37.0	37.0	37.0
Total Split (s)	32.0	32.0	37.0	37.0	37.0	37.0
Total Split (%)	46.4%	46.4%	53.6%	53.6%	53.6%	53.6%

Lanes, Volumes, Timings

9: Essa Rd & Mabern St

12-12-2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Yellow Time (s)	3.0	3.0	5.0	5.0	5.0	5.0
All-Red Time (s)	1.0	1.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	3.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Min	Min	Min	Min
Act Effect Green (s)	9.4	9.4	40.0	40.0	40.0	40.0
Actuated g/C Ratio	0.17	0.17	0.73	0.73	0.73	0.73
v/c Ratio	0.32	0.19	0.20	0.65	0.55	0.11
Control Delay	22.0	7.3	5.8	9.8	7.3	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.0	7.3	5.8	9.8	7.3	2.3
LOS	C	A	A	A	A	A
Approach Delay	16.4			9.5	6.6	
Approach LOS	B			A	A	
Queue Length 50th (m)	9.2	0.0	2.9	45.8	33.7	1.4
Queue Length 95th (m)	17.7	7.1	9.5	#110.6	71.1	6.6
Internal Link Dist (m)	405.9			429.6	1233.3	
Turn Bay Length (m)	30.0		30.0			30.0
Base Capacity (vph)	926	856	439	1336	1336	1158
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.07	0.20	0.65	0.55	0.11

Intersection Summary

Area Type: Other

Cycle Length: 69

Actuated Cycle Length: 55.1

Natural Cycle: 80

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 8.7

Intersection LOS: A

Intersection Capacity Utilization 58.2%

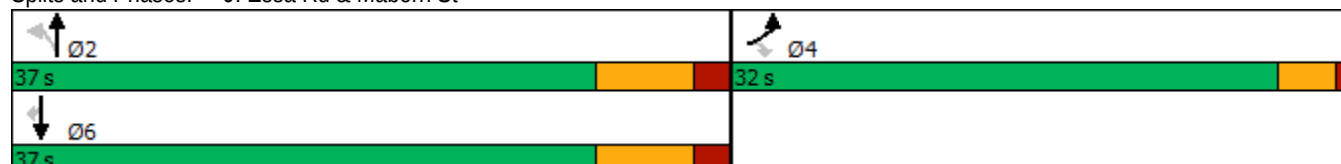
ICU Level of Service B

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 9: Essa Rd & Mabern St



HCM Unsignalized Intersection Capacity Analysis

13: Essa Rd & Salem Rd

12-12-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized			MOYes			MOYes						
Traffic Volume (veh/h)	10	32	5	33	122	145	42	728	36	103	592	23
Future Volume (veh/h)	10	32	5	33	122	145	42	728	36	103	592	23
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	11	34	5	35	130	154	45	774	38	110	630	24
Approach Volume (veh/h)		45			165			857			764	
Crossing Volume (veh/h)		775			830			155			210	
High Capacity (veh/h)		748			715			1227			1175	
High v/c (veh/h)		0.06			0.23			0.70			0.65	
Low Capacity (veh/h)		591			563			1018			971	
Low v/c (veh/h)		0.08			0.29			0.84			0.79	
Intersection Summary												
Maximum v/c High			0.70									
Maximum v/c Low			0.84									
Intersection Capacity Utilization			96.1%			ICU Level of Service				F		

HCM Unsignalized Intersection Capacity Analysis

14: County Road 27 & Private Access/Salem Rd

12-12-2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	1	3	0	90	0	449	6	28	218	0
Future Volume (Veh/h)	0	0	1	3	0	90	0	449	6	28	218	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	0	1	4	0	107	0	535	7	33	260	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	972	868	260	866	864	538	260				542	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	972	868	260	866	864	538	260				542	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.2	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.3	
p0 queue free %	100	100	100	99	100	80	100				97	
cM capacity (veh/h)	183	283	784	269	284	541	1316				997	
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total	1	4	107	542	293							
Volume Left	0	4	0	0	33							
Volume Right	1	0	107	7	0							
cSH	784	269	541	1316	997							
Volume to Capacity	0.00	0.01	0.20	0.00	0.03							
Queue Length 95th (m)	0.0	0.4	5.8	0.0	0.8							
Control Delay (s)	9.6	18.6	13.3	0.0	1.3							
Lane LOS	A	C	B		A							
Approach Delay (s)	9.6	13.5		0.0	1.3							
Approach LOS	A	B										
Intersection Summary												
Average Delay	2.0											
Intersection Capacity Utilization	47.2%			ICU Level of Service					A			
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

17: County Road 27 & Mabern St

12-12-2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	25	54	481	59	59	221
Future Volume (Veh/h)	25	54	481	59	59	221
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	59	523	64	64	240
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	891	523			587	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	891	523			587	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	89			94	
cM capacity (veh/h)	293	554			988	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	27	59	523	64	64	240
Volume Left	27	0	0	0	64	0
Volume Right	0	59	0	64	0	0
cSH	293	554	1700	1700	988	1700
Volume to Capacity	0.09	0.11	0.31	0.04	0.06	0.14
Queue Length 95th (m)	2.4	2.8	0.0	0.0	1.7	0.0
Control Delay (s)	18.5	12.3	0.0	0.0	8.9	0.0
Lane LOS	C	B			A	
Approach Delay (s)	14.2		0.0		1.9	
Approach LOS	B					
Intersection Summary						
Average Delay			1.8			
Intersection Capacity Utilization			42.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

18: County Road 27 & Commercial Access

12-12-2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	15	8	521	14	7	265
Future Volume (Veh/h)	15	8	521	14	7	265
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	9	566	15	8	288
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	870	566			581	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	870	566			581	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	98			99	
cM capacity (veh/h)	319	524			993	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	25	566	15	8	288	
Volume Left	16	0	0	8	0	
Volume Right	9	0	15	0	0	
cSH	372	1700	1700	993	1700	
Volume to Capacity	0.07	0.33	0.01	0.01	0.17	
Queue Length 95th (m)	1.7	0.0	0.0	0.2	0.0	
Control Delay (s)	15.4	0.0	0.0	8.7	0.0	
Lane LOS	C			A		
Approach Delay (s)	15.4	0.0		0.2		
Approach LOS	C					
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			37.4%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix F

Traffic Signal Warrant Analysis

Signal Warrant Calculation

Major Street: **Essa Road**

Minor Street: **Mabern Street**

Comment: **Future Total (2021) Traffic Condition**

Number of Approaches: 1 ☐ 2 ☒

Tee Intersection Configuration: Yes ☒ No ☐

Flow Condition: Free Fv (Rural) ☐
Restricted Flow (Urban) ☒

VOLUME	AM	PM	FACTOR *	
1A - All	899	1,351	n/a	563
1B - Minor	168	110	25%	70
2A - Major	731	1,241	25%	493
2B - Cross	111	102	25%	53

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% Satisfied: Yes ☐ No ☒ Warrant for new intersection with forecast traffic

120% Satisfied: Yes ☐ No ☒ Warrant for existing intersection with forecast traffic

100% Satisfied: Yes ☐ No ☒ Warrant for existing intersection with existing traffic *

COMBO 80% Satisfied: Yes ☐ No ☒ Warrant for existing intersection with existing traffic

80% Satisfied: Yes ☐ No ☒

* Consider full underground provisions if 100% for forecast traffic

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
				X	
ALL APPROACHES	480	720	600	900	563
	% FULFILLED				63%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
				X	
MINOR STREET APPROACHES	180	255	180	255	70
	% FULFILLED				27%

150% Satisfied: Yes ☐ No ☒

120% Satisfied: Yes ☐ No ☒

100% Satisfied: Yes ☐ No ☒

80% Satisfied: Yes ☐ No ☒

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
				X	
MAJOR STREET APPROACHES	480	720	600	900	493
	% FULFILLED				55%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
				X	
TRAFFIC CROSSING MAJOR STREET	50	75	50	75	53
	% FULFILLED				71%

150% Satisfied: Yes ☐ No ☒

120% Satisfied: Yes ☐ No ☒

100% Satisfied: Yes ☐ No ☒

80% Satisfied: Yes ☐ No ☒

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on minor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both minor streets, (2) heaviest through from minor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.

Signal Warrant Calculation

Major Street: **Essa Road**

Minor Street: **Mabern Street**

Comment: **Future Total (2031) Traffic Condition**

Number of Approaches: 1 ☐ 2 ☒

Tee Intersection Configuration: Yes ☒ No ☐

Flow Condition: Free Fv (Rural) ☐ Restricted Flow (Urban) ☒

VOLUME	AM	PM	FACTOR *	
1A - All	1,430	1,819	n/a	813
1B - Minor	220	142	25%	91
2A - Major	1,210	1,677	25%	722
2B - Cross	150	129	25%	70

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% Satisfied: Yes ☐ No ☒ Warrant for new intersection with forecast traffic

120% Satisfied: Yes ☐ No ☒ Warrant for existing intersection with forecast traffic

100% Satisfied: Yes ☐ No ☒ Warrant for existing intersection with existing traffic *

COMBO 80% Satisfied: Yes ☐ No ☒ Warrant for existing intersection with existing traffic

80% Satisfied: Yes ☒ No ☐

* Consider full underground provisions if 100% for forecast traffic

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
ALL APPROACHES	480	720	600	900	813
	% FULFILLED				90%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
MINOR STREET APPROACHES	180	255	180	255	91
	% FULFILLED				36%

150% Satisfied: Yes ☐ No ☒

120% Satisfied: Yes ☐ No ☒

100% Satisfied: Yes ☐ No ☒

80% Satisfied: Yes ☐ No ☒

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
MAJOR STREET APPROACHES	480	720	600	900	722
	% FULFILLED				80%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
TRAFFIC CROSSING MAJOR STREET	50	75	50	75	70
	% FULFILLED				93%

150% Satisfied: Yes ☐ No ☒

120% Satisfied: Yes ☐ No ☒

100% Satisfied: Yes ☐ No ☒

80% Satisfied: Yes ☒ No ☐

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on minor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both minor streets, (2) heaviest through from minor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.